BOOK NO.
1180

THE

# JOURNAL

OF THE

# BOMBAY NATURAL HISTORY SOCIETY.

EDITED BY

W. S. MILLARD,

R. A. SPENCE and N. B. KINNEAR.

1913-14

## VOL. XXII.

*Consisting of Five Parts and containing Twelve Coloured Plates, Fifty-nine Lithographed Plates, Diagrams and Maps and Fifty-four Blocks.*

*Dates of Publication.*

| | |
|---|---|
| Part I (*Pages* 1 *to* 218) ... ... ... ... ... ... ... ... | 21*st April*, 1913. |
| II (*Pages* 219 *to* 418) ... ... ... ... ... ... ... ... | 30th *Sept.*, 1913. |
| III (*Pages* 419 *to* 652)... ... ... ... ... ... ... ... | 20*th Dec.*, 1913. |
| IV (*Pages* 653 *to* 823)... ... ... ... ... ... ... ... | 31*st Mar.*, 1914. |
| V (*Index, &c.*) ... ... ... ... ... ... ... ... | 10*th July*, 1914. |

Bombay:

PRINTED AT THE TIMES PRESS.

505.0954.792
PHI

ACC. No. 771
19/12/06

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# ERRATA.

## COMMON BUTTERFLIES OF THE PLAINS.

The numbers in form of the species should be changed as follows:—

| | | | | | | |
|---|---|---|---|---|---|---|
| Vol. XXI, | page 1145, | Leptosia xiphia | from | 87 | to | 97 |
| „ | „ 1148, | Delias hierta | „ | 88 | „ | 98 |
| „ | „ 1149, | Delias eucharis | „ | 89 | „ | 99 |
| „ | „ 1151, | Prioneris sita | „ | 90 | „ | 100 |
| „ | „ 1153, | Anaphæis mesentina | „ | 91 | „ | 101 |
| Vol. XXII, | „ 92, | Pieris brassicæ | „ | 92 | „ | 102 |
| „ | „ 93, | Pieris canidia | „ | 93 | „ | 103 |
| „ | „ 93, | Pieris glauconome | „ | 94 | „ | 104 |
| „ | „ 94, | Synchloe lucilla | „ | 95 | „ | 105 |
| „ | „ 95, | Huphina nerissa | „ | 96 | „ | 106 |
| „ | „ 98, | Huphina remba | „ | 97 | „ | 107 |
| „ | „ 320, | Ixias pyrene | „ | 98 | „ | 108 |
| „ | „ 326, | Ixias marianne | „ | 99 | „ | 109 |
| „ | „ 328, | Ixias nola | „ | 100 | „ | 110 |
| „ | „ 331, | Appias libythea | „ | 101 | „ | 111 |
| „ | „ 333, | Appias zelmira | „ | 102 | „ | 112 |
| „ | „ 334, | Appias hippo | „ | 103 | „ | 113 |
| „ | „ 338, | Appias indra | „ | 104 | „ | 114 |
| „ | „ 339, | Appias albina | „ | 105 | „ | 115 |
| „ | „ 340, | Appias leis | „ | 106 | „ | 116 |
| „ | „ 341, | Appias wardi | „ | 107 | „ | 117 |
| „ | „ 517, | Catopsilia crocale | „ | 108 | „ | 118 |
| „ | „ 526, | Catopsilia pyranthe | „ | 109 | „ | 119 |
| „ | „ 522, | Catopsilia florella | „ | 110 | „ | 120 |
| „ | „ 523, | Terias venata | „ | 111 | „ | 121 |
| „ | „ 524, | Terias læta | „ | 112 | „ | 122 |
| „ | „ 525, | Terias libythea | „ | 113 | „ | 123 |
| „ | „ 527, | Terias hecabe | „ | 114 | „ | 124 |
| „ | „ 530, | Terias silhetana | „ | 115 | „ | 125 |

Termites from British India, Part II—

PLATE E, FIGS. 1, 2 & 3 AND PLATE F, FIGS. 4, 5 & 6.

For *Odontotermes bengalensis* read *Odontotermes bangalorensis.*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Page | 243, | line | 16 | for | Naia | *read* | Naja. |
| „ | 245 | „ | 51 | „ | a hood mark | *read* | no hood mark. |
| „ | 253 | „ | 34 | „ | vermine | *read* | Vermin. |
| „ | 255 | „ | 2 | „ | pieces | „ | juices. |
| „ | 271 | „ | .. | „ | *Dentaïdæ* | read | *Dentaliidæ.* |
| „ | 271 | „ | .. | „ | *Caduceus* | „ | *Cadulus.* |
| „ | 277 | „ | 6 | „ | *Melcioniscus* | „ | *Helcioniscus.* |
| „ | 277 | „ | 8 | „ | „ | „ | „ |
| „ | 397 | „ | 15 | „ | 5 | „ | 3 |
| „ | 404 | „ | 25 | „ | cuncate | „ | cuneate. |
| „ | 550 | „ | 34 | „ | uinti | „ | until. |
| „ | 550 | „ | 35 | „ | vivarnal | „ | vivarium. |
| „ | 558 | „ | 36 | „ | thn | „ | the |
| „ | 550 | „ | 37 | „ | quiverede | „ | quivered. |
| „ | 553 | „ | 39 | „ | entoza | „ | ectozoa. |
| „ | 554 | „ | 40 | „ | divides | „ | divide. |
| „ | 556 | „ | 33 | „ | find | „ | finds. |
| „ | 556 | „ | 29 | „ | albined | „ | albino. |
| „ | 634 | „ | 37 | „ | anal 21″ | „ | anal 2″. |
| „ | 770 | „ | 25 | „ | January 1913 | „ | June 1913. |
| „ | 794 | „ | 27-28 | „ | delete "a particularly....11½ lbs." | | |

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Venour, Major W. E. ... .. ... Kohat.

Whitehead, Major J. H. ... ... ... Mandalay.
Whitworth, G. C. ... ... ... *Europe.*
Wroughton, R. C. (F.Z.S.) ... ... ... *Europe.*

Yerbury, Col. J. W. ... ... ... *Europe.*

## MEMBERS.

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Bombay Veterinary College, The Principal ... Bombay.
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Brooke, A. S. ... ... ... ... Dehra Ismail Khan.
Brooke, R. H. ... ... ... ... Bombay.
Broughton, Capt. T. D. (R.E.) ... ... ... Darjeeling
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Browning, C. S. ... ... ... ... Ferozepur
Browning, G. E. (M.I.C.E.) ... ... ... Trichoor.
Brunlees, L. H. ... ... ... ... Lahore.
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Budd, Col. N. A. H. ... ... ... Bolarum Deccan.
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Bulkley, H. G. ... ... ... ... Thana.
Bulkley, W. W. ... ... ... .. *Europe.*
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Burkill, I. H. (M.A.) .... ... ... Singapore.
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Burne, Capt. L. E. L. ... ... ... Mogok.
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Burns, Dr. W. ... ... ... ... Poona.

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Bute, The Most Hon'ble Marquis of (*Life Member.*) *Europe.*
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Curror, John ... ... ... ... S. Syihet.
Cursetji, Khan Bahadur C. M. (*Life Member*) ... Bombay.
Cutch, H. H. Sir Shri Kengurji Sawai Bahadoor, the Rao Saheb of (G.C.I.E.) (*Life Member*) ... Bhuj, Cutch.

D'Abreu, E. A. ... ... ... ... Nagpur.
D'Albedyhll, C. C.... ... ... ... *Europe.*
DaCunha, Miss Olivia .. ... ... Bombay.
Dallaporta, J. N. ... ... ... ... Bombay.
Dalrymple-Hay, Mrs. L. ... ... ... Trichinopoly.
Daly, The Hon'ble Col. Sir Hugh (K.C.I.E., C.S.I.) Bangalore
Dames, Felix L. ... ... ... ... Germany.
Danson, J. W. W. ... .. ... *Europe.*
Dannehl, Dr. H. ... ... ... ... Bombay.
Darjeeling, The Vice-President, Natural History Museum ... ... ... ... Darjeeling.
Dastur, J. F. ... ... ... ... Pusa, Bengal.
Datia, H. H. the Maharaja Lokendra Govind Singh, Bahadur ... ... ... ... Datia, C. I.
Datta, Dr. D. N. P. (M. D.) ... ... ... Gurgaon.
Daukes, Capt C. T. ... ... ... Kashmir.
Davidson, J. ... ... ... ... *Europe.*
Davidson, Major J. (I.M.S., D.S.O.) (*Life Member*) ... Dehra Dun.
Davidson-Houston, Major C. E. D. ... ... Quetta.
Davidson, Norman ... ... ... ... Thazi, Burma.
Davidson, H. M. M. ... ... ... Behali P.O., Assam.
Davies, H. J. (F.G.S.) ... ... ... Burma.
Davison, A. ... .. ... ... Raipur.
Dawkins, C. G. E. (I.F.S.) ... ... ... Pyinmana, Burma.
Dawson, W. G. ... ... ... ... *Europe.*

Dawson, W. H. (I.C.S.) (*Life Member*) ... ... *Europe.*
Deakin, Mrs. M. E. ... ... ... Bombay.
Deane, Dr. A. H. ... ... ... ... *Europe.*
Deane, H. H. (C.E.) ... ... ... Bombay.
Deane, N. B. ... ... . . Rangoon.
De Carteret, St. G. ... ... ... Agra, U. P.
DeCruz, A. M. ... ... ... ... Bombay.
DeRhe-Philipe, G. W. V. (F.R.S.) ... ... Bombay.
DeSouza, A. B. ... ... ... ... Sholapur.
Delmé-Radcliffe, Capt. A. ... ... ... Poona.
Delmé-Radcliffe, Lt.-Col. H. ... ... *Europe.*
Delany, M. F. ... ... ... ... Bombay.
Dempster, Capt. G. H. ... ... ... Rawalpindi.
Denso, W. ... ... ... ... Bombay.
Deputy Director of Agriculture, Burma ... Mandalay.
deSa, Dr. V. P. (L.M. & S.) ... .. ... Goa.
Devas, A. E. ... ... ... ... *Europe.*
Dew, Major A. B. ... ... ... Mastung.
Dewar, D. (I.C.S.) ... ... ... ... Philibhit, U. P.
Dewar, F. (I.C.S.) ... ... ... ... Balaghat, C. P.
Dewes, Lt.-Col. F. J. (I.M.S.) ... ... ... Myingyan.
Dhar, H. H. The Raja of (K.C.S.I.) (*Life Member*)... Dhar, C. I.
Dharamdas Tribhuvandas Varjivandas, Sir ... Bombay.
Dharwar, The Principal Training College for men.. Dharwar.
Dhunjibhoy Bomanji (*Life Member*) ... ... Bombay.
Director of Agriculture, Bombay ... ... Poona.
Director of Agriculture, F. M. S. . ... .. Kuala Lumpur.
Director of Land Records & Agriculture, E. B. & Assam ... ... ... ... Shillong.
Dixey, Revd. Mr. Duncan (C.M.S.) ... ... Sibi, Baluchistan.
Dixit, D. L. (B.A.) ... ... ... ... Poona.
Dobbs, H. R. C. (I.C.S., C.I.E.) ... ... Quetta.
Dobbs, J. G. ... ... ... ... Raichur.
Dobbs, W. E. J. (I.C.S.) ... ... ... *Europe.*
Dodgson, J. (I.F.S.) ... ... ... .. *Europe.*
Dodgson, R. C. ... ... ... ... Sialkote.
Dodsworth, P. T. L. (F.Z.S. M.B.O.U.) ... ... Simla.
Donaghey, J. O. B.... ... ... ... Bangalore.
Donald, C. D. ... ... ... ... Rangoon.
Donald, C. H. ... ... ... ... Simla.
Donald, J. (I.F.S.) ... ... ... ... Dehra Dun.
Donaldson, Lionel ... ... ... ... Dharamsala Punjab.
Donovan, Lt.-Col. C. (I.M.S.)... ... ... Madras.
Dow H. (I.C.S.) .. ... ... ... *Europe.*
Dowlay, F. M. ... ... ... ... Bezwada.
Downing, A. K. Weld ... ... ... Coonoor, Nilgiris.
Doyle, James ... ... ... ... Balaghat, C. P.
Dracott, C. H. ... ... ... ... Gangtok.

Drake-Brockman, Major D. H. ... ... Lansdowne, Garhwal, U. P.
Drake-Brockman, D. L. (I.C.S.) ... ... Jhansi, U. P.
Drake-Brockman, E. C. (I.C.S.) ... ... Bhagalpur.
Drake-Brockman, Lt.-Col. H. E. (I.M.S., F.Z.S.) (*Life Member*) ... ... ... ... Bombay.
Drake-Brockman, Lt.-Col. V. G. (I.M.S.) ... *Europe.*
Dreckmann, Rev. F. (S.J.) ... ... ... Bombay.
Drummond, J. R. (B.A., F.L.S.) ... ... Europe.
DuBoulay, The Hon'ble Sir J. H. (I.C.S., K.C.I.E.) ... Simla.
Dubash, K. D. ... ... ... ... Bombay.
Duff, A. C. (I.C.S.) ... ... ... ... Mercara, Coorg.
Duke, A. H. ... ... ... ... Siam.
Duggan, E. M. (C.B.) ... ... ... Bombay.
Dumayne, Sir F. G. ... ... ... *Europe.*
Dunbar-Brander, A. A. (I.F.S.) ... ... Chikalda.
Dunlop, Mr. R. W. L. (C.I.E.) ... ... Bombay.
Dunn, C. W. (I.C.S.) ... ... ... Rangoon.
Dunn, Dr. J. J. F. ... ... ... ... Delhi.
Dunsterville, Col. K. S. (R.A.) ... ... ... *Europe.*
Dunsterville, Lt.-Col. L. C. ... ... ... Jhelum.
Durant, J. L. ... ... ... ... Hasimara.
Durie, G. A. ... ... ... ... Rangoon, Burma.
Durie, T. E. (R.F.A.) ... ... ... Cawnpore.
Duxbury, Major C. D. (*Life Member*) ... ... Mhow.
Dwane, E. H. ... ... ... ... Secunderabad.
Dwane, F. C. ... ... ... ... Deccan.
Dwane, H. M. ... ... ... ... Madras.
Dwane, Major J. W. ... ... ... *Europe.*
Dyer, Lt.-Col. R. E. ... ... ... Hongkong.
Dyson, Lieut.-Col. T. E. (I.M.S.) ... ... Maymyo.

Ebden, J. W. ... ... ... ... Shillong.
Eccles, P. (I.C.S.) ... ... ... ... *Europe.*
Economic Botanist to Government, U. P. ... Cawnpore.
Ede, F. J. (A.M.I.C.E.) ... ... ... Silchar, Cachar.
Edwards, W. N. ... ... ... ... Majuligarh, Assam.
Egerton, Sir Bryan (K.C.I.E.) ... ... ... Hyderabad, Deccan.
Elgee, Major J. W. L. ... ... ... .. Malta.
Elliot, Capt. C. H. ... ... ... ... *Europe.*
Elliott, A. (C.I.E.) ... ... ... ... *Europe.*
Elliott-Lockart, Lt.-Col. P. C. ... ... Mardan.
Elliott, R. E. A. (I.C.S.) ... ... ... *Europe.*
Ellis, E. V. (I.F.S.) ... ... ... Tharrawaddy.
Ellis, R. H. (I.C.S.) ... ... ... ... Mercara, Coorg.
Ellis, S. F. ... ... ... ... Hyderabad, Sind.
Eltoft, H. A. ... ... ... ... Bombay.
Elwes, G. F. W. ... ... ... Siam.

Elwes, H. J. (F.R.S.) ... ... ... *Europe.*
Emanuel, A. E. L. (I.C.S.) ... ... ... Alibagh.
Emblen, H. ... .. ... ... Cachar.
English, E. E. ... ... ... ... Bombay.
Enthoven, The Hon'ble Mr. R. E. (I.C.S., C.I.E.) ... Simla.
Ernaculam College, The Principal ... ... Ernaculam, Cochin State.

Evans, Evan ... ... ... ... Dibrugarh, Assam.
Evans, Geoffrey (B.A.) ... ... ... Hoshangabad, C. P.
Evans, Col. G. H. (I.C.V.D., F.L.S., C.I.E.) ... Rangoon.
Evans, Major G. P. ... ... ... *Europe.*
Evans, T. M. ... ... ... ... Bombay.
Evans, Lt. T. W. D. ... ... ... Rawalpindi.
Evans, Capt. W. H. (R.E.) ... ... ... Simla.
Evans, Capt. W. K. ... ... ... *Europe.*
Evans, Wm. ... ... ... Bombay.
Everard, L. E. C. ... ... ... ... *Europe.*
Evershed, John ... .. ... ... Kodaikanal.

Fagan, Major B. ... ... ... ... Imphal, Manipur.
Fagan, H. R. ... ... ... ... Rangoon.
Fairbank, Rev. H. ... ... ... ... Ahmednagar.
Falkiner, Dr. J. M. ... ... ... ... *Europe.*
Farr, E. T. C. ... ... ... ... Ceylon.
Farrell, R. C. (I.F.S.) ... ... ... Aurangabad.
Farrington, Sir H. A., Bart. (I.F.S.) ... ... *Europe.*
Fatehsingrao of Akalkote, H. H. Raja ... ... Kirkee.
Fawcett, E. B. ... ... ... ... Port Blair.
Fayrer, Major F. D. S. (I.M.S.) ... ... Bombay.
Fell, G. B. H. (C.I.E., I.C.S.) ... ... Rangoon.
Fendall, C. E. ... ... ... ... Bussahir State, Simla District.

Fenton, Col. L. L. ... ... ... ... *Europe.*
Fenton, Capt. L. S. ... ... ... Gyantse.
Ferrar, Capt. M. L. (I.A.) ... ... ... Kulu.
Ferry, E. ... ... ... ... ... Benares.
Field, Frank ... ... ... ... Indore, C. I.
Field, W. P. ... ... ... ... Jalpaiguri.
Filson, J. T. W. ... ... ... ... *Europe.*
Finlay, Sir C. Kirkman ... ... ... *Europe.*
Firth, L. B. ... ... ... ... ... Calicut.
Fischer, C. E. C. (I.F.S.) ... ... ... Coimbatore.
Fisher, W. D. (I.F.S.) ... ... ... *Europe.*
Fitz-Gerald, Capt. C. A. G. ... ... ... *Egypt.*
Fitz-Gerald, W. J. ... ... ... Gwalior.
Fitz-Gibbon, Lt. F. (R.A.) ... ... ... Jubbulpore.
Fleming, Major A. M. (I.M.S.) ... ... Jubbulpore.
Fletcher, T. Bainbrigge (F.E.S.) ... ... Pusa.

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|---|---|
| Florence, James ... ... ... | ... Calcutta. |
| Flower, Capt. S. S. ... ... | ... *Egypt.* |
| Flynn, A. A. ... ... ... | ... Karachi. |
| Forbes, Alister ... ... ... | .. *Europe.* |
| Forbes-Sempill, The Hon'ble R. A. ... | ... *Europe.* |
| Forsham, R. ... ... ... | ... Bombay. |
| Forster, T. W. (B.F.S.) ... ... | ... Tharrawaddy. |
| Forsyth, Dr. W. ... ... ... | ... *Europe.* |
| Foster, C. B. ... ... ... | ... Ambala. |
| Foster, Capt. R. (I.A.) ... ... | ... Mussoorie. |
| Foster, R. Guy ... ... ... | ... Sallebile P. O. |
| Foster, Capt. R. T. ... ... ... | ... *Europe.* |
| Foulkes, George F. T. (I.F.S.) ... | ... Manantoddy. |
| Foulkes, R. ... ... ... | ... Madura. |
| Foulkes, Major T. H. (I.M.S.) (*Life Member*) | ... Madras. |
| Fountaine, Miss M. E. (F.R.S.) ... | ... *Europe.* |
| Fowle, F. C. ... ... ... | ... Bengal. |
| Francies, H. F. (R.G.A.) ... ... | ... Rangoon. |
| Francis, R. F. ... ... ... | ... Jullundur |
| Fraser, D. ... ... ... | ... Bombay. |
| Fraser, D. de M. S. ... ... | ... Shiraz, Persian Gulf. |
| Fraser, Capt. F. C. (I.M.S., M.D., F.L.S.S.) | ... *Europe.* |
| Fraser, Prof. J. N. ... ... | ... Bombay. |
| Fraser, J. S. ... ... ... | ... Madras. |
| Fraser, the Hon'ble Mr. S. M. (I.C.S., C.I.E.) | ... Hyderabad. |
| Fraser, S. G. G. ... ... ... | ... Belgaum. |
| Fraser, Capt. W. J. (I.M.S.) ... ... | ... Chindwara. |
| Fraser, W. S. ... ... ... | ... Ajmer, Rajputana. |
| Frederick, Capt. E. B. ... ... | ... *Europe.* |
| French, H. A. L. ... .. ... | ... Karachi. |
| Frere, Capt. A. G. ... .. ... | ... Madras. |
| Friedlander, F. L. ... ... ... | ... Insein. |
| Friedlander and Sohn, Messrs. R. ... | ... *Europe.* |
| Frizelle, Major J. ... ... ... | ... Lahore. |
| Fry, John T. ... ... ... | ... Bombay. |
| Fulton, Major H. T. (D.S.O.) (*Life Member*) | ... New Zealand. |
| Fyson, Prof. P. F. ... ... | ... *Europe.* |
| Gairdner, K. G. ... ... ... | ... Bangkok. |
| Gale, A. C. ... ... ... | ... Dharwar. |
| Gale, Capt. B. (I.M.S. ... ... ... | ... Peshawar. |
| Gale, Major E. S. ... ... ... | ... Maymyo. |
| Gales, R. R. ... ... ... | ... Calcutta. |
| Gallie, H. H. ... ... ... | ... Moulmein. |
| Gammie, Prof. G. A. (*Life Member*) ... | ... Kirkee. |
| Garbett, C. C. (I.C.S.) ... ... | ... Lahore. |

Gardyne, Major A. D. G. ... ... ... Cairo.
Garrett, H. B. G. (I.F.S.) ... ... ... Bangkok.
Garrett, R. S. ... ... ... ... *Europe.*
Gaye, W. C. ... ... ... ... *Europe.*
Gatherer, Capt. R. G. T. ... ... ... Bhamo, Burma.
Gebbie, F. St. J. ... ... ... ... Karachi.
George, C. P. ... ... ... ... Secunderabad.
Gerhardt, Paul ... ... ... ... *Europe.*
Gervers, Major F. R. S. ... ... ... Dagshai.
Gharpurey, Capt. K. G. (I.M.S.) ... ... Bombay.
Ghosal, J. (I.C.S.) ... ... ... ... Kaira.
Giberne, H. D. ... ... ... ... Kindat.
Gibson, E. C. (I.C.S.) ... ... ... Akola.
Gibson, R. E. (I.C.S.) ... ... ... Poona.
Gibson, W. R. (F.R.C.S., L.R.C.P.) ... ... Madras.
Gilbert, C. C. ... ... ... ... Ceylon.
Gilbert, C. E. L. (I.F.S.) ... ... ... *Europe.*
Gilbert, R. N. ... ... ... ... Dongri P. O.
Gilbert-Cooper, W. J. (I.F.S.) ... ... ... Kado, Moulmein.
Giles, G. W. ... ... ... ... Trichinopoly.
Gilchrist, G. W. ... ... ... ... Bombay.
Gill, Capt. C. A. (I.M.S.) ... ... ... Rawalpindi.
Gill, C. G. ... ... ... ... Amritsar.
Gill, H. ... ... ... ... Cachar.
Gillespie, Major R. S. (R.E.) ... ... ... Secunderabad.
Gillett, Capt. E. S. (A.B.D.) ... ... ... Simla.
Gillum, S. J. ... ... ... ... Calcutta.
Gimlette, Lt.-Col. G. H. D. (C.I.E., I.M.S.) ... *Europe.*
Gimson, C. (I.C.S.) ... ... ... ... Habiganj.
Girard, George ... ... ... ... Calcutta.
Girvin, Lt.-Col. J. (R.A.M.C.) ... ... ... *Europe.*
Gladstone, H. S. (F.Z.S., F.R.S.E.) ... ... *Europe.*
Glascock, L. C. (M.V.O.) ... ... ... Gurdaspur.
Glasson, J. W. (I.C.S.) ... ... ... Kodaikanal.
Gleadow, F. (F.R.M.S.) ... ... ... *Europe.*
Gloster, Major J. H. (I.M.S.) ... ... ... *Europe.*
Godber, Rev. John ... ... ... ... Calcutta.
Godfrey, E. J. (B.SC) ... ... ... *Europe.*
Godson, Capt. C. A. (I.M.S.) ... ... ... Dacca.
Goldsmith, Dr. B. K. ... ... ... Bombay.
Goldsmith, H. A. ... ... ... ... Rewah, C. I.
Goll, E. A. ... ... ... ... Bombay.
Gombert, Rev. F. (S.J.) ... ... ... Trichinopoly.
Gonsalves, A. F. (*Life Member*) ... ... Bandra.
Gordon, D. M. ... ... ... ... Keng Tung, S. Shan States.
Gordon, R. G. (I.C.S.) ... ... ... *Europe.*
Gordon-Ralph, J. B. ... ... ... *Europe.*

Gore, F. W. ... ... ... ... *Europe.*
Gore, Dr. S. N. (L.M.S.) ... ... ... Agra.
Gough, Lt.-Col. C. H. ... ... ... *Europe.*
Gough, Major H. (L.A.) ... ... ... *Europe.*
Gould, B. J. (I.C.S.) ... ... ... Sikkim.
Gourju, P. E. ... ... ... ... Berhampur.
Gover, A. A. ... ... ... ... Bangalore.
Graf, J. ... ... ... ... ... Bombay.
Grafton-Wignall, J. D. ... ... ... Nowshera.
Graham, A. K. ... ... ... ... *Europe.*
Graham, C. T. ... ... ... ... Rangoon.
Graham, D. N. (*Life Member*) ... ... *Europe.*
Graham, Capt. G. F (I.M.S.) ... ... ... *Europe.*
Graham, Capt. G. H. I. ... ... ... Ajmer.
Graham, J. A. ... ... ... ... Mercara, Coorg.
Graham, L. (I.C.S.) ... ... ... ... Rajkot.
Graham, R. J. D. (M.A.) ... ... ... Nagpur, C. P.
Graham Roe, E. W. ... ... ... *Europe.*
Graham, Hon'ble Mr. W. L. ... ... ... Bombay.
Grant, F. A. ... ... ... ... Bhamo, Burma.
Grimely, F. H. ... ... ... ... Calcutta.
Gray, Chas. ... ... ... ... Coonoor.
Gray, P. B. ... ... ... ... *Europe.*
Greaves, H. R. ... ... ... ... Bombay.
Greaves, S. E. ... ... ... ... *Europe.*
Green, E. Ernest (F.E.S.) ... ... ... *Europe.*
Green, James ... ... ... ... *Europe.*
Green, Lt.-Col. J. S. (R.A.M.C.) ... ... Bangalore.
Greener, W. J. ... ... ... ... Charanpur.
Greer, Major F. A. ... ... ... ... Quetta.
Greer, R. F. (I.C.S.) ... ... ... ... Rangoon.
Greer, W. (I.C.S.) ... ... ... ... *Europe.*
Gregory, Major C. ... ... ... ... Ootacamund.
Gregory, R. V. ... ... ... ... Purna, Deccan.
Gregson, Capt. C. D. ... ... ... Bangalore.
Gregson, E. G. (C.I.E.) ... ... ... *Europe.*
Gregson, T. S. ... ... ... ... Bombay.
Greig, Major W. B. ... ... ... ... Nowshera.
Grey, W. A. P. ... ... ... ... Burma.
Gribbon, M. C. ... ... ... ... Quetta.
Grigson, P. St. J. B. ... ... ... Rangoon.
Grieve, F. C. L. (R.H.A.) ... ... ... Mhow, C. I.
Grönvold, H. ... ... ... ... *Europe.*
Gross, Carl ... ... ... ... Rangoon.
Grubbe, Major E. A. ... ... ... *Europe.*
Gupta, B. Sen ... ... ... ... Fakiragram, Dhubri.
Gupta, Basat Lal (B. SC.) ... ... ... Lucknow.

Gurdon, Lt.-Col. B. E. M. ... ... ... Patiala.
Gut, J. ... ... ... ... ... Andheri.
Gwyer, C. (I.F.S.) ... ... ... ... Thayetmyo.

Habibuddin, S. (N.C.S.) (*Life Member*) ... ... Hyderabad, Deccan.
Hacker, K. ... ... ... ... Papun.
Hadow, Capt. H. R. ... ... ... Loralai.
Haffenden, Ed. D. H. ... ... ... Rangoon.
Haig, Major N. W. ... ... ... Muttra.
Haigh, P. B. (I.C.S.) ... ... ... Satara.
Hale, Lt.-Col. C. H. (R.A.M.C.) ... ... Kamptee, C. P.
Haldane, C. H. ... ... ... ... Mandalay.
Hamburg Natural History Museum ... ... Hamburg.
Hamer, Thruston ... ... ... ... Ceylon.
Hamid, A. Ali ... ... ... ... Hyderabad, Sind.
Hamilton, A. G. ... ... ... ... *Europe.*
Hamilton, J. D. (B.F.S.) ... ... ... Sandoway.
Hamilton, W. S. (I.C.S.) ... ... ... Lahore.
Hainpson, Sir George F., Bart. (F.L.S., F.E.S.) ... *Europe.*
Hankin, A. C. (C.S.I., C.I.E.) ... ... ... Secunderabad.
Hanhart, S. ... ... ... .. Bombay.
Hankin, Dr. E. H.... ... ... ... Calcutta.
Hannay, A. L. (I.C.S.) ... ... ... Waltair.
Hannyngton, F. (I.C.S.) ... ... ... *Europe.*
Hannyngton, W. O. ... ... ... Shwebo, Burma.
Harcourt, Major J. S. M. ... ... ... Dehra Dun.
Hardie, Dr. Geo. W. ... ... ... *Europe.*
Hardy, G. S. (I.C.S.) ... ... ... Bombay.
Hargreaves, C. K. ... ... ... ... Taungoo.
Harington, Major H. H. ... ... ... Peshawar.
Harington, Col. V. (I.M.S.) ... ... ... *Europe.*
Harkness, Miss L. ... ... ... ... Bombay.
Harman, S. H. ... ... ... ... Tavoy.
Harold, Major C. F. ... ... ... Wadhwan.
Harper, E. W. (F.Z.S.) ... ... ... Africa.
Harris, H. R. ... ... .. .. Bombay.
Harris, Capt. O. M. (R.H.A.) ... .. ... Trimulgherry.
Harris, W. ... ... ... ... Gauhati.
Harrison, A. J. ... ... ... ... *Europe.*
Harrison, Major C. B. (I.M.S.) ... .. Bellary.
Harrison, Major C. F. ... ... ... Tavoy.
Harrison, C. H. (I.C.S.) ... ... ... Nilgiris.
Harrison, R. T. (A.M.I.C.E.) ... ... *Europe.*
Harrold, W. ... ... ... ... Abu Road.
Hart, E. H. ... ... ... .... *Europe.*
Hart, G. S. (C.I.E.) ... ... .. Nagpur, C. P.
Harter, R. W. ... ... ... ... Bombay.
Hartshorne, J. F. B. (I.C.S.) ... .. Satara.

Harvey, Major W. F. (I.M.S.) ... ... Kasauli.
Haslam, R. E. ... ... ... ... Travancore.
Haslehust, H. M. ... ... ... ... Belgaum.
Hasted, H. R. G. ... ... ... ... Chittoor.
Hassels-Yates, Capt. G. A. (R.G.A.) .. ... Quetta.
Hatchell, D. G. ... ... ... ... *Europe.*
Hate, Prof. Vinayek N. ... ... ... Bombay.
Haughton, Capt. H. L. ... ... ... China.
Hauxwell, T. A. (I.F.S.) ... ... ... *Europe.*
Hawes, C. G. ... ... ... ... Bhartghar, *via* Bhor.
Hawley, Capt. W. G. B. ... ... ... Quetta.
Hay, E. Alan ... ... ... ... *Europe.*
Hay, E. F. A. ... ... ... ... Pyinmana.
Hay, Capt. G. W. ... ... ... ... *Europe.*
Hayden, H. H. (C.I.E.) ... ... ... Calcutta.
Hayne, A. R. H. ... ... ... ... Bombay.
Hazlewood, Miss M. ... ... ... ... Rangoon.
Hearn, E. S. ... ... ... ... Meerut.
Headlam, Comdr. E. James (R.I.M.) ... ... Bahrein, P. Gulf.
Hearsey, C. H. ... ... ... ... Burma.
Hearsey, T. N. (I.F.S.) ... ... ... Pollikonda.
Heath, R. H. (C.E.) ... ... ... ... Sabarmati.
Hector, G. P. (M.A., B.SC.) .. ... ... Dacca.
Henderson, Capt. H. D. ... ... ... Imphal, Manipur.
Henderson, G. S. ... ... ... ... Mirpurkhas, Sind.
Henderson, W. L. ... ... ... ... Rangoon.
Hepburn, W. ... ... ... ... Rangoon.
Herbert, E. G. ... ... ... ... Bangkok.
Herbert, H. P. ... ... ... ... Madagascar.
Herbert, V. A. ... ... .. ... Almora.
Heron, F. A. ... ... ... ... Punjab.
Heseltine, Capt. J. E. N. ... ... ... Jubbulpore, C. P.
Hewson, R. B. ... ... ... ... Jalna.
Heyder, H. M. ... ... ... ... Ambala.
Heygate, Col. R. H. G. (D.S.O.) ... ... *Europe.*
Hichens, G. W. ... ... ... ... Rangoon.
Hickman, R. St. J. .. ... ... Cachar.
Hickey, B. S. ... ... ... ... Champarun.
Hide, P. (*Life Member*) .. ... ... Indore.
Higgins, H. A. ... ... ... ... Hatikhira, Sylhet.
Higgins, J. C. (I.C.S.) ... ... ... Imphal, Manipur.
Higginson, G. R. ... ... ... ... Fatehgarh.
Hignell, S. R. (I.C.S.) ... ... ... Purulia.
Hiley, A. C. (I.F.S.) ... ... ... Belgaum.
Hill, Rev. E. E. (M.A.) ... ... ... *Europe.*
Hill, Hon'ble Mr. Claude H. (I.C.S., C.I.E., C.S.I.)... *Europe.*
Hill, E. W. ... ... ... ... Ceylon.
Hill, G. S. ... ... ...

Hill, Capt. R. D. O. (*Life Member*) ... ... Chitral.
Hingston, Capt. R. W. (I.M.S.) ... ... Abbottabad.
Hitchcock, R. H. ... ... ... ... *Europe.*
Hoare, H. J. (I.C.S.) ... ... ... *Europe.*
Hobart, R. C. (I.C.S.) ... ... ... *Europe.*
Hodding, G. H. Kakima ... ... ... Bengal.
Hodgins, R. D. Scoble ... ... ... Travancore.
Hodgson, Capt. M. R. K. ... ... ... *Europe.*
Hodgson, Hon'ble Mr. H. P.... ... ... *Europe.*
Hojel, Lt.-Col. J. G. (I.M.S.) ... ... ... *Europe.*
Holden, Major H. N. ... ... ... Jaipur.
Hole, R. S. (I.F.S.) ... ... ... ... Dehra Dun.
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Holme, A. T. (I.C.S.) ... ... ... Ajmer.
Holme, H. B. (I.C.S.) ... ... ... *Europe.*
Holmes, H. R. ... ... ... ... Kamptee, C. P.
Holmes, J. F. ... ... ... ... Bilaspur.
Hood, A. F. ... ... ... ... Mogok, Burma.
Homfray, Jeston ... ... ... ... Calcutta.
Hoosein Belgrami, The Hon'ble Mr. Syed Nawab Imud-ul-Mulk Bahadoor (C.S.I.) ... ... Hyderabad, Deccan.
Hope, A. J. R. ... ... ... ... Taunggyi, Burma.
Hopwood, J. C. ... ... ... ... Kindat, Burma.
Hopwood, S. F. (I.F.S.) ... ... ... Maymyo, U. Burma.
Horsfall, G. L. ... ... ... ... Ceylon.
Hosken, A. Fayrer... ... ... ... Secunderabad.
Hoste, R. D. ... ... ... ... *Europe.*
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Howell, E. B. ... ... ... .. *China.*
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Howlett, Capt. A. W. (I.M.S.) ... ... *Europe.*
Howlett, F. M. (M.A., F.E.S.) ... ... ... Pusa.
Hoyos, Count E. (*Life Member*) ... ... Austria.
Hudson, Lt.-Col. C. T. (I.M.S.) ... ... Dharwar.
Hudson, Major C. (D.S.O., I.M.S.) ... ... Bangalore.
Hudson, C. W. M. (I.C.S.) ... ... ... Godhra.
Hudson, Major J. H. ... ... ... Maymyo.
Hudson, E. H. (A.M.I.C.E.) ... ... ... Jalna, Deccan.
Huggins, J. R. ... ... ... ... *Europe.*
Hughes, Capt. F. L. ... ... ... Waziristan.
Hughes, T. O. ... ... ... ... *Europe.*
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Hume, H. R. ... ... ... ... Ahmedabad.
Humphrys, Capt. F. H. ... ... ... Charsadda.

Hundley, G. ... ... ... ... Mepale.
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Hunt, Dr. E. H. ... ... ... ... Secunderabad.
Hunt, Capt. F. W ... ... ... ... Sialkot.
Hunter, W. H. ... ... ... ... *Europe.*
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Husbands, Capt. G. S. (I.M.S.) ... ... Lahore.
Husbands, J. E. (I.C.S.) ... ... ... Poona.
Hutchins, B. R. ... ... ... ... Shwegyin.
Hutchinson, Major F. H. G. (I.M.S.) ... ... Poona.
Hutchinson, J. C. ... ... ... ... Almora.
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Hutton, C. I. ... ... ... ... Ywataung.
Hyam, Judah (G.B.V.C., F.Z.S.) (*Life Member*) ... Pusa, Bengal.
Hyde-Cates, Lt.-Col. G. E. ... ... ... *Europe.*
Hyderabad, The Librarian, State Library ... Hyderabad, Deccan.

Ichalkaranji, The Hon'ble Meherban Narayen Govind *alias* Babasaheb Ghorpade, Chief of (*Life Member*) ... ... ... ... Kolhapur.
Idar, Maharaj Kunwar Major Dowlatsing, A.-D.-C. (*Life Member*) .. ... ... ... Mahi Kanta.
Imperial Library, The Librarian ... ... Calcutta.
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Inglis, Chas. M. (*Life Member*) ... ... Durbhanga.
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Inspector of Schools, Surma Valley & Hill Dists... Cachar, Assam.
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Jackson, Lt.-Col. Thos. (I.M.S.) ... ... Bombay.
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James, Aston ... ... ... ... *Europe.*
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James, Capt. F. H. ... ... ... *Europe.*
James, Mrs. Leslie... ... ... ... Mandalay.
Jamkhandi, Shrimant Parashram Ramchandra Patwardhan, The Chief of (*Life Member*) ... Kolhapur.
Jamsetji M. Doctor (C.M.Z.S.)... ... ... Bombay.
Janjira, H. H. Sir Sidi Ahmed Khan (K.C.I.E.) Nawab of (*Life Member*) ... ... ... Janjira.
Janson, V. T. ... ... ... ... Bombay.
Jardine, A. J. A. (D.S.P.) ... ... ... Rangoon.
Jardine, M. R. ... ... ... ... Bombay.
Jardine, W. E. (I.C.S., C.I.E.) ... ... Baroda.
Jayakar, M. S. (M. A.) ... ... ... Bombay.
Jeddere-Fisher, H. C. ... ... ... *Europe.*
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Jenkin, R. Trevor ... ... ... ... Saugor, C. P.
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Jenkins, J. B. ... ... ... ... Sukkur.
Jenkyns, H. H. (I.C.S.) ... ... ... Sialkot.
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Jermyn, Col. T. ... ... ... ... *Europe.*
Jesse, William ... ... ... ... Meerut.
Johnson, W. E. C. ... ... ... ... *Europe.*
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Johnston, S. E. ... ... ... ... Toungoo.
Johnstone, J. W. D. (C.I.E.) ... ... ... *Europe.*
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Joly, P. B. ... ... ... ... China.
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Jones, C. P. G. ... ... ... ... Burma.
Jones, Lt.-Col. F. W. C. (R.A.M.C.) ... ... Quetta.
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Jones, R. T. ... ... ... ... Peshawar.
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Jones, Dr. W. D. ... ... ... ... Kyankse, U.Burma.
Jouguet, H. ... ... ... ... Delhi.
Julius, V. A. ... ... ... ... Colombo.
Jukes, J. E. C. (I.C.S.) ... ... ... Ahmedabad.

Kagal, Meherban Piraji Rao Bapu Saheb Ghote, Chief of (*Life Member*) ... ... ... Kagal, S. M. C.
Karachi, Victoria Museum, The Curator ... Karachi, Sind.
Kashmir, Rajkumar, Hari Singh of ... ... Ajmere.
Kauffman, Oscar ... ... ... ... *Europe.*
Kealy, E. H. (I.C.S.) ... ... ... *Europe.*
Keddie, D. L. ... ... ... ... Thamakhan.

Keddie, J. F. ... ... ... ... Raheng, Siam.
Kelly, B. P. ... ... ... ... Maymyo.
Kelly, Major C. R. (R.G.A.) ... ... ... *Europe.*
Kelly, Capt. E. D. F. ... ... ... *Europe.*
Kelsall, Major H. J. (R.A.) ... ... ... *Europe.*
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Kemball, H. L. ... ... ... ... Gurgaon, Punjab.
Kemball, H. V. (C.E.) ... ... ... *Europe.*
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Kenrick, Major W. H. (I.M.S.) ... ... Khandwa.
Keogh, A. D. ... ... ... ... Narayenganj.
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Kerr, H. R. ... ... ... ... Rangoon, Burma.
Kerr, Nigel ... ... ... ... Bombay.
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Khan, Muncherji Framji (*Life Member*) ... Bombay.
Khareghat, M. P. (I.C.S.) ... ... ... Bombay.
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Kilkelly, Major P. P. (I.M.S.) ... ... *Europe.*
Kilner, Dr. J. N. (M.B.) ... ... ... Adra.
King Edward Library, the Hon. Secretary ... Rawalpindi.
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Kingston, A. H. ... ... ... ... Bombay.
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Kinloch, A. P. ... ... ... ... Nilambur P. O.
Kinloch, Victor ... ... ... ... Klang, F. M. S.
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Kirkness, L. H. ... ... ... ... *Europe.*
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Kirwan, Neol G. B. ... ... ... Birur.
Kitson, Commander H. (R. N.) ... ... East Indies Station.
Knowles, A. B. (I.C.S.) ... ... ... Amraoti Camp.
Knowles, E. D. ... ... ... ... Manbhoom.
Knowles, Major G. ... ... ... ... Sangor.
Knapton, Major H. A. F. (I.M.S.) ... ... Poona.
Knyvett, Capt. W. A. ... ... ... *Europe.*
Koechlin, M. C. ... ... ... ... Munaar.
Kolhapur, H. H. the Maharaja Sir Shahu Chhatrapati (G.C.S.I., G.C.V.O., G.C.I.E.) (*Life Member*) ... Kolhapur.

Kotah, H. H. the Maharaja Sir Umed Sing, Bahadoor (K.C.S.I., G.C.S.I.) (*Life Member*)... ... Kotah.
Kunhardt, Capt. J. C. G. (I.M.S.) ... ... Bombay.
Kurth, C. ... ... ... ... Bassein.
Kushal Pal Singh, Raja ... ... Kotla, Agra Dist.
Kynaston, E. ... ... ... *Europe.*

Lace, E. W. ... ... ... ... Madras.
Lace, John H. (C.I.E., F.L.S.) ... ... ... *Europe.*
Lahore, Curator, Central Museum ... ... Lahore.
Lahore Punjab Veterinary College, The Principal.. Lahore.
Laird-MacGregor, E. G. L. (I.C.S.) ... ... Calcutta.
Lake, E. A. W. ... ... ... ... Bombay.
Lamb, The Hon'ble Sir R. A. (I.C.S., K.C.S.I., C.I.E.) Poona. (*Life Member*).
Lambert, G. B. (I.C.S.) ... ... ... Bijnor, U. P.
Lane, E. ... ... ... ... Koderma P. O.
Lane, H. S. ... ... ... ... *Europe.*
Lane, Major W. H. ... ... ... Bombay.
Langford, Capt. E. G. (R.F.A.) ... ... Jubbulpore.
Laughton, G. A. ... ... ... ... Kolaba.
Larkana, Ma'rassatul-Islam, The Principal ... Larkana, Sind.
Laurie, A. S. (P.W.D.) ... ... ... Waltair.
Laurence, T. R. ... ... ... ... Bombay.
Lawrence, Revd. F. (C.M.S.) ... ... ... *Europe.*
Lawton, W. ... ... ... ... Rangoon.
Leach, F. B. ... ... ... ... Rangoon.
Lean, R. ... ... ... ... Madras.
Learoyd, G. E. D. ... ... ... ... Rawalpindi.
Leckie, Capt. O. T. M. ... ... ... Baroda.
Lecky, R. ... ... ... . Vizianagram.
Lee, Capt. A. J. (I.M.S.) ... ... ... Aurangabad.
Lee, Major A. W. H. ... ... ... *Europe.*
Lee, D. H. (*Life Member*) ... ... ... *Europe.*
Lee, Lt.-Col. F. ... ... ... ... *Europe.*
Lees, John ... ... ... ... *Europe.*
LeMesurier, H. P. (C.E.) ... ... ... Vizagapatam.
Lemarchand, J. R. ... ... ... Kookila Mook, Assam.
Lea-Wilson, Rev. H. W. ... ... ... Bombay.
Leeson, G. W. ... ... ... ... Goalundo.
Leete, F. A. (F.C.H., I.F.S.) ... ... ... Tharrawaddy.
Lefroy, H. Maxwell (M.A., F.E.S., F.Z.S.) ... *Europe.*
Leftwich, C. G. (I.C.S.) ... ... ... Bombay.
Legard, Chas. ... ... ... ... *Europe.*
Leonard, Capt. W. H. ... ... ... Bombay.
Leslie, Major G. A. J. (R.E.) ... ... Jullunder.
Leslie, M. ... ... ... ... Bombay.

Leslie, Capt. Norman ... ... ... Calcutta.
Levett-Yeats, G. A. (I.S.O.) ... ... ... *Europe.*
Levinge, Hon'ble Mr. E. V. (C.S.D., I.C.S.) ... Ranchi.
Lewin, Capt. E. O. ... ... ... ... Bombay.
Ley, A. H. (I.C.S.) ... ... ... ... Calcutta.
Librarian, Students' Library, St. Xaviers' College. Bombay.
Light, Major W. A. ... ... ... *Europe.*
Lightfoot, S. St. C. ... ... ... Loikaw, Burma.
Lilburn, W. ... ... ... ... Lucknow.
Limaye, S. P. ... ... ... ... Bijapur.
Lindley, E. S. (C.E.) ... ... ... Rasul.
Lindsay-Smith, Major J. (I. A.) ... ... Multan.
List, John N. ... ... ... ... Rangoon, Burma.
Lister, R. S. ... ... ... ... Ghoom, D.-H. Ry.
Liston, Major W. G. (I.M.S., C.I.E.) ... Bombay.
Little, E. ... ... ... ... ... Kirkee.
Little, F. D. ... ... ... ... *Europe.*
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Lloyd, J. B. ... ... ... ... Calcutta.
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Lloyd, Capt. R. A. (I.M.S.) ... ... ... Bilaspur.
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Logan, Capt. R. O. ... ... ... ... *Europe.*
Logan Home, Capt. W. M. ... ... ... Nowshera.
Lomas, H. A. (I.C.S.) ... ... ... Gonda.
Long, G. R. (I.F.S.) (*Life Member*) ... ... Rangoon.
Long, Major W. C. ... ... ... Coimbatore.
Lory, F. B. P. (M.A.) ... ... ... Dharwar.
Lovegrove, W. H. (I.F.S.) ... ... ... Jummoo.
Lovell, E. H. (R.A.) ... ... ... Calcutta.
Lowis, Hon'ble Mr. J. R. F. ... ... ... Bettiah.
Lowis, Major R. M. ... ... ... Dera Ghazi Khan.
Lowndes, G. R. ... ... ... ... *Europe.*
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Lowson, Major C. S. (I.M.S.) ... ... ... Poona.
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Lucas, E. N. A. ... ... ... ... Bellary.
Lucas, Col. T. J. R. (C.B.) ... ... ... *Europe.*
Lucas, The Hon'ble Mr. W. H. (I.C.S.) ... ... Karachi.
Luck, W. H. ... ... ... ... *Europe.*
Lucknow, The Curator, Provincial Museum ... Lucknow.
Lucknow Public Library, The Honorary Librarian. Lucknow.
Ludlow, F. ... ... ... ... Karachi.
Luffman, M. A. ... ... ... ... Camilla, Tippera.
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Luke, K. J. ... ... ... ... Akhaura.
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Lushington, P. M. (I.F.S.) ... ... ... *Europe.*
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Lyall, Capt. R. A. ... ... ... ... Parachinar.
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Macdonald, K. C. (D.S.P.) ... ... ... Maymyo.
Mac Ewen, Lt.-Col. D. L. ... ... ... Poona.
MacFadden, R. R. ... ... ... Bilaspur.
MacGregor, J. A.... ... ... ... Jalarpet.
MacGregor, Capt. R. F. D. (I.M.S.) .. Bombay.
MacIlvaine, Miss Anne ... ... ... *New Jersey, U.S.A.*
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Mackenzie, Colin A. ... ... ... Ootacamund.
Mackenzie, J. M. D. (I.F.S.) ... ... ... Kindat Burma.
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Macphail, G. ... ... ... ... *Europe.*
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Madan, F. R. ... ... ... Kurnool.
Maddock, Major E. C. G. (I.M.S.) ... ... Ahmednagar.

Madras Forest College, The Principal ... ... Coimbatore.
Madras, The Librarian, Govt. Central Museum ... Madras.
Madras, The Principal, Presidency College ... Madras.
Madras, The Professor of Zoology, Christian College. Madras.
Magrath, Lt.-Col., H. A. F. ... ... ... Kohat.
Mahaluxmiwalla, C. D. ... ... ... Bombay.
Mahomedbhoy Currimbhoy Ebrahim ... ... Bombay.
Mahon, E. L. ... ... ... ... Pollibetta.
Main, T. F. ... ... ... ... Poona.
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Maltby, C. M. ... ... ... ... Bombay.
Manavadar, Khan Shree Fatehdinkhan, Chief of (*Life Member*) ... ... ... ... Kathiawar.
Manders, Lt.-Col. N. (A.M.D., F.Z.S., F.E.S.) (*Life Member*) ... ... ... ... Egypt.
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Mann, Dr. H. H. ... ... ... ... Poona.
Mann, T. H. ... ... ... ... *Europe.*
Manners-Smith, Lt.-Col. J. (V.C., C.I.E., C.V.O.) ... Nepal.
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Marshall, Lt.-Col. T. E. (R.A.) ... ... *Europe.*
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Martin, L. K. ... ... ... ... Chanda.
Martin, S. J. ... ... ... ... Binsar.
Martindell, H. E. W. ... ... ... Maymyo, Burma.
Masani, A. M. (*Life Member*) ... ... ... Baroda.
Mason, C. W. ... ... ... ... *Europe.*
Masson, The Hon'ble Sir D. P. (K.C.I.E.) ... Lahore.
Massy, Capt. W. J. ... ... ... Falam, Chin Hills, Burma.
Maung, Po Bye (K.S.M. & F.R.G.I.) ... ... Myaung-Mya.
Maunsell, Capt. E. C. C. (I.M.S.) ... ... Cochin.
Maxwell, Lt.-Col. J. (R.F.A.) ... ... ... Jubbulpore.
Maxwell, Major L. L. ... ... ... Saugor, C. P.
Maxwell, R. M. (I.C.S.) ... ... ... Karwar, Kanara.
Maxwell, Capt. W. F. (R.L.) ... ... ... Ambala.
Mayes, W. ... ... ... ... Abbottabad.
Mayne, Major H. B. (R.G.A.) ... ... ... Quetta.
McCarrison, D. L. (D.S.P.) ... ... ... *Europe.*

McCleverty, G. M. ... ... ... ... Dehra Dun.
McComas, H. ... ... ... ... Shajahanpur.
McCormack, Dr. H. ... ... ... Nahan, Punjab.
McCrie, C. M. (I.F.S.) ... ... ... Dehra Dun.
McCudden, Capt. J. H. ... ... ... Poona.
McDiarmid, K. ... ... ... ... *Europe.*
McDonald, Capt. E. J. C. (I.M.S.) ... ... Assam.
McDonald, J. ... ... ... ... *Europe.*
McGlashan, John (C.E.) ... ... ... Calcutta.
McIlwrick, L. ... ... ... ... Bombay.
McIntosh, Alex. (C.E.) ... ... ... Trichinopoly.
McKerral, A. ... ... ... ... Insein, Burma.
McMahon, Col. The Hon. Sir A. H. (K.C.I.E., C.B., V.O., C.S.I.). ... ... ... ... Buldana, Berar.
McNeale, J. H. ... ... ... ... Buldana, Berar.
McNeill, J. (I.C.S.) ... ... ... ... Delhi.
McPherson, Major G. (I.M.S.)... ... ... Bombay.
McRae, A. D. ... ... ... ... Rangoon.
Mead, P. J. (I.C.S.) ... ... ... ... Ahmednagar.
Mears, Major A. (I.A.) ... ... ... Calcutta.
Meek, Br. D. ... ... ... ... Cachar.
Meikle, H. G. W. ... ... ... Delhi.
Meinertzhagen, Capt. R. ... ... ... Quetta.
Mellor, J. E. M. ... ... ... ... *Europe.*
Mendoza, V. A. ... ... ... ... Bombay.
Menezes, Hector ... ... ... ... Bombay.
Menon, K. G. ... ... ... ... Trichoor, Cochin.
Mercer, A. W. ... ... ... ... Phillaur, Punjab.
Mercer, D. ... ... ... ... Bombay.
Merrikin, M. S. ... ... ... ... Burma.
Mess President, R. A. Mess ... ... ... Bombay.
Mess President, R. A. Mess ... ... ... Roorkee.
Mess Secretary, R. A. Mess ... ... ... Cambellpore.
Mess Secretary, R. A. Mess ... ... ... Meerut.
Mess Secretary, R. A. Mess ... ... ... Trimulgherry.
Mess Secretary, R. A. Mess ... ... ... Jhansi.
Mess President, The King's Liverpool Regiment, 2nd Battln. ... ... ... Lahore Cantonment.
Mess President, Leicestershire Regt. ... ... Ranikhet.
Mess President, 1st Connaught Rangers ... Ferozepore.
Mess President, The 1st Border Regiment ... Mayamyo.
Mess President, 1st Battalion, The Royal Scots ... Allahabad.
Mess Secretary, 5th Ammunition Column, R. F. A. Deesa.
Mess President, 6th Jat. Light Infantry ... Secunderabad.
Mess President, 7th Hussars ... ... ... Bangalore.
Mess President, XI K. E. O. Lancers ... ... Delhi.
Mess Secretary, 18th Infantry ... ... Dera Ismail Khan.
Mess President, 41st Dogras ... ... ... Bareilly.

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| Mess President, 42nd Deoli Regiment ... | ... Rajputana. |
| Mess President, 44th Merwara Infantry | ... Ajmer. |
| Mess President, 45th Rattray's Sikhs ... | ... Dera Ismail Khan |
| Mess President, 52nd Sikhs ... ... | ... Bannu. |
| Mess Secretary, 58th Rifles. ... ... | ... Quetta. |
| Mess Secretary, 59th Scinde Rifles ... | ... Jullundur. |
| Mess President, 62nd Punjabis ... | ... Cawnpore. |
| Mess President, 64th Pioneers ... | ... Mandalay. |
| Mess Secretary, 74th Punjabis, Book Club | ... Lucknow. |
| Mess President, 86th Carnatic Infantry | ... St. Thomas Mount. |
| Mess Secretary, 87th Punjabis ... | ... Jhelum. |
| Mess President, 90th Punjabis ... | ... Nasirabad. |
| Mess President, 101st Grenadiers ... | ... Bangalore. |
| Mess President, 103rd Mahratta Lt. Infy. | ... Ahmednagar. |
| Mess Secretary, 109th Infantry ... | ... Aden. |
| Mess President, 110th Mahratta L. Infantry | ... Belgaum. |
| Mess President, 117th Marathas ... | ... Poona. |
| Mess President, 122nd Infantry ... | ... Kohat. |
| Mess Secretary, 39th C. I. Horse ... | ... Agar, Malwa. |
| Mess Secretary, R. I. M. S. "Dufferin" | ... Bombay. |
| Messent, P. G. (C.I.E., C.E.) ... ... | ... *Europe.* |
| Metcalfe, J. G. E. ... ... ... | ... Bombay. |
| Meyer, Carl ... ... ... | ... Rangoon. |
| Meyer, O. ... ... ... | ... Bombay. |
| Meyrick, E. (F.R.S.)... ... ... | ... *Europe.* |
| Millard, W. S. (F.Z.S.) (*Life Member*) ... | ... Bombay. |
| Miller, A. C. ... ... ... | ... Belgaum. |
| Miller, W. A. H. ... ... ... | ... Belgaum. |
| Millett, Hon'ble Mr. G. P. (I.F.S.) ... | ... Poona. |
| Mills, J. D. (*Life Member*) ... ... | ... *Europe.* |
| Milner, C. E. ... ... ... | ... Rangoon. |
| Milner-Moore, D. ... ... ... | ... Abu Road. |
| Milroy, A. J. W. ... ... ... | ... Gauhati. |
| Milward, R. C. (I.F.S.) ... ... | ... Chakratta. |
| Minns, Mrs. H. C. ... ... | ... Rangoon. |
| Miraj, Shrimant Gungadhar Rao Ganesh, *alias* Babasaheb Patwardhan, Chief of (*Life Member*).. | Miraj. |
| Mitchell, F. J. ... ... ... | ... Kashmir. |
| Mitchell, R. St. J. ... ... ... | ... Nanded Dn. |
| Mitchell, H. H. G. ... ... ... | ... Madras. |
| Mockler, Major G. F. ... ... | ... *Europe.* |
| Mody, Bomanji Edulji ... ... | ... Surat. |
| Moggridge, C. B. ... ... ... | ... Pyinmana. |
| Mohun Shumshere Jung Bahadur, General | ... Nepal. |
| Molesworth, Capt. A. L. M. ... ... | ... Shillong. |
| Mollison, J. (C.I.E.) ... ... ... | ... *Europe.* |
| Montagnon, D. J. ... ... | ... Sylhet. |
| Monté, Dr. D. A. de (L.M. & S.) ... | ... Bandra. |

Monteath, G. (I.C.S.) (*Life Member*) ... ... Karwar.
Monteath, J. (I.C.S.) ... ... ... Bombay.
Montgomerie, A. (I.C.S.) ... ... ... *Europe.*
Montgomerie, C. W. E. (I. C. S.) ... ... Jubbulpore.
Montgomery, Miss E. A. ... ... ... Broach.
Montmorency, G. F. de (I. C. S.) ... ... Delhi.
Montresor, Capt. L. B. (R.F.A.) ... ... *Europe.*
Moore, J. ... ... ... ... Korapat.
Moore, T. D. ... ... ... ... Bombay.
Moore, W. G. ... ... ... ... Maymyo.
Morgan, Capt. R. R. ... ... ... Calcutta.
Morris, Major A. H. (R.A.M.C.) ... ... *Europe.*
Morris, A. P. (B.Sc.) ... ... ... Insein.
Morris, Major D. O. ... ... ... *Europe.*
Morris, Major G. M. ... ... ... Rawalpindi.
Mosse, Capt. A. H. E. (*Life Member*) ... ... Aden.
Motilal Vallabhji ... ... ... ... Bombay.
Moule, Capt. H. E. ... ... ... Falam, Burma.
Mowbray, G. B. De... ... ... ... Maskeliya, Ceylon.
Moylan, W. M. ... ... ... ... Nasik.
Moysey, E. L. (I.C.S.) ... ... ... Dharwar.
Mudhol, Shrimant Malojirao Raje Ghorpade, Chief of ... ... ... ... Mudhol, S. M. C.
Muir, G. B. F. (I.C.S.) ... ... ... Karwi, Banda Dist.
Mullan, J. P. (M.A.) ... ... ... Bombay.
Muller, C. H. A. ... ... ... ... Quetta.
Müller, Professor O. V. ... ... ... Bombay.
Mulings, C. T. ... ... ... ... Rajahmundry.
Mullins, Bt.-Col. W. B. ... ... ... *Europe.*
Mulraj, Lala ... ... ... ... Quetta.
Mumford, J. ... ... ... ... *Europe.*
Mundy, B. H. H. (F.R.G.S.) ... ... ... Bombay.
Mundy, N. S. ... ... ... ... Silchar, Cachar.
Munn, Leonard ... ... ... ... Hyderabad, Deccan.
Murdoch, F. ... ... ... ... Jalpaiguri.
Murison, Major C. C. (I.M.S.) ... ... Bombay.
Murphy, Dr. R. A. ... ... ... Dibrugarh.
Murphy, E. J. ... ... ... ... Monywa, U.Burma.
Murray, Capt. A. D. ... ... ... Quetta.
Murray, A. G. ... ... ... ... Munnar, S. I.
Murray, Lt. J. Wolfe (R. N.) ... ... *Europe.*
Murray, Capt. J. H. (I.M.S.) ... ... ... Bombay.
Murray, R. A. C. ... ... ... ... Agra.
Murray, S. B. (P.W.D.) ... ... ... Madras.
Musgrave, Major A. D. (R.F.A.) ... ... Neemuch.
Muspratt, Lt.-Col. F. C. ... ... ... Bombay.
Mysore, Agricultural Chemist ... ... Bangalore.

Mysore, The Superintendent, Mysore Government Museum ... ... ... ... Bangalore.
Mysore, H. H. the Maharaja Krishna Raj Woodayar Bahadoor (G.C.S.I.) (*Life Member*) ... ... Mysore.

Nadgir, Dr. Y. G. (M.S.) ... ... .. Bombay.
Nahar Singh of Bedla, Rao ... ... ... Bedla near Udaipur.
Nanavati, D. D., (I.C.S.) ... ... ... Rangoon.
Nangle, Major M. C. ... ... ... Rangoon.
Napier, A. G. Fitz. (M.SC., A.M., I.C.E.) ... ... Rangoon.
Napier, Capt. A. H. (I.M.S.) ... ... ... Alipore.
Naraenji Dwarkadas (*Life Member*) ... ... Bombay.
Narrotumdas Morarji Goculdass (*Life Member*) ... Bombay.
Nash, H. J. ... ... ... ... Ajmere.
Nasrulla Khan, H. H. Nawab Mahomed ... Bhopal, C. I.
Neale, Capt. W. G. (I.A.) ... ... ... Bombay.
Needham, J. E. ... ... ... Bombay.
Nene, Sadashive Sitaram ... ... ... Sangamner, Ahmednagar Dist.
Nevill, Capt. G. A. ... ... ... ... Tezpur, Assam.
Nevill, Humphry ... ... ... ... Lahore.
Nevill, T. N. C. ... ... ... *Europe.*
Newcome, Lionel ... ... ... ... Shanivarsante P.G.
Nichol, Col. C. E. (D.S.O., R.A.M.C.) ... ... Calcutta.
Nicholetts, W. A. ... ... ... ... Assam.
Nicholls, W. A. ... ... ... ... Campbellpore.
Nicholson, the Hon'ble Mr. E. F. (F.Z.S.) ... Bombay.
Nicholson, Capt. E. H. ... ... ... Jamalpore.
Nicholson, E. M. F. ... ... ... Bombay.
Nisbett, Major W. G. ... ... ... Benares.
Nisbet, R. H. ... ... ... ... Siam.
Nixon, Capt. F. B. ... ... ... ... *Europe.*
Nizam's College, The Librarian ... ... Hyderabad, Deccan.
Norman, Capt. A. C. ... ... ... Assam.
Norman, Major H. H. (R.A.M.C.) ... ... *Europe.*
Noyce, F. (I.C.S.) ... ... ... ... Simla.
Nurse, Lt.-Col. C. G. (F.R.S.) (*Life Member*) ... *Europe.*
Nuttall, W. M. ... ... ... ... Dibrugarh.

Oakley, R. R. ... ... ... ... Ceylon.
Oberholser, H. C. ... ... ... ... Washington, U.S.A.
O'Brien, Major Edward ... ... ... Kolhapur, S.M.C.
O'Brien, Capt. H. C. H. ... ... ... *Europe.*
O'Brien, P. ... ... ... ... Mirpurkhas, Sind.
O'Callaghan, T. P. M. ... ... ... Sadiya.
O'Connell, Dr. J. M. ... ... ... *Europe.*
O'Donel, H. V. ... ... ... ... Alipur, Duars.
O'Donnell, O. ... ... ... ... *Europe.*

O'Nash, E. ... ... ... ... Calcutta.
Ogilvie, A. W. (I.F.S.) ... ... ... Prae, Siam.
Ogilvie, G. H. (I.F.S.) (*Life Member*) ... ... Burma.
Ogilvy, W. ... ... ... ... *Europe.*
Okeden, W. P. ... ... ... ... Rangoon.
Oliphant, J. ... ... ... ... *Europe.*
Oliphant, J. N. ... ... ... ... Kheri Lakimpur.
Oliver, A. W. L. ... ... ... ... Sydney.
Oliver, Lt.-Col. L. G. ... ... ... Allahabad.
Olivier, Col. H. D. (R.E., F.Z.S.) (*Life Member*) ... *Europe.*
Ollenbach, O. C. ... ... ... ... Dehra Dun, U. P.
Orchha, H. H. the Raja Bhagvunt Singji ... Tikumgarh, Bundelkhund.
Ormiston, W. ... ... ... ... *Europe.*
Orr, Capt. H. M. C. ... ... ... *Europe.*
Orr, J. P., Hon'ble Mr. (I.C.S., C.S.I.) ... ... Bombay.
Osmaston, A. E. (I.F.S.) ... ... ... Garhwal.
Osmaston, B. B. (I.F.S.) ... ... ... *Europe.*
O'Sullivan, Col. D. (R.A.M.C.) ... ... *Europe.*
Owen, W. Tudor (I.C.S.) ... ... ... Junagadh.
Oxley, Capt. J. C. S. (I.M.S.) ... ... ... Chanda.

Paddison, G. F. (I.C.S.) ... ... ... Madras.
Page, A. J. (I.C.S.) ... ... ... ... Nyaunglebin.
Page, W. G. ... ... ... ... *Europe.*
Page, W. T. (F.Z.S.) ... ... ... *Europe.*
Paget, B. C. T. ... ... ... ... *Europe.*
Painter, H. L. (I.C.S.) ... ... ... Bombay.
Palanpur, Nawab Zada Paley Mahomed Khan ... Palanpur.
Palmer, W. L. (I.F.S.) ... ... ... Siam.
Panday, Mrs. J. L. ... ... ... Bombay.
Panna, H. H. the Maharaja Mohendra Yadvendra Singh Bahadur ... ... ... Ajmer.
Pargeter, C. E. ... ... ... ... *Europe.*
Parish, N. B. ... ... ... ... Alwar, Rajputana.
Parker, R. N. (I.F.S.) ... ... ... Lahore.
Parkin, Thomas (M.A., F.L.S., F.Z.S., M.B.O.U.) ... *Europe.*
Parnell, R. (I.F.S.) ... ... ... ... Lahore.
Parr, Major H. O. ... ... ... ... Ahmedabad.
Parrington, Capt. J. W. (R.A.) ... ... Bangalore.
Parshotumdas Vishram Maoji ... ... Bombay.
Parsons, A. A. L. (C.S.) ... ... ... Simla.
Parsons, A. E. B. ... ... ... ... Bannu, N.W.F.P.
Parsons, S. R. ... ... ... ... Buldana, Berar.
Partridge, E. A. ... ... ... ... Deccan.
Parton, F. J. ... ... ... ... Koppa P. O.
Pascoe, J. Harding ... ... ... Nilgiris.
Pasteur Institute of India, The Director ... Kasauli, Punjab.

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| Patiala, H. H. the Maharaja of (*Life Member*) | ... Patiala. |
| Patterson, C. B. ... ... ... | ... Dehra Dun. |
| Patton, Capt. W. S. (I.M.S.) ... ... | ... Madras. |
| Patuck, P. S. (I.C.S.) ... ... | ... Narsingpur. |
| Payne, R. (B.A.) ... ... ... | ... Bankipur, E. I. Ry. |
| Pearce, Major C. R. (I.M.S.) ... ... | ... Maymyo. |
| Pears, S. G. (I.C.S.)... ... ... | ... Khyber, Peshawar. |
| Pearse, Lt.-Col. J. L. ... ... | ... *Europe.* |
| Pearson, G. H. A. ... .. ... | ... Kohat. |
| Pearson, R. S. (I.F.S.) ... ... | ... Dehra Dun, U. P. |
| Pearson, Major W. B. ... ... | Karachi. |
| Peck, N. F. (I.C.S.) ... ... | ... *Europe.* |
| Peile, Major H. D. (I.M.S.) ... ... | ... Mussoorie. |
| Pendlebury, W. M. F. ... ... | ... *Europe.* |
| Pentland, The Right Hon'ble Lord (P.C., G.C.I.E.) | ... Madras. |
| Peppe, F. H. ... ... ... | ... Rawalpindi. |
| Percival, A. P. (I.F.S.) ... ... | ... *Europe.* |
| Percival, G. S. P. ... ... ... | ... Ramnad. |
| Perfect, S. R. (P.W.D.) ... ... | ... Larkana, Sind. |
| Perreau, Major G. A. ... ... | ... Punjab. |
| Peshawar Club, Ld., The Honorary Secretary | ... Peshawar, N. W. F. P. |
| Pershouse, Capt. S. ... ... | ... *Europe.* |
| Pestonji Jivanji (N.C.S.) (*Life Member*)... | ... Hyderabad, Deccan. |
| Peters, C. R. ... ... ... | ... Benares. |
| Peters, E. G. ... ... ... | ... Rosekandi, Cachar. |
| Peters, Col. C. T. (I.M.S. retd.) ... | ... Dinajpur. |
| Petit, Bomanji Dinshaw (*Life Member*)... | ... Bombay. |
| Petit, Dhunjibhoy Bomanji (*Life Member*) | ... Bombay. |
| Petit, Jehangir Bomanji (*Life Member*) | ... Bombay. |
| Petit, Phirozsha Bomanji ... ... | ... Bombay. |
| Petley, C. A. ... ... ... | ... Toungoo. |
| Phelps, Major M. P. ... ... | ... Bombay. |
| Philip, C. L. ... ... ... | ... Orissa. |
| Phillimore, Capt. R. H. (R.E.) ... | ... Maymyo. |
| Phillips, J. R. ... ... ... | ... *Europe.* |
| Phipson, H. M. (F.Z.S.) (*Life Member*)... | ... *Europe.* |
| Phythian, Adams, Lt. E. G. P. ... | ... Bhamo. |
| Pickersgill-Cunliffe, Lt. J. C. (*Life Member*) | ... *Europe.* |
| Pilcher, Col. J. G. (I.M.S.) ... ... | ... *Europe.* |
| Pile, J. ... .. ... ... | ... Secunderabad. |
| Pinfold, E. S. ... ... ... | ... Rangoon. |
| Pinhey, The Hon'ble Lt.-Col. A. F. (C.I.E.) | ... *Europe.* |
| Pipe, T. S. ... ... ... | ... Poona. |
| Pitman, C. R. S. ... ... ... | ... *Europe.* |
| Pitt, W. H. ... ... ... | ... Madras. |
| Player, H. B. ... ... ... | ... *Europe.* |
| Plunkett, P. E. ... ... ... | ... Katha, U. Burma. |

Pollard, Major A. E. St. V. ... ... ... Bombay.
Pogson, Miss E. G. M. ... ... ... Kotgarh, *via* Simla.
Pogson, Capt. F. V. ... ... ... Meerut.
Poncins, Baron Edmond de (*Life Member*) ... *France.*
Ponsonby, W. G. ... ... .. ... Purna.
Pope, J. A. (I.C.S.) ... ... ... ... Satara.
Porbandar State, The Administrator ... ... Porbandar.
Porter, A. A. ... ... ... ... Lakon, U. Siam.
Pottinger, Lt. J. A. ... ... ... Jhansi.
Pottinger, Major R. S. ... ... ... Bombay.
Powalla, Jamsetji C. ... ... ... Bombay.
Powell, Dr. A. ... ... ... ... Bombay.
Powell, J. E. ... ... ... ... Ghazipur.
Powell, J. W. ... ... ... ... Bombay.
Powell, V. N. F. ... ... ... ... Beawar.
Powell, W. S. (I.F.S.) ... ... ... Rangoon.
Praed, Capt. G. A. M. ... ... ... Nowgong.
Prall, Lt.-Col. S. E. (I.M.S.) ... ... ... Aden.
Pratt, H. C, ... ... ... ... Selangor.
Prendergast, H. H. L. ... ... ... *Europe.*
Prescott, Capt. H. B. B. ... ... ... Bombay.
Preston, F. J. ... ... ... ... Bombay.
Priestley, E. ... ... ... ... Belgaum.
Primrose, Alex. M. ... ... ... Ding Dinga.
Prince, Chas. S. ... ... ... ... Nagercoil.
Principal, Agricultural College and Research Institute ... ... ... ... Coimbatore.
Procter, Sir H. E.... ... ... ... *Europe.*
Proctor, Capt. Alfred H. (I.M.S.) ... ... Meerut.
Professor of Forestry, Oxford University ... *England.*
Punjab Agricultural College, The Principal ... Lyallpur.
Purkis, F. C. (B.F.S.) ... ... ... Rangoon.
Purkis, H. V. ... ... ... ... Madhopur.

Quin, Maj. R. P. W. ... ... ... *Europe.*
Quinlan, D. (M.R.C.V.S.) ... ... ... Ranchi.
Quinn, Dr. T. W. ... ... ... ... Drug, C. P.
Quarry, P. S. ... ... ... Jessore.

Radford, W. T. ... ... ... Bangalore.
Rae, Capt. M. E. (*Life Member*) ... ... Peshawar.
Raikes, E. B. .. ... ... ... *Europe.*
Rajkumar College, The Principal ... ... Rajkote.
Rake, B. C. ... ... .. ... Kindat, Burma.
Ralston, Capt. W. H. ... ... ... Jullundur.
Randle, H. N. ... ... ... ... *Europe.*
Rane, K. R. ... ... ... ... Juvem.
Rane, Y. K. .. ... ... ... Juvem.

Raper, J. C. D. (A.M.I.C.E.) ... ... ... Lanowli.
Ravenshaw, Col. C. W. (*Life Member*) ... ... *Europe.*
Rawalpindi Club, The Secretary ... ... Rawalpindi.
Readymoney, N. J. ... ... ... Bombay.
Rearden, T. R. ... ... ... ... *Europe.*
Rebello, Rev. João ... ... .. ... Margao, Goa.
Rector, St. Mary's College ... ... ... Mazagon, Bombay.
Reed, W. H. ... ... ... ... Kolasa P. O.
Reeve, C. F. ... ... ... ... Nasrapur.
Reid, Cecil H. (I.C.S.) ... ... ... Calcutta.
Reid, Hon'ble Mr. M. F. (C.I.E.) ... ... Bombay.
Reid, W. J. (I.C.S., C.I.E.) ... ... ... Shillong.
Riley, R. C. ... ... ... ... Balaghat, C. P.
Reilly, Capt. N. E. ... ... ... *Europe.*
Reinhold, Capt. C. H. (I.M.S.) ... ... Bombay.
Remington, G. L. ... ... ... ... Bombay.
Rendall, H. D. (I.C.S.) ... ... ... Junagadh.
Rennick, Capt. Alex. de C. ... ... Delhi.
Rennie, Thos. (I.C.V.D.) ... ... ... Rangoon.
Reynolds, Capt. D. (R.F.A.) ... ... ... Nowshera.
Reynolds, Capt. G. N. ... ... ... Saugor, C. P.
Reynolds, L. W. (I.C.S.) ... ... ... China.
Rhenius, C. E. ... ... ... ... Coconada.
Rhodes, T. M. ... .. ... ... *Europe.*
Rice, F. E. ... ... ... ... *Europe.*
Rice, H. D. ... ... ... ... *Europe.*
Richards, B. D. (B. SC.) ... ... ... *Europe.*
Richmond, R. D. (I.F.S.) ... ... ... Coimbatore.
Ritchie, A. B. ... ... ... ... Rangoon.
Robert, A. W. ... ... ... ... Ganjam.
Roberts, A. A. Lane (I.C.S.) ... ... ... Lahore, Punjab.
Roberts, Capt. A. S. B. ... ... ... *Europe.*
Roberts, Lt.-Col. Sir J. R. (I.M.S., C.I.E.) ... Simla.
Roberts, Lt.-Col. M. B. (*Life Member*) ... ... Garhwal.
Robertson, Hon'ble Sir B. (I.C.S., C.I.E., K.C.S.I.) ... Nagpur, C. P.
Robertson, J. H. (I.C.S.) ... ... ... *Europe.*
Robertson, Laurence (I.C.S.) ... ... ... Poona.
Robertson, L. V. M. (I.C.S.) ... ... ... *Europe.*
Robinson, H. C. ... ... ... Kuala Lumpur.
Robinson, H. K. (I.F.S.) ... ... ... *Europe.*
Robinson, Hon'ble Mr. Justice S. M. ... ... Rangoon.
Robinson, Major H. A. ... ... ... Bangalore.
Rocke, Capt. C. A. ... ... .. Montgomery.
Roddis, F. ... ... ... ... *Europe.*
Rodger, A. (I.F.S.) ... ... ... ... Maymyo.
Roe, F. R. (I.C.S.) ... ... ... ... Bankipore.
Rogers, A. C. ... ... ... ... *Europe.*
Rogers, C. G. (I.F.S.) ... ... ... Maymyo.

Rogers, J. B. Leslie ... ... ... *Europe.*
Rogers, Rev. K. St. A. ... ... ... Mombasa, B. E. A.
Rogers, W. S. ... ... ... ... Bombay.
Rome, Capt. H. C. ... ... ... ... Poona.
Roper, F. ... ... ... ... *Europe.*
Rorie, J. J. ... ... ... ... Bhamo, Burma.
Rose, Col. H. ... ... ... ... *Europe.*
Rosenthal, F. M. ... ... ... ... Secunderabad.
Ross, J. P. ... ... ... ... Bombay.
Ross, Major Tyrell (*Life Member*) ... ... *Europe.*
Routh, Capt. G. F.... ... ... ... Meerut.
Roughton, N. J. ... ... ... ... Khandwa.
Row, Dr. R. (M.D.) ... ... ... Bombay.
Rowlandson, B. C. .. ... ... ... Bombay.
Rowlandson, E. J. S. ... ... ... Calicut.
Roy, N. ... ... ... ... ... Dacca.
Royal Asiatic Society, The Honorary Secretary ... Bombay.
Ruddle, W. H. ... ... ... ... *Europe.*
Rudman, F. R. R. (I.C.S). ... ... .. Mandla.
Rumboll, A. C. ... ... ... ... Bombay.
Rushton, C. E. ... ... ... ... Mandalay.
Rust, P. J. (I.C.S.) ... ... ... ... Lahore.
Rutherford, W. F. ... ... ... ... China.
Ryan, J. G. ... ... ... ... Cawnpore.
Ryan, W. J. N. ... ... ... ... *Europe.*
Rylands, H. R. ... ... ... ... *Europe.*
Ryves, The Hon'ble Mr. Justice A. E.... ... Allahabad.

Sabour, The Principal, College of Agriculture ... Sabour, Bengal.
Salar Jung, H. E. The Nawab ... ... Hyderabad, Deccan.
Sale, Edward L. (I.C.S.) ... ... ... *Europe.*
Salkeld, Capt. R. E.... ... ... ... *Kismayu, British East Africa.*
Salmon, Capt. W. H. B. ... ... ... *Europe.*
Sanders, A. D. ... ... ... ... Bellary.
Sanders, J. H. (I.C.S.) ... ... ... Ahmednagar.
Sanderson, P. M. D. ... ... ... *Europe.*
Sangli, Shrimant Chintamanrao Appasaheb Patwardhan (*Life Member*) ... ... ... Sangli, S. M. C.
Saone, G. Prier De ... ... ... *Europe.*
Sarkar, Capt. S. (I.M.S.) ... ... ... Bombay.
Sarawak Museum, The Curator ... ... Kuching, Sarawak, Borneo.
Sassoon, Mrs. S. D. ... ... ... *Europe.*
Saxby, H. B. ... ... ... ... Ajmer.
Saunders, C. ... ... ... ... Calcutta.
Saunders, Capt. C. ... ... ... ... *Europe.*
Saunders, H. F. ... ... ... ... Gwalior, C. I.

Saunders, Major F. W. (R.E.) ... ... Bombay.
Savile, L. H. ... ... ... ... Bombay.
Savory, R. A. ... ... ... ... Lahore.
Scarlett, Capt. J. S. (R.H.A.) ... ... ... *Europe.*
Scindia, H. H. the Maharaja Sir Madhowrao (G.C.S.I., G.C.V.O.) (*Life Member*) ... ... Gwalior, C. I.
Schomberg, Capt. R. C. F. ... ... ... Taiping.
Schultz, Chas. S. ... ... ... ... *Europe.*
Scot, J. S. (I.F.S.) ... ... ... ... Madura.
Scott, A. G. ... ... ... ... Akola, Berar.
Scott, Edmund ... ... ... ... Ceylon.
Scott, Capt. G. B. ... ... ... ... Tochi Valley.
Scott, G. B. ... ... ... ... Ahwaz.
Scott, F. B. ... ... ... ... Hissar.
Scott, R. P. ... ... ... ... Bombay.
Scrafton, Capt. J. E. B. ... ... ... Secunderabad.
Scribner, Staff Surgeon R. B. (R.N.) ... ... *Europe.*
Scroggie, Capt. W. R. J. (I.M.S.) ... ... Mercara, Coorg.
Scroope, H. W. P. (I.C.S.) ... ... ... *Europe.*
Secunderabad Club Library, The Honorary Secretary ... ... ... ... Secunderabad.
Selby, Major W. (D.S.O., F.R.C.S., I.M.S.) ... Lucknow.
Seale, Dr. C. E. B. ... ... ... Darjeeling.
Sealy, Major A. E. ... ... ... ... Bakloh, Punjab.
Sedgwick, L. J. (I.C.S.) ... ... Ahmedabad.
Seervai, Dr. Rustom F. ... ... ... Bombay.
Seychelles, Curator, Botanic Station ... ... Seychelles.
Seton-Karr, H. W. (*Life Member*) ... ... *Europe.*
Settlement Reading Club, The Principal ... Port Blair.
Sewell, J. H. ... ... ... ... Rangoon, Burma.
Seymour Sewell, Capt. R. B. (I. M. S.) ... ... *Europe.*
Shand, J. H. B. (I.M.S.) ... ... ... Bombay.
Sharp, The Hon'ble Mr. W. H. ... ... Poona.
Sharp, The Hon'ble Mr. H. ... ... ... Delhi.
Shaw, Capt. W. S. J. (I.M.S.) ... ... *Europe.*
Shebbeare, E. O. ... ... ... ... Jalpaiguri.
Shephard, T. F. G. ... ... ... ... Bulsar.
Shepherd, Philip ... ... ... ... Quetta.
Shepherd, W. C. (I.C.S.) ... ... ... Bombay.
Shepherd, W. S. ... ... ... ... Toungoo.
Shepperson, C. J. W. ... ... ... *Europe.*
Shevade, S. V. (B. SC.) ... ... ... Poona.
Shipp, W. E. ... ... ... ... Ajmer.
Shipman, Major H. J. ... ... ... Bombay.
Shirlay, G. S. ... ... ... ... Rangoon.
Shore, H. A. ... ... ... ... *Europe.*
Shortland, C. V. N. (A.M.I.C.E.) ... ... Nagpur.
Shortt, H. E. (I.M.S.) ... ... ... Benares.

Shoubridge, H. O. (C.E.) ... ... ... *Europe.*
Shuttleworth, H. L. (M.A., F.R.G.S., I.C.S.) ... Hoshiarpur.
Silvester, C. J. ... ... ... ... Moradabad, U. P.
Simcox, A. H. A. (I.C.S.) ... ... ... Bombay.
Simonds, Capt. M. H. ... ... ... Ferozepore.
Simpson, J. Hope (I.C.S.) ... ... ... Gorakhpur, U. P.
Simson, Lt. R. ... ... ... ... Fyzabad.
Sinclair, R. L. ... ... ... ... Castle Rock.
Sind Club, The Hony. Secretary ... ... Karachi.
Sirdar Anandrao Scindia ... ... ... Gwalior, C. I.
Sitwell, Capt. N. S. H. (R.A.) ... ... ... Dum Dum.
Sitwell, S. A. H. ... ... ... ... *Europe.*
Skelton, J. H. ... ... ... ... Bombay.
Skene, G. A. ... ... ... ... Thayetmyo.
Skilling, W. ... ... ... ... Calcutta.
Skinner, C. W. ... ... ... ... Dehra Dun.
Skinner, Miss A. L. ... ... ... Kuala Lumpur.
Skinner, Capt. J. M. (I.M.S.) ... ... ... Ganjam.
Skinner, Capt. R. B. (R.E.) ... ... ... Bannu, N.W.F.P.
Slade, G. E. R. ... ... ... ... Bombay.
Slade, Rear-Admiral Sir E.J. Warre (K.C.I.E., K.C.V.O.) *Europe.*
Sladen, J. (I.C.S.) ... ... ... ... Rajkot.
Sladen, Dr. R. J. L. ... ... ... Bina.
Slater, A.F. ... ... ... ... Aligarh.
Slater, H. Kelshall ... ... ... ... Bangalore.
Slater, J. Sanders ... ... ... ... Bombay.
Smallwood, H. St. C. ... ... ... Moulmein, Burma.
Smales, Chas. B. (I.F.S.) ... ... ... *Europe.*
Smart, Dr. A. G. H. (M. B.) ... ... ... Singapore.
Smith, A. Kirke ... ... ... ... Bombay.
Smith, Capt. E. C. ... ... ... ... Miranshah.
Smith, Lt. E. Cecil ... ... ... *Europe.*
Smith, J. H. ... ... ... ... *Europe.*
Smith, J. I. (I.C.S.) ... ... ... ... Vizianagram.
Smith, Major F. A. (I.M.S.) ... ... ... Indore, C. I.
Smith, Capt. H. H. ... ... ... ... Fyzabad.
Smith, Dr. Malcolm ... ... ... Bangkok, Siam.
Smith, W. R. G. ... ... ... ... Gadag, Dharwar.
Smith, Major O. A. ... ... ... Hazaribagh.
Smith, S. D. (B.A.) ... ... ... ... Bombay.
Smith, W. J. ... ... ... ... Colombo.
Smyth, L. D. G. ... ... ... ... Katha, Burma.
Sommers, W. B. (M.B.) ... ... ... Rangoon.
Somervaille, Geo. ... ... ... ... Bassein, L. Burma.
Souter, C. A. (I.C.S.) ... ... ... Madras.
Southon, Major C. E. (I.M.S.) ... ... ... Bombay.
Spalding, Capt. W. B. ... ... ... Cawnpore.
Sparke, W. ... ... ... ... *Europe.*

Sparling, A. H. ... ... ... ... Allahabad.
Sparrow, Major R. ... ... ... ... Trimulgherry.
Spence, Dr. A. D. ... ... ... ... Rangoon.
Spence, R. A. ... ... ... ... Bombay.
Spink, H. H. M. ... ... ... Ahmednagar.
Spooner, T. J. (C.E.) (*Life Member*) ... ... Belgaum.
Sprott, F. H. ... ... ... ... Coorg.
Sprott, F. W. ... ... ... ... Bombay.
Squire, D. ... ... ... ... Madura.
Srinagar Club, The Secretary ... ... Srinagar, Kashmir.
Stables, Major Alex. (R.A.M.C.) ... ... Chikalda
Stack, Mrs. C. E. ... ... ... ... Aurangabad.
Stakelum, E. R. ... ... ... ... Bombay.
Stanbridge, Capt. W. J. ... ... ... *Europe.*
Standen, B. (I.C.S., C.I.E.) (*Life Member*) ... Pachmarhi.
Stanton, W. C. ... ... ... ... *Europe.*
Stebbing, E. P. (I.F.S., F.L.S., F.E.S., F.Z.S.) ... *Europe.*
Steel, Capt. D. (I.M.S.) ... ... ... Bombay.
Steen, Capt. R. (I.M.S.) ... ... ... *Europe.*
Steffen, O. ... ... ... ... Bombay.
Stephens, L. B. ... ... ... ... Karachi.
Stephenson, B. ... ... ... ... *Europe.*
Stevens, Herbert ... ... ... ... Nagri Spur, P. O. Sonada.
Stevenson, Capt. F. (I.M.S.) ... ... ... *Europe.*
Stevenson, Hon'ble Surg.-Genl. H. W. (I.M.S., C.S.I.). *Europe.*
Stevenson, Capt. W. D. H. (I.M.S.) ... ... *Europe.*
Stewart, C. G. ... ... ... ... Tharrawaddy, Burma.
Stewart, Dr. D B. ... ... ... ... Rangoon.
Stewart, Major G. E. (I.M.S.) ... ... Mahableshwar.
Stewart, Major G. H. (I.M.S.) ... ... Rangoon.
Stewart, John ... ... ... ... Travancore.
Stewart, Capt. J. M. ... ... ... Bombay.
Still, John ... ... ... ... Ceylon.
Stirling, J. H. ... ... ... ... Jodhpur.
Stockley, Capt. C. H. ... ... ... *Europe.*
Stockley, Capt. J. P. ... ... ... Kotra, Rajputana.
Stodart, J. C. (I.C.S.) ... ... ... Pollachi.
Stokes, I. W. ... ... ... ... Bombay.
Stone, F. H. S. ... ... ... ... Bombay.
Stoney, R. F. ... ... ... ... Madras.
Stoner, W. ... ... ... ... *Europe.*
Storey, Thos. H. ... ... ... ... Oodeypur.
Story, S. S. ... ... ... ... Bombay.
Strachan, N. J. ... ... ... ... Travancore.
Street, E. ... ... ... ... Mandalay.

Stringfellow, H. P. ... ... ... ... *Europe.*
Strong, F. W. (I.C.S.) ... ... ... Dinajpur.
Strong, R. P. W. ... ... ... ... Bombay.
Stuart, C. J. ... ... ... ... Nellore.
Stuart, G. A. D. (I.C.S.) ... ... ... *Europe.*
Stuart, J. D. ... ... ... ... *Europe.*
Stubbs, L. M. (I.C.S.) ... ... ... Mainpuri.
Subedar, Nawab Burzoji Jamsetjee ... ... Aurangabad.
Sulivan, Col. G. D. F. ... ... ... Kashmir.
Sullivan, E. H. ... ... ... ... *Europe.*
Surveyor, Dr. N. F. (M.D.) ... ... ... Bombay.
Suter, Dr. M. F. ... ... ... ... Bombay.
Sutherland, Rev. W. S. ... ... ... Kalimpong.
Sutton, A. T. C. ... ... ... ... Nizamabad.
Swinhoe, Col. C. ... ... ... ... *Europe.*
Sydenham, Lord (F.R.S., G.C.M.G., G.C.I.E., G.C.S.I.) ... *Europe.*
Sykes, C. M. (C.E.) ... ... ... ... Dwarka.
Symes, W. C. ... ... ... ... *Europe.*
Symons, H. (R.G.A.) ... ... ... ... *Europe.*
Symons, C. T. ... ... ... ... Colombo.

Talbot, A. D. ... ... ... ... Multan.
Talbot, G. W. ... ... ... ... Bombay.
Talbot, W. A. (I.F.S.) ... ... ... Kirkee.
Tambe, Dr. Gopal Ramchandra (M.A., B.SC., L. M. & S.). Indore, C. I.
Tanner, Lt.-Col. C. O. O. ... ... ... Karachi.
Taskar, T. J. (I.C.S.) ... ... ... Ootacamund.
Tata, Sir Dorabji J. *(Life Member)* ... ... Bombay.
Tata, Ratan *(Life Member)* ... ... ... *Europe.*
Tate, A. R. W. ... ... ... ... Peshawar.
Taylor, Capt. E. C. (I.M.S.) ... ... ... Parachinar.
Taylor, Capt. J. (I.M.S.) ... ... ... Bombay.
Taylor, James H. ... ... ... ... *Europe.*
Taylor, L. E. (A.M. I.C.E.) ... ... ... Madras.
Taylor, H. W. O. (B.SC., A.M.I.C.E.) ... ... Satara.
Taylor, J. N. ... ... ... ... Mergui.
Tejpal, Goverdhandas Goculdas *(Life Member)* ... Bombay.
Tenison, Lt. W. P. C. (R.F.A.) ... ... *Europe.*
Tessman, H. ... ... ... ... Bombay.
Tew, G. C. (I.C.S.) ... ... ... ... Pyinmana.
Thom, W. S. ... ... ... ... Paletwa, Arracan Hill Tracts.
Thomas, E. F. (I.C.S.) ... ... ... Madras.
Thomas, M. P. ... ... ... ... Chandpur.
Thomasset, H. P. ... ... ... ... Seychelles.
Thomason College, The Principal ... ... Roorkee.
Thompson, Miss A. ... ... ... ... Betul, C. P.
Thompson, Major W. G. (R.F.A.) ... ... *Europe.*

Thompson. R. H. E. (I.F.S.) ... ... ...*Europe.*
Thomson, Major D. B. ... ... ...*Europe.*
Thomson, F. P. ... ... ... ...Shwegyin.
Thomson, Lt.-Col. Henry (I.M.S.) ... ...Calcutta.
Thomson, R. D. (C.S.) ... ...Montgomery.
Thomson, Capt. W. M. (I.M.S.) ... ...Chaubattia, U. P.
Thomson-Glover, J. W. ... ... ...Rawalpindi.
Thornhill, Lt.-Col. Sir H. B. (K.C.I.E.) ... ...*Europe.*
Thornton, Capt. F. E. ... ... ...*Europe.*
Thornton, H. A. (I.C.S.) ... ... ...Lashio, Shan States.
Thorus-Roberts, J. W. B. ... ... ...Kindat.
Thring, Lt.-Col. R. H. D. ... ... ...*Europe.*
Thruston, L. A. ... ... ... ...Mandalay.
Thubron, J. B. S. ... ... ... ...Aden.
Thuillier, Major H. F. (R.E.) ... ... ...Ahmednagar.
Thullier, Capt. L. C. (I.A.) ... ... ...Bombay.
Thurn, Count ... ... ... ...Calcutta.
Tibbs, Rev. P. G. ... ... ... ...Bombay.
Tilly, T. H. *(Life Member)* ... ... ...Canada.
Tipper, G. H. (B.A.) ... ... ...Calcutta.
Tod, Alex. M. ... .. ... ...Bombay.
Tomkins, Major E. L. (R.A.) ... ... ...Jubbulpore.
Tomlinson, Capt. W. Paget, 7th Hussars ...Bangalore.
Toppin, S. M. (R. A.) ... .. ...Bhamo, Burma.
Tottenham, W. F. L. (I.F.S.) ... ... ..*Europe.*
Townsend, Lt.-Col. E. C. ... ... ...Rangoon.
Traill, W. H. ... .. ... ...*Europe.*
Travancore, H. H. The Maharaja Sir Sultan Rama Raja Bahadoor (G.C.S.I., G.C.I.E.) (*Life Member*). Trivandrum.
Travers, W. L. ... ... ... ...Jalpaiguri.
Treeby, H. F. ... ... ... ...Ambala.
Trench, C. G. C. (I.C.S.) ... ... ..*Europe.*
Trevor, C. G. (I.F.S.) ... ... ...Kulu, Kangra Dist.
Trivandrum, The Director, Government Museum and Public Gardens ... ... ...Trivandrum.
Trotter, E. W. ... ... ... ...Bangkok, Siam.
Trotter, H. (I.F.S.) ... ... ... ...Tharrawady, Burma.
Troup, N. F. T. ... ... ... ...Kousanie, Almora.
Troup, R. S. (I.F.S.) ... ... ... ...Dehra Dun.
Truninger, L. ... ... ... ...Calcutta.
Tunnard, T. E. ... ... ... ...Ceylon.
Tunstall, A. C. ... ... ... ...Calcutta.
Turkhud, Dr. D. A. ... ... ... ...Bombay.
Turner, A. J. (B.SC.) ... ... ... ...Bombay.
Turner, H. G. ... ... ... ...*Europe.*
Turner, Capt. J. F. (R.E.) ... ... ...Gilgit.
Turner, Sir Montague ... ... ...*Europe.*
Tweedie, A. G. ... ... ... ...Calcutta.

Tweedie, Capt. J. L. ... ... ...*Cairo.*
Twiss, Capt. A. M. (R.E.) ... ... ...Kirkee.
Tyabji, S. B. ... ... ... ...Sholapur.
Tyler, H. H. F. M. (I.C.S.) ... ... ...Madras.
Tyrrell, Major J. R. (I.M.S.) ... ... ...Nowgong, Bundelkhand, C. I.
Tytler, Lt.-Col. H. C. ... ... ...Lucknow.

Udaipur, H. H. The Maharaj Kunwar Bhupal Singh Bahadur ... ... ... ...Udaipur, Rajputana.
United Service Club, The Secretary ... ...Bangalore.
United Service Library, Hon. Secretary ...Poona.
Unwalla, J. N. (*Life Member*)... ... ...Bhavnagar.
Upper Burma Club, Honorary Secretary ...Mandalay.
Urwin, Major J. J. (I.M.S.) ... ... ...*Europe.*
U. S. Department of Agriculture, The Librarian ...*Washington D. C.*

Vakil, J. D. ... ... ... ...Bhavnagar.
Van Ingen, E. M. ... ... ... ...Mysore.
Varvill, M. N. ... ... ... ...Bombay.
Vaughan, W. (F.E.S.) (*Life Member*) ... ...*Europe.*
Venables, Capt. J. D. ... ... ...Mandalay.
Venning, Capt. F. E. W. (*Life Member*) ...*Europe.*
Venour, Major W. E. (I.A.) (*Life Member*) ...Kohat.
Vernon, C. V. (I.C.S.) ... ... ...Karwar.
Vernon, H. A. B. (I.C.S.) ... ... ...Kurnool.
Victoria College, The Principal ... ...Palghat.
Victoria Technical Institute, The Curator and Librarian ... ... ... ...Nagpur.
Vijayarajji, Maharaj Kumar Shri ... ...Bhuj, Cutch.
Villar, A. R. ... ... ... ...Tharrawaddy.
Vincent, W. H. H. (I.C.S.) ... ... ...Simla.
Vithuldas Damodhar Thakersey, The Hon'ble Sir....Bombay.
Vlasto, P. ... ... ... ...Bombay.
Volkart, L. ... ... ... ...Bombay.

Waddington, T. H. (I.F.S.) ... ... ...*Europe.*
Wahab, R. S. ... ... ... ...Bangalore.
Wainwright, F. M.... ... ... ...Godaveri.
Wait, W. E. ... ... ... ...Colombo.
Waite, H. W. ... ... ... ...Ferozepore.
Wakefield, G. C. E. ... ... ...Hyderabad, Deccan.
Wakefield, J. G. ... ... ... ...Gaya, Bengal.
Walker, G. B. ... ... ... ...Hyderabad, Deccan.
Walker, J. S. E. ... ... ... ...Motihari, Bengal.
Walker, Capt W. B. (R.A.) ... ... ...Madras.
Wall, Major F. (I.M.S., C.M.Z.S.) ... ...Almora.
Wall, M. G. ... ... ... ...Punjab.

Wallace, John (C.E.) ... ... ... Bombay.
Wallace, R. ... ... ... ... Bombay.
Wallace, Lt. R. ... ... ... ... Kasauli.
Wallace, W. V. (I.C.S.) ... ... ... Burma.
Waller, C. H. ... ... ... ... Secunderabad.
Wallinger, W. A. ... ... ... ... *Europe.*
Walsh, E. P. (I.C.S.) ... ... ... Rajahmundry.
Walsh, M. P. ... ... .. ... Akola, Berar.
Walsh, W. ... ... ... ... Burma.
Walters, O. H. ... ... ... ... Rawalpindi.
Walton, Major H. J. (I.M.C., C.M.Z.S.) ... ... Bombay.
Warburton, A. P. ... ... ... Kindat.
Warburton, H. G. (I.C.S.) ... ... ... Lucknow.
Ward, Col. A. E. ... ... ... ... Naini Tal.
Ward, Major C. H. ... ... ... Multan.
Ward, W. ... ... ... ... Ootacamund.
Wardrop, Major A. E. ... ... ... Meerut.
Ware, F. ... ... ... ... Madras.
Warner, Granville Lee ... ... ... Jubbulpore.
Wasey, G. K. ... ... ... ... *Europe.*
Waterfield, E. H. (I.C.S.) ... ... ... Larkana.
Waney, Capt. C. W. ... ... ... Peshawar.
Watson, E. A. ... ... ... ... Narayangunj.
Watson, Capt. H. R. ... ... ... Bangalore.
Watson, H. W. A. (I.F.S.) ... ... ... Mogok, Burma.
Watson, Major J. W. (I.M.S.) ... ... ... Bombay.
Watts, Major G. A. R. ... ... ... Quetta.
Watt, J. D. ... ... ... ... Vizagapatam.
Way, J. D. ... ... ... ... Vizagapatam.
Webb, G. R. ... ... ... ... *Europe.*
Webb, M. (I.C.S.) ... ... ... ... *Europe.*
Webb, W. K. ... ... ... Sonada.
Webb, J. E. N. ... ... ... ... Orissa.
Webster, J. R. ... ... ... ... Bombay.
Webster, Lieut. D. (R.N.) ... ... ... *Europe.*
Weldon, W. L. ... ... ... ... *Europe.* [S. Ry.
Weller, A. O. ... ... ... Kanchrapara, E. B.
Wells, Capt. F. W. A. ... ... ... Toungoo, U. Burma.
Wells, Dr. H. E. (M.B.) ... ... ... Pegu.
Wells, Capt. R. T. (I.M.S.) ... ... ... Bombay.
Welman, P. H. ... ... ... ... Bombay.
Wenden, H. (C.E., C.I.E.) ... ... ... *Europe.*
Weston, A. T. ... ... ... ... Hminelongyee, L. Burma.
Weston, W. V. ... ... ... ... Sylhet.
Whalley, G. P. ... ... ... ... Berhampur, Bengal.
Whately, Richard ... ... ... ... Bombay.
Wheatley, Major P. (R.F.A.) ... ... ... Mhow, C. I.

Whiffin, D. ... ... ... ... Panposh, B.-N. Ry.
Whistler, Hugh ... ... ... ... Hissar.
White, Capt. A. W. ... ... ... Poona.
White, Colin R. ... ... ... ... *Europe.*
White, C. R. ... ... ... ... Shwebo, Burma.
White, Chas. W. ... ... ... ... Bombay.
White, G. H. ... ... ... ... Bombay.
White, W. T. ... ... ... ... Rangoon.
White, W. P. ... ... ... ... Chanda, C. P.
Whitehead, Capt. C. H. T. ... ... ... *Europe.*
Whitehead, John (I.F.S.) ... ... ... *Europe.*
Whitehead, Major J. H. (*Life Member*) ... Port Blair.
Whitehead, T. A. ... ... ... ... Cuddapah.
Whittall, Lieut. G. ... ... ... Malapuram.
Whitworth, G. G. (*Life Member*) ... ... *Europe.*
Whymper, S. L. ... ... ... ... *Europe.*
Wickham, P. F. (C.E.) ... ... ... Rangoon.
Wiles, G. (I.C.S.) ... ... ... ... Belgaum.
Wilkis, J. S. ... ... ... ... *Europe.*
Wilcox, A. V. ... ... ... ... *Europe.*
Williams, E. Alban ... ... ... ... Bombay.
Williams, Lt.-Col. C. E. (I.M.S.) ... ... Rangoon.
Williams, J. K. ... ... ... ... Dharwar.
Williamson, A. (I.C.S.) ... ... ... Shwegyin.
Williamson, W. J. F. ... ... ... Bangkok, Siam.
Willingdon, H. E. The Right Hon'ble Lord, (G.C.I.E.) ... ... ... ... Bombay.
Willis, R. A. ... ... ... ... Bombay.
Willock, Comdr. A. R. G. (R.I.M.) ... ... Akyab.
Wilson, Major Allan ... ... ... Shillong, Assam.
Wilson, A. R. ... ... ... ... Almora, U. P.
Wilson, P. R. ... ... ... ... Bombay.
Wilson, Capt. A. T. (C.M.G.) ... ... ... Basrah.
Wilson-Johnstone, J. (I.C.S.) ... ... ... *Europe.*
Wilson, C. H. E. ... ... ... ... Veeramgaum.
Wilson, Lt.-Col. C. H. L. F. (R.A.) ... ... *Europe.*
Wilson, Mr. D. W. ... ... ... Bombay.
Wilson, H. C. ... ... ... ... Madras.
Wilson, H. R. ... ... ... ... Assam.
Wilson, J. C. C. ... ... ... ... Papun, Burma.
Wilson, P. N. W. ... ... ... ... Jubulpore.
Wilson, R. A. (I.C.S.) ... ... ... Yeotmal.
Wimbush, A. ... ... ... ... Nilambar, Malabar.
Winter, G. B. (A.M.I.C.E.) ... ... ... Bandra.
Withinshaw, L. ... ... ... ... Ramnad.
Withers, D. S. ... ... ... ... Assam.
Witt, D. O. (I.F.S.) ... ... ... Saugor, C. P.
Wood, C. W. (C.E.) ... ... ... *Europe.*

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|---|---|
| Wood, Major H. (R. E.) ... ... | ...Bombay. |
| Wood, John A. ... ... ... | ...Kelantan. |
| Wood, S. C. G. ... ... ... | ...*Europe.* |
| Wood, Major W. M. P. ... ... | ...Rajkot. |
| Woodhouse, E. J. ... ... ... | ...Sabour. |
| Wooster, W. G. ... ... ... | ...Monywa. |
| Worgan, Capt. R. B. ... ... | ...Bolarum. |
| Wordsworth, R. G.... ... ... | ...Khaira Gali, Murree Hills. |
| Wright, A. J. ... ... ... | ...Travancore. |
| Wright, H. C. ... ... ... | ...*Europe.* |
| Wright, J. M. (I.C.S.) .. ... | ...Shwebo, Burma. |
| Wright, Capt. W. D. (I.M.S.)... ... | ...Belgaum. |
| Wroughton, R. C. (F.Z.S.) (*Life Member*) | ...*Europe.* |
| Wyndham, P. (I.C.S.) ... ... | ...Mirzapur. |
| Yates, R. C. C. ... .. ... | ...Madras. |
| Yeo, Edwin W. ... ... ... | ...*Europe.* |
| Yerbury, Col. J. W. (R.A.) (*Life Member*) | ...*Europe.* |
| Younan, Lt.-Col. A. C. (I.M.S.) ... | ...China. |
| Young, F. B. ... ... ... | ...*Europe.* |
| Young, H. G. ... ... ... | ...Lahore Cantt. |
| Young, J. V. (I.F.S.) ... ... | ...Pyinmana, Burma. |
| Young, L. W. H. ... ... ... | ...Bhavnagar Para. |
| Young, R. H. ... ... ... | ...Karachi. |
| Yule, Capt. R. A. ... ... ... | ...Hazara. |
| Zollinger, A. E. ... ... ... | ...Amraoti, Berar. |

# BOMBAY NATURAL HISTORY SOCIETY.

## *STATEMENT of ACCOUNTS from 1st January 1913 to 31st December 1913.*

| RECEIPTS. | Rs. a. p. | Rs. a. p. |
|---|---|---|
| To Balance on 31st December 1912— | | |
| Cash with The National Bank .. .. | 2,214 3 6 | |
| „ on hand .. .. .. .. .. | 847 8 5 | |
| Balance per Postage Book .. .. .. | 48 2 9 | |
| „ „ Petty Cash.. .. .. .. | 10 7 4 | |
| | | 3,120 6 0 |
| To Subscription for 1907 (in arrears) .. .. | 15 0 0 | |
| „ „ 1908 „ .. .. | 30 0 0 | |
| „ „ 1909 „ .. .. | 75 0 0 | |
| „ „ 1910 „ .. .. | 190 0 0 | |
| „ „ 1911 „ .. .. | 288 0 0 | |
| „ „ 1912 „ .. .. | 589 5 0 | |
| „ „ 1913 | 20,478 3 6 | |
| „ „ 1914 (in advance) .. .. | 2,353 1 0 | |
| „ „ 1915 ( „ ) .. .. | 8 9 0 | |
| „ Life Membership .. .. | 200 0 0 | |
| | 24,127 2 6 | |
| *Less*—Refund of Subscription .. .. | 120 4 0 | |
| | | 24,006 14 6 |
| To Entrance Fee .. .. .. .. .. | 1,430 0 0 | |
| „ Government of Bombay Grant-in-aid .. | 5,000 0 0 | |
| „ Sale of Journals . .. .. .. .. | 1,474 13 8 | |
| „ Pigeon and Dove Book .. .. .. .. | 113 0 0 | |
| „ Books on Wood Destroying white Ants .. | 375 0 0 | |
| „ Snake Books .. .. .. .. .. | 968 10 0 | |
| Carried over .. | 9,361 7 8 | 27,127 4 6 |

| PAYMENTS. | Rs. a. p. | Rs. a. p. |
|---|---|---|
| By Journal Account .. .. .. .. .. | 13,821 1 1 | |
| „ Snake Book .. .. .. .. .. | 154 8 0 | |
| „ Salaries .. .. .. .. .. | 10,259 2 6 | |
| „ General Charges .. .. .. .. .. | 1,522 4 6 | |
| „ Rent .. .. .. .. .. .. | 2,200 0 0 | |
| „ Printing and Stationery .. .. .. | 462 15 5 | |
| „ Auditor's Fees .. .. .. .. .. | 140 0 0 | |
| „ Insurance .. .. .. .. .. .. | 115 11 0 | |
| „ Library .. .. .. .. .. .. | 173 4 9 | |
| „ Postage .. .. .. .. .. .. .. | 884 7 9 | |
| „ Petty Cash .. .. .. .. .. | 638 4 3 | |
| „ Furniture .. .. .. .. .. .. | 514 2 0 | |
| „ Sundries .. .. .. .. .. .. | 204 4 0 | |
| „ Bank Charges .. .. .. .. .. | 83 7 0 | |
| | | 35,199 8 3 |
| *By Balance*— | | |
| „ Cash with The National Bank of India, Ld .. | 1,757 9 9 | |
| „ Cash on hand.. .. .. .. .. .. | 404 12 0 | |
| „ Balance per Postage Book .. .. | 13 11 0 | |
| „ Balance per Petty Cash Book .. .. | 22 3 1 | |
| „ Advance to Staff .. .. .. .. | 350 0 0 | |
| | | 2,548 3 10 |
| Carried over .. | | 38,747 12 1 |

## *STATEMENT of ACCOUNTS from 1st January 1913 to 31st December 1913—contd.*

| RECEIPTS. | Rs. a. p. | Rs. a. p. | PAYMENTS. | Rs. a. p. | Rs. a. p. |
|---|---|---|---|---|---|
| Brought forward .. | 9,561 7 8 | 27,127 4 6 | Brought forward .. | | 38,747 12 1 |
| To Butterfly Books .. .. .. .. .. | 8 0 0 | | | | |
| „ Interest on Investments .. .. .. .. | 1,607 2 7 | | | | |
| „ Interest allowed by Bank on Current Account .. .. .. .. .. .. | 119 14 7 | | | | |
| „ Registration fee for Journals .. .. .. | 26 14 9 | | | | |
| „ Sundries .. .. .. .. .. .. | 497 0 0 | 11,620 7 7 | | | |
| Total Rs. .. | | 38,747 12 1 | | | 38,747 12 1 |
| | | | *Securities—* | | |
| | | | 3½ % Government of India Pro. Notes .. | 14,000 0 0 | |
| | | | 4 % Bombay Port Trust Unguaranteed Bonds .. .. .. .. .. .. | 14,000 0 0 | |
| | | | 4 % City of Bombay Improv. Trust Bonds .. | 15,000 0 0 | |
| | | | Total Rs. .. | 43,000 0 0 | |

We have seen a letter from the National Bank of India, Limited, to the effect that the above Securities were held on the Society's behalf on the 31st December 1913.

Examined and found correct.

(Sd.) L. H. SAVILE,
*Honorary Treasurer.*

(Sd.) A. F. FERGUSON & Co.,
*Chartered Accountants and Auditors.*

BOMBAY, 27*th March* 1914.

# BOMBAY NATURAL HISTORY SOCIETY.

## MAMMAL FUND ACCOUNT.

*STATEMENT of ACCOUNTS from 1st January 1913 to 31st December 1913.*

| RECEIPTS. | Rs. a. p. | Rs. a. p. | PAYMENTS. | Rs. a. p. | Rs. a. p. |
|---|---|---|---|---|---|
| To Balance on 31st December 1912 – | | | By Salary of Mr. Shortridge .. .. .. .. | 3,600 0 0 | |
| Fixed Deposit with the National Bank of India, Ltd. .. .. .. .. | 10,380 0 0 | | „ Income Tax on his Salary .. .. .. | 93 12 0 | |
| Cash in the National Bank of India, Ltd... | 4,333 13 3 | | „ Allowance .. .. .. .. .. .. | 927 9 3 | |
| Advance to Mr. Shortridge .. .. .. | 475 0 0 | | „ Travelling and Camp Expenses .. .. .. | 4,712 11 8 | |
| Advance to Mr. Crump .. .. .. .. | 300 0 0 | | „ Camp Kit for Mr. Shortridge .. .. .. | 40 14 0 | |
| Balance per Postage Book .. .. .. | 12 11 9 | | „ Rifle .. .. .. .. .. .. | 343 4 0 | |
| Balance per Petty Cash Book .. .. .. | 15 15 5 | | | | 9,718 2 11 |
| To Donations received during the year 1913 .. | 25,544 3 9 | 15,517 8 5 | By Salary of Major Mayor .. .. .. .. | 2,826 11 0 | |
| „ Interest received on Fixed Deposits .. .. | 500 9 5 | | „ Allowance .. .. .. .. .. .. | 315 0 0 | |
| „ „ „ Current Account .. .. .. | 73 0 3 | | „ Travelling and Camp Expenses .. .. .. | 3,371 8 11 | |
| „ „ „ Unguaranteed Bombay Port Trust Bonds .. ..Rs 97 6 4 | | | „ Camp kit for Major Mayor .. .. .. | 60 7 6 | |
| *Less*—Paid when purchased the Bonds .. „ 81 2 9 | | | „ Gun .. .. .. .. .. .. | 218 9 0 | |
| | 16 3 7 | | „ Tent .. .. .. .. .. .. | 136 8 0 | |
| | | 25,931 1 0 | | | 6,928 12 5 |
| | | | By Salary of Mr. Crump .. .. .. .. | 2,900 0 0 | |
| | | | „ Income Tax on his Salary .. .. .. | 78 2 0 | |
| | | | „ Allowance while in Bombay .. .. .. | 48 6 2 | |
| | | | „ Travelling and Camp Expenses .. .. .. | 1,675 4 0 | |
| | | | | | 4,701 12 2 |
| | | | By Passage Expenses for Major Mayor from London to Bombay .. .. .. .. | 966 13 1 | |
| | | | „ Passage Expenses for Major Mayor to Ceylon .. .. .. .. .. .. | 116 0 0 | |
| | | | „ General Charges .. .. .. .. .. | 374 2 0 | |
| | | | | | 1,447 6 1 |
| Carried over Rs. .. | | 41,451 9 5 | Carried over Rs. .. | | 22,796 1 7 |

## *Mammal Fund Account*—contd.

| RECEIPTS. | Rs. a. p. | Rs. a. p. | PAYMENTS. | Rs. a. p. | Rs. a. p. |
|---|---|---|---|---|---|
| Brought forward .. | | 41,451 9 5 | Brought forward .. | | 22,796 1 7 |
| | | | By Ammunition .. .. .. .. .. .. | 364 8 6 | |
| | | | ,, Collecting Expenses .. .. .. | 655 5 6 | |
| | | | ,, ,, Boys .. .. .. .. .. | 466 8 0 | |
| | | | ,, Salaries of the Staff .. .. .. .. | 792 6 2 | |
| | | | ,, Traps .. .. .. .. .. .. | 579 0 0 | |
| | | | ,, Auditor's Fee .. .. .. .. .. .. | 30 0 0 | |
| | | | ,, Printing and Stationery .. .. .. .. | 93 11 4 | |
| | | | ,, Sundries .. .. .. .. .. .. | 53 7 0 | |
| | | | ,, Discount and Commission charged by the Bank .. .. .. .. .. | 42 7 0 | |
| | | | ,, Commission charged by the Bank on Bonds purchased .. .. .. .. .. | 12 8 0 | 6 |
| | | | ,, Compensation to the family of the boy skinner killed by accident .. .. .. .. | 276 0 6 | |
| | | | ,, Petty Cash Book .. .. .. .. .. | 353 5 8 | |
| | | | ,, Postage Account .. .. .. .. .. | 48 1 0 | |
| | | | | | 3,807 4 8 |
| | | | ,, *Balance*— | | |
| | | | ,, Fixed Deposit with the National Bank of India, Limited .. .. .. .. .. | 5,000 0 0 | |
| | | | ,, Bombay Port Trust Unguaranteed Bonds Rs. 5,000 .. .. .. .. .. | 5,150 0 0 | |
| | | | ,, Balance per Petty Cash Book .. .. .. | 22 9 9 | |
| | | | ,, ,, ,, Postage Book .. .. | 14 10 9 | |
| | | | ,, Balance with the National Bank of India, Limited .. .. .. .. .. .. | 3,235 14 8 | |
| | | | ,, Advance to Mr. G. C. Shortridge (to be accounted for) .. .. .. .. .. | 725 0 0 | |
| | | | ,, Advance to Mr. Crump (to be accounted for) | 300 0 0 | |
| | | | ,, Advance to Major Mayor (to be accounted for) .. .. .. .. .. .. .. | 450 0 0 | |
| | | | | | 14,846 3 2 |
| Total .. | | 41,451 9 5 | | | 41,451 9 5 |

Examined and found correct.

(Sd.) L. H. SAVILE,
*Honorary Treasurer.*

(Sd.) A. F. FERGUSON & Co.,
*Chartered Accountants and Auditors.*

BOMBAY, 27*th March* 1914.

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Printed by E. G. Pearson for the Proprietors of the Times Press, Bombay, and published by W. S. Millard for the Bombay Natural History Society.

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Accn: 771
dt. 19/12/06.

THE IMPERIAL OR BLACK-BELLIED [illegible] (Pt. arenarius).

JOURNAL
OF THE
Bombay Natural History Society.

APRIL 1913. VOL. XXII. No. 1.

# THE GAME BIRDS OF INDIA, BURMA AND CEYLON.

BY

E. C. STUART BAKER, F.L.S., F.Z.S., M.B.O.U.

PART IX.

*With Plate IX.*

(*Continued from page 1128 of Volume XXI.*)

## Order—*PTEROCLETES.*

The order *Pterocletes* contains but one Family, *Pteroclidæ*, and the distinguishing characteristics of the order and the family are therefore the same and are dealt with under one head.

## Family—*PTEROCLIDÆ.*

The Sand-Grouse, or Pigeon-Grouse, as Huxley happily named them, constitute an order of one family, which comes half way between the Pigeons and Doves, *Columbæ*, and the *Gallinæ*, or true Game Birds to which latter they are very closely allied, through the real Grouse. In general external appearance they are, perhaps, more nearly like the true Grouse than any other game-bird, but they have also a strong resemblance to Pigeons in build, carriage of head, etc., though both feet and bill are Galline.

In the Pigeons the toes are broad and well fitted for perching, whereas in the Sand-Grouse they are more fitted for ground-work, as in the Galline birds; the bill also has no cere, or soft skin over the basal half as have the *Columbæ*. Both *Pteroclidæ* and *Columbæ* have 11 primaries and the 5th secondary wanting; whereas the *Gallinæ* have only 10 primaries, but possess a 5th secondary. In all these orders the muscles of the thighs and legs are similar. The *flexor perforans digitorum* is attached to the *flexor longus hallucis*

by a fibrous vinculum, the former supplying the three front toes, and the latter, as usual, the hallux, or hind toe. The ambiens muscle is present, except in a few pigeons. The femoro-caudal, except in Peafowl and Turkeys, the accessory femora-caudal, the semi-tendinosus and accessory semi-tendinosus are all present as well as both carotids, except in the Megapodes.

The keel of the sternum is very high, and there are usually two notches on each side of the posterior margin, but the inner is sometimes reduced to a foramen.

The gall bladder is present and the Sand-Grouse possess a nude oil gland and their contour feathers have aftershafts.

Palate schizognathous; nasals generally schizorhinal, but very variable; basipterygoid processes present; cervial vertibræ 15 or 16.

The dorsal feather-tract has an interscapulary fork and the lateral bare tracts extend on the shoulders as far as the base of the neck.

Pigeons, of course, have their young hatched naked and singularly helpless, but the young of the Sand-grouse are covered with richly coloured down and are able to run, and, to some extent, feed themselves directly they leave the egg.

The tarsus is well feathered in all the genera of this family, in one the feathering extending also to the toes. They are birds of swift powerful flight with comparatively long wings.

The order contains but three genera, *Pterocles* and *Pteroclurus*, which are very closely allied, and *Syrrhaptes* which is fairly distinct. All three genera have representatives in India, and some species are to be found in Africa, South and Central Europe and Asia.

Most Sand-Grouse are migratory and in all species the two sexes differ in plumage, the male bird being much the most brilliantly coloured.

## KEY TO THE GENERA.

*a.* A hind toe present. Tarsus only feathered in front and toes naked.
  a′ Middle tail feathers normal..... *Pterocles.*
  b′ Middle tail feathers pointed and longer than the others ..... *Pteroclurus.*

*b.* No hind toe; tarsus feathered throughout and toes also feathered ..... *Syrrhaptes.*

Ogilvie Grant distinguishes 16 species altogether, of which exactly half are found in India.

## The Genus—*PTEROCLES.*

The first of our genera *Pterocles* is also the largest, containing

according to Sharpe and Ogilvie Grant 10 species, of which four are found in India. Of these, one is entirely resident, but the other three are, to some extent, migratory, although they breed either close to, or actually within, the borders of the Indian Continent.

The difference between *Pterocles* and *Pteroclurus* are hardly generic, consisting, as already shewn, only in the elongation of the tail feathers in the latter; the differences are, in fact, identical with those between *Sphenocercus sphenurus* and *Sphenocercus apicaudus* amongst the Pigeons, though these two latter have not yet been split into two genera.

## KEY TO THE SPECIES.

*a.* Abdomen black throughout ..... *arenarius*, ♂, ♀.
*b.* Abdomen banded black and white .....
a′ Two dark pectoral bands .....
a″ No band across hind neck ... *fasciatus*, ♂.
b″ Band across hind neck..... *lichensteini*, ♂.
b′ No dark pectoral bands .....
c″ Chin unspotted, tarsus spotted or barred ..... *fasciatus*, ♀.
d″ Chin spotted, no spots or bars on tarsus ..... *lichensteini*, ♀.
*c.* Abdomen unspotted buff in male, spotted buff in female..... ..... *coronatus*, ♂, ♀.

### PTEROCLES ARENARIUS.

*The Large, Imperial, or Black-bellied Sand-Grouse.*

*Sand-Grouse.*—Lath. Gen. Syn. ii, p. 751 (1783).
*Tetrao arenarius.*—Pallas, Nov. Com. Petrop. xix, p. 418 (1775).
*Pterocles arenarius.*—Temminck, Man. d'Orn, p. 300 (1815); Gray, list B. iii, p. 49; Blyth, Cat. B. As. Soc. Mus., p. 249; Jerdon, B. of In., iii, p. 496; Hume, Str. Feath. i., p. 219; Adam, *ibid*, p. 391; Dresser, B. of Europe, vii, p. 61; James, Str. Feath. iii, p. 418; Hume, Str. Feath. iv., p. 4; Butler, *ibid*, iv, p. 4; Wise, *ibid*, p. 230; Blanford, E. Persia, ii, p. 271; Butler, Str. Feath. v., p. 222; Hume and Marsh. Game B., i. p. 47; Hume, Str. Feath. vii, p. 161; Butler, *ibid*. p. 186; Marshall, *ibid*, viii, p. 492; Butler, Cat. B., Sind, p. 52; Hume, Cat. No. 799; Tufnell, Str. Feath. ix, p. 200; Barnes, *ibid*, pp. 219, 458; Reid, *ibid*, x, p. 61; Biddulph, *ibid*, p. 275; Barnes, Birds Bom., p. 294; *ibid*, Journ. Bom. N. H. Soc. v., p. 333; Rattray, *ibid*, xii, p. 345; C. G. Nurse, *ibid*, xiv., p. 388; S. E. Marshall, *ibid*, xv., p. 353; Nicol. Cumming, *ibid*, xvii. p. 691; Ogilvie Grant, Cat. B. M. xxii, p. 18; Oates, Game B. Ind., i, p. 36; Indian Field, 21st Feb., 1907; Le Mess., Land and Water B. of Ind., p. 56.

*Pteroclis arenarius.*—Sharpe, Hand list, I, p. 50; Oates, Cat. Eggs, B. M. i, p. 86.

*Vernacular names.*—Bhat-titur Bakht, Bakhy-titur (*Hin.*); Banchur, Kurmor (*Peshawar*); Burra Bhatta (*Hariana*); Siya-sinah (*Persian*); Katinga (*Sind*); Katarr (*Arabic*).

*Description—Adult Male.*—Head above, neck and upper back grey, tinged with russet, except round the eye where the grey is more pure; chin, upper throat, sides of the face and neck chestnut, extending as a collar round the neck except in the centre where it pales into orange and finally merges into the grey; a triangular patch of black on the lower throat, the base sometimes continued as short lines under the chestnut of the neck; back, rump and upper tail coverts grey, deepening to blackish grey towards the last, each feather pale buff at the base and with a large drop of rather deeper buff at the end, and the tail coverts margined with yellow. Inner coverts of the wing and scapulars like the back but with the terminal spots still larger and a yellow ochre in colour; visible portions of secondary and median coverts yellow ochre; bastard-wing grey, the outer webs freckled paler; primaries and their coverts grey, the outer webs of the first primary brownish-black; secondaries white on the basal half and greyish-brown on the terminal; in nearly all birds the quills have a few curious streaks of brown on either web, looks as if some of the barbs had decomposed; shafts and under aspect of the quills dark brown, axillaries white. Tail with central rectrices barred grey and buff, the terminal inch a grey-green, tipped with a very narrow line of buff, remaining tail feathers the same but with a broad terminal band of white and each pair of feathers becoming darker towards the outermost, which are deep grey, merely stippled with rufous near the base. Breast a clear grey followed by a black band, which runs up the shoulders in front of the wings; below the band there is a broad belt of vinous or pinkish grey; remainder of abdomen, flanks and upper thighs and round vent black or deep chocolate brown, the bases of the feathers rusty and frequently shewing through; remainder of lower tail coverts, thighs and feathering of tarsi white.

Iris dark brown, bill bluish grey, or plumbeous grey, darker at the tip and varying much in tone and tint. Legs and feet greyish of bluish plumbeous. Measurements: wing 1·8" to 9·75", averaging about 9·35"; bill ·44" to ·53", averaging ·5"; tarsus ·97" to 1·10", averaging about 1·03"; tail between 4" and 5".

"The feet and the back of the trasi are grey, in some an earthy grey, in some pale French grey, or pale plumbeous, or dark greyish plumbeous; the claws darker and horny; the irides are brown;

edges of eyelids pale lemon; the bill is pale bluish grey, or pale plumbeous, often darker, sometimes blackish, at the tip." (Hume.)

"*Males*:—Length 13·75" to 14·75"; expanse 27·1" to 30·0"; wing 9·0" to 9·9"; tail from vent 4" to 5"; tarsus 1·1" to 1·25"; gape 0·64" to 0·8". Weight 1 lb. to 1 lb. 4 ozs." (Hume.)

*Adult female*:—Whole upper plumage a pinkish grey; the head, nape, neck and upper back with black streaks, formed by each feather having a terminal spot of black, the remainder of upper parts often more rufous and barred, instead of spotted with black. Central tail feathers like the back, each succeeding pair deepening in colour and with broad terminal bars of white. Chin, throat and sides of the head yellowish grey, varying considerably in intensity of colouration, the centre immaculate, the sides of the head lores and ear coverts streaked with fine black shaft lines; lower throat with reversed, half moon shaped band of black followed by a pearl grey band which fades into the pinkish grey of the breast. This latter is streaked with black, formed by the black central spots to the feathers and is followed by the black band like that of the male, but narrower and often much broken. Lower breast above abdomen like that of the male, but generally paler; remainder of lower parts similar to the same parts in the male. Scapulars and inner wing coverts like the back; quills like those of the male but the shade more brownish and the inner webs and tips of the primaries edged white, absent on the first and most broadly so on the innermost; primary coverts grey, secondary coverts dark grey, median coverts yellow ochre on visible portions otherwise as in the male.

In many females, probably not fully adult, the colour of the throat, breast and upper abdomen is very smoky and practically the same from the chin to the black abdomen.

Soft parts the same as in the male.

*Measurements*.—Wing 8·36" to 9·2", the average being barely 9·0"; bill at front from tip to central feathering ·42" to ·5" and averaging ·47"; tarsus ·82" to 1·08" with an average size of ·9"; tail about 4·0" to 4·5".

"*Females*:—Length 13·38" to 14·47"; expanse 27·38" to 28·5"; wing 8·7" to 9·4"; tail 4·13" to 4·15"; tarsus 1·0" to 1·1"; weight 15 ozs. to 17 ozs." (Hume.)

*Young male*:—Shot in October, has the whole upper plumage, chin, throat and breast and upper abdomen a pale isabelline or pinkish grey, barred and vermiculated with blackish brown. Abdomen black and under tail coverts white with black bases. The tail feathers are barred black and rufous buff, the latter colour being replaced by white on the outer ones. Wing quills and primary coverts grey, tipped with rufous; innermost secondaries and scapulars like the back.

The wing of this young bird measures 6·5.

"The *immature male* differs from the adult in having the tips of the primaries and primary coverts edged with buff vermiculated with black, some of the feathers of the top of the head with a black sub-terminal band and rufous buff margin, and several feathers of the upper back and scapulars yellowish buff barred with black as in the female." (Ogilvie Grant.)

*Distribution.*—*Pterocles arenarius* is found as far West as the Canaries and throughout Northern Africa and to the Sahara from the extreme N. West. It occurs also in the European countries bordering on the Mediterranean, being common in Portugal and Spain and rare elsewhere, but is again more often met with in South East Russia. In Asia it occurs in Asia Minor, Caucasus, Palestine, Persia, Baluchistan, Afghanistan and thence into North-West India.

Within Indian limits it is very common in the Punjab, Bikaner, North-West Rajputana, Sind and the Runn of Cutch. It is also fairly numerous in Northern Guzerat and the North-West of Central India, and it occurs as far South as Kathiwar, where Col. L. L. Fenton informs me that "this bird is only an occasional visitor, in some years not a single bird is to be seen, in others a few only, whilst at rare intervals, they come in large flights." In the South of Central India it is much less common, but has been killed as far South as Bhopal.

There is also an account in the "Indian Field" of the 21st February 1907 by "Big Bore" of the shooting of three of these grouse in Mysore. This is, of course, far out of the ordinary range, but "Big Bore" is the nom-de-plume of a well-known sportsman who has for a great many years been a keen field naturalist and collector and it is impossible that he should have made a mistake over so well marked a bird. He writes, "On the 24th November last, my two sons were out shooting at a place called Giribet, nine miles east of Mysore (City) on the Mysore-Kollegal Road. They were lucky in getting a fairly large bag of duck, snipe, partridges and grouse: amongst the latter I noticed three birds that were strangers to me and being interested in ornithology, I worked out the birds and found they were the "Large or Black-bellied Sand Grouse" (*Pterocles Arenarius*). This bird is only a cold weather migrant to North-Western India, and as far as I can make out has never before this been recorded in South India. During the whole time I collected birds for the late Mr. Allen Hume and for myself, I never came across a single specimen of it. It would be interesting to know if any other sportsman has shot this bird in South India." (Big Bore.)

To the East the Imperial Sand-Grouse straggles as far as Nepal from which State there is a female skin in the British Museum,

presented by Hodgson, and it has been procured near Lucknow and again a little further East and South near Allahabad. To the North-East it has been obtained both in Kashmir and Gilgit, in the former by Major Stone and in the latter State by Colonel Biddulph.

According to Jerdon, Col. Chesney found this species extremely common in Arabia, but Hume discredits the accuracy of this record on the grounds that, Zoologically, Turkish Arabia, or Mesopotamia is more nearly allied to North-East Africa than to Europe or Asia.

The Imperial Sand-Grouse has, however, been obtained from the Saiar Mountains in the extreme South of Palestine by St. George Littledale and it, apparently, is found thence Northwards and Eastwards through Palestine, Aleppo and Diarbekir in Kurdistan, so that its occurrence, on migration if at no other time, in Mesopotamia would seem to be extremely likely.

The Large or Black-bellied Sand-Grouse is only a winter visitor to India, its arrival and departure being much influenced, according to Hume and others, by the state of the weather, great heat delaying its arrival and accelerating its departure. They generally arrive within Indian limits, *i.e.*, the extreme North-West of the Punjab and Sind, in the first week of October or, in early years, a few flights may be seen in the last few days of September. They, however, do not seem to work their way further South and East at all fast, as I am informed that they are seldom seen in Cutch until the end of the former month, whilst they do not reach South Rajputana, Central India, Sindia and the West of the United Provinces until well on in November. These last mentioned parts of India they leave again in the latter part of February and by the end of March but few will be found anywhere, though a few stay on in unusually cold winters as late as the beginning, or middle, of April.

Within its favourite haunts, *i.e.*, all round the extreme North-East of the Indian habitat this bird is extremely numerous and may often be seen in hundreds and sometimes in thousands. Hume, on one occasion in Jodhpore, came upon a group of these birds, which he estimated to contain fully two thousand birds, which were packed together in a mass not more than thirty yards long by about ten wide and so densely were they lying that, though he could not get within 80 yards of them, he dropped three birds by firing into the mass as they rose.

The same author narrates how when driving between Fazilka and Ferozepur he saw, during the 15 miles' drive, over 100 *packs* of these birds crossing the road, these *packs* varying from four or five in number to nearly a hundred.

They keep very much to the larger sandy waste or plains so numerous in this part of India, and though they prefer such as are

within reasonable flight of the larger rivers, to which they resort to drink, they are often found at great distance from any water. When there are no rivers near enough, they will then drink at the nearest tank and even at quite small ponds or pools.

Hume thus describes the kind of country most frequented by this Grouse. He says: "I have but seldom met with them on *stubbles* (though they affect these a good deal, I hear, in some parts of the country), or in any ground under crop, nor have I ever found them on or about the more or less scrub-clad bases of the low hills, so common in Rajputana. Wide, open sandy plains are their favourite resorts; and, though they do sometimes feed on bare ploughed lands, it is rare to find them on these, except when basking in the early morning or when taking their mid-day siesta. This, like all the Sand-Grouse, they always take when the sun is hot, though on cold, cloudy, gloomy days, they are moving the whole day. They bustle about in the sand or loose loam, like old hens, until they have worked out a depression that fits them, and then in this they sit a little on one side, first with one wing a little under them and the uppermost one a little opened, and then, after a time, they shift over to the other side, so as to give the other wing its turn of grilling. During their siesta they are never closely packed; they are scattered about irregularly, one here, two or three there, and so on; and though at this time you may generally by circling get within reach of them, they are by no means all asleep, and the instant you halt or raise a gun, or fix your eyes on any of them, the alarm note is sounded, and they are off with a strong rapid flight, which most of us, at one time or another, have found too much for the second barrel."

"In part of the country where they have not been shot at, especially when they first arrive, you may easily approach within thirty yards, shoot two or three on the ground, and perhaps a couple more as they rise, but after having been worried a good deal they become the wildest birds imaginable, and then the only plan is to get them driven over you, which, with good native fowlers, is almost a certainty, and affords at the same time most difficult shooting and capital sport. It takes a straight eye, No. 3, shot and a hard-hitting gun, to bring down a clean-killed right and left out of a party going over you, 30 to 35 yards high, at the pace these birds can go."

They are very regular and punctual in visiting their drinking places, more especially in the morning, for this species of Grouse does not seem to always drink in the evenings. As a rule, the first few birds appear at the river or tank, as the case may be, within an hour and a half after sunrise and flocks continue to arrive for about two hours, or rather less, after which, it is quite useless waiting for other birds to come. In the evening, if they

come at all, they generally arrive about a couple of hours before sunset, just as the shadows begin to lengthen and the coolness of evening becomes apparent.

Where they have been undisturbed the birds come straight down to the water and take their drink, and a good deal of hustling and squabbling takes place, especially when two or more flocks, or packs as they should be called, arrive at the same time. Where, however, the birds have been much shot at, the packs will come down at a great pace, high overhead and often take two or three circles round in the air before they venture down to the water.

Even when they drink from big rivers these Grouse seem to have certain places which they favour more than others, but it is when they drink at tanks and other small places of water that the native, and often indeed the European sportsman takes the heaviest toll of them. At such places the shooter hides himself either in a hole in the ground or else behind such cover as may be available; and, if suitably dressed and sufficiently quiet in his movements, may be certain of obtaining a satisfactory bag. Often in this manner a couple of guns will obtain a very large bag of this and other grouse and Hume records a bag of 54 couple of this species alone made by three guns in a couple of hours.

The native fowlers and professional snarers also take advantage of this habit of the Sand-Grouse and catch a very great number for the market by means of nets and snares at the drinking places. When nets are used they are placed close to the drinking place athwart the favourite line of flight, the nets are some six feet in height and are kept erect by sticks which are so put up that the first impact from a flock of birds knocks them over, and many of the flock are entangled in the meshes are easily caught. When nooses only are used, these are placed in great numbers at the edge of the water, either pegged down singly or attached in rows to one long string, which is pegged down, or weighed down, at either end.

They keep no regular formation either in flight or when basking and feeding. The first thing in the morning many flocks often collect together and lie in the sun, warming themselves and at this time appear to get on well enough until they break up into their respective flocks and make their way to water; when, however, they again meet, either at the water-side or on their own feeding ground, they are very quarrelsome and a constant bickering fighting goes on amongst the males, this often taking place between members of the same flock.

Their flight is, as Hume says, very swift and powerful, and the sound of their wings makes a soft swish, which, when the birds pass very close, rises almost to a whistle. In appearance their action is much like that of a pigeon and they rise and fall in the

air with equal ease and grace; but the beats of their wings are never accompanied by the clapping sound made by the wings of the pigeons meeting overhead when those birds suddenly change their elevation or direction.

Their note is described by some writers as a clucking sound difficult to write down in words; other observers call it a soft double chuck or chuckle which is uttered both when on the wing and when on the ground, and when feeding and drinking. Indeed, even when the birds are indulging in their midday rest, a few will be seen constantly moving about and chuckling softly to themselves.

Their diet is mainly a vegetarian one, consisting for the most part of seeds and grain, and to a very small extent of young shoots and buds; but they will also eat small insects of all kinds,—white ants, beetles, larvæ, etc.,—but never, as far as I can ascertain, worms or similar items of food.

When they first arrive in India, the flocks consist entirely of one sex, either male birds only or females only; but as the season advances the flocks seem to become mixed and some time before they take their departure, they will be found to contain about equal numbers of either sex. I have been told that the first few flocks to reach India will invariably be found to be those of males, but, though this is probably correct, I have not as yet been able to verify it.

For the table they are generally said to be good, though, as usual, opinions differ somewhat on this point. Jerdon writes: "The flesh is mixed brown and white on the breast, though somewhat tough when fresh, and perhaps requiring to be skinned, it is reckoned delicious eating; indeed, one writer says that it is the finest game-bird for the table in India."

Whitaker's description of the habits of *Pterocles arenarius* (Birds of Tunisia, p. 236) in Tunis agrees well with that given by Hume; he writes:—"The present species is eminently a denizen of the plains, and more particularly semi-desert plains, where sandy hillocks, strewn with stones and dotted with patches of Halfa-grass are a characteristic feature of the country. The tops of these hillocks or mounds are favourite resorts of the birds during the middle of the day for resting, or basking in the sun, and possibly also for roosting at night. In these spots the birds remain quietly for the greater part of the day and do not leave them except for drinking and feeding purposes. Like other Sand-Grouse, *P. arenarius* is chiefly to be seen during the early morning and evening hours, when on its way to and from its drinking and feeding haunts. It is said to drink regularly twice a day, but in Tunisia I never observed the bird drinking except in the morning. To reach the water they often travel a great distance, but no doubt do

this with the greatest ease, being remarkably strong and swift on the wing. When rising from the ground the rattling noise this species makes probably with its wings, is most peculiar, and unlike that of any other bird with which I am acquainted. The note it utters when on the wing, and which may be heard at a great distance, is like the word "catarr" repeated several times, whence the birds' Arabic name "Katarr." When disturbed, it will travel a great distance, often completely out of sight, before sitting down again, but at its drinking resorts it seems loth to leave the spot until its thirst is quenched.

The species feeds chiefly upon the seeds and tender shoots of wild plants, though when in the vicinity of cultivated land it will resort thereto in search of grain. As a bird for the table its flesh is by no means to be despised, and though, perhaps, rather drier, may be likened to that of Black-Game, the flesh of the breast being both dark and light as in that bird. Sand-Grouse in general, are difficult to skin, their feathers, like those of Pigeons, being loosely attached to the skin; and it requires all the taxidermists' art to make good museum specimens.

Like all its congeners, the present species is monogamous and rather a late breeder, though not as late as stated by most authors and I have obtained full clutches of eggs by the middle of April. The nesting season of the species, however, continues throughout that and the following month, and probably also throughout June."

Although the Large Sand-Grouse has never been found breeding within Indian limits its eggs were taken by Lieut. E. Barnes at Chaman, Afghanistan, on the 15th May, and it is quite possible, therefore, that it may be found breeding occasionally in Sind or the South East Punjab.

It breeds in Afghanistan, probably also Baluchistan, and in Seistan and Persia, the Caucasus, Asia Minor and more or less throughout South Russia and the countries bordering on the Mediterranean, but common only in Spain and North West Africa, in Algeria and Morocco, from which last place I have received eggs.

The breeding season commences in April, when the birds begin to pair and the eggs are laid in May and June. Those in the collection of the British Museum show that in Spain and Northern Africa the breeding season is later than it is in Asia Minor and the rest of its Eastern Range. All the eggs from the former countries are dated between the 27th May and 15th June, whereas those from the Eastern countries were taken between the 9th and 15th May. The eggs in my own collection confirm this as all my Spanish and Algerian eggs are dated between the 30th May and 22nd June, whilst those from the Altai are dated 3rd to 17th May. Whitaker, however, says "I have taken full

clutches of eggs by the middle of April. The nesting season of the species, however, continues throughout that and the following month, and probably also throughout June."

The eggs appear to be laid on the ground in a slight hollow scratched out by the parent bird in the sand and, as a rule, there is absolutely no attempt made at concealment, the place selected being one quite in the open, though on some occasions, slight protection from sun and observation may be afforded by a stone, small rock or tuft of grass.

The full number of eggs laid is three, but two eggs are sometimes incubated. They are typical Sand-Grouse-eggs in every respect, being of the usual elliptical form and decidedly glossy, especially when first laid, as they lose the gloss to some extent after they have been kept a few years. The texture is smooth and close, but not very fine, and the eggs are rather brittle and fragile for their size.

The ground colour varies from greyish stone colour, pale dull cream, pale yellowish grey, pale buff or greenish grey to a rather warm buff stone colour, or stone colour with a distinct green tint. Most eggs are, however, very pale and their pale dull colouration generally is a distinct feature of this Sand-Grouse's eggs. The superior makings consist of indefinite smudges, blotches and spots of reddish brown, dull grey brown or dull rufous brown, the edges often paler and merging into the secondary markings, which are pale lavender grey or purplish grey. The markings, both surface and sub-surface vary considerably in amount, sometimes being rather sparse, at others rather numerous, but they are nearly always distribute, fairly evenly over the whole surface of the egg.

According to Oates the series in the British Museum collection measure from 1·7" to 2" in length and from 1·23" to 1·33" in breadth (=43·5 to 51 and 31·2 to 33·6mm.). With the exception of three eggs, all those in my collection come within these limits. The three exceptions measure 2·05", 2·07" and 2·10" (=52, 52·6 × 53·2 mm.) in length, but are not as broad as the broadest of the Museum eggs. Including these latter, the average of 68 eggs I have measured is 1·86" × 1·27" = (47·5 × 29·8 mm.). Oates in describing the Museum eggs says "The eggs of the Black-bellied Sand-Grouse are, on the whole, very pale, and present a marbled appearance." This "marbled" appearance is common to all the Sand-Grouse eggs and together with their curious elliptical shape make them resemble very remarkably the eggs of the Caprimulgidæ or Nightjars.

Whitaker gives the average of the eggs measured by him as 45 × 30 mm.

# SCIENTIFIC RESULTS FROM THE MAMMAL SURVEY.

BY

R. C. WROUGHTON, F.Z.S., AND KATHLEEN V. RYLEY.

## III*

### A.—A NEW SPECIES OF MYOTIS FROM KANARA.

In dealing with the Genus *Myotis* (under the name *Vespertilio*, Mammalia p. 328 *et seq.*) Blanford arranged these bats in two sections, *viz.*, those with large feet (now generally accepted as a sub-genus under the name *Leuconoe*) and those with small feet (*i.e.*, true *Myotis*). In the Kanara Collection Mr. Shortridge obtained a true *Myotis* so different from any known Indian Species that we propose to describe it under the name.

MYOTIS PEYTONI, sp. n.

A *Myotis*, of the small-footed section, much larger than either *mystacinus* or *nipalensis*.

Fur fairly long (5-6 mm.) and loose. General colour above uniform, dark 'vandyke brown;' washed with paler below. Membranes dusky, almost black, in colour. Wings extending to the base of the outer toe. Calcar comparatively short, extending about halfway to the tail, no post-calcareal lobe. Inner edge of ear convex, tip pointed, outer edge straight above, convex below. Tragus of medium length, its inner edge straight, its outer margin convex, crenulated, with a marked lobe at its base.

*Dimensions of the Type.*—Head and body, 62; tail, 44; ear, 15; forearm, 46; III finger, metacarpal, 42; first phalanx, 16; second phalanx, 16;—total, 77. IV finger, metacarpal, 41; first phalanx, 12; second phalanx, 11;—total, 60; V finger, metacarpal, 39; first phalanx, 10·5; second phalanx, 8·5;—total, 56; hindleg above ankle, 19; hindfoot, 10; calcar, 15; tragus (length on inner edge), 5·2; greatest breadth (at about half its length), 2·5.

*Skull.*—Greatest length, 18; zygomatic breadth, 6; braincase, 9; breadth across third upper molar, 7·5; front of canine to back of last molar, 6.

*Habitat.*—S. India. (Type from Gersoppa Falls, Kanara). Altitude 1,300 ft.

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* We find that these papers on the taxonomic results of the Survey promise to be far more frequently required than was foreseen. We think, therefore, it will be most convenient to publish them in future under a uniform heading, with serial numbers (in Roman figures, to prevent confusion with the serial numbers of the "Reports"), and with sectional headings to the subjects treated. This is the third paper to be published and we have decided that it is best so to number it. The earlier papers will be found as follows:—

I—at Vol. XXI, p. 338.
II—at Vol. XXI, p. 767.

R. C. W.
K. V. R.

*Type.*—Adult female. B. M. No. 12.8.25.1. Original number 1042. Collected by Mr. G. C. Shortridge, and presented to the National Collection by the Bombay Natural History Society.

Mr. Shortridge obtained thirty specimens, a very even series in colouring and measurements allowing for age.

We have named the species in memory of General Peyton, who for a generation was Conservator of Forests in, and virtual Rajah of Kanara.

*B.*—A New Species of Kerivoula from N. W. Mysore.

Horsfield (Researches in Java, 1824) described *Kerivoula hardwickii* on a specimen from Java. The national collection received a nice series of this Bat from the Balston Expedition to Java. These were collected by Mr. Shortridge in Java, and may be confidently accepted as representing true *hardwickii*.

In 1871 (P. A. S. B. p. 215) Dobson described *Kerivoula fusca*. Besides a few measurements and the colour. Dobson only records :—"On the outer side of the ear there is a wide emargination which forms the tip, and without which the ear would be regularly, broadly oval." He adds, however, "this species differs from *K. hardwickii*, Horsf, which it resembles, in some respects, in the form of the ears, and colour and distribution of the fur." In his Catalogue of the Chiroptera of the Indian Museum, Calcutta, (1876), Dobson sinks *fusca* as a synonym of *hardwickii*. His No. 682 in the Catalogue is probably the type of *fusca* but it is not so marked. This specimen is not available for examination, but in the Catalogue it is labelled "no locality" and "no history," so that it may well have been a Java specimen and even one of Horsfield's. In view of the evidence available, I have no hesitation in describing a specimen obtained by Mr. Shortridge in the Kardibetta Forest, Shimoga, as a distinct species, under the name of—

Kerivoula crypta, sp. n.

A *Kerivoula* rather similar to *hardwickii* in general appearance, but distinguished by its smaller and less emarginate ear, shorter wing, and darker colour.

Fur long and silky. General colour above pale "seal brown," the individual hairs self-coloured to their bases (hairs in *hardwickii* are bicoloured); below somewhat paler. Fur not extending on to the wing or interfemoral membranes. Wings reaching to base of outer toe. Ears broadly oval, a well marked notch, but no "wide emargination" on the outer edge; tragus long, narrowing gradually to a sharp point.

Skull not differing materially from that of *hardwickii*.

*Dimensions of the Type.*—Head and body, 44 (41·45); tail, 42

(45·46); fore-arm, 31·5 (33·34, 7); ear, 12·5 (14·15); tibia, 16 (15·5, 16·5); hindfoot, 7 (6·8); middle finger, metacarpal 31 (38·6-36); first phalanx, 15 (15·8-17);—total, 65 (69-73·2).

*Skull.*—Condylo-incisive length, 13·3 (13·2-14); basilar length, 11 (11-12); zygomatic breadth, 9 (9-9·5); braincase, 8·2 (7·8-8·2); front of upper canines to back of last molar, 5-5 (5·5-6); breadth across palate at front end of last molar, 5-5 (5-5·8).

(NOTE:—The figures between brackets are the maximum and minimum in three adult specimens of *hardwickii*.)

*Habitat.*—Shimoga, South India.

*Type.*—Adult male. B. M. No. 12.8.25.2. Original No. 1317, collected by Mr. G. C. Shortridge, on 20th June 1912, and presented to the National Collection by the Bombay Natural History Society.

### C.—A NEW SPECIES OF HARE FROM THE CENTRAL PROVINCES.

Amongst the hares obtained by Mr. Crump in the Hoshangabad District are some specimens from the Mahadeo Hills, which are so markedly and distinctly different from those of the surrounding country that I propose to describe them as a new species under the name.

LEPUS MAHADEVA, sp. n.

*The Pachmarhi Hare.*

A hare, allied to *L. simcoxi*, with a similar grey neck, but distinguished from that species by its much richer, darker colouring and the absence of the grey patch on the rump, so characteristic of *L. simcoxi*.

General colour above "cinnamon rufous" strongly washed with black, individual hairs of the back white at the base (10 mm.) followed by black band (4·5 mm.), the remainder (12 mm.) about equally cinnamon and black; below pure white. The grey rump so characteristic of *simcoxi* almost or entirely wanting. The face coloured like the back, ears in front dark bistre, ticked with buffy. Cheeks between "wood-brown" and "cinnamon," much washed with black. Tail above dingy rufous, the individual hairs black with buffy tips. Nape grey, as in *simcoxi*.

On the whole the average size of the skull is smaller and the nasals narrower than in true *simcoxi*.

*Dimensions of the Type* (recorded by the Collector).—Head and body, 455; tail, 79; hindfoot, 102; ear, 94.

*Skull.*—Greatest length, 94; basal length, 74; zygomatic breadth, 44; greatest length of nasals, 40; palatal foramen, 24; upper molar series, 16.

*Habitat.*—Mahadeo Hills, Central Provinces. (Type from Dhaim). Altitude 2,300 ft.

*Type.*—Adult female. B. M. No. 12.7.8.1. Original No. 893. Collected by Mr. C. A. Crump, 10th February, 1912, and presented to the National Collection by the Bombay Natural History Society.

Mr. Crump obtained six specimens from various places round Pachmarhi. This is no doubt the representative of *simcoxi* in the altered conditions of hilly country, heavy rainfall, and thick forest found in the Mahadeo Hills. The dark and rich colouring and the absence of the pale grey rump distinguish it at once from *simcoxi*.

### *D.*—The Genera Leggada and Mus.

In a recent issue of this Journal (Vol. XXI, p. 772) Wroughton described, on a single specimen, taken by Mr. Crump at Asirgarh in the Nimar District, a new species, *Mus phillipsi*. A careful revision of the Nimar Collection (No. 4) has resulted in the discovery of two more specimens (♀ 180...Chikalda and ♀ 205...Pili Sipna Valley), from an examination of which we are now in a position to record that the mammary formula of *phillipsi* is 3—2 = 10.

In the Bellary Collection there is a series of eight specimens, taken by Mr. Shortridge at Vijayanagar, which though closely allied to *phillipsi* represent a distinct species. Before describing this new form, however, we have felt compelled to enquire into the whole question of the status of the two Genera *Mus* and *Leggada*.

*Leggada* was separated from *Mus* by Gray, in 1837 (A.M.N.H. I, p. 586) when he included in it two species, *viz.*, *booduga* and *platythrix*. Hitherto *booduga* has been accepted as best representing the genus, and the presence of "an additional lunate lobe at the base of the front edge" of the upper anterior molar, cited by Gray, has been regarded as the primary generic character. This position is no longer tenable, for recently a number of species, allied to *booduga*, have been discovered in Africa, in many of which this character is but imperfectly developed, and in some is entirely absent.

Mr. Thomas has pointed out to us that the name *Leggada* is based on "leggyade," the Kanarese name of *platythrix* (*teste* Elliot, Madr. Journ. L. & Sc. X, p. 215) and that, consequently, by the rule of tautonomy, *platythrix*, and not *booduga*, is the type species of the Genus *Leggada*, and has advised us to adopt the presence or absence of frontal ridges* on the skull as the primary generic character, in the place of the one mentioned above.

The adoption of this position necessitates a complete redistribution of the known species between the two Genera *Mus* and

* (Note.—These are well shown in the text block published on page 773 of a recent issue (Vol. xxi, 1912, of this Journal.)

*Leggada*. So far as the Indian species go* the following changes must be made in Blanford's Mammalia :—

1. In the key on p. 401, after the clause "A. Form slender; transverse laminæ of molars considerably curved," insert :—

*A*¹—No frontal ridges; coat silky, almost or quite spineless ..... *Mus.*

*B*¹—Frontal ridges present; coat spiny ..... *Leggada.*

2. In the key on p. 405, after the clause "*b*¹. Ear not extending to eye," insert :—

*a*¹. General colour dark brown ..... *M. booduga.*

*b*¹. General colour pale grey ..... *M. dunni.*

and delete entirely the last clause under "A" *viz* :—"*b*. Dorsal fur mainly, or wholly, composed of inflexible spines..... *M. platythrix.*"

(Note :—We do not wish it to be understood that we accept all the rest of the key as it stands. The species included in it have in several cases been removed to other genera, for instance, the first ten species mentioned in it have, with others, been transferred to the genus *Epimys*. The remainder of section "A" however may be accepted as dealing with the genus *Mus*, after the change we have suggested above has been made).

3. Immediately after *Mus* insert a new genus *Leggada* with a key as follows :—

A Mammary formula 4—2=12; spines comparatively fine.

*a*. Size larger, hindfoot 18mm., skull 25.

*a*². General colour brown ..... *L. platythrix*

*b*². General colour pale grey ..... *L. sadhu.*

*b*. Size smaller, hind foot 16, skull 22; General colour pale grey ..... *L. cinderella.*

B. Mammary formula 3—2=10; spines coarse and stiff.

*a*. Size smaller, hind foot 15, skull 21

*a*². General colour dark grey, nearly black *L. phillipsi.*

*b*². General colour pale grey ..... *L. surkha.*

*b*. Size larger, hind foot 17-5, skull 27 ..... *L. bahadur.*

## *B.*—A NEW SPECIES OF LEGGADA FROM BELLARY.

### LEGGADDA SURKHA, sp. n.

A *Leggada* with mammary formula 3—2=10, and stiff coarse spines, as in *phillipsi*, but differing from that species in colouring.

Size about as in *phillipsi*. Fur composed of stiff, coarse spines intermixed with a few finer, buffy hairs. Length of spines on back 8mm. General colour above, pale fawn grey, individual spines pale slate grey, with dark tips; below pure white.

* (Note.—Apparently all the African species now classed as *Leggada* must be relegated to the Genus *Mus*.)

Tail coarsely ringed, darker above and paler below; sparsely clothed with short hairs. Pads of hindfoot 6. Mammæ 3—2=10.

Skull about the same size as in *L. phillipsi*. The parietals flatter and interorbital region broader than in that species; frontal ridges well marked and continuing backwards round the parietals.

*Dimensions of the Type* (measured in the flesh):—Head and body, 89; tail, 64; hindfoot, 15; ear, 12.

*Skull*:—Condylo-incisive length, 21 (21·5); basilar length, 18 (18); zygomatic breadth, 11·5 (11); nasals, 9 (9); diastema, 6, (6·5); upper molar series, 4 (3·7).

(NOTE:—The figures in brackets refer to skull measurements taken on the *type* of *L. phillipsi*).

*Habitat*:—Vijayanagar, Bellary District.

*Type*:—Adult male. B. M. No. 12· 10· 16· 1. Original number 1651. Collected by Mr. G. C. Shortridge, 12th August 1912, and presented to the National Collection by the Bombay Natural History Society.

The series of eight specimens obtained by Mr. Shortridge is remarkably constant in colour and size.

The specific name is based on the Urdu word "surkha" meaning "grey"—as applied to an animal.

### C—A NEW SPECIES OF LEGGADA FROM KANARA.

In working out the above our attention has been called to two spirit specimens of a mouse which were sent to us some time ago, by the Society, for determination. Unfortunately there is no history to these specimens except that they were taken at Karwar, in the Kanara District, and they have been so long in alcohol that the colour has been bleached out of them. They represent, however, a very distinct new species which we propose to call *L. bahadur*.

### LEGGADA BAHADUR, sp. n.

A *Leggada* belonging to the group with 10 mammæ, but very markedly larger in size than either *phillipsi* or *surkha*.

Size large as compared with the other species in this section of *Leggada*, about as in *L. platythrix*. Coat composed almost entirely of coarse, stiff spines, as in *phillipsi* and *surkha*. General colour above probably some shade of grey (the specimens, owing to long immersion in alcohol, have turned a reddish colour), the individual spines pale at the base with dark tips; below pure white.

Skull the same size as in *platythrix*, which it resembles in shape in all essential characters.

*Dimensions of the Type* (measured on a spirit specimen):—Head and body, 85; tail, about 65-70 (broken); hindfoot, 17·5; ear, 13.

*Skull* :—Condylo-incisive length, 27 ; basilar length, 23 ; zygomatic breadth, 13·5 ; nasal, 12 ; diastema, 8 ; upper molar series, 5.

*Habitat* :—Karwar, Kanara District.

*Type* :—Old female. B. M. No. 12·10·16·3. Presented to the National Collection by the Bombay Natural History Society.

It is unfortunate that there is no history of these two specimens, but it is to be hoped that a series, properly measured in the flesh, will now soon be obtained.

The second specimen, though showing the mammæ quite plainly, is much younger and smaller, but though the combined head and body measurement is only 75 mm. and that of the skull less than 23 mm. the hindfoot is the same size as in the type specimen.

The specific name refers to its size, which is conspicuously greater than that of *phillipsi* and *surkha*, and in which it equals *platythrix*, hitherto the giant of the Genus.

### *E.*—Generic classification of the Indian Murinæ.

In the 20 years since Blanford published his Key at page 401 of the "Mammalia," great additions have been made to the knowledge of the Indian *Murinae*, a result the credit for which belongs largely to the Bombay Natural History Society. Since 1891 four Genera, not recognized by Blanford, have been revived, and no less than seven new ones have been established.

We recognize that any Key drawn up now will almost certainly require to be amended as the Survey progresses ; but we have found that for our own convenience some Key, based on our present knowledge, was necessary ; and we believe it will have a certain value, even though it be only provisional, in enabling Members interested to follow the results of the Survey intelligently.

We do not claim to have made any special investigations for the purposes of this Key, but have accepted the data recorded by Blanford, when such were available and suitable for our purpose.

"*Mus chiropus*," an aberrant species referred to by Blanford in his Key, seems, from the description recorded, to fit into the Genus *Hæromys* Thos. (A.M.N.H., p. 207., 1911). We have, therefore, included that genus in our Key to represent it. "*Mus erythrotis*," known only from a single immature specimen, appears to us generically indeterminable, and we have left it out of consideration.

The following is the Key :—

I.—Tubercles on anterior lower molar in 3 longitudinal series; *coat silky; mammæ* 2—2=8 ..... *HAPALOMYS.*

II.—Tubercles on anterior lower molar in 2 longitudinal series.

Tail coarsely ringed, darker above and paler below; sparsely clothed with short hairs. Pads of hindfoot 6. Mammæ 3—2=10.

Skull about the same size as in *L. phillipsi*. The parietals flatter and interorbital region broader than in that species; frontal ridges well marked and continuing backwards round the parietals.

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(NOTE:—The figures in brackets refer to skull measurements taken on the *type* of *L. phillipsi*).

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Skull the same size as in *platythrix*, which it resembles in shape in all essential characters.

*Dimensions of the Type* (measured on a spirit specimen):—Head and body, 85; tail, about 65-70 (broken); hindfoot, 17·5; era, 13.

*Skull* :—Condylo-incisive length, 27 ; basilar length, 23 ; zygomatic breadth, 13·5 ; nasal, 12 ; diastema, 8 ; upper molar series, 5.

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The following is the Key :—

I.—Tubercles on anterior lower molar in 3 longitudinal series; *coat silky; mammæ* 2—2=8 ..... *HAPALOMYS.*

II.—Tubercles on anterior lower molar in 2 longitudinal series.

A. First and fifth digits of all feet with flat nails; *coat silky*; *mammæ* 2—2=8... *VANDELEURIA.*

B. Fifth digit with a claw.

*a.* Hallux with a flat nail.

$a^1$. Postero-internal cusp of upper molars present; *coat silky*; *mammæ* 0—2=4 ..... *CHIROPODOMYS*

$b^1$. Postero-internal cusp of upper molars absent ..... *HÆRROMYS.*

*b.* Hallux with a claw.

$a^1$. Incisors longitudinally grooved; *coat harsh*; *plantar pads* 6; *mammæ* 2—2 = 8 ..... *GOLUNDA.*

$b^1$. Incisors not longitudinally grooved.

$a^2$. Plantar pads less than 6.

$a^3$. Plantar pads 4; *coat silky*; *mammæ* 1—2 = 6; *mesopterygoid fossa roofed in anteriorly* ..... *GRYPOMYS.*

$b^3$. Plantar pads 5; *coat varying in texture mammæ* 2—2 = 8 *mesopterygoid fossa normal* ..... *MILLARDIA.*

$b^2$. Plantar pads 6

$a^3$ Postero-internal cusp of upper molars present; *coat silky*; *mammæ* 1—2=6. ..... *APODEMUS*

$b^3$ Postero-internal cusp of upper molars absent,

$a^4$. Bevelled edge of incisors notched; $m^1$ longer than $m^2$. and $m^3$ combined.

$a^5$. Frontal ridges well marked; coat spiny; mammæ 3—2=10 or 4—2 = 12. ..... *LEGGADA.*

$b^5$. Frontal ridges absent; *coat silky*; *mammæ* 3—2=10 *MUS.*

$b^4$. Bevelled edge of incisors not notched; $m^1$ equal to or shorter than $m^2$ and $m^3$ combined.

$a^5$. Front edge of zygomatic plate concave; *coat harsh*; *mammæ* 2—2 = 8 ..... *HADROMYS.*

$b^5$. Front edge of zygomatic plate straight or convex.

$a^6$. Transverse laminæ of upper molars considerably curved.

$a^7$. Mesopterygoid fossa roofed in anteriorly; *coat spiny*; *mammæ* 4—2 =12 ..... *PYROMYS.*

$b^7$. Mesopterygoid fossa normal.

$a^8$. Mammæ 1—2 = 6; *coat silky* ..... *CREMNOMYS*

$b^8$. Mammæ more than 6; *coat silky*, sometimes mixed with spines ..... *EPIMYS.*

$b^6$. Transverse laminæ of upper molars straight.

$a^7$. Size large, head and body more than 300 mm.; *coat harsh*: *mammæ* 3—3=12. *BANDICOTA.*

$b^7$. Size smaller, head and body at most 225mm.

$a^8$. Palatal foramina long (8mm.); coat harsh; multimammate (16-18) ..... *GUNOMYS.*

$b^8$. Palatal foramina short (5mm.); *mammæ* 2—2=8. *NESOKIA.*

# A POPULAR TREATISE ON THE COMMON INDIAN SNAKES.

ILLUSTRATED BY COLOURED PLATES AND DIAGRAMS.

BY

MAJOR F. WALL, I.M.S., C.M.Z.S.

*Part XIX with Plate XIX, Diagram and Map.*

(*Continued from page 1021 of this Volume.*)

## *COLUBER HELENA* (Daudin).

The genus *Coluber* is one of the many into which the family *Colubridæ* is divided, and belongs to the "aglyphous" (or fangless) series.

It contained, when Boulenger's Catalogue appeared in 1894, 45 species inhabiting Europe, Asia and America. Nine of these are known to occur within Indian limits. The type of the genus is the North American *C. guttatus*.

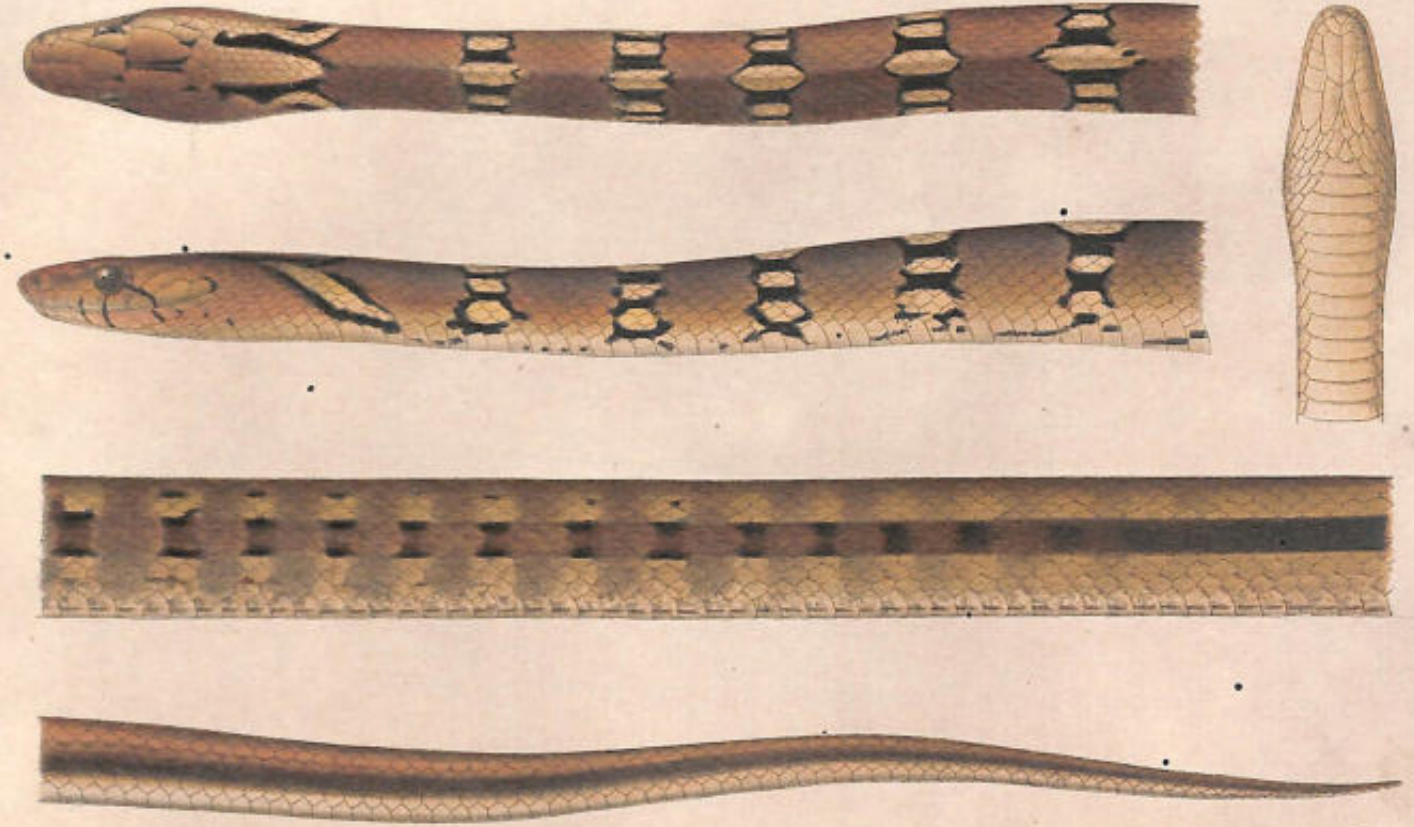
*History.*—Our earliest reference to *Coluber helena* is contained in Russell's work published in 1796, where it is figured (Vol. 1. plate XXXII), and some interesting notes are incorporated with a description of the snake.

*Nomenclature—Scientific.*—The generic name is from the Latin coluber, a term applied to any species in the same way as our English word "snake" is. Under this term Linné in 1766 included many species which subsequent authors on very good grounds have dissociated, and made the types of genera distinct, *Helena* the specific name was given to it by Daudin in 1803, in recognition of its beauty.

*English.*—"The trinket snake" suggests itself as appropriate, the beautiful ornamentation anteriorly reminding one of jewels set in a ring or trinket.

*Vernacular.*—Russell mentions the name "mega-rekula-poda" as in use about Vizagapatam, and Willey says in Ceylon it is called "mudu karawala."

*General characters.*—The head is rather narrow, with a somewhat elongate, and bluntly rounded snout. There is little or no indication of a *canthus rostralis*. The nostril is fairly large, and occupies about three-fourths of the upper part of the suture between the nasal shields. The eye is moderately large, rather less than half the length of the snout, and placed laterally. The pupil is round, or horizontally elliptical, and the iris is adorned with gold. The tongue pinkish at the base, becomes bluish black except at the very tips which are white. I noted in a specimen from the Nilgiris that the mucous membrane of the mouth was blackish.



J. G. del.

THE COMMON INDIAN SNAKES. (Wall).

Coluber helena, *harmless, nat size.*

J. Green, Chromo.

The neck is fairly evident, and the body which is robust, is compressed somewhat, and smooth. The belly is angulated obtusely on either side. The tail is short, and about one-fifth the total length of the snake.

*Colour and markings.*—The ground colour dorsally is brownish, but subject to much variation, some specimens being very light, others very dark. One I had from the Anamallays was almost blackish. On the face the brown fades to dirty yellow, or whitish on the lip. There is almost always a more or less obvious oblique black stripe from the eye to the lip before the gape, and often some, or all the sutures on both lips have dark streaks. The forebody for a variable length is very beautifully ornamented with ocellated cross-bars of a pattern peculiar to this among Indian snakes. In a well marked, and freshly sloughed specimen, such as we have figured in our Plate these bars are outlined, and intersected with rich black, the intersecting lines being specially heavy. In Günther's * excellent figure those are shown in almost the entire length of the snake, but this is unusual. Frequently they are only seen in the anterior half of the body, and sometimes in a much more restricted length. In all specimens they become modified sooner or later, and gradually disappear. This is well shown in figure 3 of our Plate. On the nape there is usually, but not always, a conspicuous black mark, which may be V. shaped, or merely consist of two parallel lines. Sometimes these project backwards to connect two or three cross-bars, and in some specimens they resemble a hairpin rather than a capital V. In all the specimens I have seen from Western India as far North as about Bombay, the anterior cross-bars are connected by narrow festoons on the sides of the ventral shields. These are seen though somewhat more disconnected than usual in figure 2 of our Plate. There is no vestige of these in Himalayan specimens, nor do I find a trace of them in an example from Udaipur, in another from Broach and in a third from Berhampore (Orissa).

On the sides of the body as the cross-bars fade, a dark and broad stripe gradually appears. This involves the upper half of the 3rd and the 4th, 5th, and 6th rows of scales above the ventrals and passes backwards along the tail to its tip.

The skin between the dorsal scales is pinkish. The belly is uniform pearly white, or faintly yellow in the middle, and more or less mottled with greyish beyond the angulation of the ventral shields. Russell figures a somewhat differently marked specimen from Vizagapatam in which the anterior two-thirds of the body is yellowish on the back, and pink on the sides. There are no cross-bars such as I have described above, but a dark zigzag line runs down the back with a white dot, at each angle of the zigzag.

*Identification.*—This is not difficult if attention is given to scale characters. The following combination of characters will distinguish it from other Indian snakes: (1) Scales 25 to 29 in mid-body, (2) an entire anal, (3) two or three labials touching the eye.

*Dimensions.*—Specimens over 4 feet are unusual, and over 5 feet rare. The largest I have seen measured 4 feet 11 inches from Matheran, 5 feet 2 inches, and 5 feet 3 inches from Paralai in the Anamallay Hills.

*Disposition.*—All who have remarked upon the species are in agreement as to its vicious temper. Russell * speaking of a specimen he had in Vizagapatam says: "It appeared singularly alert in its movements, and snapped at everything presented to it. In preparing to attack, it wreathed its neck, and part of the trunk, into close turns, and at the same time, retracting its head, presented, at a distance, something of the appearance of a hooded snake. When it snapped, the body being more raised by the assistance of the tail, the wreaths were rapidly unwreathed, and the head darted obliquely forward, with a motion so rapid, that the animal, without rising from the ground, seemed to fly on his prey. In this manner it could unexpectedly seize an object which in appearance lay far beyond its reach. A chicken, intended for experiment, having made its escape, was accidentally pursued into the chamber where the snake had been left at liberty, and was no sooner perceived than the snake flew furiously at him, snapped several times as he passed, and soon seized and secured him, by wreathing round the body. In two minutes the bird was found dead, having been strangled by the snake's tail.

A second chicken was attacked in like manner, and had he not been relieved in time would have suffered the same fate. He was bitten in several places."

Colonel Light in a letter written to our Secretary remarks of one he got in Poona that "It showed great fierceness, and struck repeatedly at the stick when being killed." A young specimen I had in Bangalore I noted was wonderfully active. When teased it showed fight by erecting, and throwing the fore part of the body into broad sigmoid curves, which it straightened in the act of striking. It struck out repeatedly and in an upward direction much like the Dhaman (*Zamenis mucosus*). I noticed that prior to striking the neck was markedly compressed, the spine in this region arched, and the throat distinctly pouched, just in fact exactly similar to what I have seen in the Dhaman under similar circumstances. When erect the body scales anteriorly were

* Rept. of Brit. India, Pl. XXI A.

† Loc. cit.

separated, revealing the pinkish colour of the intervening skin, and enhancing the beauty of the little reptile.

*Haunts.*—As far as I am aware, it is usually to be found in or near jungle though this may not be very dense. It certainly frequently quarters itself in, and about well populated areas, being frequently found in Cantonment limits, and it is no unusual circumstance for it to stray into habitations. One was killed in the Municipal Library in Almora two years ago, and another in my sweeper's house. This one would expect from the nature of its food.

*Habits.*—It is frequently encountered during the day, more often I think under these circumstances being disturbed from its lair in brushwood, than actively pursuing its quest for food. More usually in man's immediate environment, it seems to emerge as daylight fails, and is abroad at night.

One specially interesting trait in its character is its habit of constricting its prey prior to deglutition. Green* speaking of specimens in his vivarium says: "I have several times observed its capture of a small skink (*Lygosoma*, sp.). On one occasion the Coluber had captured a lizard, and was tightly constricting it, the whole body of the snake being twisted into a complicated knot. It commenced work upon the tail, which became detached from the body of the lizard and was promptly swallowed. The snake then apparently forgot that the largest part of its captive was still enclosed in the folds of its body, and began looking about for another victim. Eventually it re-discovered its original capture, and commenced to engulf it, drawing it gradually through the encompassing coils."

*Food.*—Under natural conditions a decided partiality is shown for mammalian fare, but it would seem that lizards, and even snakes are acceptable under press of hunger. Green† has frequently seen his captive specimens eat lizards as already mentioned, but he remarks that in hunting lizards it is very inexpert, and repeatedly fails to effect a capture. As soon as the lizard stopped, the snake lost interest in it, and appeared attracted by moving objects only. Mr. Millard writing to me some time ago said that a specimen in Bombay refused lizards and frogs, but took a mouse that was offered at once. One voracious individual tried on two occasions to eat snakes with which it was incarcerated. Once the species was *Chrysopelea ornata*, and once *Dendrophis pictus*.

*Breeding.*—It is remarkable that of the many specimens that have come into my hands none should have proved gravid. I know nothing of its breeding habits, nor can I find anything in the literature of the species to which I have access. The smallest

* Spol., Zeylan, Vol. III. Part X. p. 157, and Vol. III. Part XI. p. 197

† *Loc. cit.*

specimens I have had were 1 foot $3\frac{3}{8}$ inches from Almora in March, 1 foot $3\frac{1}{4}$, and 1 foot $3\frac{1}{2}$ inches from Paralai, dates of capture unrecorded.

*Parasites.*—I have found the stomach invaded by the nematode worm *Kallicephalus willeyi*.

*Distribution*—(a) *Local.*—I have always regarded *Coluber helena* as a hill snake that rarely straggles into the plains in the proximate vicinity of hills, but it will be seen from our map that it occurs sparingly in certain localities at low elevations removed from hilly country. There is no doubt that it favours altitudes between about 1,500 and 6,000 feet, and below this it is in my experience a distinctly rare snake. Haly, in his List of Ceylon Snakes in 1886, wrote: "a very common up-country snake. The collection (Colombo Museum) possesses no specimen from the low country." Later, however, in 1891 he records one in the collection from Colombo. Ferguson, writing of the snakes* of Travancore in this Journal, says it is a common snake above an altitude of 1,000 feet. I have had many specimens from the Anamallays at an elevation of 3,500 to 4,000 feet, and I am told by Father Gombert that at Shembaganur in the Palneys it is common at 6,000 feet. I have had it from Kil Kotagiri in the Nilgiris above 5,000 feet. On the Mysore Plateau at about 2,000 to 3000 feet, and at the same altitude on the Western Ghats it is not uncommon. In the Western Himalayas about Kumaon it is quite common, and I have had it from as far West as Bakloh. One cannot escape the conviction that it must occur in the Eastern Himalayas since a specimen in the Indian Museum is from Samaguting in the Naga Hills, Assam. If it occurs in the Eastern Himalaya it must be rare as there is no record, as far as I am aware, from this region.

It is common in parts of Rajputana notably where the altitude exceeds about 1,500 feet, such places as Mount Abu, Udaipore, Ajmer, and Jeypore, all in or beside the Aravalli Hills. It is noteworthy also that Vizagapatam where Russell got his specimen is close to hills, and Berhampore (Orissa) from where I have had a specimen, is only ten miles or so from hills. On the other hand Karachi, Broach, Purneah District, 24 Parganas, and Colombo from whence there are records, cannot be said to be near hills.

A detailed enumeration of its known localities is given in our map.

*Geographical distribution.*—Ceylon, Hills of Peninsula India, Sind, Rajpootana, Western Himalayas, Bengal East of Purneah, Naga Hills Assam.

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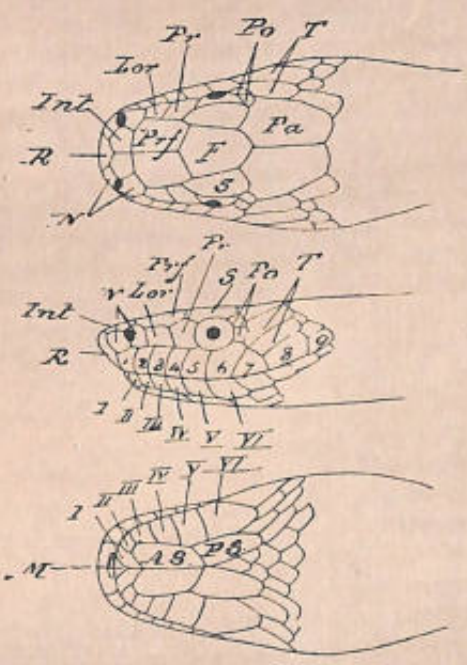
* Vol. x., p. 72.



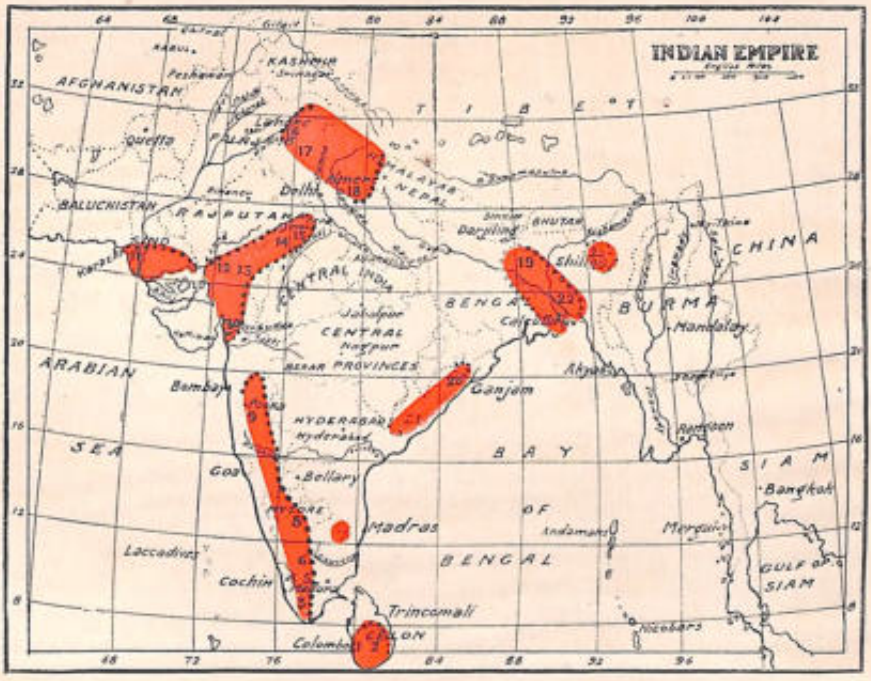

*Coluber helena* (½)

*Lepidosis Rostral.*—Touches 6 shields; the rostro-nasal sutures largest, about twice the rostro-internasal. *Internasals.*—A pairs; the suture between them half, or less than half that between the præfrontal fellows, about two-thirds the internaso-præfrontal sutures. *Præfrontals.*—A pair; the suture between them rather greater than the præfronto-frontal; in contact with internasal, postnasal, loreal, præocular, and sometimes with the supraocular. *Frontal.*—Touches 6 shields usually, 8 when the præocular meets it; the fronto-supraocular sutures largest.—*Supraoculars.*—As long as frontal, but not so broad in a line connecting the centres of the eyes. *Nasals.*—Two, almost entirely separated by the nostril, a suture running to the 1st supralabial. *Loreals.*—One rather longer than deep. *Præoculars.*—One. *Postoculars.*—Two. *Temporals.*—Two, the upper touching a supralabial usually the 6th or 7th. *Supralabcals.*—Very variable, 9, 10 or 11; usually two touch the eye, the 5th and 6th most constantly, sometimes the 6th and 7th, or in some examples three touch the eye. *Infralabails.*—6. The 5th and 6th touch the posterior sublinguals; the 6th is the longest and in contact with three scales behind. *Sublinguals.*—Two pairs, subequalor the anterior rather longer. *Costals.*—Subject to much variation. In midbody they may be 25 to 29. Anterior-

ly the rows are two less than in midbody, and posteriorly six less when the rows are 25 in midbody, eight less when 27 or 29 in midbody. The increase and decrease of the rows is interesting. Where they increase anteriorly (some 1 to 5 heads-lengths behind the head) it is the 7th row from the vertebral that divides. Where the rows decrease at the first step (at or just behind the middle of the body) it is the 6th or 7th below the vertebral that is absorbed. In all the subsequent reductions the 9th or 10th rows below the vertebrals disappear. Keels are present in some of the median costals posteriorly, and some of the basal supracaudals, but are but feeble. Apical facets are present in pairs. *Ventrals.*—220 to 265; angulate laterally. *Anal.*—Entire. *Subcaudals.*—74 to 96, divided. *Anomalies.*—Blanford mentions a specimen with two loreals.

*Dentition.*—*Maxillary* teeth 19 to 25, in an uninterrupted series, the median rather the longest. *Palatine* 10 to 14, subequal or median rather longest, as large as the maxillary. *Pterygoid* 15 to 30 (15 and 16 in a specimen from Bakloh, W. Himalayas; 27 to 30 in an example from Paralai, Anamallay Hills.) Smaller than the maxillary reducing in length posteriorly; closely set with a strong inclination inwards so that they lie nearly transversely to the jaw. *Mandibular* 22 to 30, subequal, or median slightly longest; as large as maxillary.

(*To be continued.*)




1 Colombo (Haly) near Galle (I. M.). 2 Ceylon Hills (Haly). 3 Travancore Hills (Ferguson). 4 Anamallays (B. M. and F. W.). 5 Palneys (Father Gombert in letter to me). 6 Nilgiris (F.W.). 7 Shevaroys (I.M.). 8 Bangalore (F.W.). 9 Poona, Khandalla, Matheran (B. M. and Bo. M.). 10 Broach (F.W.). 11 Karachi (I.M.). 12 Mount Aboo (I.M.). 13 Udaipore (F.W.). 14 Ajmere (I.M.). 15 Jeypore (I.M.). 16 Bakloh (F.W.) 17 Dehra Dun and Mussoorie (F.W.). 18 Almora (F.W.). 19 Caragola, Purneah District (I.M.). 20 Berhampore, Orissa (F.W.) 21 Vizagapatam (Russell). 22-24 Parganas (I.M.). 23 Samaguting Naga Hills (I.M.).

B.M. implies British Museum, I.M. Indian Museum, Bo. M. Our Society's collection, F.W., the author.

Dotted lines show uncertain limits

# BOMBAY NATURAL HISTORY SOCIETY'S MAMMAL SURVEY OF INDIA.

REPORT BY R. C. WROUGHTON, F. Z. S.

COLLECTION ... ... ... No. 6.
LOCALITY ... ... ... Kanara.
DATE... ... ... ... January, April-June 1912.
COLLECTED BY ... ... Mr. G. C. Shortridge.
EARLIER REPORTS .. .. No. 1, E. Khandeish, Vol. XXI, p. 392; No. 2, Berars, Vol. XXI, p. 820; No. 3, Cutch, Vol. XXI, p. 826; No. 4, Nimar, Vol. XXI, p. 844; No. 5, Dharwar, Vol. XXI, p. 1170.

The District of Kanara (or more properly speaking, North Kanara) in which the present collection was made, was to some extent dealt with in the description by Elliot quoted in the introduction to the Dharwar Report. It occupies a strip of country lying between the Dharwar District and the sea, immediately south of Goa, about 100 miles long by 40 miles wide. It is traversed, north and south, by the Western Ghats (2,500 to 3,000 ft.), the eastern third being above Ghats, while the western two-thirds is made up of the slopes of the Ghats, and a narrow strip of seashore from 5 to 15 miles wide.

The rainfall on the coast is about 120 inches, and is considerably heavier on the slopes of the Ghats, but on the above-ghat plateau it is less than half that amount.

The whole area is wooded, the major part with heavy forest. In the northern part of the district the forest is composed for the most part of deciduous trees, such as the teak, and the species usually associated with it, with an undergrowth of bamboos; while in the south, near the Mysore border, is found an evergreen flora, including the well-known Poon (*Calophyllum tomentosum*) carpetted and matted with creepers and canes. The practically continuous forest is only broken by clearings for rice cultivation around isolated villages, and beetal palm, and pan gardens in the evergreen area.

The following are short descriptions of the actual collecting stations, furnished by Mr. G. C. Shortridge:—

*Potoli.*—"Very small forest village, surrounded partly by evergreens, partly by deciduous forest (bamboos, &c.), hilly, plenty of permenent water."

*Dandeli.*—"On the banks of the Kalinadi River, very small, isolated village, surrounded by deciduous forest, containing a large proportion of bamboo."

*Maulinga.*—"On the banks of the Kalinadi River, similar country to Dandeli. No village."

*Barchi.*—" Forest village, surrounded by deciduous and bamboo jungle and large patches of evergreens."

*Sirsi.*—" Undulating country. Large native town, surrounded by patches of cultivation, chiefly enclosed by deciduous forest, with patches of evergreens."

*Hulekal.*—" Forest village, surrounded by deciduous and bamboo jungle and large patches of evergreen."

*Jog.*—" Mountainous, thick evergreen forest, a few patches of bamboo jungle."

*Gersoppa.*—" Sea level, at the foot of the Ghats, surrounded by hills, covered chiefly with evergreens, frequent patches of deciduous scrub and bamboo jungle."

*Honawar.*—" On the coast, flat, surrounding country, largely under cultivation, Cocoanut plantations, etc."

Later Mr. Shortridge crossed the boundary into Mysore Territory and made a small collection which it has been found most convenient to incorporate in this Report. The general conditions do not differ materially from those on the Bombay side of the River. The following are Mr. Shortridge's notes on the collecting places there :—

*Sagar.*—" Forest Town about the size of Sirsi, extensive patches of cultivation and of scrub, surrounded by deciduous forest and bamboo jungle."

*Kardibetta Forest.*—" About 40 miles N.-W. of Shimoga; a heavy jungle consisting of deciduous trees and bamboos, with very little cultivation in the neighbourhood."

*Shimoga.*—" A large native town in mulnad country, surrounded by extensive cultivation, and at a distance of 10 miles by forests."

The collection consists of 609 specimens, spread over 45 species, in 34 genera. It is especially strong in bats, 21 species, of which no less than 7 are new to the Mammal Survey List, *viz* :—*Cynopterus sphinx*, *Rhinolophus beddomei* and *lepidus*, *Hipposideros lankadiva* and *brachyotus*, *Taphozous longimanus* and *saccolaimus*, besides two species, *Myotis peytoni* and *Kerivoula crypta* which I have had to describe (*antea* p. 13-14) for the purposes of this Report.

Among the Ungulates, *Bibos gaurus*, *Axis axis*, and *Tragulus meminna* are mentioned for the first time in these reports.

Horsfield's Shrew has hitherto only been recorded from Ceylon, while the only other member of the Genus (in India) is Himalayan.

It has surprised me greatly that no Tree Shrew has been obtained, but Mr. Shortridge, who knew the Genus *Tupaia* well in Java, assures me that he has seen no sign of such in either Dharwar or Kanara. It seems, too, that we must go further south before we obtain a representative of the Hedgehogs.

In addition to the species dealt with in this report the following are mentioned in Mr. Shortridge's notes, which are in inverted commas. Either specimens were not obtained, or (in the case of the Tiger) were not sent home.

*Pteropus giganteus.*—"Although very plentiful in the open country and also on the edges of forest, this species does not seem to occur in the thick forest and evergreen jungle, such as that round Sirsi and Jog, where it was entirely absent."

*Felis tigris.*—"Measurements and weight of a tiger (No. 1050), obtained at Jog.

Entire length, between pegs, 9 feet and 1 inch; total weight 350 lbs.

| *Dimensions* | mm. | *Weights.* | lbs. |
|---|---|---|---|
| Head and body | 1775 | Head | 20 |
| Tail | 985 | Each foreleg | 21 |
| Hindfoot | 345 | Each hindleg | 29 |
| Ear | 123 | Tail | 5 |
| Height at shoulder | 1060 | Skin | 37 |
| ,, ,, withers | 1090 | Carcase | 158 |
| Girth behind forelegs | 1220 | Soft parts | 30 |
| ,, of neck | 760 | | |

This specimen seems rather light for its length."

*Viverricula malaccensis.*

*Mungos mungo.*—"The only species seen in Kanara, where it was comparatively rare."

*Paradoxurus niger.*

*Hyaena hyaena.*—Kirrba; Kuthe-Kirrba (Kanarese); Taras (Marathi) "Apparently rare in Kanara, though said to occur near the Coast."

*Cuon dukhunensis.*—Sheetnaye (Kanarese); Jungli-kutta (Mar.).

*Melursus ursinus.*—Karodi (Kanarese); Aswal (Mar.).

*Lutra sp.*?—Nunaye (Kanarese); Pani-kutta, Jalmanjar (Mar.).

*Gunomys kok.*—"Widely distributed throughout Kanara, where its mounds may be seen even in the evergreen jungles."

*Hystrix, sp.*

*Elephas maximus.*—Ane (Kanarese); Hatti (Mar.). "A frequent migrant from Mysore."

*Rusa unicolor.*

*Tetraceros quadricornis.*—"Occurring in the sparse forests on the border, not penetrating into the big jungles of Kanara."

*Sus sp.*

In my last Report (No. 5) on the Dharwar Collection I mentioned that Sir W. Elliot, I.C.S., published in 1839 (Madras Journ. L. & S. X, pp. 92 and 207) a catalogue of the mammals of the "Southern Mahratta Country," under which designation he included the present districts of Dharwar and Kanara. Of the 56 distinct species

enumerated by him 32 were represented in the Dharwar Collection and 11 more are included in the present one, leaving only 13 of the species mentioned by Elliot unrepresented. The bulk of these are large animals, many being mere visitants, *e.g.*, the Elephant, and I think Mr. Shortridge is to be congratulated on his success. There is one species, however, *viz.*, the leopard cat (*Felis bengalensis*) of which specimens are badly wanted and I would appeal to Members residing in these Districts to try and obtain specimens.

The thanks of the Society for helping our collector in Kanara are specially due to Mr. T. R. Bell, I.F.S., Mr. G. Monteath, I.C.S., and Mr. W. E. Coplestone, I.F.S.

SIMIA SINICA, L.

*The Bonnet Monkey.*

(Synonymy in No. 5.)

♂ 1209. ♀ 1200. Gersoppa, N. Kanara.

(*See* also Report No. 5.)

"Not quite so plentiful in thick jungles as the Langur, though going about in larger parties."—G. C. S.

PRESBYTIS HYPOLEUCOS, Blyth.

*The Malabar Langur.*

(Synonymy in No. 5.)

♂ 511, 516 juv. ♀ 510 juv. 512. Potoli, N. Kanara.
♀ 567, 568 juv. Barchi, N. Kanara.
♂ 1026, ♀ 1025. Hulekal, N. Kanara.
♀ 1067. Jog, N. Kanara.

(*See* also Report No. 5).

"Abundant throughout Kanara, extending to the Coast. Adult individuals vary considerably in size and weight, and also in the amount of black on the hands and arms, specimens from Jog and Gersoppa (below ghats) being unusually dark.

The Langurs of the forest districts are distinctly more shy and suspicious than those in the open country.

Its Kanara name 'musya' means whiskered monkey".—G. C. S.

CYNOPTERUS SPHINX, Vahl.

*The Southern short nosed Fruit Bat.*

1797. *Vespertilio sphinx*, Vahl. Skr. Nat. Selsk. IV., p. 123.
1797. *Vespertilio fibulatus*, Vahl. l. c., p. 124.
1803. *Pteropus pusillus*, E. Geoffroy. Cat. Mamm. Mus. N. H., p. 49.
1810. *Pteropus marginatus*, E. Geoffroy. l. c., p. 97.
1837. *Pachysoma brevicaudatum*, Temminck, Mon. Mamm. II, p. 92.
1891. *Cynopterus marginatus*, Blanford. Mammalia. No. 128.
♂ 835, 933, 934, 839 juv. ♀ 836, 837, 838, 840 juv., 841 juv., 932, 935. Sirsi, N. Kanara.
♂ 1229. ♀ 1230, 1231, 1232, 1233 in al. 1234. Honawar, N. Kanara.

This species has been recently dealt with by Dr. K. Andersen in his Catalogue of the Chiroptera and I have extracted the above synonymy from that work.

"Found in small colonies, roosting on the underside of the leaves of some Talipot Palms at Sirsi. Occurring at Jog and Honawar, where some specimens were obtained roosting on the inside eaves of a house.

Unless the roosting places of the smaller Fruit Bats are found, it is not easy to obtain them, or even to discover whether they occur as, unlike the Flying Fox, they come out well after sunset, when they can be heard, or on moonlight nights seen, flying round trees that are in fruit".—G. C. S.

LYRODERMA LYRA, Geoff.

*The Indian Vampire Bat.*

(Synonymy in No. 1.)

♂ 974, 975, 978, 979. ♀ 969, 970, 971, 972, 973, 976, 977, 999, 1000 in al. 1001, 1003. Sirsi, N. Kanara.
♂ 1029, 1098, 1099, 1101, 1104. ♀ 1100, 1102, 1103. Jog., N. Kanara.
♀ 1243, 1244. Honawar, N. Kanara.
♀ 1261, 1262, 1263, 1264, 1265, 1292, 1293, 1294 in al., 1278, 1279, 1280, 1281, 1282, 1283, 1284. Sagar, N. W. Mysore.
♂ 1338, 1353, 1354, 1355. ♀ 1337, 1356. Kardibetta Forest, N. W. Mysore.

(*See* also Reports Nos. 1, 4 and 5.)

MEGADERMA SPASMA TRIFOLIUM, Geoff.

*The Malay Vampire Bat.*

(Synonymy in No. 5.)

♂ 871, 872, 875, 877, 892, 918, 920, 936, 937. ♀ 873, 874, 876, 893, 894, 909, 917, 919, 921, 922, 923, 938, 939, 940, 941 in al., 879, 902, 924, 925, 926, 927, 928, 929. Sirsi, N. Kanara.
♀ 1014. Hulekal, N. Kanara.
♀ 1119, 1132, 1205, 1221, 1222. Gersoppa, N. Kanara.

(*See* also Report No. 5.)

"*Megaderma* and *Lyroderma* seem to have practically the same distribution in Kanara and to be equally plentiful. They are similar in habits and in their choice of roosting places. I have never found them in company with other bats, which is probably on account of their carnivorous habits. At Honkan I found them together in the same Temple, while both were plentiful round Sirsi and Hulakal, in old Temples and disused wells. I never again found both species together. At this time most of the females were pregnant or carrying young, the usual number being one, although two were quite frequent (about one in six) especially in *Megaderma*.

When at rest, the young are always attached to the abdominal teats which developed in size like the pectoral ones. (It is not uncommon to find that only one has developed. The young cling to their mothers very closely. Besides holding on with their mouths, they hook the claws of their thumbs to the hind legs firmly, and clasp their own hind legs firmly around the necks of the females. The abdominal teats when compressed give out freely a clear liquid secretion; from the working of the jaws of the young while attached to them, it is probable that they obtain nourishment as well as support from them.

The young are able to fly well before they finally leave their mothers, who, when carrying them, are often quite unable to fly owing to their weight.

Blanford is incorrect in including *Megaderma* among the early and swiftly flying bats, as a fact they come out late and, like most of the other leaf-nosed bats, have a fluttering and comparatively slow flight, as compared with *Taphozous*, *Scotophilus*, &c.

Generally low flyers, they have a habit (more noticeable than in other bats) of frequenting the same place, as, for instance, the verandah of a bungalow, where they seem to have a regular beat. They probably particularly haunt buildings on account of the wall geckos, which they prey upon and the large insects attracted by the lights.

The Megaderms have very much larger eyes than the Rhinolophs, and the nose leaf seems to be a less sensitive organ."—G. C. S.

RHINOLOPHUS BEDDOMEI, K. And.

*The Great Indian Horse-shoe Bat.*

1905. *Rhinolophus beddomei*, K. Andersen, A. M. N. H., p. 253.
1891. *Rhinolophus luctus*, Blanford. Mammalia No. 145 (partim).
♂ 907. ♀ 906. Sirsi, W. Kanara.

Dr. Andersen (l. c.) has limited *luctus* to Java and established *beddomei* for the Western Indian form, reserving *perniger* for that from the Himalayas. I have adopted the word 'Indian,' in place of Blanford's 'Eastern,' for the English name of this Bat.

"A single pair, obtained in a well at Sirsi. The female contained one young."—G. C. S.

RHINOLOPHUS ROUXI, Temm.

*The Rufous Horse-shoe Bat.*

(Synonymy in No. 5.)

♂ 518, 519, 520, 426, 540. ♀ 521, 522, 523, 524, 525, 527, 528, 529, 541 not sexed, 542, 543, 544, 545, 546, 547, 548 in al., 530, 531, 532, 533, 534, 535, 536, 537, Potoli, Kanara.
♂ 556. ♀ 557, 558. Dandeli, N. Kanara.
♂ 563, 564. Barchi, N. Kanara.
♂ 847, 848, 853, 889, 895, 896, 897, 898, 899, 900, 910. Sirsi, N. Kanara.
♂ 956, 957, 960, 962, 964, 966, 967, 968, 988, 989, 990, 994, 995, 996, 1009, 1011, 1012. ♀ 958, 959, 961, 963, 965, 987, 1010 in al., 890, 901, 911, 991, 992. Hulekal, N. Kanara.
♂ 1120, 1158. Gersoppa, N. Kanara.

(*See* also Report No. 5.)

Vernacular name—*Kankapata* (Kanarese).

"Very plentiful in the forest districts of Kanara, roosting by day, in enormous colonies, in hollow trees, old temples, disused wells, &c., &c. Usually rather low flyers. The Kanarese name, meaning 'eye-striker,' refers to the belief that a blow in the eye from a flying bat causes blindness. The name is used generally for all bats."—G. C. S.

RHINOLOPHUS LEPIDUS, Blyth.

*The Little Indian Horse-shoe Bat.*

1844. *Rhinolophus lepidus*, Blyth. J. A. S. B., XIII., p. 486.
1891. *Rhinolophus minor*, Blanford. Mammalia No. 154.
♀ 1131. Gersoppa, N. Kanara.

Dr. K. Andersen has dealt with this and allied species (P. Z. S. 1905, p. 122). He has arrived at the conclusion that *R. minor* Horsfield is an entirely distinct species from Java, which, as that name has already been used, must be called *pusillus* Temm, of which again *garoensis* Dobs. is a synonym. All these three names must therefore be omitted from the synonymy of our bat. *R. subbadius*, Blyth, was based on a Nepal specimen and is a distinct species. Possibly it may prove to be the Himalayan form of *lepidus*. There is only one specimen of this bat in the British

Museum, which is from the Ganges Valley, whence, probably, the type also came.

"Not uncommon in thick evergreen forest at Jog. This species comes out at dusk and flits about very close to the ground among trees." —G. C. S.

HIPPOSIDEROS LANKADIVA, Kel.

*The large Indian Leaf-nosed Bat.*

1852. *Hipposideros lankadiva*, Kelaart. Prod. Zeyl. p. 19.
1891. *Hipposideros diadema*, Blanford. Mammalia No. 161 (*partim*).
♂ 1106, 1107, 1108, 1110, 1111, 1112, 1134, 1135, 1133, 1139, 1159, 1160, 1161, 1162, 1175, 1177, 1178, 1206, 1214, 1215.
♀ 1105, 1109, 1136, 1137, 1174, 1176, 1207, 1216 in al. 1121, 1122, 1123, 1124, 1125, 1126, 1127, 1128, 1188.
Skull only 1189 (imm) .. .. Gersoppa, N. Kanara.

Blanford accepted Geoffroy's name *diadema*, for the Indian form. Dr. Andersen has (A.M.N.H. 1905, p. 497) recognized several geographical races of that species in different parts of the Far East, but has accepted the Ceylon form as a separate species under Kelaart's name *lankadiva*. Later he recorded *lankadiva* as collected by Fea at Bhamo, Upper Burma (Annali Mus. Genov. 1907, p. 6).

The present series proves to be the same species and (especially as I have seen specimens from the Central Provinces, to be dealt with in a later report) I have had no hesitation in arranging the synonymy as above, and in altering Blanford's English name.

"Very plentiful in an old temple at Gersoppa (below Ghats) where it occurred in company with equally large numbers of *H. dukhunensis* and a few other *Rhinolophidae*. This species has a most unpleasant smell which penetrates throughout the temple.

This Bat is as large and as powerful as *Lyroderma*, nevertheless it is here found roosting on equal terms with much smaller species. Although without doubt most of the large insectivorous bats prey occasionally on small lizards, frogs, &c., the above fact seems to show that they do not prey on other bats, as *Lyroderma* most certainly does.

This species, when at rest, hangs in quite a different position to other leaf-nosed bats, their wings not being folded round the body, but slightly extended as in *Taphozous* and *Rhinopoma*. When roosting they make a continuous, small, grunting noise which in united volume sounds like the loud purring of a cat. In Java I found that this species* occasionally roosted singly in the heads of Cocoanut Palms, but usually exactly as here. It was a much earlier flyer than the smaller leaf-nosed bats, and its flight was higher and stronger.

The fully developed abdominal teats are very stout and flat. All the pregnant females, among those obtained, contained one young.

No open gland above nose leaf."—G. C. S.

HIPPOSIDEROS DUKHUNENSIS, Sykes.

*Sykes Leaf-nosed Bat.*

(Synonymy in No. 5.)

♂ 1113, 1140, 1142, 1144, 1204, 1250. ♀ 1114, 1115, 1161, 1141, 1143, 1145, 1146, 1147, 1150, 1151, 1152, 1153, 1154, 1157 in al., 1129, 1130, 1148, 1149, 1155, 1156. Gersoppa, N. Kanara.

* Mr. Shortridge is evidently speaking of the closely allied *H. diadema*.

♂ 1246. ♀ 1235. Honawar, N. Kanara.

(*See* also Report No. 5.)

"Swarming in an old temple at Gersoppa, in company with *H. lankadiva*. After twice visiting the temple to shoot specimens, they entirely deserted it, although *lankadiva* did not. Some species, particularly *Taphozous* will thus readily desert a roosting place, while others such as *H. lankadiva* will always return, however often they may be disturbed. This species, as well as other small species of *Hipposideros* has no offensive smell.

Among the specimens collected there was never more than one young. This must have been near the end of the breeding season; for, although I found some were pregnant, most of the females were carrying nearly full grown young, which, as usual, were attached to the abdominal teats.

Found also at Honawar in a cave with *H. fulvous*.

The gland above the nose leaf very large, especially in males."—G. C. S.

HIPPOSIDEROS FULVUS.

*The Bicoloured Leaf-nosed Bat.*

(Synonymy in No. 3.)

♂ 1236, 1245. ♀ 1239, 1240, 1241, 1242. Honawar, N. Kanara.

(*See* also Reports Nos. 3 and 5.)

"Occurring in small numbers in a cave near Honawar, in company with a few specimens of *H. dukhunensis*.

The gland above the nose-leaf present in both sexes, but very small in females."—G. C. S.

HIPPOSIDEROS BRACHYOTUS, Dobs.

*The Dekhan Leaf-nosed Bat.*

1874. *Phyllorhina brachyota*, Dobson. J. A. S. B., XLIII, p. 237.
1891. *Hipposideros galeritus*, Blanford, Mammalia No. 163.
♂ 1228. Honawar, N. Kanara.

Dobson pointed out that the nose leaf is very much larger in *galeritus* Cantor from Penang. The type locality of *brachyotus* is Lingasagar in Central India.

"Open gland above nose leaf well developed, though not so large as in *dukhunensis*."—G. C. S.

PIPISTRELLUS MIMUS, Wrought.

*The Southern Dwarf Pipistrelle.*

(Synonymy in No. 1.)

♀ 539. Potoli, N. Kanara.
♂ 569. Barchi, N. Kanara.
♂ 1248. Honawar, N. Kanara.
♂ 1322. Kardibetta Forest, N. W. Mysore.

(*See* also Reports Nos. 1, 2, 3, and 5.)

PIPISTRELLUS CEYLONICUS, Kel.

*Kelaart's Bat.*

(Synonymy in No. 1.)

♂ 915, 952, ♀944. Sirsi, N. Kanara.
♂ 1247. Honawar, N. Kanara.

(*See* also Reports Nos. 1, 2, 3 and 5.)

HESPEROPTENUS TICKELLI, Blyth.

*Tickell's Bat.*

(Synonymy in No. 5.)

♀ 553. Potoli, N. Kanara.
♀ 819, 946, 947. Srisi, N. Kanara.
♂ 1016, ♀ 1007 in al. 1019. Hulekal, N. Kanara.

(*See* also Report No. 5.)

"The flight is particularly heavy and slow, and it will often keep to a regular beat for a considerable time, flying slowly backwards and forwards. The orange markings on its wing membranes show up rather distinctly."—G. C. S.

SCOTOPHILUS KUHLI, Leach.

*The Common Yellow Bat.*

(Synonymy in No. 1.)

♀ 945, 954. Sirsi, Kanara.

(*See* also Reports Nos. 1, 3, and 5.)

SCOTOPHILUS WROUGHTONI, Thos.

*Wroughton's Bat.*

(Synonymy in No. 1.)

♂ 818, 849, 955. ♀ 817, 833, 834, 850, 851, 852. Sirsi, N. Kanara.
♂ 1005, 1006, 1008, 1017. Hulekal, N. Kanara.

(*See* also Reports Nos. 1 and 5.)

"An early flyer. On one occasion found roosting, in fairly large numbers, together with a small colony of *Cynopterus*, on the underside of one of the leaves of a Talipot Palm."—G. C. S.

TYLONYCTERIS PACHYPUS, Temm.

*The Club-footed Bat.*

(Synonymy in No. 5.)

♂ 949. ♀ 908, 913, 948. Skull only 950. Sirsi, N. Kanara.
♂ 1004. Hulekal, N. Kanara.
♂ 1277. Sagar, N. W. Mysore.
♀ 1340. Kardibetta Forest, N. W. Mysore.

(*See* also Report No. 5.)

"An early and very erratic flyer, often observed in the early mornings up to just before sunrise. Probably roosting, as it does in Java, in parties of from ten to twenty, in hollow bamboos (especially in those used in house roofs) and in the thinner hollow branches of trees."—G. C. S.

MYOTIS PEYTONI, Wrought.

*Peyton's Bat.*

1912. *Myotis peytoni*. Wroughton. Journ. B. N. H. S., Vol. XXII, p. 13.

♂ 1031, 1033, 1090, 1091, 1092, 1093, 1095. ♀ 1030, 1032, 1034, imm. 1035, 1036, 1037, 1038, 1039, 1040, 1041, 1042, 1043, 1044, imm. 1045, imm. 1046, imm. 1047, imm. 1048, 1052, 1053, 1054, 1055, 1056, 1094, in al. 1057, 1058, 1059,

1060, 1061, 1062, 1063, 1064, 1065, 1066, 1087, 1088. Jog, N. Kanara.

"Swarming among rocky crevices at the foot of the Jog Falls."—G. C. S.

KERIVOULA CRYPTA, Wrought.

*The Obscure Bat.*

1912. *Kerivoula crypta*, Wroughton. Journ. B. N. H. S., Vol. XXII., p. 14.

♂ 1317. Kardibetta Forest, N. W. Mysore.

I have adopted the name 'obscure' Bat to mark the contrast with its congener the 'painted' Bat.

"A late flyer, probably rare."—G. C. S.

TAPHOZOUS MELANOPOGON, Temm.

*The black-bearded sheath-tailed Bat.*

(Synonymy in No. 1.)

♂ 1068, 1069, 1070, 1071, 1072, 1073, 1074, 1075, 1076, 1077, 1078, 1079, 1080, 1081, 1082, 1083, 1084, 1085, in al. 1086. Jog, N. Kanara.

(*See* also Reports Nos. 1, 2, 3 and 4.)

"Two colonies found in rocky caves at the foot of Jog Falls, high up in the middle of bed of the River, both of these colonies had deserted on being visited a second time. There were no females."—G. C. S.

TAPHOZOUS LONGIMANUS, Hardw.

*The long-armed sheath-tailed Bat.*

1823. *Taphozous longimanus*. Hardwicke. Trans. Linn. Soc. XIV., p. 525.
1841. *Taphozous fulvidus*, Blyth. J. A. S. B. X. p. 975.
1841. *Taphozous brevicaudus*, Blyth. l. c. p. 976.
1842. *Taphozous cantori*, Blyth. J. A. S. B. XI p. 784.
1891. *Taphozous longimanus*, Blanford. Mammalia No. 220.

♂. 842, 844, 846, 854, 866, 868. ♀. 816, 843, 845, 855, 856, 857, 858, 859, 860, 867, 869, 870, 880, 881, 882, 883, 884, 885, in al. 861, 862, 863, 886, 887, 886. Sirsi, N. Kanara.
♂. 1251, 1253, 1255, 1370, 1272, 1287.
♀. 1252, 1254, 1256, 1257, 1258, 1271, 1273, in al. 1288, 1289, 1290, 1291, Sagar, N. W. Mysore.

The type locality of *longimanus* is Calcutta. The names *fulvidus*, *brevicaudus* and *cantori* were based by Blyth on specimens from Darjiling (?), Malabar, and Calcutta, respectively. The exact type locality of *fulvidus* is not known, it may well be identical with *longimanus*, but in both the other species Blyth distinctly points out the very pale bases of the fur, which character is absent in this specie. Until we obtain topotypes, however, I propose to leave both names in the synonymy of *longimanus*.

"Plentiful at Sirsi and Siddapur, where they hang up in rows, under the eaves of the larger houses, quite exposed to the light, merely shifting their position if the sun shines directly on them, often creeping into cracks and crevices on dull or windy days. Their eyes are much larger than those of most bats. They can evidently see very well by day and display a certain amount of cunning, as they take no notice of persons walking beneath them, but if any one stands still and watches them they will either take flight or creep away out of sight. *Taphozous* is quite unlike other bats in the way it can run about on rough surfaces."—G. C. S.

TAPHOZOUS CRASSUS, Blyth.

*The pouch-bearing sheath-tailed Bat.*

1844. *Taphozous crassus*, Blyth. J. A. S. B. XIII. p. 491.
1844. *Taphozous pulcher*, Elliot, l. c. p. 492.
1891. *Taphozous saccolaemus*, Blanford. Mammalia No. 222.
♂ 1018, ♀ 914 .... Sirsi, N. Kanara.
♂ 1179. ♀ 1117, 1118 .... Gersoppa, N. Kanara.

Temminck describes *saccolaimus* from Java; a series from that country in the British Museum collection tally closely with his description. The present series exactly fit Blyth's description of *crassus* from Mirzapore, and differ constantly from true *saccolaimus* in having dark under parts, and in their smaller size all round, I have therefore adopted Blyth's name for the Indian form. Blyth quotes Elliot as authority for *pulcher*, which being practically from the same country as the present series ought also to have been *crassus*, but the limited description quoted in no way agrees. Elliot himself records (Madr. Journ. L. & S. X. p. 99) that his description was lost. For the present I accept it as a synonym of *crassus*.

"An early flyer, observed frequently around Sirsi and Gersoppa (below ghats), but I did not find its roosting place."—G. C. S.

PACHYURA, sp?

*Shrews.*

♀ 552 (in all) Potoli, N. Kanara.
♀ 566 Barchi, N. Kanara.
♂ 993, 1082, ♀ 982 Hulekal, N. Kanara.
♂ 1296, 1303, 1310, ♀ 1297, 1301, 1302, 1309. Sagar, N. W. Mysore.
♀ 1344, 1348, 1350. Kardibetta Forest, N. W. Mysore.

(*See* also Reports Nos. 1, 3, 4 and 5.)

"Widely distributed, but nowhere very common in Kanara, usually found near villages or huts."—G. C. S.

CROCIDURA HORSFIELDI, Tomes.

*Horsfield's Shrew.*

1856. *Sorex Horsfieldi*, Tomes. A. M. N. H. 2 XVII p. 23.
1870. *Crocidura retusa*, Peters. M. B. Ak. Berl. p. 585.
1888. *Crocidura horsfieldi*, Blanford. Mammalia No. 127.
♀ 559.... Dandeli, N. Kanara.

Only one species of this Genus has hitherto been found in India proper, *viz.*, *Croc. fuliginosa*, but a second was known from Peradenia, Ceylon (2000'). It is most interesting to find this latter form in Kanara. The type and other specimens in the National Collection are in alcohol.

FELIS TIGRIS, L.

*The Tiger.*

(Synonymy in No. 5).

♂ 1050 Jog, N. Kanara.

Hebbuli; Huli (Kanarese); Bagh, Wahg (Mar).

(*See* also Report No. 5).

FELIS PARDUS, L.

*The Panther.*

(Synonymy in No. 5).

♂ 555 Potoli, N. Kanara.

(*See* also Report No. 1).

"A less noisy animal in India than in Africa. In Pondoland, where it is by no means plentiful, it may be heard in the Forests on most nights, throughout the year."—G. C. S.

FELIS AFFINIS, Gray.

*The Jungle Cat.*

Synonymy in No. 1.

♂ 1020.... Hulekal, N. Kanara.

(*See* also Reports Nos. 1, 3, 4 and 5).

CANIS INDICUS, Hodgs.

*The Indian Jackal.*

(Synonymy in No. 1, under *C. aureus.*)

♂ 951 (imm.) ♀ 916 (imm).... Sirsi N. Kanara.

(*See* also Reports Nos. 1, 3, 4 and 5).

PETAURISTA PHILIPPENSIS, Ell.

*The South Indian Flying Squirrel.*

1839. *Pteromys philippensis*, Elliot. Madr: Journ: L. S. X. p. 217.

1843. *Pteromys griseicenter*, Gray. Cat: Manm: B. M., p. 133.

1891. *Pteromys oral*, Blanford. Mammalia No. 227 (partim).

♂ 1021, 1022, 1023, 1024. ♀ 1015. Hulekal, N. Kanara.

♂ 1028, ♀ 1027, 1051, 1133. Jog, N. Kanara.

I have dealt with this synonymy in this Journal (Vol. XX, p. 1015.)

Vernacular name :—KOTI KAR (Mahrathi) ; HARBEKKU (Kanarese).

"Essentially a forest animal, it is most plentiful in the deciduous forests and on the edges of the evergreen. It does not usually become active or call until quite late in the evenings after which it may be frequently heard throughout the night. During the day hides in hollow trees, at a considerable height, among thick foliage.

When gliding from one tree to another they are able to steer themselves with considerable accuracy. They apparently guide themselves by altering the position of their limbs, and the membrane uniting them, the long tail being merely a balancing organ. The interfemoral membrane can slide up and down the tail for one-third of its length, the skin on the distal two-thirds being firmly attached to the vertebræ.

The usual call is a monotonous note, uttered at regular intervals, which, although not loud, can be heard at night for a considerable distance. It has, however, a ventriloquial quality, and furnished little or no help in locating the animal's exact position. When frightened or angry it has a different and louder call and a low chatter rather like that of other squirrels. When caught it is savage and occasionally makes a curious screaming noise, which causes great excitement among any others within hearing, besides attempting to bite it will strike out with its claws, in these ways exactly reproducing the methods of *Galeopterus*, an insectivore superficially resembling, but not in the smallest degree related to it.

Comparatively sluggish in habits, when in a tree where there is plenty of food it will frequently remain, or return, there for several nights.

Although so conspicuous in flight, when it appears much larger than it really is, when motionless in a tree it is absolutely invisible, even in the brightest moonlight."—G. C. S.

RATUFA INDICA, Erxl.

*The Bombay Giant Squirrel.*

(Synonymy in No. 5.)

♂ 554. Potoli, N. Kanara.
♀ 1089. Jog, N. Kanara.
♂ 1208, 1227. Gersoppa, N. Kanara.
♀ 1312. Kardibetta Forest, N. W. Mysore.

(*See* also Report No. 5.)

Vernacular names:—KADALALU or KEMPALALU (Kanarese): KESHALI (Mahrathi).

"Very plentiful throughout Kanara. When the leaves are off the tree they, and their large nests, built of small sticks, generally among the upper branches of high trees, are very conspicuous, and although rather shy as a rule, may be seen, in the hot part of the afternoon asleep, lying lengthways on the thin topmost branches, with the tail hanging down on one side.

They seldom climb up and down the trunks of trees and probably never come willingly to the ground, but move about from tree to tree by a series of astounding leaps from branch to branch.

They are at all times noisy animals, constantly indulging in a loud chatter. They share with the monkeys the habit of raising an alarm on the approach of an enemy.

They were breeding in March."—G. C. S.

FUNAMBULUS TRISTRIATUS, Waterh.

*The jungle striped Squirrel.*

(Synonymy in No. 5.)

♂ 505, 506, 514, ♀ 513, 515, 517, 549. Potoli, N. Kanara.
♂ 825, 826, 831 juv., 953 juv., 942 juv. ♀ 832. Sirsi, N. Kanara.
♂ 983, 1013. ♀ 998. Hulekal, N. Kanara.
♂ 1163, 1185. Gersoppa, N. Kanara.
♀ 1237, 1238. Honawar, N. Kanara.
♂ 1276, ♀ 1274, 1275. Sagar, N. W. Mysore.
♂ 1321, ♀ 1316. Kardibetta Forest, N. W. Mysore.

(*See* also Report No. 5.)

Vernacular names:—ZANI (Mahrathi); ALADU (Kanarese).

"This species entirely takes the place of *palmarum* in Kanara. In the Forest Towns and Villages it is even found living in the roofs of houses. It generally, however, makes its nest in clumps of bamboo. This is usually a more tidy structure than that of *palmarum*, often made entirely of moss and fine grass."—G. C. S.

TATERA INDICA, Hardw.

*The Indian Gerbil.*

(Synonymy in No. 1.)

♀ 507, 508 juv., 509 juv. Potoli, N. Kanara.
♂ 930, 931. Sirsi, N. Kanara.

♀ 986. Hulekal, N. Kanara.
♂ 1165, 1168, 1169, 1171, 1180, 1181, 1182, 1199, 1202, 1210.
♀ 1164, 1166, 1167, 1170, 1184, 1203, 1224. Gersoppa, N. Kanara.
♂ 1259, 1260; ♀ 1266, 1267, 1268, 1269. Sagar, N. W. Mysore.
♂ 1314, 1315, 1339, 1351; ♀ 1313, 1319, 1325, 1326, 1327, 1328, 1329, 1331, 1332, 1352. Kardibetta Forest, N. W. Mysore.

(*See* also Reports Nos. 1, 2, 4 and 5.)

"Quite plentiful in all open cultivated areas throughout Kanara, but not living actually in forest. Equally common below Ghats, and observed near the sea coast at Honawar."—G. C. S.

MUS MANEI, Kel.

*The common Indian House Mouse.*

(Synonymy in No. 6.)

♂ 824 (skull only). Sirsi, N. Kanara.
♂ 1225; ♀ 1218, 1219, 1220, 1226. Gersoppa, N. Kanara.
♂ 1300, 1305, 1311. Sagar, N. W. Mysore.

(*See* also Report No. 5.)

MUS BOODUGA, Gray.

*The Southern Field Mouse.*

(Synonymy in No. 1.)

♂ 560. Dandeli, N. Kanara.
♀ 815, 827. Sirsi, N. Kanara.
♂ 1298. Sagar, N. W. Mysore.
♂ 1330, 1336, 1341, 1346, 1347. Kardibetta Forest, N. W. Mysore.

(*See* also Reports Nos. 1, 2, 4 and 5.)

"Apparently rare in forest country, though occasionally trapped near villages. One specimen trapped in thick forest near Sirsi."—G. C. S.

EPIMYS RUFESCENS.

*The common Indian Rat.*

(Synonymy in No. 1.)

♀ 551. Potoli, N. Kanara.
♂ 820, 823, 830. Sirsi, N. Kanara.
♂ 1049. Jog, N. Kanara.
♂ 1195, 1197; ♀ 1172, 1173, 1186, 1187, 1190, 1191, 1192, 1193, 1196, 1198, 1201, 1211, 1212, 1213, 1217. Gersoppa, N. Kanara, in al. 1249. Honawar, N. Kanara.
♀ 1299, 1306, 1307, 1308. Sagar, N. W. Mysore.

VAR.—with white underparts.

♂ 821, 822, 829, 878, 913, 943. Sirsi, N. Kanara.
1194, 1223. Gersoppa, N. Kanara.
♂ 1286. Sagar, N. W. Mysore.
♂ 1318, 1323, 1324, 1333, 1335, 1349; ♀ 1320, 1334, 1345. Kardibetta Forest, N. W. Mysore.

(*See* also all former Reports.)

EPIMYS BLANFORDI, Thos.

*The white-tailed Rat.*

(Synonymy in No. 2.)

♀ 538. Potoli, N. Kanara.
♂ 828; ♀ 864, 865. Sirsi, N. Kanara.

(*See* also Report No. 2.)

"Confined to thick forests, well in the interior of Kanara, apparently not occurring far from permanent water. To a great extent arboreal, making a large, untidy nest, inside a hollow tree, around the bases of which their presence can easily be detected, where they probably also collect stores, and remain during the monsoon. Very local and nowhere plentiful, soon getting trapped off."—G. C. S.

BANDICOTA MALABARICA, Shaw.

*The Malabar Bandicoot.*

(Synonymy in No. 5.)

♀ 550 (imm.) Potoli, N. Kanara.
♂ 1183. Gersoppa, N. Kanara.
♂ 1295, 1304; ♀ 1285. Sagar, N. W. Mysore.

(*See* also Report No. 5.)

"Widely distributed throughout Kanara, although never trapped far from villages, apparently as much a domesticated species as *E. rufescens*. Not found in large numbers anywhere."—G. C. S.

GOLUNDA ELLIOTI, Gray.

*The Indian Bush Rat.*

(Synonymy in No. 1.)

♂ 1342, 1343. Kardibetta Forest, N. W. Mysore.

(*See* also Reports Nos. 1, 2, 3, 4 and 5.)

"Not readily trapped, occurring in open patches, or among scrub surrounded by forest, probably occurring in suitable localities throughout N. Kanara, feeding largely on the berries of the Lantana."—G. C. S.

LEPUS NIGRICOLLIS, Cuv.

*The Black-naped Hare.*

(Synonymy in No. 5.)

♂ 891. Sirsi, N. Kanara.
♀ 1097. Jog, N. Kanara.

(*See* also Report No. 5.)

"Occurring equally frequently in every kind of country, nowhere very plentiful and nowhere scarce."—G. C. S.

BIBOS GAURUS, H. Sm.

*The Gaur.*

1827. *Bos gaurus*, H. Smith. Griff. An. Kingd. IV, p. 399.
1828. *Bos gour*, Hardwicke. Zool. Journ. III, p. 233.
1828. *Bos gayoeus*, Hardwicke. l. c.
1837. *Bibos subhemachalus*, Hodgson. J. A. S. B. VI, p. 49.
1837. *Bibos cavifrons*, Hodgson. l. c., p. 747.
1891. *Bos gaurus*, Blanford. Mammalia, No. 338.

♂ 570. Donshet, N. Kanara.
♂ 797. Togarhalli, N. Kanara.

MUNTIACUS VAGINALIS, Bodd.

*The Barking Deer.*

(Synonymy in No. 2.)

♀ 905. Sirsi, N. Kanara.
♂ 1096. Jog, N. Kanara.

Vernacular names.—Chale, Kondhwori (Kanarese); Jungli-Bekri (Marathi).

(*See* also Report No. 2.)

"Occurring well in the interior of Kanara, in thick forest, both evergreen and deciduous, much more frequently heard than seen."—G. C. S.

AXIS AXIS, Erxl.

*The Spotted Deer.*

1777. *Cervus axis*, Erxleben. Syst. Regn. Anim., p. 312.
1827. *Cervus axis ceylonensis*, H. Smith. Griff. An. Kingd. IV, p. 117.
1831. *Cervus nudipalpebra*, Ogilby. P. Z. S., p. 136.
1841. *Axis major* et *minor*, Hodgson. J. A. S. B. X., p. 941.
1843. *Axis maculata*, Gray. Cat. Mamm., p. 178.
1891. *Cervus axis*, Blanford. Mammalia No. 368.
♂ 562; ♀ 561. Maulinga, N. Kanara.

(*See* also Report No. 5.)

The collection of skulls of Axis in the Natural History Museum is very poor. I have compared the present male specimen with the only buck's skull available, one unfortunately without recorded locality, but can find no single difference of any importance. As pointed out by Blanford, there has always been a suspicion that there are two forms of *Axis*, varying in size. I have met many natives who maintained this, but I have no material to enable me to record an opinion on the subject.

TRAGULUS MEMINNA, Erxl.

*The Indian Chevrotain or Mouse Deer.*

1777. *Moschus meminna*, Erxleben. Syst. Regn. An., p. 322.
1841. *Tragulus mimenoides*, Hodgson. J. A. S. B. X., p. 914 (nomen nudum).
1836. *Meminna indica*, Gray, P. Z. S., p. 36.
1891. *Tragulus meminna*, Blanford. Mammalia. No. 371.
♂ 903, 904. Sirsi, N. Kanara.
♂ 980, 981, 985; ♀ 984, 997. Hulekal, N. Kanara.

Vernacular name.—*Burka* (Kanarese); Pisei (Marathi).

"Solitary and skulking in their habits, found chiefly in Evergreen Forests, probably largely nocturnal. Their sharp tushes are held by the natives to be poisonous, a belief which also prevails in Java.

One of the specimens was obtained from a porcupine's burrow."—G.C.S.

MANIS CRASSICAUDATA, Geoff..

*The Indian Pangolin.*

(Synonymy in No. 3.)

♂ 565. Barchi, N. Kanara.

Alawa (Kanarese); Kowli-Mah (Marathi).

(*See* also Report No. 3.)

REPORT BY R. C. WROUGHTON, F.Z.S., AND KATHLEEN V. RYLEY.

COLLECTION ... ... No. 7.
LOCALITY ... ... Central Provinces.
DATE ... ... ... January-June 1912.
COLLECTED BY ... ... Mr. C. A. Crump.
EARLIER REPORTS.. ... No. 1, E. Khandeish, Vol. XXI, p. 392; No. 2, Berars, Vol. XXI, p. 844; No. 3, Cutch, Vol. XXI, p. 286; No. 4, Nimar, Vol. XXI, p. 844; No. 5, Dharwar, Vol. XXI, p. 1170; No. 6, Kanara, Vol. XXII, p. 29.

The specimens in this collection were obtained in the western half of the Central Provinces: from the Damoh and Saugor districts in the extreme north, Hoshangabad District in the west and from the Balaghat and Chanda Districts in the south. The Damoh and Saugor Districts are in the Jubbulpore Division of the Central Provinces, lying between 23° and 25° N. Lat. and 78° and 80° E. Long., practically along the tropic of cancer. Damoh is a part of the Vindhyan plateau and joins Saugor on the west, the latter forming an extension of the Malwa plateau above the Nerbudda valley; the two districts are bounded on the north by the United Provinces. The country is undulating and broken by ranges of hills; the most striking feature being the sheer scarp of the Vindhyan range; some of the hills are stony and bare, others are covered with trees. The chief rock formation is Vindhyan sandstone. The trees are mostly teak, bamboo and the usual scrub. The annual rainfall averages about 50 inches.

The Hoshangabad District is situated immediately east of Nimar and north of the Berars, between 22° and 23° N. Lat., and 77°-79° E. Longitude. It comprises a narrow strip of open black soil country along the bank of the Nerbudda, and of a southerly and easterly portion of mountainous broken country, composed of the Mahadeo and other hills which are outliers of the Satpuras. The vegetation of these hills is of the same character as that of Nimar and the Berars, but the forests are much more luxuriant and continuous, as is only to be expected, with a rainfall exceeding 50 inches.

The Balaghat and Chanda Districts are in the Nagpur Division of the Central Provinces, between 18° and 23° N. Lat. and 78° and 81° E. Long., and bounded on the west by Berar, and Bastar on the east.

The country is hilly and forms part of the Satpura plateau, it is covered with thick forests and the soil is generally sandy. The rock formation is chiefly granite. Teak is general but not abundant, bamboo is also general, but the forest vegetation is of a mixed character. Wheat and rice are grown. Balaghat has an average rainfall of 62 inches, which is high for the Central Provinces; Chanda has about 50 inches.

Mr. Crump gives the following notes on the actual parts of the district in which he obtained the specimens :—

*Damoh.*—"The surroundings are more or less flat with extensive cultivation of cotton, rice and wheat. A few miles out are some low hills covered with scrub and thin jungle, at this time of year, the only water near the hills is in a tank."

*Narsingarh.*—"The country here is all under cultivation and is, as a rule, almost devoid of cover ; the place contains the ruins of a fort."

*Ouda* (Balaghat District) "is a small village at the foot of the hills and just on the forest line, the forest is mixed and vegetation fairly thick, the grass being very long and plentiful; the rock is trap ; a good stream rises in the hills and flows past the village ; cultivation is mostly rice and wheat, there is no jowari cultivation here."

*Chinchpali* (Chanda).—"The country for some distance round Chinchpali is either flat or undulating. Heavy mixed forest on trap rock. There is a good tank near the village."

*Chanda.*—"The surroundings of the city are entirely flat, to the north and west very extensive cultivation of jowari, rice and wheat, interspersed everywhere with patches of babhul jungle. Government Forest commences within a couple of miles to the south, it is of the heavy scrub type, large trees being the exception, no water except in a tank alongside the high road."

The collection consists of 828 specimens, divided between 46 species in 36 genera.

As was to be expected, the Fauna is of the same general type as that of Nimar and the Berars. The following names, however, are new to the list of this survey, *viz.*—*Simia rhesus*, the common Bengal Monkey ; *Cynopterus sphinx gangeticus* the northern form of the common short-nosed Fruit Bat ; *Mungos smithi*, a rather rare mungoose, recognisable by its black tail-tip, *Lutra macrodus*, the smooth Indian Otter (93 of Blanford, *vide* also p. 601 of the Mammalia) ; and the eastern form of the common giant squirrel (*Ratufa indica*), which Blanford separated (Journal of this Society, Vol. XI, p. 303) from the western form, under the subspecific name of *bengalensis*.

The distribution of the Hedgehogs so far as it is known is a curiously interrupted one. Hedgehogs have been obtained by this survey in Cutch, and have been otherwise authentically reported from Rajputana ( at least the northern half ) and Delhi, but between this and the extreme south of Madras, where they have been often taken, there is no record of any hedgehog—Mr. Crump records frequently in his notes that he has made enquiries, but has found no one who knew them. They have been recorded from the lower Himalayas, but the record is somewhat doubtful.

Specimens of Mouse Deer were heard of but not obtained. Very little is known of the distribution of the Tree Shrews (*Tupaia*). Blanford only recognises one species the type locality of which is the Coromandel Coast. The British Museum has some specimens from Guzerath which, it is understood, Mr. Lyon of the Washington Museum, U. S. A., who is monographing the Genus, proposes to separate specifically, if not generically, from *T. ellioti*—but the whole country between these two points has so far yielded no *Tupaia*. Mr. Crump writes; "An unstriped squirrel, about the size of a Palm squirrel, is reported from the Alopalli Range." This is almost certainly a *Tupaia*.

A series of Hares has been obtained from the Mahadeo Hills, which proves to be different from *L. simcoxi*, the ordinary hare of this area. This hare has been described (*antea* p. 5) under the name of *L. mahadeva*.

We venture to point out the following three directions in which Members may render valuable assistance by furnishing the Honorary Secretary of the Soceity with notes, accompanied wherever possible by specimens, *viz* :—

1. Records of the existence of hedgehogs in (*a*) the area between Rajpootana and the Carnatic, (*b*) the Himalayas.
2. Records of the existence of Tree Shrews *anywhere*.
3. Records of the Hares to be found between the Godavery River and the Carnatic.

SIMIA RHESUS, Audeb.

*The Bengal Monkey.*

1797. *Simia rhesus*, Audebart. Hist. Nat. Sing., p. 5, pl. 1.
1800 (?) *Simia erythræa*, Wagner. Schreb. Saug. Sup., pl. 8. C.
1840. *Macacus* (*Pithex*) *oinops*, Hodgson. J. A. S. B. IX., p. 12.
1888. *Macacus rhesus*, Blanford, Mammalia No. 3.
♀. 1114. Sohagpur, Hoshangabad.
♂. 1320. Karkara, Damoh.

Audebert's Plate is quite recognizable, which is more than can be said for Wagner's. The date of publication of this latter cannot be exactly fixed, lying between 1792 and 1802. The name *rhesus* has always been used and must be given the benefit of the doubt over *erythræa*. Both, as well as *oinops*, evidently refer to the same animal.

PRESBYTIS ENTELLUS, Dufr.

*The Langur.*

(Synonymy in No. 1.)

♂. 916. Bori, Hoshangabad.
♀. 975. Rorighat, Hoshangabad.
♂. 1324. Ouda, Balaghat.

(*See* also Reports Nos. 1, 2 and 4.)

These specimens do not seem to differ in any way from those obtained earlier by Mr. Crump.

PTEROPUS GIGANTEUS, Brunn.

*The Common Flying-Fox.*

(Synonymy in No. 2.)

♂. 1036, 1037, 1039, 1041, 1042. ♀. 1034, 1035, 1040. } Sohagpur, Hoshangabad.
♂. 1313, 1314, Narsingarh, Damoh.
♂. 1337, 1338, Ouda, Balaghat.
♂. 1339, Sonawanee, Balaghat.
♂. 1523, 1524, 1525, 1526, 1591. ♀. 1368, 1531. Chanda.

(*See* also Reports Nos. 2, 3, 4 and 5.)

The colour variation in this species is very unusual in an animal so strongly and distinctively coloured.

CYNOPTERUS SPHINX GANGETICUS, K. And.

*The Northern Short-nosed Fruit Bat.*

1891. *Cynopterus marginatus*, Blanford. Mammalia No. 138 (Pt.)
1910. *Cynopterus sphinx gangeticus*, K. Andersen, A. M. N.H., p. 623.
♂. 1374, 1375, 1424, 1447, 1448, 1556, 1570, 1584.
♀. 1372, 1373, 1376, 1445, 1446, 1571, 1572, 1573. Chanda.

This geographical race has been fully dealt with by Dr. K. Andersen in the Catalogue Chiroptera British Museum (1912) p. 604.

Dr. Andersen has most courteously examined the present series and accepts them as his *C. s. gangeticus*.

LYRODERMA LYRA, Geoff.

*The Indian Vampire Bat.*

(Synonymy in No. 1.)

♀. 891, Dhain, Hoshangabad.
♂. 1070, 1071, 1076, 1086, 1087. ♀ 1075, 1082, 1083, 1084, 1085, 1090, 1092, in al. 1079, 1101, 1106, 1107. Sohagpur, Hoshangabad.
♂. 1191. ♀ 1218, 1219, 1220, 1222 in al., 1247. Mundra, Saugor.
♂. 1258. ♀ 1256, 1257, 1259, 1260. Damoh.
♀. 1284, 1285, 1286, 1287, 1288, 1289, 1303. Narsingarh, Damoh.
♂. 1387, 1388, 1397. ♀ 1389. Chinchpali, Chanda.
♂. 1427, 1431, 1433, 1434, 1436, 1438, 1439. ♀ 1428, 1429, 1430, 1432, 1435, 1437, 1440. Bulapur, Chanda.

(*See* also Reports Nos. 1, 4 and 5.)

These appear to be quite normal *L. lyra*.

RHINOLOPHUS LEPIDUS, Blyth.

*The Little Indian Horse-shoe Bat.*

(Synonymy in No. 6.)

♂ 1069, 1080, 1089, 1093 1094, 1104. ♀ 1063, 1064, 1081, 1095, 1102, 1105, 1110, in a . 1061, 1065, 1139, 1147, 1148, 1149, 1150, 1153. Sohagpur, Hoshangabad.
♂ 1290, 1296, 1299, 1300, 1302. Narsingarh, Damoh.

(*See* also Report No. 6 )

HIPPOSIDEROS LANKADIVA, Kel.

*The Large Indian Leaf-nosed Bat.*

(Synonymy in No. 6.)

♀ 1059. Sohagpur, Hoshangabad.
♂ 1189, 1202, 1213. ♀ 1190, 1199, 1200, 1201. Mundra, Saugor.

(*See* also Report No. 6.)

HIPPOSIDEROS FULVUS, Gray.

*The Bicoloured Leaf-nosed Bat.*

(Synonymy in No. 3).

♂ 1808. ♀ 1097, 1098, 1099, 1100, 1108, 1109 in al., 1078, 1120, 1121, 1122, 1123, 1140, 1141, 1142, 1143, 1144, 1145, 1146, 1151, 1152, 1154, 1155, 1156, 1157, 1158, 1159, 1160, 1161, 1163, 1162. Sohagpur, Hoshangabad.

(*See* also Reports Nos. 3 and 5.)

PIPISTRELLUS MIMUS, Wrought.

*The Southern Dwarf Pipistrelle.*

(Synonymy in No. 1.)

In al. 771. Khapa, Hoshangabad. (Destroyed).
♀ 935. Bori, Hoshangabad.
♀ 1055, 1058, 1072, 1074, 1128. Sohagpur, Hoshangabad.
In al. 1238. Mundra, Saugor.
♂ 1390. Chinchpali, Chanda.
♀ 1444, in al. 1385. Chanda.

(*See* also Reports Nos. 1, 2, 3, 5 and 6.)

PIPISTRELLUS DORMERI, Dobs.

*Dormer's Pipistrelle.*

(Synonymy in No. 1.)

♂ 1054, 1073, 1112. Sohagpur, Hoshangabad.
♂ 1234. Mundra, Saugor.

(*See* also Reports Nos. 1, 2, 3, and 5.)

SCOTOPHILUS KUHLI, Leach.

*The Common Yellow Bat.*

(Synonymy in No. 1.)

♂ 1062, 1067. ♀ 1066. Sohagpur, Hoshangabad.
♂ 1255. Damoh.
♂ 1425, 1426, 1442, 1518, 1519, 1557. ♀ 1377, 1378, 1379, 1380, 1381, 1382, 1383, 1384, 1456, 1457, 1468, 1469, 1473, 1479, 1483, 1497, 1498, 1499, 1500. Chanda.

(*See* also Reports Nos. 1, 3 and 5.)

SCOTOPHILUS WROUGHTONI, Thos.

*Wroughton's Bat.*

(Synonymy in No. 1.)

♀ 1091. Sohagpur, Hoshangabad.

♂ 1450, 1495, 1512, 1575. ♀ 1470, 1478, 1505, 1506, 1507, 1508, 1509, 1510, 1511, 1513, 1514, 1515, 1516, 1517, 1561, 1562, 1563, 1564, 1565, 1567, 1568, 1569, 1574, 1580, 1581, 1582, 1583, 1585, 1586, 1587, 1588. Chanda.

(*See* also Reports Nos. 1, 5 and 6.)

TAPHOZOUS MELANOPOGON, Temm.

*The Black-bearded Sheath-tailed Bat.*

(Synonymy in No. 1.)

♂ 1203, 1204, 1205, 1206, 1207, 1208, 1211, 1217, 1221, 1223, 1225, 1226, 1240. ♀ 1212, 1214, 1215, 1216, 1239, in al. 1241, 1242, 1243, 1244, 1245, 1246. Mundra, Saugor.

♂ 1263, 1264, 1265, 1266, 1267, 1268, 1274, 1275, 1276, 1277, 1278, 1279, 1280, 1281, 1297, 1298, 1305, 1306, 1311, 1312. ♀ 1262, 1282, 1283, 1304, 1307. Narsingarh, Damoh.

(*See* also Reports Nos. 1, 2, 3, 4 and 6.)

TAPHOZOUS LONGIMANUS, Hardw.

*The Long-armed Sheath-tailed Bat.*

(Synonymy in No. 6.)

♂ 1050, 1053, 1056. ♀ 1048, 1049, 1051, 1057, 1068. Sohagpur, Hoshangabad.

♂ 1488, 1494, 1555. ♀ 1484, 1485, 1486, 1489, 1490, 1491, 1492, 1493, 1534, 1535, 1536, 1537, 1538, 1539, 1576, 1577, 1578. Chanda.

(*See* also Report No. 6.)

RHINOPOMA HARDWICKII, Gray.

*The lesser Indian Mouse-tailed Bat.*

(Synonymy in No. 3.)

♂ 1270, 1272. ♀ 1269, 1271, 1295, 1309, 1310, 1315, 1316, in al. 1317, 1318. Narsingarh, Damoh.

(*See* also Reports Nos. 3 and 4.)

PACHYURA.

*Shrews.*

♂ 796. ♀ 787, 804. Khapa, Hoshangabad.

♂ 825, 835, 846. ♀ 826. Sakot, Hoshangabad.

♂ 936. ♀ 930. Bori, Hoshangabad.

♀ 970, 985. Rorighat, Hoshangabad.

♂ 1052, 1119. ♀ 1060, 1096, 1118. Sohagpur, Hoshangabad.

♂ 1184, 1186. Mundra, Saugor.

♂ 1451, 1487, 1520, 1533, 1545, 1548, 1549, 1553. ♀ 1464, 1472, 1480, 1521, 1522, 1529, 1541, 1546, 1547, 1560, 1592. Chanda.

(*See* also Reports Nos. 1, 3, 4, 5 and 6.)

"The natives state that Shrews come into their huts before the rains and return to the fields in October."—C. A. C.

PACHYURA STOLICZKANA, Anders.

*Stoliczka's Shrew.*

(Synonymy in No. 4.)

♀ 943. Bori, Hoshangabad.

We deal with this specimen with great hesitation. The skull is too badly damaged to be of any use in determining the genus. *Crocidura fuliginosa* is a Himalayan species and though this Survey has proved the extension of *C. horsfieldi*, the Ceylon species, on to the mainland, a specimen having been obtained in Kanara, there is no record of any *Crocidura* in the plains of India. In the circumstances we accept the probabilities and rank this specimen as a *Pachyura*.

More than 20 species, of about the same size as this specimen, have been described. The name *stoliczkana* was adopted, to represent this group provisionally, in the Nimar Report (No. 4). This specimen does not altogether agree with any of the published descriptions mentioned above, nevertheless we propose for the present to list it as *stoliczkana*.

FELIS AFFINIS, Gray.

*The jungle Cat.*

(Synonymy in No. 1.)

♂ 777, 780. Khapa, Hoshangabad.
♂ 856, 857. Chimar, Hoshangabad.
♂ 858, 878. Dhain, Hoshangabad.
♀ 915. Bori, Hoshangabad.
♂ 1028. Pachmarhi, Hoshangabad.
♀ 1236. Mundra, Saugor.
♂ 1593, 1595. Chanda.

(*See* also Reports Nos. 1, 3, 4, 5 and 6.)

MUNGOS MUNGO, Gmel.

*The common Indian Mongoose.*

(Synonymy in No. 1.)

♂ 1116, 1117, 1130. ♀ 1132, 1133, 1138. Sohagpur, Hoshangabad.
♂ 1210. Mundra, Saugor.
♀ 1249, 1254. Damoh.
♀ 1566, 1594. Chanda.

(*See* also Reports Nos. 1, 2, 3, 4, 5 and 6.)

MUNGOS SMITHI, Gray.

*The ruddy Mungoose.*

1837. *Herpestes smithi*, Gray. Mag. Nat. Hist. I., p. 578.
1839. *Herpestes thysanourus*, Wagner. Munch. Gel. Anz. IX., p. 440.
1841. *Crossarchus rubiginosus*, Wagner. Schreb. Saug. Supp. II, p. 329.
1851. *Herpestes ellioti*, Blyth. J. A. S. B. XX, p. 162.
1864. *Herpestes jerdoni*, Gray. P. Z. S., p. 550.
1867. *Herpestes monticolus*, Jerdon. Mamm., p. 135.
1888. *Herpestes smithi*, Blanford. Mamalia No. 61.

♂ 973. Rorighat, Hoshangabad.
♂ 1023. Pachmarhi, Hoshangabad.

The type locality of Gray's *smithi* is not known, but as it was presented by Jerdon it was probably from S. India, and was also very likely the specimen on which *jerdoni* was based, *ellioti* and *monticolus* were also based on specimens from the Madras Presidency, and these may well all be synonyms. The names *thysanourus* and *rubiginosus* were both given by Wagner to a Kashmir animal. There is no Mongoose with a black tipped tail from Kashmir in the National Collection, nor have we seen any record of such elsewhere, so for the present these names may conveniently remain in the synonymy of *smithi*.

VIVERRICULA MALACCENSIS, Gmel.

*The small Indian Civet.*

(Synonymy in No. 3.)

♂. 1125, 1129. ♀. 1126. Sohagpur, Hoshangabad.
♂. 1590. Chanda.

(*See* also Reports Nos. 3 and 5.)

PARADOXURUS NIGER, Desm.

*The Indian Toddy Cat.*

(Synonymy in No. 5.)

♂. 961, 974. Rorighat, Hoshangabad.
♂. 993, 1022. Pachmarhi, Hoshangabad.
♂. 1044. Sohagpur, Hoshangabad.

(*See* also Report No. 5.)

HYÆNA HYÆNA, L.

*The striped Hyæna.*

(Synonymy in No. 1.)

♂ 1323. Ouda, Balaghat.

(*See* also Reports Nos. 1, 3 and 4.)

CANIS INDICUS, Hodgs.

*The Jackal.*

(Synonymy in No. 1 under 'aureus' and in No. 3.)

♀ 839. Sakot, Hoshangabad.
♀♀ 953. Rorighat, Hoshangabad.
♂♂ 1045, 1115. ♀ 1127. Sohagpur, Hoshangabad.
♂♂ 1164, 1229 (imm.), 1230 (imm.), 1232 (imm.). ♀ 1228 (imm.), 1231 (imm.), 1233 (imm.). Munda, Saugor.
♂ 1325, 1336. Ouda, Balaghat.
♂♂ 1410, 1411. Chinchpali, Chanda.
♂ 1540. Chanda.

(*See* also Reports Nos. 1, 3, 4, 5 and 6.)

CUON DUKHUNENSIS, Sykes.

*The Indian Wild-Dog.*

(Synonymy in No. 2.)

♂ 932. Bori, Hoshangabad.

(*See* also Reports Nos. 2 and 4.)

VULPES BENGALENSIS, Shaw.

*The common Indian Fox.*

(Synonymy in No. 1.)

♂ 1113, 1131, 1136, 1137. ♀ 1033, 1134, 1135. Sohagpur, Hoshangabad.
♀ 1227. Mundra, Saugor.
♀♂ 1253. Damoh.
♀ 1334. Ouda, Balaghat.

(*See* also Reports Nos. 1, 3 and 5.)

LUTRA MACRODUS, Gray.

*The smooth Indian Otter.*

1865. *Lutra macrodus*, Gray. P. Z. S., p. 128.
1878. *Lutra ellioti*, Anderson. An. Zool. Res., p. 211.
1888. *Lutra ellioti*, Blanford, Mammalia No. 93.
♂ 1319. Kakara, Damoh.

Though Blanford originally adopted *ellioti* as the name of this species, he later accepted *macrodus*, as explained by him in his 'Appendix and errata' at page 601 of the "Mammalia."—Very little is known of the representatives of the genus *Lutra* in India. Many who are in a position to obtain specimens are tempted to retain them on account of the pelt. We would venture to point out that if any member will send the skin of the head in front of the ears and the skull all that is essential for diagnosis will be available.

RATUFA INDICA BENGALENSIS, Blanf.

*The Central Indian Giant Squirrel.*

1897. *Sciurus indicus bengalensis*, Blanford. Journ. B. N. H. S., Vol. XI., p. 303.
1910. *Ratufa indica bengalensis*, Wroughton. Journ. B. N. H. S., Vol. XIX., p. 889.
♂ 866, 886. ♀ 865, 867, 868, 876, 877. Dhain, Hoshangabad.
♂ 902, 903, 904, 906, 909, 910, 929. ♀ 907, 911, 925, 926, 927, 928. Bori, Hoshangabad.

"These animals were first found at Dhain, on a steep hill side sloping up from the river. When disturbed they do not dash off and so betray their whereabouts, but generally lie flat along a branch, and, notwithstanding their brilliant colour, are almost invisible unless actually looked for. They may often be found by following up their shrill whistling call. They can take big leaps from one bough to another, but I have never seen them near or on the ground. The nest is very large and composed of twigs and placed high up in the topmost branches of a tree."—C. A. C.

FUNAMBULUS PALMARUM, L.

*The Palm Squirrel.*

(Synonymy in No. 2.)

♀ 894, 898, 899. Dhain, Hoshangabad.
♂ 979, 984, 991, 992. ♀ 972, 980, 983. Rorighat, Hoshangabad.
♂ 994, 995, 998, 1002, 1021, 1029. ♀ 996, 997, 1004, 1005, 1015, 1032. } Pachmarhi, Hoshangabad.
♀ 1386. Chinchpali, Chanda.

(*See* also Reports No. 2, 4 and 5.)

"These squirrels were found high up on the hills and living amongst the bamboos. They are not common, but seem quite fearless, in appearance they are round and fluffy, the hair does not lie flat but stands on end. The call seems to be a piping note, but not such a shrill note as that used by the similar squirrels in open cultivated areas."—C. A. C.

FUNAMBULUS PENNANTI, Wrought.

*The common five-striped Squirrel.*

(Synonymy in No. 1.)

♂ 775. Khapa, Hoshangabad.
♂ 845. ♀ 838, 850. Sakot, Hoshangabad.

♂ 887. 864, 900. Dhain, Hoshangabad.
♂ 1047. Sohagpur, Hoshangabad.
♂ 1327. ♀ 1328. Ouda, Balaghat.
♂ 1370, 1371, 1394, 1395, 1402, 1416, 1421, 1441, 1452, 1463, 1551. ♀ 1369, 1386, 1396, 1420, 1422, 1423, 1443. Chanda.

(*See* also Reports Nos. 1, 2, 3, 4 and 5.)

"The short-coated squirrel of the valleys differs entirely in its habits from the last. It is exceedingly shy and difficult to approach. It can be fairly easily trapped, but the trap must often be left set for some days to do so. Its call is a very soft twittering chirp."—C. A. C.

TATERA INDICA, Hardw.

*The Indian Gerbil.*

(Synonymy in No. 1.)

♂ 803. Khapa, Hoshangabad.
♀ 869, 870, 882, 883. Dhain, Hoshangabad.
♀ 946, 947. Bori, Hoshangabad.
♂ 948, 951, 952. Rorighat, Hoshangabad.
♀ 1009, 1026. Pachmarhi, Hoshangabad.
♂ 1166, 1169, 1170, 1180, 1181, 1186, 1193. ♀ 1171, 1179, 1182, 1194, 1224, 1237. Mundra, Saugor.
♀ 1273. Narsingarh, Damoh.
♀ 1474. Chinchpali, Chanda.
♂ 1474. ♀ 1496, 1527, 1554. Chanda.

(*See* also Reports Nos. 1, 2, 4, 5 and 6.)

VANDELEURIA OLERACEA, Benn.

*The Dekhan Tree Mouse.*

(Synonymy in No. 2.)

♀ 1342. Sonawanee, Balaghat.

(*See* also Reports Nos. 2, 4 and 5.)

EPIMYS RUFESCENS, Gray.

*The Common Indian Rat.*

♂ 782, 783, 800, 801, 802. ♀ 776. Khapa, Hoshangabad.
♀ 807, 808, 817, 824, 853, 854. ♀ 818, 822, 823, 830, 831. } Sakot, Hoshangabad.
♂ 884. ♀ 875. Dhain, Hoshangabad.
♂ 918, 919. Bori, Hoshangabad.
♂ 964. ♀ 960. Rorighat, Hoshangabad.
♂ 1046, 1047. Sohagpur, Hoshangabad.
♂ 1340, 1349, 1354, 1359, 1362. ♀ 1341, 1355, 1360, 1361, 1363. Sonawanee, Balaghat.
♂ 1407, 1408, 1415. ♀ 1391, 1392. Chinchpali, Chanda.
♂ 1559. ♀ 1454, 1459, 1465, 1482. Chanda.

VARIETY with white underparts.

♀ 774. Khapa, Hoshangabad.
♂ 860, 871, 872, 874, 879, 880, 892, 897, 901. ♀ 861, 862, 873, 881, 885, 905, 908. Dhain, Hoshangabad.
♂ 938. ♀ 914, 922. Bori, Hoshangabad.
♂ 957, 958, 962, 969, 987, 988. ♀ 959, 965, 968. Rorighat, Hoshangabad.

♂ 1348. ♀ 1350. Sonawanee, Balaghat.
♂ 1398, 1403. ♀ 1393, 1504, 1409. Chinchpali, Chanda.
♂ 1461. ♀ 1471, 1552. Chanda.

There is nothing in this series to cause us to make any change in the view taken in earlier Reports. We adhere, therefore, to the plan of classifying all the specimens as *Epimys rufescens*, indicating those with white underparts as a variety. On the whole, however, we think that same evidence is now coming forward to prove that there *are* intermediates.

EPIMYS BLANFORDI, Thos.

*The White-tailed Rat.*

(Synonymy in No. 2.)

♂ 768. ♀ 769, 772. Khapa, Hoshangabad.
♂ 920. Bori, Hoshangabad.
♂ 978, 982, 989, 990. ♀ 976, 977, 981, 986. Rorighat, Hoshangabad.
♂ 999, 1000, 1003, 1006, 1010, 1011, 1016, 1018, 1019, 1024, 1025. ♀ 1001, 1007, 1008, 1012, 1017. Pachmarhi, Hoshangabad.

(*See* also Reports Nos. 3 and 6.)

"One specimen was obtained in the sandy bed of a dried up stream (at Khapa), but, subsequently, all individuals of this species were found among rocks on hillsides. In this environment no burrows were found and the rats appeared to live under rocks, around which were found quantities of nuts of the 'Harda' (*Terminalia chebula*). The shell is pierced at one end and the kernel extracted."—C. A. C.

NOTE.—The nuts referred to have been identified by Col. K. R. Kirtikar, I.M.S. In the Bombay Forests it is the allied 'Bheda' (*T. belerica*) which is habitually attacked by Forest rodents.

MUS BOODUGA, Gray.

*The Southern Field Mouse.*

(Synonymy in No. 1.)

♂ 793, 794, 795. ♀ 770, 790, 805 in al., 791. Khapa, Hoshangabad.
♂ 813, 828, 829, 836, 851. ♀ 812, 814, 837, 849 in al., 843 . . . Sakot Hoshangabad.
♂ 888. ♀ 889, 895, 896. Dhain, Hoshangabad.
♂ 917, 923, 924, 931, 933, 937, 940, 942. ♀ 912, 913, 921, 934, 941, 944. Bori, Hoshangabad.
♂ 966. ♀ 955, 967 in al., 956. Rorighat, Hoshangabad.
♂ 1020. ♀ 1027. Pachmarhi, Hoshangabad.
♂ 1173, 1192, 1235. ♀ 1183. Mundra, Saugor.
♂ 1326, 1327, 1330, 1335. ♀ 1331, 1332. Ouda, Balaghat.
♂ 1412, 1419 in al., 1405. Chinchpali, Chanda.
♂ 1344, 1351. ♀ 1343, 1356, 1357. Sonawani, Balaghat.
♂ 1449, 1455, 1528. ♀ 1501, 1579 in al., 1542. Chanda.

(*See* also Reports 1, 2, 4, 5 and 6.)

LEGGADA PLATYTHIX, Benn.

*The Dekhan Spiny Mouse.*

(Synonymy in No. 1.)

♀ 890. Dhain, Hoshangabad.

♀ 949, 971. Rorighat, Hoshangabad.

(*See* also Reports Nos. 1, 2, 4 and 5.)

MILLARDIA MELTADA, Gray.

*The Soft-furred Field-Rat.*

(Synonymy in No. 1.)

♂ 811, 821, 827, 832, 833, 834. ♀ 806, 816. Sakot, Hoshangabad.
♂ 1168, 1185. ♀ 1167, 1174, 1187. Mundra, Saugor.
♂ 1477, 1504. ♀ 1481. Chanda.

(*See* also Reports Nos. 1, 3, 4, 5 and 6.)

BANDICOTA MALABARICA, Shaw.

*The Malabar Bandicoot.*

(Synonymy in No. 5.)

♂ 1358. ♀ 1347, 1352, 1353. Sonawanee, Balaghat.
♂ 1400. Chinchpali, Chanda.
♂ 1460, 1503 (juv.), 1550, 1558. ♀ 1461, 1502, 1532, 1544, 1589. Chanda.

(*See* also Reports Nos. 5 and 6.)

These specimens are apparently quite typical *malabarica*.

GUNOMYS KOK, Gray.

*The Southern Mole-Rat.*

(Synonymy in No. 1.)

♀ 781. Khapa, Hoshangabad.
♂ 859. ♀ 863. Dhain, Hoshangabad.
♀ 954. Bori, Hoshangabad.

(*See* also Reports Nos. 1, 4 and 5.)

GOLUNDA ELLIOTI, Gray.

*The Indian Bush-Rat.*

(Synonymy in No. 1.)

♂ 784, 785, 786, 788, 789, 797, 798. ♀ 773, 778, 792, 799. ♀ Khapa, Hoshangabad.
♂ 819, 840, 841, 844, 847, 852. ♀ 815 820, 842, 848, 855. Sakot, Hoshangabad.
♂ 939. Bori, Hoshangabad.
♂ 950, 963. Rorighat, Hoshangabad.
♀ 1014. Pachmarhi, Hoshangabad.
♂ 1172, 1195, 1198 (imm.), 1248. ♀ 1196, 1197, 1209. Mundra, Saugor.
♂ 1345, 1365, 1367. ♀ 1366. Sonawanee, Balaghat.
♂ 1476, 1543. Chanda.

(*See* also Reports Nos. 1, 2, 3, 4, 5 and 6.)

LEPUS SIMCOXI, Wrought.

*The Khandeish Hare.*

(Synonymy in 1.)

♂ 1043, 1103, 1111 (imm.) ♀ 1038, 1124. Sohagpur, Hoshangabad.

♂ 1401. ♀ 1417, 1418. Chinchpali, Chanda.
♂ 1462, 1466. ♀ 1453, 1458, 1475, 1530. Chanda.

(*See* also Reports Nos. 1, 2 and 4.)

The present series enables us to define, to some extent, the distribution of *L. simcoxi*. It was first taken at Edlabad in East Khandeish and has since been obtained in Nimar, the Berars, Balaghat, Chanda and Hoshangabad (inclusive of the Mahadeo Hills).

Some specimens in the British Museum point to the below-Ghat hare as a distinct form so that the Ghat line is apparently a western boundary.

A series presented to the National Collection by Capt. C. H. T. Whitehead, from Sehore, in Central India, and the specimens in the present Collection from Saugor and Damoh show that it does not cross the Vindhyan Mountains and the Nerbudda River.

Its range to the eastward is at present quite an open question, while, though it probably ranges at least as far south as the Godavery River, we have no specimens to show that it is so.

We take this opportunity to point out to Members of the Society that the hare fauna of the *whole country between Khandeish and Dharwar* is unknown.

LEPUS MAHADEVA, Wrought.

*The Pachmarhi Hare.*

1912. *Lepus mahadeva*, Wroughton. Journ. B. N. H. S. *antea*.
♂ 779, 810. ♀ 809. Khapa, Hoshangabad.
♀ 893. Dhaim, Hoshangabad.
♂ 1031. ♀ 1030. Pachmarhi, Hoshangabad.
♂ 1322. Ouda, Balaghat.

This series from the Mahadeo Hills is quite constant in its colouration and consistently differs from *simcoxi*. It may be that further material will show that it is merely a local race of *simcoxi*, but the absence of intermediates negatives that view for the present.

LEPUS, sp.

♂ 1175. 1176, ♀ 1165 (imm.), 1177, 1178. Mundra, Saugor.
♀ 1251, 1252, 1253. Damoh.
♂ 1291. 1301 ♀ 1261, 1292, 1293, 1294, 1308. Narsingarh, Damoh.

*L. ruficaudatus* was described by Geoffroy from 'Bengal.'—Blanford accepts it as ranging right across India from the N. W. Frontier to Assam. If this is so, this series may possibly belong to that species. We cannot think that any species is likely to range unchanged through such very different climatic and physiographical conditions. Until material is available to enable us to compare it with similar series from neighbouring areas, we do not feel justified in dealing with it.

TETRACEROS QUADRICORNIS, Blainv.

*The four-horned Antelope.*

(Synonymy in No. 2.)

♀ 945. Bori, Hoshangabad.
♂ 1413. ♀ 1399. Chinchpali, Chanda.

(*See* also Report No. 2.)

GAZELLA BENNETTI, Sykes.
*The Indian Gazelle.*
(Synonymy in No. 1.)
♀ 1408. Chinchpali, Chanda.
(*See* also Reports Nos. 1 and 3.)

MUNTIACUS VAGINALIS, Bodd.
*The Rib-faced Deer.*
(Synonymy in No. 2.)
♂ 1333. Ouda, Balaghat.
♀ 1341. Sonawanee, Balaghat.
(*See* also Reports Nos. 2 and 6.)

AXIS AXIS, Erxl.
*The Spotted Deer.*
(Synonymy in No. 6.)
♂ 1321. Ouda, Balaghat.
(*See* also Report No. 6.)

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REPORT BY R. C. WROUGHTON AND KATHLEEN V. RYLEY.

| | | |
|---|---|---|
| COLLECTION | ... | ... No. 8. |
| LOCALITY | ... | ... Vijayanagar, Bellary. |
| DATE | ... | ... July-August. |
| COLLECTED BY | ... | ... Mr. G. C. Shortridge. |
| EARLIER REPORTS | .. | .. No. 1 E. Khandeish, Vol. XXI, p. 392; No. 2 Berars, Vol. XXI, p. 820; No. 3 Cutch, Vol. XXI, p. 826; No. 4 Nimar, Vol XXI, p. 844; No. 5 Dharwar, Vol. XXI, p. 1170; No. 6 Kanara, Vol. XXII, p. 29; No. 7. Central Provinces, Vol. XXII, p. 45. | |

This collection was made at Vijayanagar, an ancient city, situated on the right bank of the Tungabhadra river, in the Bellary District of Madras, about Lat. 15·20′ N. and Long. 76·28′ E. It was a famous capital in the 17th century; now it consists chiefly of ruined palaces and temples, only a small part of the city being inhabited. Numerous fortifications surround the city and the whole area is covered with rocky granite hills, weathered to every shade of colour; these hills are very barren, no vegetation or even grass growing upon them. The Tungabhadra is narrow and rapid. Huge boulders are scattered over the entire district.

The Bellary District lies on the Northern slope of the Dekhan Plateau. The country suffers much from droughts, the rainfall varying from 19 to 39 inches, the Western part having the lowest rainfall. The flora consists largely of drought resisting plants; some date palms flourish in the damper hollows of the West. The

above account is taken from the Gazetteer. The following description is sent by Mr. Shortridge:—

"Vijayanagar (Hampi)—Six miles to the North of Hospet Station on the South bank of the Tungabhadra river, which forms the southern boundary of the Nizam's Territory. Altitude 1,500 feet.

There are several small villages on the site of the old city, the chief of which are Kamalapur and Hampi. The country consists partly of flat patches of land where rice and sugarcane are grown. Well irrigated by canals, which were originally cut during the existence of Vijayanagar city. A large part of the country consists of rocky hills, entirely composed of huge masses and boulders of granite, which afford almost impenetrable cover for panthers, jackals, porcupines, etc.

The trees are chiefly 'Babhul,' while there are numerous hedges and patches of milkbush and prickly pear. The country is very suitable for grazing, and the villagers keep enormous numbers of cattle and goats. The rivers themselves as well as the numerous rock crevices afford shelter for countless numbers of bats."—G. C. S.

The Collection includes 330 specimens, belonging to 28 species, in 21 Genera.

The Monkeys are represented, as was to be expected, by the Bonnet Monkey and the Malabar Langur. The Bats constitute more than half the Collection, and belong, for the most part, to forms already taken in Dharwar and Kanara; one species, however, the Cutch sheath-tailed Bat, until this Survey commenced, was only known from Cutch; we have now had it from Khandeish and Bellary as well as from the type locality. The *Insectivora* are represented by four specimens of a Pigmy Shrew, which we have provisionally identified as the Indian Pigmy Shrew of Blanford's "Mammals." This whole Genus, which includes the familiar Musk Rat, is a most difficult one to deal with; the material available for study is comparatively scanty, while a great number of species have been described in it on characters very difficult of diagnosis. Until much more material is available, if not, indeed, until this Survey is complete, at any rate for the Peninsula, we cannot hope to arrive at any definite taxonomic conclusions. The *Carnivora* are represented by only two specimens, the Common Mongoose and equally common Toddy Cat. Among the 10 species of Rodents represented, it is most interesting to find that the Cutch Rock Rat reappears, practically unchanged, while it is somewhat surprising to find a southern representative of Phillips's Spiny Mouse, which was discovered by the Survey in Nimar. The Ungulates are represented by two specimens of the Indian Wild Pig and the Edentates by a specimen of the Indian Pangolin.

In addition to the animals actually collected, Mr. Shortridge, in

his Field Notes, mentions the following, with their vernacular names as having been seen by, or reported to him, no specimens however being obtained :—

*Felis pardus.*—CHIRUTALI or CHIRUTAPULI (Telegu); WANIGA or SIRSA (Kanarese).

*Felis affinis.*—ADIVIPILLI (Telegu); ADNIBEKKU (Kanarese).

*Canis indicus.*—NAKKA (Telegu); NARI (Kanarese).

*Vulpes bengalensis.*—GUNTANAKKA (Telegu).

*Bandicota malabarica.*—PUNDIKOKKU. (Telegu); YEGNA (Kanarese).

*Golunda ellioti* "Observed among Prickly Pear."

*Hystrix.* sp.—MUNDLAPUNDHI or MEKUM (Telegu) YEDHU, MULLHUNDHI, MULLFUNDHI (Kanarese).

Finally Mr. Shortridge gives the following list of animals for which he has obtained a definite vernacular name, but no evidence that they occur within the area covered by his Survey :—

*Hyæna hyaena.*—KATAGORUKU (Telegu).

*Canis pallipes.*—THODELI (Telegu): THOLA (Kanarese).

*Antelope cervicapra.*—GINKA (Telegu); CHIGERI (Kanarese).

*Gazella bennettii.*—BURIDIGADU or BURIGINKA (Telegu) CHANNACHIGERI (Kanarese).

SIMIA SINICA, L.

*The Bonnet Monkey.*

(Synonymy in No. 5.)

♂ 1573, 1574. Vijayanagar, Bellary.

(*See* also Reports Nos. 5 and 6.)

Vernacular names—*Kothi* (Kanarese); *Koti* (Telegu).

"Plentiful in the vicinity of Hampi Temple."—G. C. S.

PRESBYTIS HYPOLEUCOS, Blyth.

*The Malabar Langur.*

(Synonymy in No. 5.)

♀ 1572. Vijayanagar, Bellary.

(*See* also Reports Nos. 5 and 6.)

Vernacular names—*Karikoti* (Kanarese); *Kumdamuchu* (Telegu).

"Fairly plentiful among the hills around Vijayanagar. The specimens obtained here were unusually large; a male, which was nearly 5½ feet high, in entire length, weighed 35 lbs. and a female 27 lbs. Where it occurs in the open country this species is very much less shy and suspicious than in forest districts."—G. C. S.

PTEROPUS GIGANTEUS, Brunn.

*The common Flying Fox.*

(Synonymy in No. 2.)

♂ 1654; ♀ 1642, 1655. Vijayanagar, Bellary.

(*See* also Reports Nos. 2, 3, 4, 5 and 7.)

Vernacular name—*Sitava* (Telegu).

HIPPOSIDEROS LANKADIVA, Kel.

*The large Indian Leaf-nosed Bat.*

(Synonymy in No. 6.)

♂ 1372, 1373, 1460, 1461, 1462, 1463, 1464, 1465, 1466, 1467, 1469.
♀ 1371, 1374, 1459, in al. 1389, 1390, 1454, 1455. Vijayanagar, Bellary.

(*See* also Reports Nos. 6 and 7.)

Vernacular name—*Gabbilum* (Telegu) for all bats.

"Plentiful in Pattabhirama Swami Temple, but on being shot at on several occasions the colony entirely deserted. I have noticed elsewhere that *H. diadema*, and its closely allied forms, are frequently high flyers, and, unlike other leaf-nosed bats, may frequently be seen, in the early evenings, hawking high up in the air, in company with *Pipistrellus* and other early high flyers."—G. C. S.

HIPPOSIDEROS DUKHUNENSIS, Sykes.

*Sykes' Leaf-nosed Bat.*

(Synonymy in No. 5.)

♂ 1365, 1366, 1367, 1368, 1369, 1370, 1437, 1439, 1449, 1500.
♀ 1399, 1435, 1436, 1438, 1446, 1473, 1498, 1499, 1501, 1502, 1503, 1598, 1599, 1600, in al. 1379, 1380, 1381, 1382, 1393, 1394, 1416, 1417, 1418, 1419, 1420, 1421, 1549, 1550, 1593, 1594, 1595, 1596, 1597, 1637, 1680, 1681, 1682, 1683, 1684. Vijayanagar, Bellary.

(*See* also Reports Nos. 5 and 6.)

"Around Vijayanagar this bat occurs in enormous numbers, being probably more plentiful than all of the other species put together. Immense colonies roost in many of the ruins and in numerous crevices among the hills. They are low flyers. The hedges in the district are chiefly composed of milk bush and prickly-pear which are not very high, and in the quite early evenings these bats fly backwards and forwards along these hedges in a most peculiar manner, following each other in endless processions at short intervals."—G. C. S.

HIPPOSIDEROS FULVUS, Gray.

*The bicoloured Leaf-nosed Bat.*

(Synonymy in No. 3.)

♀. 1472. Vijayanagar, Bellary.

(*See* also Reports Nos. 3, 5, 6 and 7.)

"A stray specimen was obtained in a recently excavated, semi-underground temple, close to the "Palace buildings," in company with a colony of *H. dukhunensis*. A colony of this species probably existed somewhere in the neighbourhood."—G. C. S.

LYRODERMA LYRA, Geoff.

*The Indian Vampire Bat.*

(Synonymy in No. 1.)

♂ 1537, 1539, 1542; ♀ 1536, 1538, 1543, 1544, 1545, 1546 1547, 1563, 1564, 1566, 1567, 1568, 1569, in al. 1422, 1423, 1424, 1425, 1426, 1427. Vijayanagar, Bellary.

(*See* also Reports Nos. 1, 4, 5, 6 and 7.)

" A particularly late flyer, never appearing until well after sunset. On moonlight nights it may often be recognised, flying low and hawking over a small area for a considerable time. Probably on account of its habit of preying when it has an opportunity on the smaller bats, its roosting places seem always to be avoided by other species, even by those as large as itself. Occurring here in a small Temple to the east of Pattabhirama, in Izara Temple, near Vittalaswami, and in Krishnaswami's Temple. Although two other species of bat, *viz.*, *Taphozous kachhensis* and *Hipposideros dukhunensis* also occurred in Krishnaswami, they roosted in the 'ambulatary' while this species occurred in the inner shrine, where they were quite isolated."—G. C. S.

PIPISTRELLUS CEYLONICUS, Kel.

*Kelaart's Pipistrelle.*

(Synonymy in No. 1.)

♀ 1659. Vijayanagar, Bellary.

(*See* also Reports Nos. 1, 2, 3, 5 and 6.)

PIPISTRELLUS DORMERI, Dobs.

*Dormer's Bat.*

(Synonymy in No. 1.)

♀ 1639, 1640, 1658, 1666, 1667, 1679. Vijayanagar, Bellary.

This species was originally described from Bellary by Dobson in 1875.

(*See* also Reports Nos. 1, 2, 3, 5 and 7.)

PIPISTRELLUS MIMUS, Wrought.

*The Southern dwarf Pipistrelle.*

(Synonymy in No. 1.)

♂ 1641, 1653, 1657, 1665, 1685; ♀ 1632, 1664. Vijayanagar, Bellary.

(*See* also Reports Nos. 1, 2, 3, 5, 6 and 7.)

TAPHOZOUS LONGIMANUS, Hardw.

*The long-armed Sheath-tailed Bat.*

(Synonymy in No. 6.)

♀ 1678. Vijayanagar, Bellary.

(*See* also Reports Nos. 6 and 7.)

" Shot on the wing, roosting place not discovered."—G. C. S.

TAPHOZOUS MELANOPOGON, Temm.

*The black-bearded Sheath-tailed Bat.*

(Synonymy in No. 1.)

♂ 1674. Vijayanagar, Bellary.

(*See* also Reports Nos. 1, 2, 3, 4, 6 and 7.)

" Shot on the wing, roosting place not discovered."—G. C. S.

TAPHOZOUS KACHHENSIS, Dobs.

*The Cutch Sheath-tailed Bat.*

(Synonymy in No. 1.)

♂ 1475, 1477, 1478, 1479, 1554, 1555, 1556, 1579, 1580, 1582.

♀ 1474, 1476, 1480, 1481, 1482, 1483, 1484, 1485, 1486, 1487, 1488, 1489, 1553, 1575, 1576, 1577, 1578, 1581, In al. 1490, 1491, 1583, 1584, 1585, 1586, 1587, 1588, 1589, 1590, 1591, 1592. Vijayanagar, Bellary.

(*See* also Reports Nos. 1 and 3.)

"Very plentiful in Krishnaswami, the large Ganesha, Vittalaswami, and Achyutariswami Temples. All the specimens obtained were enormously fat and when disturbed never attempted to leave the temple."—G. C. S.

RHINOPOMA HARDWICKII, Gray.

*The lesser Indian Mouse-tailed Bat.*

(Synonymy in No. 3.)

♂ 1364, 1407, 1408, 1430, 1433, 1434, 1494, 1495, 1537.
♀ 1409, 1428, 1429, 1431, 1432, 1447, 1448, 1528, 1529, 1530, 1531, 1532, 1533, 1534, 1604, 1605, 1660, In al. 1375, 1376, 1377, 1378, 1410, 1411, 1412, 1413, 1414, 1415, 1496, 1497, 1557, 1558. Vijayanagar, Bellary.

(*See* also Reports Nos. 3, 5 and 7.)

"*Rhinopoma* is very easily recognised on the wing, it comes out rather early and is a high flyer. Its flight, which is comparatively slow, is accompanied by a peculiar fluttering of the wings. On windy evenings they appear to make headway against the wind with the greatest difficulty. This is remarkable because the other Genera of the *Emballonuridæ* are among the swiftest and strongest flying of all bats. This species is very plentiful and generally distributed here, occurring, not only in many Temples, but also in crevices and caves in the surrounding hills. When roosting they sometimes hang from the roof, but they can creep over the walls, crab fashion, like *Taphozous*, when disturbed."—G. C. S.

PACHYURA PERROTTETI, Duvern.

*The Indian Pigmy Shrew.*

(Synonymy in No. 4.)

♂ 1505, 1638.
♀ 1456, 1677. Vijayanagar, Bellary.

(*See* also Report No. 4.)

Vernacular names:—SUNDUYALUKA (Telegu); ELICHI (Kanarese.)

"Two of these specimens were caught by natives on different occasions (although near the same spot) among heaps of road-metal, near Malavanta Ragunda's Temple, where the road crosses some rocky country. One of the females contained four young."—G. C. S.

MUNGOS MUNGO, Gmel.

*The Common Indian Mongoose.*

(Synonymy in No. 1.)

♂ 1440. Vijayanagar, Bellary.

(*See* also Reports Nos. 1, 2, 3, 4, 5 and 7.)

Vernacular names:—MUNGISA (Telugu); MUNGILI (Kanarese).

PARADOXURUS NIGER, Desm.

*The Indian Toddy Cat.*

(Synonymy in No. 5.)

1627 (Skull only). Vijayanagar, Bellary.

(*See* also Reports Nos. 5 and 7.)

Vernacular names:—PUNUGUPILLI (Telegu); PUNAGINBEKKU (Kanarese).

FUNAMBULUS PALMARUM, L.

*The Palm Squirrel.*

(Synonymy in No. 2.)

♂ 1358, 1360, 1361, 1362, 1363, 1396, 1397, 1504, 1601.
♀ 1359, 1398, 1603, 1663. Vijayanagar, Bellary.

(*See* also Reports Nos. 2, 4, 5 and 7.)

Vernacular names:—VUDUTHA (Telegu); VURCHI (Kanarese.)

"Very plentiful. Much more numerous among the ruined Temples and rocky hills than in trees. This species, as well as *Tatera indica*, almost invariably have their mouths and feet stained by the fruit of the Prickly-Pear, on which apparently they feed very largely."—G. C. S.

TATERA INDICA, Hardw.

*The Indian Gerbil.*

(Synonymy in No. 1.)

♂ 1384, 1385, 1387, 1404, 1405, 1441, 1443, 1444.
♀ 1383, 1386, 1406, 1442. Vijayanagar, Bellary.

(*See* also Reports Nos. 1, 2, 4, 5, 6 and 7.)

Vernacular names:—YALUK (Telegu for all field-rats); BUDDILCHI (Kanarese).

"When kept alive, even when first caught, these Gerbils will never attempt to bite, unless actually handled, while they will live on quite friendly terms with squirrels and other small mammals."—G. C. S.

MUS MANEI, Kel.

*The common Indian House Mouse.*

(Synonymy in No. 5, and in No. 1 under *M. musculus*.)

♂ 1676. Vijayanagar, Bellary.

(*See* also Reports Nos. 1, 3, 5 and 6.)

MUS BOODUGA, Gray.

*The Southern Field Mouse.*

(Synonymy in No. 1 under *Leggada booduga*.)

♂. 1586, 1518, 1519, 1520, 1559, 1560, 1602, 1622, 1623, 1630 1631.

♀. 1517, 1521, 1535, 1561, 1562, 1617, 1620. Vijayanagar, Bellary.

(*See* also Reports Nos. 1, 2, 4, 5, 6 and 7.)

"These mice are great cannibals, and if a number are confined together alive, even when given plenty of food, several will be found killed and partly eaten every day."—G. C. S.

Gray in establishing the *Leggada* indicated as the chief generic character the presence of an additional "eunate lobe" or cusp on the anterior face of the first molar, as we have explained in detail earlier in this issue. (p. 16.)

We have on the advice of Mr. Thomas substituted for this as the primary generic character the presence of lateral crests or ridges on the frontal; consequently *booduga* must be transferred to the Genus, *Mus*, its skull being entirely smooth, without any vestige of a ridge laterally bounding the

frontal. The presence of the "lunate lobe," however, is a useful character for separating it together with *dunni* ( *vide* Report No. 3 ) from *Mus manei* and other forms allied to *M. musculus*.

LEGGADA SURKHA, Wroughton and Ryley.

*The grey Spiny Mouse.*

19. *Leggada surkha*. Wroughton and Ryley. Journ. B.N.H.S., Vol. XXII, p. 17.
♂ 1635, 1651.
♀ 1515, 1548, 1626, 1636, 1652, 1668. Vijayanagar, Bellary.

"In the females examined there were only 10 mammæ.—G. C. S.

Our reasons for separating this species from *Leggada phillipsi* ( = *Mus phillipsi* of Report No. 4), as well as for including it in the Genus *Leggada* are given in detail earlier in this issue (p. 16).

The mammary formula 3—2—10 places it in the second section of the Genus as there indicated.

CREMNOMYS CUTCHICUS, Wroughton.

*The Cutch Rock Rat.*

(Synonymy in No. 3.)

♂ 1470, 1509, 1510, 1511, 1522, 1524, 1540, 1541, 1610, 1612, 1614, 1616, 1619, 1621, 1625, 1628, 1643, 1648, 1650, 1656, 1661.
♀ 1492, 1506, 1507, 1508, 1512, 1513, 1514, 1523, 1525, 1526, 1552, 1565, 1609, 1611, 1613, 1615, 1618, 1620, 1624, 1633, 1634, 1644, 1645, 1649, 1662, 1669, 1670, 1671, 1672, *in al.* 1608, 1646, 1647. Vijayanagar, Bellary.

(*See* also Report No. 3.)

"Nocturnal. Very plentiful among the rocky hills in the district. Readily trapped with cocoanut or cheese as bait. Several specimens had their mouths stained by the fruit of the Prickly Pear."—G. C. S.

EPIMYS RUFESCENS, Gray.

*The Common Indian Rat.*

(Synonymy in No. 1.)

♂ 1675, 1686, Vijayanagar, Bellary.

(*See* also all earlier Reports.)

Vernacular names:—VURAYALUKA (Telegu), ILLI (Kanarese.)

GUNOMYS KOK, Gray.

*The Southern Mole-Rat.*

(Synonymy in No. 1.)

♂ 1400, 1451, 1471, 1570, 1571, 1607.
♀ 1388, 1391, 1395, 1401, 1402, 1403, 1468, 1606. Vijayanagar, Bellary.

(*See* also Reports Nos. 1, 4, 5 and 7.)

Vernacular names:—KOKKU (Telegu).

"If kept in a cage this Rat is particularly savage, and will even dash itself against the wires in its attempts to reach any moving object outside."—G. C. S.

LEPUS NIGRICOLLIS, Cuv.

*The Black-naped Hare.*

(Synonymy in No. 5.)

♂ 1452.

♀ 1329, 1453 (skull only), 1458, 1493. Vijayanagar, Bellary.

(*See* also Reports Nos. 5 and 6.)

Vernacular names:—KUNDHILI or CHEVULAPILLI (Telegu); MOLA (Kanarese).

SUS CRISTATUS, Wagn.

*The Indian Wild Boar.*

(Synonymy in No. 5.)

♂ 144.

♀ 1551. Vijayanagar, Bellary.

(*See* also Report No. 5.)

Vernacular names:— PUNDHI (Telegu); MIKKA (Kanarese).

MANIS CRASSICAUDATA. G. St. Hel.

*The Indian Pangolin.*

(Synonymy in No. 3.)

♂ 1687. Vijayanagar, Bellary.

(*See* also Reports Nos. 3 and 6.)

Vernacular names:— ALAVA (Telegu); ALAVI (Kanarese).

"Occurring in both forest and open country, although in the latter it probably only occurs in the neighbourhood of rocks in broken country. On account of its nocturnal and burrowing habits, it would be very seldom seen."—G. C. S.

A YOUNG DOUBLE COCONUT PALM (*Lodoicea Seychellarum*, Labill.)
IN THE BOTANICAL GARDEN OF PERADENIYA.

# THE PALMS OF BRITISH INDIA AND CEYLON, INDIGENOUS AND INTRODUCED

BY

E. BLATTER, S.J.

PART VIII.

*(With Plates XL—XLVIII, and text-figures* 28—31.)

*(Continued from page 968 of Volume XXI.)*

*LODOICEA, LABILL.* Ann. Mus. Paris, IX, 140, t. 13[1].

("Lodoicea" is said to be altered from "Laodicea," so called after Laodice, the daughter of Priam.)

Willd. Sp. Pl. 402.—Kunth Enum. Pl III, 225.—Mart. Hist. Nat. Palm. III, 221, t. 109, 122.—Baker Fl. Maurit. 379.—Benth. et Hook. Gen. Pl. III, II. 939, 117.—Lurs. Bot. II, 338.

A tall dioecious palm. Flowers in axillary spadices, surrounded at the base by several obliquely truncate spathes. Male: spikes cylindrical, the flowers in subreniform clusters in hollows of the axis, imbricated in two rows, each flower subtended by a bracteole. Outer segments of the perianth spathulate-cucullate; inner obcuneate. Stamens about 36; filaments monadelphous; anthers linear; rudimentary pistil represented by 1-3 subulate processes. Female: flowers fewer than in the male spikes, contained in cups formed by a pair of bracteoles; ovary ovoid, 3-rarely 2-or 4-celled; stigmas sessile; stamens represented by minute staminodes.

Fruit a drupe, large, olive-green; usually 1-seeded; mesocarp thick, fibrous; pyrene large, bony, firmly attached to the mesocarp, usually 2-lobed; albumen homogeneous, cartilaginous; embryo placed between the lobes.

SPECIES—1.

DISTRIBUTION.—Seychelles.

*LODOICEA SEYCHELLARUM*, Labill. in Ann. Mus. Paris. IX, 140 t. 13; Spreng. Syst. Veg. II, 622; W. J. Hooker in Curtis, Bot. Mag. 2734-38; Mart. Hist. Nat. Palm. III, 221, t. 109, 122, t. X, fig. II et t. Z. V. fig. VIII; Brandis For. Fl. 545; Baker, Fl. Maurit. & Seych. 380.—*Cocos maldivica*, Gmel. Syst. Nat. II, 69; Willd. Spec. Pl. IV, 402, n. 6. —*Borassus sonnerati*, Giseke Lin. Prael. Ord. Nat. 88.—*Lodoicea callipyge* sive *Cocos maritima*, Commers, Ms. II et Palmarium volum. t. 1-15.—*Lodoicea maldivica*, Pers. Enchir. II, 630.—*Nux medica*, Clusius Exotic. libri decem (1563).

NAMES.—Tavacarre, Coquinko (Seychelles).

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[1] "Giseke (Prael. 1792, p. 88) correctly divined its affinities, naming it *Borassus Sonnerati*. Labillardière created for it the genus *Lodoicea*. But this, though maintained, is only distinguished technically from *Borassus* by the numerous stamens and large fruit."—W. T. Thiselton-Dyer.

Double Coconut Palm, Sea Coconut Palm, Ccconut of the Maldives (English).

Coco de mer, Coco de Salomon, Double Coco, Cul de Négresse, Coco des Seychelles, Coco de l'île Praslin, Cocotier des îles Séchelles, Cocotier des Maldives, Cocotier des Seychelles, Lodoïce des Maldives, Lodoicée, Lodoicée des Séchelles (French).

Coco das Maldivas (Portug.).

Meercocos, Seecocos, Doppelte Cocosnuss, Wundernuss Salomons, Maldivische Nuss, Kokosartige Lodoïcee (Germ.)

Dubbele Cocosnoot van de Seychelles, Dubbele Klapper, Maledivische Noot, Seychellennoot, Zeeklapper (Dutch).

Darya-ka-naryal (Hind.).
Darya-ka-narel (Decc.).
Jahari-naral (Bomb.).
Kadat-rengay (Tam.).
Samudrapu-tenkaya (Tel.).
Katal-tenna (Malay.).
Darya-nu-nariyal (Guz.).
Mudu-pol (Sing.).
Penle-on-si (Burm.).
Narjile-bahri (Arab.).
Nargile-bahri (Pers.).

Calappa Laut (called so by the Dutch in the Indian Archipelago).

Djenggi, Djenggli, Kelapa Laut, Kepo djenggi, Pelok djenggi (Java).

DESCRIPTION.—Trunk 60-100 feet high, straight, apparently destitute of bark, annulate, about 1 foot in diameter, with scarcely any difference in size to the very top. Leaves 12-20, large, 8-10 feet long, 5-6 feet broad [sometimes up to 20 feet long and 12 broad], the youngest rising from the centre, at first folded like a shut fan, and then clothed with a downy substance, later on broadly-ovate with a central rib and regular folds diverging from it; margins more or less deeply cut, especially at the extremity; the colour bright yellow green; texture thin and dry.

Spathes sheathing at the base of the spadices, small. Male and female flowers on different trees. Male spadix from the axils of the leaves, amentaceous, from 2-4 feet long, 3-4 inches in diameter in the thickest part, cylindrical, tapering towards the apex, closely covered on all sides with densely imbricated, semicircular, slightly convex scales. When looking externally at these scales, a small aperture will be perceived, from which the stamens issue; and this aperture, though near the base, is not in the centre of each scale, but constantly on one and the same side; and as the scale laps over with that side the one next above it, so the aperture and the stamens will be found to pass through both. The flowers in subreniform clusters in hollows of

A DOUBLE COCONUT PALM (*Lodoicea Seychellarum*, Labill.) in the Jungle of Praslin Island.

the axis, imbricated in two rows. Sepals and petals oblong, yellowish-brown ; the sepals rather larger and more angular than the inner. Filaments united at the base into one body ; anthers linear, 2-celled, opening longitudinally, each cell terminating in two globular heads. Female spadix rising from the axils of the leaves, pendent, 2-4 feet long, thick and woolly, tortuose, clothed with large sheathing, red-brown scales, which are singularly fimbriated, or more generally erose at the margin, and support several, more or less distantly placed, female flowers of different ages, at the same time, and of various sizes. Sepals and petals almost hemispherical and 1 inch thick at the base ; ovary almost concealed by the perianth, broadly ovate, narrow at the base above the insertion of the perianth.

As we had no opportunity of dissecting the fruit of this palm we borrow the following notes from the interesting paper on the "Germination of the Double Coco-nut" by W. T. Thiselton-Dyer[1].

"It is not a little remarkable," he says, "that our detailed knowledge of the morphology of a plant with so singular a history and such striking characteristics should still be very imperfect. But that this is the case is evident from the description given by Bentham and Hooker in the Genera Plantarum, III, 939. . .

As long as the Coco-de-mer was only known from sea-borne specimens it was of course assumed that the Double Coco-nut, as it was called, was the entire fruit. As soon as the palm producing it was discovered, it was at once obvious that this was not the case. The Coco-de-mer is in fact the stone of a gigantic drupe with a fibrous mesocarp. The complete fruit is rarely to be seen in Museums[2] ; but Kew possesses one, as well as a plaster model which the late General Gordon had made in the Seychelles and presented to it. The fruit is poorly figured by Sonnerat, but the best representations are in the fine series of pictures (Nos. 474-7 and 479) in the North Gallery at Kew, by Miss North who visited the Seychelles in 1883 for the purpose of painting. According to Sir William Hooker, it is 'often a foot and a half in length, weighing twenty or twenty-five pounds.'

Sonnerat figures the drupe as ellipsoidal. This, if it ever occurs, except in the youngest stage, must be exceptional. The Genera Plantarum, no doubt correctly, describes it as 'oblique obovoideus.' Miss North, quoted by Sir Henry Yule (Hobson-Jobson, p. 178) says : 'The outer husk is shaped like a mango.' It is clearly therefore usually unsymmetrical ; one side is somewhat flattened, and the other rounded. This arises from the fact that in the maturing ovary one carpel only usually develops.

[1] Annals of Botany, Vol. XXIV, No. XCIII, January 1910.
[2] There is a good specimen in the Museum of St. Xavier's College, Bombay.

FIG. 28.—The first leaves of a Double Coco-nut Palm, the nut being still visible to the right of the plant.

(Photograph supplied by Major Gage, I. M. S.)

One point which seems to require further investigation is the number of primary component carpels, or, at any rate, of cells in the ovary. The Genera Plantarum says it is '3—rarius 2-4—loculare.' The whole symmetry of the flower is ternary, with

A MALE DOUBLE COCONUT PALM (*Lodoicea Seychellarum*, Labill.) in flower in the Botanic Garden of Peradeniya.

three stigmas in the female. This would imply three component carpels, and therefore a three-celled ovary. It is possible, though the point requires further investigation, that the discrepancy has been produced by the misinterpretation of sections containing the bilobed seed. Sir William Hooker figures in the Botanical Magazine (tab. 2737, fig. 1) a transverse section of an ovary which clearly points to a normal tricarpellary structure.

The stone or nut, as it is sometimes called, is, as is well-known, deeply bilobed.....The outline of the putamen in a longitudinal section is roughly that of an exaggerated dumb-bell. The cavities of the two lobes communicate in the middle. The upper parts of the lobes are separated by an open sinus, but the lower are more or less united, and if a cross-section be made at this point, the nut would show, as in one of Sonnerat's figures, a bilocular structure.

Another point which has not been ascertained is the number of ovules in each ovarian cell. Analogy and such evidence as is valuable suggest there being only one. The 'nut,' therefore, if developed from one carpel, would be only one-seeded. W. B. Hemsley, in the 'Catalogue to the North Gallery' (p. 74), refers to 'the two-lobed nut, which usually contains only one seed.' But I am not aware of any proof of its ever containing more. It seems probable that the bilobed form of the nut has suggested that it might consist of two coalescing carpels, but there is no evidence of this.

Juglans affords a familiar instance of ingrowths from the pericarp into the seed cavity. The purpose of such spurious dissepiments, especially when they intrude on the developing seed and modify its form, is difficult to account for. The separation of the cavities at the base of the seed of *Lodoicea* is apparently due to such an ingrowth. But this can only be ascertained by following the development. The free lobes themselves are only lateral inflations in order to provide space for the enormous endosperm. They are much more distended on the dorsal than on the ventral surface, which is somewhat flattened; this produces the corresponding difference in the two surfaces of the fruit which has already been mentioned. In this case, which seems the most usual, the fruit contains only one nut and one seed. The Genera Plantarum describes the fruit as 'I—V. imperfecte 2-3—locularis.' The latter condition can be only due to the more or less complete development of one or both of the other carpels.

The endosperm is voluminous. According to the Genera Plantarum it is hollow, 'late cavo.' My recollection of a specimen examined at Kew, though unfortunately I made no note at the time, is that it was solid. The account given by Sir William Hooker seems to confirm this. He says: 'The cavity is filled by the almond, which is very hard, white, and corneous, so that it

may be rasped with a file, but is with difficulty cut with a knife.' I can only conjecture that this must have been described from an old and desiccated nut. A fresh one which afforded Dr. Walter Gardiner material for a study of the histology of the endosperm must have been immature, for sections were easily cut with a razor, and the consistence was not much harder than that of a turnip.

Apparently in an earlier stage of development, the endosperm is unconsolidated and gelatinous. Sir William Hooker says: 'Before the fruit has attained its perfect maturity, the interior . . . . contains a substance like a white jelly, firm, transparent, and sweet to the taste. A single Coco-nut holds, perhaps, three pints of this substance; but if kept a few days, it turns sour, thick and unpalatable, giving out a very disagreeable smell.' Miss North gives a more graphic description: 'The outer shell was green and heart-shaped; only the inner shell was double, and full of white jelly, enough to fill the largest soup tureen.'[1] And elsewhere, as quoted by Sir Henry Yule: 'I ate some of the jelly from inside . . . . of the purest white and not bad.'[2] The late General Gordon, who, as is well-known, was deeply interested in the palm, on somewhat mystical grounds, informed me in a note: 'The nut when ripe is black and falls from the tree; the gelatinous jelly is then hard like ivory.' It would be extremely interesting to trace the histological changes which accompany that of the texture . . . . According to the Genera Plantarum *Lodoicea* has the 'embryo basilaris, sinum spectans.' But unless I am mistaken the sinus is the apex of the nut, and the embryo is therefore apical. In any case the sinus being open affords the embryo a free path for emergence."

GERMINATION:—According to William Hooker, a year elapses from the period of its falling from the tree before the nut begins to germinate. Button, however, says, that it germinates four or five months after falling from the tree, and sometimes even before. Thiselton-Dyer gives the following description: "The germination morphologically is of an ordinary monocotyledonous type. The apex of the cotyledon remains immersed in the endosperm and develops into a vast suctorial organ, while its petiole, which is about an inch in diameter, emerges from the nut carrying with it the plumule and 'radicle' ". According to Button, the petiole "enters the ground to the depth of about one or two feet, then continues underground nearly parallel to the surface for a distance of four, five, six feet, sometimes more." "A note of General Gordon's is that it 'comes to sprout out of the ground twelve feet from nut.' Mr. Button subsequently informed me that it 'runs in the ground,

[1] Recollections of a happy life, II, 289.

[2] Hobson-Jobson, 178.

A Double Coconut Palm (*Lodoicea Seychellarum*, Labill.) in fruit, growing on Praslin Island.

sometimes to a distance of several yards before coming to the surface.' " (Thiselton-Dyer).[1]

Fauvel[2] draws the attention to an interesting fact which came to his notice through Mr. R. Dupont, Director of the Botanic Station of the Seychelles.

On examining a number of fruits one will discover that they show a distinct dimorphism (cf. fig. 28). Those which have a deep sinus in the middle of the two lobes (which gives them a nasty[3] appearance) are said to be female by the natives of the Seychelles, whilst those with two parallel lobes and not having a sinus are called male. The former are supposed to produce female trees, the latter male.[4]

J. Stanley Gardiner of the Exploring Mission Sealark, examined over 300 nuts and found that both kinds of fruit are of about the same number.[5]

FLOWERS.—Lindley and Moore's "Treasury of Botany", states that only 30 years after germination the first flowers are produced.

Waby reports[6] that in March 1907 a thirteen year old specimen, kept in the Botanic Gardens of Georgetown, produced a spadix with seven pistillate flowers. Two more spadices were produced in the same year, two during the next, two more in 1909, and one in 1910.[7]

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[1] On the chemical side of germination cf. :
Thiselton-Dyer, l. c., p. 228-229.
Gardiner, in Phil. Trans., R. S., 1883, p. 848.

[2] Fauvel, A. A. Note sur quelques points nouveaux de l'anatomie du Cocotier de Mer, *Lodoicea Seychellarum*. In Bull. Mus. Hist. Nat. XII (1906), 585-592.

[3] Clusius, in his 'Opusculum de Nuce Medica' (Amstelodami, 1634), says of the fruit :—"Facies nucis Medicae extrema pudendum muliebre et podicem refert non impare magnitudine."
Fauvel tells us that the King of Bantam, who wished to make a present of a nut to the Dutch Admiral Wolfart Harmansen, took care to remove the upper part of the fruit in order not to offend the modesty of the famous officer (p. 586, l. c.).

[4] Dupont, R., Curator of the Bot. Garden, Port-Victoria Mahé des Seychelles. Lettre du 22 mai 1906, a son Excellence W. R. Davidson, Governor of the Seychelles, transmise par ce dernier a M. Fauvel le 26 juin 1906.—Published in Fauvel, l. c. 591.

[5] Nature, No. 1891, vol. 73, January 25, 1906. The Percy Sladen Expedition by H. M. S. "Sealark" to the Indian Ocean. The Seychelles Archipelago. A letter in J. S. Gardiner, Zoological Laboratory, Cambridge, January 15, 1906.
For further notes on the fruit, *vide* :—
(*a*) Swinburn Ward, in Gardner's Chronicle (1864), p. 294.
(*b*) W. Watson, cod. loco, (1886), p. 557.
(*c*) Van Houtte's 'Flore des Serres et Jardins de l'Europe. Vol. XV (1862-65), p. 168, No. 1427 : Le Cocotier des Seychelles, aver 2 figures.

[6] Kew Bull. (1910), p. 256.

[7] Short notices of the flowering of these palms have been published in the Reports of the Botanic Gardens, British Guiana, for the years 1906-7, p. 11, 1907-8, p. 10, 1908-9, p. 4.

We do not know the source of Seemann's statement which is to the effect that *Lodoicea* bears only one spadix in each year; but what he adds, *viz.*, that it has often above ten spadices in bloom at once, becomes intelligible from Waby's observations.[1]

FRUITS.—The statement as to the time which the fruit takes to reach maturity vary a good deal. William Hooker writes: "Twelve months elapse, from the time of the appearance of the germen, before the fruits are fully ripe; and they have been known to hang three years on the tree before falling to the ground."

C. Button informed Thiselton-Dyer in a letter that the period was much longer: "It remains seven years before arriving to its perfect maturity and falls to the ground. This experience has been several times made by me personally; but the proprietors of Coco-de-mer trees generally break the fruit at about four years of age for commercial purposes, as the shell at that time is sufficiently hard."[2] The same period for ripening the fruit is assigned by Gordon and K. Wald,[3] whilst others, v. g. Trimen, state that from the time of flowering to the maturation of the fruit, a period of nearly 10 years elapses.

Thiselton-Dyer thinks that "the discrepancy had arisen from a confusion between the time at which the fruits are gathered and that at which they are really mature."

HABITAT.—Seychelles: on the Isles of Praslin and Curieuse and Round Island. Endemic.

R. W. Plant, the well-known explorer of Port Natal, has the following note about the native country of the Double Coco-nut, in a letter, dated Port Natal, April 16, 1855, and addressed to John Smith at Kew.[4]

"In the Seychelles I more nearly realized my preconceived ideas of tropical vegetation than at any other place;—the beach fringed with common Coco-nuts; the ravines and watercourses overhung with Bananas, Bamboos, and three or four indigenous palms; the open ground full of Pine-apples—miles of them run wild; the tops of the mountains covered with forests of Ebony and Rosewood, interspersed with Tree-Ferns of some twenty to thirty feet high; and then these glorious *Lodoicea* with their leaves of fifteen to twenty feet span, and trunks reaching to the sky; to say nothing of Cinnamon and Cloves and Bread-fruit all new to me in this their natural wildness and beauty: you may believe that I enjoyed it; so much so that I nearly forgot the errand that brought me there. We have many beautiful scenes

[1] Cf. ad hoc: Wald, K., Lebensbaeume. Regensburg, 1906, p 60. Rothe, K. C. Palmen-Studien. Wien, 1910, p. 34.
[2] Thiselton-Dyer, W. T., l. c., p. 226.
[3] Wald, K., Lebensbaeume. Regensburg, 1906, p. 60.
Also: Rothe, K. C. Palmen-Studien. Wien, 1910, p. 34.
[4] Seemann, B. History of the Palms. London, 1856, p. 241.

A FRUITING SPECIMEN of the DOUBLE COCONUT PALM (*Lodoicea Seychellarum*, Labill.) from Praslin Island.

in this country (Natal), and there is much excitement in travelling over it, but it is altogether of a different character; a savage sternness or monotonous sameness marks the two principal divisions of it, and the really beautiful spots look small by comparison with the vast extent spread around of another character."

On the Seychelles "the tree grows on all kinds of soil, from the sandy shore to the arid mountain-top, but the finest are found in deep gorges, on damp platforms, covered with vegetable soil; in such situations, the great height and slender diameter of the trunk, and the length of its enormous leaves, produce a fine effect, though near the seashore, its leaves, torn by the storms and hanging in long strips, give it a desolate appearance. It is to be regretted that the tree is not cultivated, and that a practice has prevailed of cutting it down in order to get at the fruit and tender leaves. In fact, it is feared that the species will be, ere long, entirely lost." [1]

This danger of complete destruction of the once famous palm has been removed in the meantime. Owing to the suggestion of John Horne, then Director of the Botanic Gardens of Mauritius, the Lodoiceas are, since 1875, under the protection of Government.[2]

It is a striking fact that the seeds, although capable of a wide oceanic dispersal which must have continued over a long period of time, in no case established themselves spontaneously in any new territory. This forms a strange contrast with the ordinary coconut, which probably originally a native of South America, is now widely distributed throughout the tropics. (W. T. Thiselton-Dyer.)

## CULTIVATION.[3]

ILLUSTRATIONS.—Plate XL shows a young Double Cocoanut Palm in the Botanic Gardens of Peradeniya. We called it "young", but as a matter of fact, it must be about 40 years old. Cave figures the same specimen in his "Book of Ceylon" (Pl. 376) and the palm has about the same size as the one reproduced in our plate. He took it in 1892, "when it was already 40 years old and had not begun to form its stem." The strong stout leaf-stalks are very remarkable.

The following photographs of the Double Cocoanut Palm (except Pl. XLII which was supplied by Mr. Macmillan) were kindly presented by Mr. Nigel Kerr.

*Plate XLI.*—A comparatively young palm growing in the jungle of Praslin Island. The age is between 50 and 60 years. It will be noted that the leaves are not very numerous.

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[1] Seemann, l. c., p. 245.

[2] Rothe, K. C., Palmen-Studien. Wien. 1910, p. 34.
Cf. etiam: Ward, Swinburne. On the preservation of the Coco-de-mer. Journ. Linn. Soc. IX (1867), p. 119-120, 259-261. Page 119-120 contains an answer to a letter of Sir H. Barkly relative to the preservation of the Coco-de-mer. Barkly's letter is printed on p. 118-119 of the same volume.

[3] The paragraphs on Cultivation and Fig. 29 have been omitted by mistake but will appear in the next Number.—[EDS.]

*Plate XLII.*—This photograph, taken in the Botanic Gardens of Peradeniya, shows a male specimen of *Lodoicea*. From between the stout petioles arise six flowering spadices. The flowers are distinctly visible.

*Plate XLIII.*—A fruiting specimen of the Double Cocoanut Palm growing on Praslin Island. The spadices are bent down and rest on the stem on account of the heavy weight of the numerous gigantic fruits. The palm seems to develop a much denser crown of leaves when not pressed on all sides by a luxurious vegetation as is the case on Plate XLI.

*Plate XLIV.*—The central part of the crown with several female spadices bearing fruits at different stages of development.

*Plate XLV.*—A grove of *Lodoiceas* in the Coco-de-mer Valley of Praslin Island. The stems are straight and uniformly thick up to a few yards below the crown.

## IV—CEROXYLINÆ.[1]

Spadix simple or one or several times branched; flowers diclinous, usually dimorphic; when diœcious, solitary with rudimentary bracts, when monœcious usually in cymes of 3 flowers, 2 being male and 1 female, or rarely 8 males and one at the end of the row being female; carpels 3, 3-2-1-locular; fruit smooth, not scaly; feather leaves.

### 6. Arecineæ.

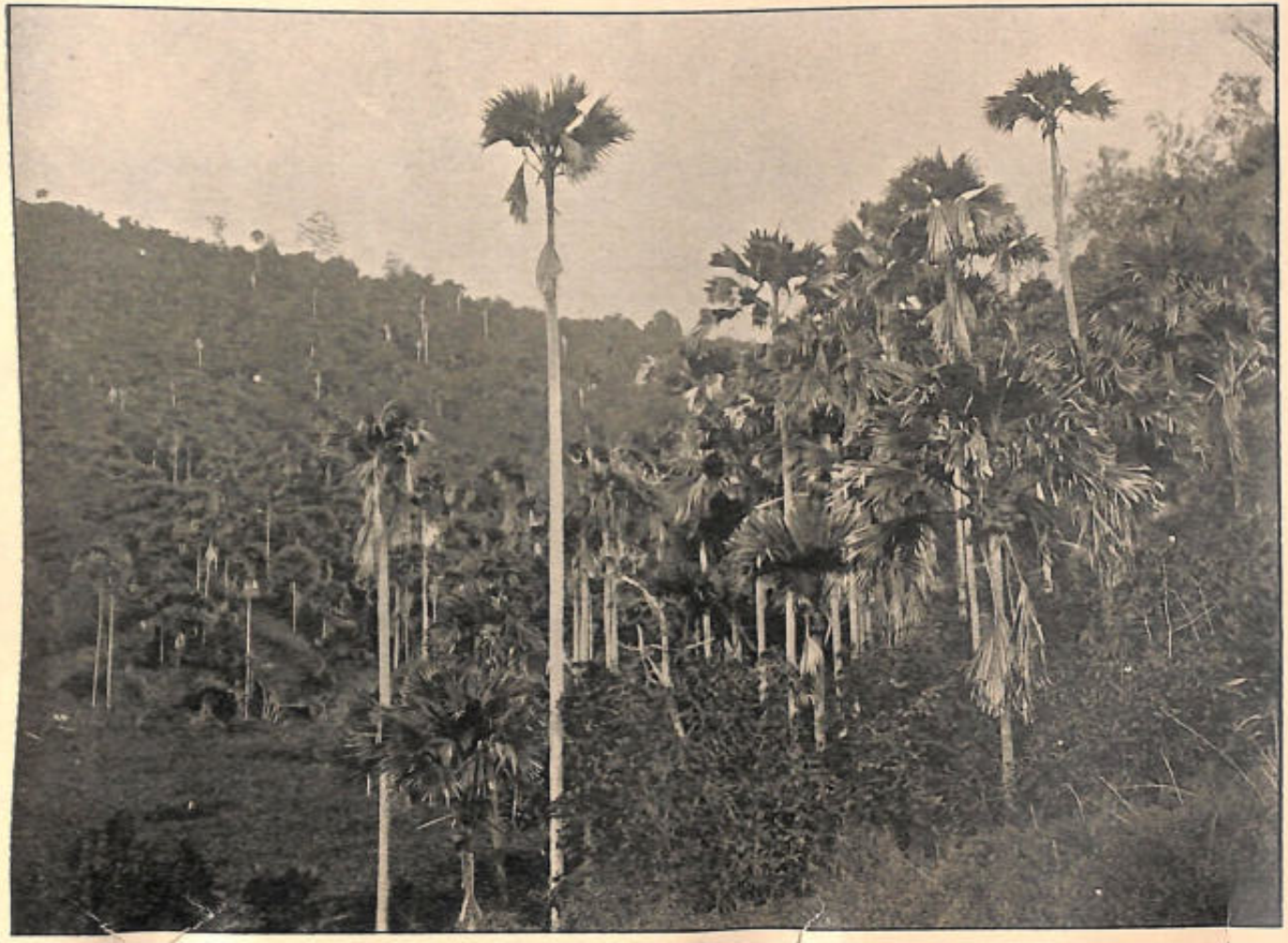
Berry of 3 carpels, united or separating after fertilization; exceptionally a fibrous woody endocarp is formed.

Distribution.—In the tropics of all the continents; little represented on the African continent, increasing on the East-African islands, with the greatest number in the Indian region from Assam and Malacca to the south-eastern islands of the Malay Archipelago, the north-eastern coast of Australia and New Zealand; with different sub-tribes in America from Mexico and the Antilles to Rio de Janeiro and Juan Fernandez.

#### A. Sub-tribe: *Caryoteæ*.

Spadix in the axils of living or dead leaves; peduncle clothed with several tubular, incomplete spathes (except *Orania* which has got 2 spathes); flowers free on the slender branches of the 1st and 2nd order. Male flowers symmetrical, usually with many stamens. Calyx of 3 sepals, imbricate. Corolla deeply 3-partite, valvate. Female flowers with a corolla of 3 leaves or

1 According to the systematic arrangement of the palms, the *Lepidocaryinæ* would be the next sub-order to be described after the *Borassinæ*. But as we have not been able up to now to procure a sufficient number of good photographs of that sub-order, we decided to deal with the *Lepidocaryinæ* at the end of our series, *viz.*, after the *Ceroxylinæ*.



A GROVE OF DOUBLE COCONUT PALMS in the Co[illegible] Valley of Praslin Island.

3-partite, valvate. Ovary of 1-3 united carpels, 1-3-locular. Berry with 1-3 seeds; remains of stigma apical (except *Orania*). Embryo dorsal.

DISTRIBUTION.—India, Malay Peninsula.

*Caryota*, *L.*, *Arenga*, Labill., *Didymosperma*, W. & Dr., *Wallichia*, Roxb., *Oraniâ*, Zipp.

KEY TO THE GENERA DESCRIBED BELOW.

| | |
|---|---|
| Male sepals 3. Stamens many. Albumen ruminate | *Caryota.* |
| Male sepals 3. Stamens many. Albumen equable | *Arenga.* |
| Male calyx cupular. Stamens many. Albumen equable | *Didymosperma.* |
| Male calyx tubular. Stamens 6. Albumen equable | *Wallichia.* |
| OR | |
| Leaves bipinnate | *Caryota.* |
| Leaves simply pinnate | |
| Fruit 3-seeded | *Arenga.* |
| Fruit 2-seeded | *Didymosperma.* |
| Fruit 1-seeded | *Wallichia.* |

## *CARYOTA*, L. Gen. Nat. 1228.

(From the Greek "Caryotos," nut-like, on account of the shape of the fruit; the Greeks first applied this name to their cultivated Date.)

Mart. Hist. Nat. Palm. III., 193, 315, t. 107, 108, 162.—Bl. Rumph. II., 134, t. 162, 163.—Kunth Enum. Pl. III., 198, 504.—Griff. Calc. Journ. Nat. Hjst. V., 477.—Miq. Fl. Ind. Bat. III., 37.—Kurz For. Fl. II., 530—Benth. Fl. Austr. VII., 134.—Wendl. Linn. 39, 191.—Drude Bot. Zeitg. 1877, 638, t. 6, fig. 25, 26.—Becc. Males. I., 69.—Bot. Mag. 5762.—Trim. Journ. Bot. 1879, 174.—Benth. & Hook. Gen. Pl. III., II., 918, 73.—Hook. Fl. Brit. Ind. VI., 422.

Tall, unarmed palms with annulate, naked or sheathed trunks, soboliferous or not, flowering when full grown from the axils of the leaves, beginning at the upper and then successively downwards, after which the plant dies, usually a male and a female spadix alternately.

Leaves few, very large, broad, bipinnatisect or decompound; leaflets very obliquely dimidiately flabelliform or cuneiform, præmorse or rounded at the tip, their bases swollen at the insertion; nerves and veins flabellate.

Spathes 3-5, inclompete, tubular. Spadices interfoliar, shortly peduncled, much fastigiately branched; branches slender, pendu-

lous. Flowers monœcious, solitary and nude, or ternate with the central flower female. Male flowers symmetric: sepals ; 3, short, rounded, coriaceous, closely imbricate; petals 3, larger than the sepals, linear-oblong or ovate-oblong, valvate ; stamens very many; filaments very short ; anthers long ; pistillode O. Female flowers subglobose, smaller than the male ; sepals 3, ovate or orbicular, concave, closely imbricate ; petals 3, rounded, valvate ; ovary obovoid, 3-gonous, 3-celled ; ovule in each fertile cell solitary ; stigma sessile, 3-lobed ; staminodes 3 or 6 or O.

Fruit globose, 1-2-(rarely 3-) seeded, crowned by the stigma ; sarcocarp full of raphides. Seed erect, albumen ruminate ; embryo dorsal.

Species about 12. Tropical Asia, Malaya and Australia.

CULTIVATION IN EUROPE.—The species of this genus form very noble stove palms. When in a young state, Caryotas serve as excellent ornaments for dinner tables, etc. They thrive well in a compost of loam and vegetable mould in equal parts, to which a little sand may be added. Perfect drainage and much water during the growing are necessary. Propagation is easily effected by seeds or by suckers.

## INDIGENOUS SPECIES.

*CARYOTA URENS*, L. Fl. Zeyl. 187 ; Gaertn. Fruct. I., 20, t. 7 ; Roxb. Fl. Ind. III., 625 ; Mart. Hist. Nat. Palm. III., 193, t. 107 and 108, and 162 ; Griff. in Calcut. Journ. Nat. Hist. V., 479 ; Palms Brit. Ind. 159 ; Thw. Enum. 329 ; Dalz. & Gibbs Bomb. Fl. 278 ; Miq. Fl. Ind. Bat. III., 41 ; Hook. Fl. Brit. Ind. VI., 422 ; Brandis Ind. Trees, 654 ; Trim. Fl. Ceyl. IV., 324 ; Talb. Trees Bomb. ed. 2, 341 ; Prain Bengal Pl. 1093 ; Cooke Fl. Bomb. Pres II. 805.—Rheede Hort. Malab. I., t. 11.

NAMES.—Fish-tail Palm, Hill Palm, Indian Sago Palm, Bastard Sago Palm, East Indian Wine Palm, Jaggery Palm, Kittul Tree, Toddy Palm, Wine Palm, Mhar Palm (English).

Caryote brûlant, faux sagonier de l'Inde, palmier cêleri (French).

Bastardsagopalme, Ostindische Brennpalme, Sagopalme (German.)

Jagerieboom, Nieboom, Sagueerboom, Wilde Sagueerboom (Dutch).

Mari (Hind.).

Bherawa, berli, bhirli mahad, berli mad, bherla mada, berli mhar, ardhi supari (Mar.).

Birli mhad, birli mhar (Bombay).

Shiwajata, shankar jata (Guj.).

Birli mad (Konk.).

Baini, bagni, beina, bhyni (Kan.).

Mari-ka-jhar (Dec.).

Mhar mardi, mari, jirugu, jilugu, goragu, gorrega (Tel.).

Conda-panna, erin-panna, utalipanna, kundal-panai, thippali (Tam.).

FISH-TAIL PALM (*Caryota urens*, L.) AND YOUNG PLANTS OF *Oreodoxa regia*, Mart., in Victoria Gardens, Bombay.

Shunda pana (Mal.).
Minbo, minbaw, kimbo (Burm.).
Bara flawar (Assam.).
Rungbong, simong (Lepcha).
Salopa (Uriya).
Kittul, nepora (Sing.).
Hlyamban (Magh.).

*Names of the Sago.*—Bastard sago or sago (English).
Sagon d'Assam (French).
Palmenstärke, Sago (German).
Sago (Dutch).

*Names of the Fibre.*—Black fibre, Indian Gut, Kitool, Kittool fibre, Kittul fibre, Salopa fibre (English).
Crin végétal (French).
Kitoolfaser, Siamfaser (German).
Kitoolvezel, Kittoelvezel (Dutch).

*Names of the Sugar.*—Jagery, Jaggory, Palm sugar (English).
Jaggery, sucre de palme, sucre de palmier (French).
Palmzucker (German).
Palmsuiker (Dutch).

*Names of the Wine.*—Palm wine, toddy (English).
Toddi, vin de palme, vin de palmier (French).
Palmwein, Toddy (German).
Palmwijn, Toddy (Dutch).

DESCRIPTION.—Trunk 40-60 feet high, 1-1½ feet in diameter; cylindric, annulate, not or scarcely soboliferous, smooth, grey, shining, covered with long shallow cracks with corky edges. The crown is rather thin, consisting of several ascending, gracefully curved bi-pinnate leaves, of great size, being 18-20 feet long and 10-15 broad; the primary divisions 5-6 feet long, arched and drooping; leaflets 4-8 inches long, fasciculate or alternate, cuneiform, obliquely truncate, irregularly serrate-toothed on the truncate margin, the upper margin produced beyond the leaflets into a tail, flabellately veined, glabrous, bright green, shining, the margins at the base recurved. Petiole very stout, at the base measuring about 3 inches across, the lower foot in its length is naked, and the margins of the sheath continued upon it as an elevated confluent line. Rete moderate and coarsely fibrous.

Spadix very large, 10-12 feet long. Peduncle curved, stout, entirely covered with large, greyish, coriaceous spathes, one or one-and-a-half foot long, and closely imbricated; branches simple, very long, pendulous, level-topped, resembling a huge docked horse-tail. Flowers very numerous, placed in threes, the central and lowermost coming female, and later than the others in development. Male flowers: Buds narrowly cylindric, ½ inch long; sepals 3, roundish, cordate, ciliate imbricate; petals coriaceous, concave, reddish; sta-

mens about 40 ; filaments short, white ; anthers about as long as the petals, linear, acuminate ; pistillode O. Female flowers much the same as the male, but the sepals broader, more ciliate, the corolla shorter, and of greenish colour ; staminodes usually 3, placed opposite the sepals and angles of the ovarium, resembling young anthers. Ovary subtrigonal, roundish, 3-locular ; ovule solitary, erect ; stigma sessile, 3-lobed.

FIG. 30.—A Fishtail-Palm (*Caryota urens*) in flower and fruit. (Photograph taken at Khandala by Rev. M. Maier, S.J.)

Fruit $\frac{2}{3}$-$\frac{3}{4}$ inch in diameter, reddish ; pericarp thin, yellow, acrid ; seeds one or two ; albumen ruminate, embryo dorsal.

FLOWERS during most of the year (during the hot and rainy season, according to Brandis).

HABITAT.—Sub-Himalayan tract from Nepal eastwards, ascending to 5,000 feet ; Assam ; Khasi Hills ; Manipur ; Chittagong ; Upper Burma ; Pegu ; very common in the evergreen forests of the Konkan and Northern Kanara ; Coimbatore ; Nilgiris ; Malabar

Madura; Orissa; the Circars; shady valleys on the east side of the Peninsula; Ceylon; Malaya.

USES[1].—The most important product of this palm are the fibrous cords or fibro-vascular bundles found naked at the base of the leaf-sheath and within the petioles, flowering stalks and even the stems as well. These constitute the strong kittul-fibre of Ceylon and the salapa of Orissa, a fibre which also comes from Burma and Bombay. It is manufactured into ropes, brushes, brooms, baskets, caps, and similar articles. It has been shipped as a brush fibre from Ceylon to England since 1860. It has been found that five or more strands, fastened together by special machinery, make an excellent substitute for whalebone in corsets. It has further been discovered that the kittul-fibre is superior to the Bahia piassava (fibre of *Attalea funifera*) being less brittle. Kittul-fibre, therefore, is in much request, in India as well as in Europe, where it is used in brush-making; some of the finest qualities have been substituted for bristles. For this purpose the fibre is steeped in linseed-oil in order to make it so pliable that it can be used either with or without bristles in the manufacture of soft, long-handled brooms. These have the advantage of being extremely durable and much cheaper than ordinary hair-brooms. According to Dodge it is also made up into machine brushes for polishing linen and cotton yarns, for cleaning scutched flax, brushing velvets, etc. In Ceylon and India fishing-lines are made of the fibre, and strong wiry ropes which are used for tying wild elephants. Watt gives the following quotations of the London Market on April 20, 1901: For long quality 8½*d* to 9*d* per lb; for No. 1, 6½-7*d*; No. 2, 2¾*d* to 3¼*d*; No. 3, 1*d*. The exports from India are unimportant, whilst from Ceylon they are considerable. The maximum till 1909 was for the year 1898, *viz.*, 3,794 cwt.

The pith or farinaceous part of the trunk of old trees is considered to be almost equal to the best sago of commerce; the natives bake it into bread and boil it into a thick gruel. "These form," says Roxburgh, "a great part of the diet of these people; and during the famine they suffered little, while those trees lasted. I have reason to believe this substance to be highly nutritious. I have eaten the gruel and think it fully as palatable as that made of the sago we get from the Malay countries."

Toddy is also prepared from these palms. This juice is either fermented and distilled into an alcoholic liquor or boiled down into a dark syrup which solidifies into palm-sugar or jaggery, which is an important product, especially in Bombay and Ceylon. Sawyer,[2] describing the process of "training" and "tapping" in North Travancore, says that at the end of the first five days of tapping the yield is

[1] We follow Watt, Comm. Prod. of India, 1908, p. 286-87.
[2] Ind. For. (1896), XXI, 134-8.

about 4 quarts per day, increasing by degrees to 6, 8 and 12 quarts. In strong, healthy individuals even 18 or 20 quarts may be obtained at the end of the course. Sometimes, in an unusually prolific palm, three or even four spathes, may be seen tapped at the same time, while others in spite of the most careful training, yield no toddy whatever. An average-sized spathe is tapped in about four months, and all the spathes of one palm are exhausted in about two years. Roxburgh mentions that the best trees give as much as 100 pints in 24 hours.

The "cabbage" or terminal bud is edible, like that of most palms. The woolly substance or scurf scraped from the leaf-stalks is used in Burma for caulking boats; it also serves as tinder.

The timber, being strong and durable, is much used for agricultural purposes, water-conduits, beams and rafters.

Sometimes it is cut into walking sticks.

The seeds are used as beads by the Mahomedans.

According to Commelinus[1] the pulp of the fruit is bitter and irritates the tongue. It is probably this circumstance which suggested the specific name of the palm 'urens,' *i.e.*, 'burning.' Watt remarks: "The fruit is certainly very pungent and insipid, but I cannot recollect having observed the tingling property just mentioned, though I have eaten it."

I never tasted the fruit, but I remember that, some years back, I asked my students in Botany to dissect the fruit of *Caryota*. After a few minutes they gave it up, showing me their hands which looked, indeed, as if they had been handling nettles. The victims of science felt the irritation for about two hours. Unfortunately I do not remember whether the fruits were fully ripe at the time or not. All I know is that they were still on the tree when I gathered them.

Wald[2] gives quite a different explanation of the name 'urens,' but he does not say on what authority. He says that the bark of the tree when wetted, causes a distinct irritating sensation.

Cultivation in India.—This palm thrives in gardens with ordinary border treatment. It reaches its full size in about 15 years, and about 7 years more are occupied in producing its flowers before it becomes unfit for the garden. The first flowering panicle is of immense size and pendulous from the axil of one of the upper leaves. The second is from a lower axil and somewhat smaller, and so on downwards until the tree is exhausted (Woodrow).

Cultivation in Europe.—This species is frequently employed in subtropical gardening from June till September.

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[1] Rheede, Hort. Mal. I, 16, n.

[2] Wald, K. Lebensbæume. Regensburg, 1906, p. 74.

*Caryota mitis*, Lour., in the Botanic Garden, Calcutta

ILLUSTRATION: PLATE XLVI.—The photograph, taken by Mr. Phipson, shows a beautiful group of palms in Victoria Gardens, Bombay. The centre is occupied by a Fish-tail Palm. From the axils of the leaves there rise three gigantic spadices; the largest of them (to the right) is the youngest and has the flowers not open as yet, whilst the one to the left bears fruit. The stem below the petioles of the leaves is ringed.

The Fish-tail Palm is surrounded by several young plants of *Oreodoxa regia*, Mart.

*CARYOTA OBTUSA*, Griff., in Calc. Journ. Nat. Hist., V., 480. Palms Brit. Ind., 170; Mart. Hist. Nat. Palm., III, 195; Hook. Fl. Brit. Ind., VI, 422; Brandis Ind. Trees, 654.—*C. obtusidentata*, Griff., Palms Brit. Ind., 236, A, B.

NAME.—Bura Suwar (Ass.). This is also the name for *C. urens*.

DESCRIPTION.—This palm has got the habit and stature of *C. urens*, from which it can be at once distinguished by the more rounded and crenate apex of the leaflets and by the shorter, unexpanded male flowers.

Trunk tall, stout, 1½-2 feet in diameter, not soboliferous. Leaves very large; leaflets cuneate, very unequal-sided, coriaceous, when dry, remarkably striato-plicate, the upper margin not caudate; the teeth short and very obtuse.

Branches of the male spadix long, flexuose, scurfy. Flowers distant, 3 together, the central (female) are later in development. Male buds about as long as broad. Male flowers about 5 lines long; sepals rounded, scurfy, and ciliate; petals 2½ times longer than the sepals; stamens indefinite; anthers linear, slightly mucronate. Female flowers: Calyx as in the male; petals much smaller, valvate. Staminodes 3, opposite to the sepals. Ovary 3-celled; ovules solitary, erect; stigma 3-lobed.

Fruit ¾-1 inch in diameter, base not apiculate.

HABITAT.—Upper Assam; Mishmi Mountains about Yen, 3,400 feet.

USES.—The inhabitants of the Mishmi Mountains use the central soft portion of the trunk as food.

*CARYOTA MITIS*, Lour., Fl. Cochinch. II, 569; Mart. Hist. Nat. Palm. III, 195; Kunth. Enum. III; Hook. Fl. Brit. Ind. VI, 423; Brandis Ind. Trees, 654.—*C. sobolifera*, Wall. Cat. 8594; Mart. l. c. III, 194, t. 107, f. 2; Griff. in Calc. Journ. Nat. Hist. V. 481; Palms Brit. Ind. 171, t. 236, C; Miq. Fl. Ind. Bat. III, 41; Kurz For. Fl. II, 530—*C. urens*, Jacq. Fragm, 20, t. 12, f. 1.—*C. nana*, Wall, Cat. 8595.—*C. furfuracea* Bl. in Mart. l. c. 195; Rumphia II, 141 (excl. var. *caudata*).—*C. propinqua* Bl. in Mart. l. c. 195; Rumphia l. c. 138 t. 155 (partim), 162.—*C. griffithii* Becc. in Nuov. Giorn. Bot. Ital. III. 15.

NAMES.—Tookkus (Malay); Doodoor (in Penang.)

DESCRIPTION.—A very elegant palm, stem 12-40 feet high, 4-5 inches in diameter, soboliferous, forming very thick compact tufts, greenish, distinctly annulate. Petioles, leaf-sheaths and spathes

scurfily villous. Leaves 4-9 feet long, spreading, nodding towards the apex, glaucescent greenish; leaflets 4-7 inches long, very obliquely cuneiform erose and toothed, the upper margin acute, regularly and rather obtusely jagged.

Spathes concealing the whole peduncle, almost boat-shaped, at length deciduous. Branches of spadix very numerous, about 1 foot long, the whole resembling the spadix of *C. urens*, but much

FIG. 31.—*Caryota mitis*, Lour., in flower in Victoria Gardens, Bombay. (Photograph by Rev. M. Maier, S.J.)

smaller, with fewer unequal scurfy branches and much smaller flowers. Male flowers very numerous, about ¼ inch long, oblong, flesh-coloured, with reddish points; calyx cup-shaped, sepals broad, imbricate; petals 3, coriaceous, striate, almost distinct;

*Caryota Rumphiana*, Mart., in the Botanic Garden of Peradeniya.

stamens many, 17 according to Brandis, filaments very short, united at the base; anthers linear, adnate, generally slightly mucronate; pollen ovate-lanceolate, 1-or 3-plicate. Female flowers at the time of expansion of the males, minute, rudimentary, not developed until after the males of the same spadix have fallen off, smaller than the males, not always solitary, but sometimes 2 or 3 together, or solitary with a scar of one male only; sepals rounded, with a brown intramarginal line, and ciliate edges; petals 3, twice as long as the sepals, valvate, coriaceous, brown; staminodes 3, yellowish, tips glandular; ovary roundish ovate, with 3 obtuse angles.

Fruit ½ inch in diameter, red[1], surrounded at the base by the perianth, depressed, rather round; epicarp brittle, sub-fibrous. Seed globose; albumen horny, ruminate; embryo dorsal.

HABITAT.—Burma; from Arakan southwards; Martaban; Malay Peninsula; Penang; Andaman Islands; Malay Archipelago.—(De Kerchove de Denterghem[2] says, that the original home of *Caryota sobolifera*, Wall. (—*C. mitis*, Lour.) is Tibet and the Malacca Peninsula. Has this palm ever been observed in Tibet?)

ILLUSTRATION: PLATE XLVII.—The photograph, supplied by Major Gage, shows a clump of *Caryota mitis*, Lour., growing in the Botanic Garden of Calcutta. If not disturbed by the gardener's knife, this palm will always form a thick compact tuft.

### * INTRODUCED SPECIES.

*CARYOTA RUMPHIANA*, Mart. Hist. Nat. Palm. III (1850) 195; Blume Rumphia, II, 140; Miq. Fl. Ind. Bat. III, 40; Becc. Malesia I, 70; Koorders Exkursionsfl. Java (1911) I, 237.—*Caryota maxima*, Blume in Mart. l. c. (1850) 195; Miq. l. c. 39.—*Caryota furfuracea β caudata* Bl. Rumphia II, 136, tab. 163, C; Miq. Fl. Ind. Bat. III, 39.—*Caryota Nö*, Becc. in Nuovo Giornale Bot. Ital. III, 12.—*Caryota Alberti*, F. v. Muell. in Wendl. et Drude, Palm. Austr. in Linnæa (1875), 219.

NAMES.—Rumph's Caryota, Albert Palm (English).

Suwangkung, Suwangkung gede, (Sunda Isl.), after Koorders.

DESCRIPTION.—A fine tree, growing more than 60 feet high. Stem columnar, up to 1½ feet in diameter, unarmed, not soboliferous. Crown of leaves broad. Leaves doubly pinnate, 13-20 feet long; leaflets very oblique, half fan-shaped, much plicate, up to 1½ feet long, only 2-3 inches broad at the base, thick-leathery rigid, irregularly and obtusely toothed, the lower margin sometimes produced into a long obtuse point, sometimes shorter than the next fold.

Spikes often above 2 feet long. Male flowers about 5 lines or rather more. Stamens above 30.

[1] Hooker describes the fruit as bluish black, Griffith as greenish red or red. Mr. Burkill informs me that a specimen in his garden bears red fruits.

[2] Les Palmiers. Paris, 1878, p. 329.

Fruiting spadix up to 10 feet long. Fruit more or less spherical, more than 1 inch in diameter.

HABITAT.—Western Java between 3,300 and 4,200 feet above sea in shady evergreen mixed forests (Koorders); Malay Archipelago (New Guinea, Borneo, etc.); N. Australia.

ILLUSTRATION: PLATE XLVIII.—The photograph, taken by Mr. Macmillan, shows a fine specimen of *Caryota Rumphiana* growing in the Botanic Garden of Peradeniya. This palm is much more ornamental than the species described above. Unfortunately it is very rare in Indian gardens.

# ON A REMARKABLE NEW FREE-TAILED BAT FROM SOUTHERN BOMBAY.

BY

OLDFIELD THOMAS.

WITH A PLATE.

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Among the numerous mammals recently obtained by the collectors employed by the Bombay Natural History Society, there occur three specimens of a most remarkable and conspicuous new Free-tailed bat, which Mr. Wroughton has been good enough to refer to me for description.

The specimens were obtained by Mr. S. H. Prater, assistant in the Society's Museum, in a large cave near Talewadi, about 25 miles north of Castle Rock, on the Ghats between Belgaum and Goa. The cave contained large numbers of bats, most of which proved to be Megaderms, but among them were three specimens of the species here described.

I propose to call it:—

NYCTINOMUS WROUGHTONI, sp. n.

A large dark-coloured Nyctinomus, with large ears and a conspicuous patch of whitish across the shoulders.

Size very large, the forearm slightly exceeding in length that of the largest previously known species, *N. martiensseni*, Matschie. Fur fine and velvety, hairs of back about 3·5 mm. in length; mostly limited to the trunk, but there is a patch of fur on the anterior external base of the ears, a line of fur along the upper and under sides of the forearm, a patch on the membrane between the base of the fifth metacarpal and the forearm, and the base of the interfemoral is hairy; beneath, the fur of the body extends outwards as far as a line joining the elbow and knee. General colour above dark rich chocolate brown, with a strongly contrasted greyish drabby-white mantle across the shoulders, the back behind it also mixed with whitish. Under surface duller brown, the lower side of neck greyish; fur on under side of wing membrane lighter than that of the body. Top of head dark glossy brown, but minute patches of white present on the dorsal side of the inner bases of the ears. Ears very large, oval, rounded, connected with each other at their inner base, inner margin convex, dotted with a dozen or more small horny points, tip broadly rounded, outer margin flattened above, evenly convex below; no antitragus present, but the extra lobe on the inner side of the conch, opposite to the tragus, unusually well developed. Tragus practically

obsolete, minute, triangular, its height not more than half the breadth of its base.

A small, shallow and inconspicuous gular sac present in the male.

Skull long, smooth and rounded, in general shape not unlike that of *N. teniotis*; quite different from that of "Chærephon"; ridges much reduced, upper profile sinuate, a marked concavity passing across the fronto-parietal suture; antero-external corners of braincase unusually prominent; upper side of zygomata with an immensely developed postorbital plate, far exceeding that of any other member of the family. Premaxillary region essentially of the "Chærephon" type, the narrow notch between the premaxillaries not reaching to the level of the hinder edge of the incisor roots, and not communicating with the very small anterior palatine foramina. Posterior edge of palate level with $m^3$. Distinct, deep, and sharply defined basisphenoid pits present, with overhanging edges, and high mesial septum. Tympanics very large, their antero-internal halves projected forwards nearly to the pterygoids.

Teeth as in typical *Nyctinomus*. Small upper premolar in the centre of the considerable space between the canine and large premolar. $M^3$ normal, broad, with four well-marked cusps and their connecting commissures. Lower incisors 4 in number. Anterior lower premolar about half the height and nearly equalling the area in cross section of the posterior premolar, from which it is separated by a narrow space.

Dimensions of the type, the italicized measurements taken in the flesh :—

Forearm 68mm.

Head and body *99mm.*; tail *46*; ear *33*; third finger, metacarpus 66, first phalanx 25, second phalanx 47; fifth finger 62; lower leg and hindfoot (c. u.) 32mm.

Skull, greatest length 25; basal length 21·7; zygomatic breadth 13·7; intertemporal breadth 4·2; breadth of braincase 11·5; palatal length 9·2; front of canine to back of $m^3$ 9·2; breadth between outer corners of $m^3$ 9·3.

Habitat.—Barapede Cave, near Talewadi, S. India.

12.11.24.1.
DATE 15.Oct'12 SEX ♀ No. 16
Type Nyctinomus wroughtoni, Thos.
LOC. Talewadi Castle Rock
ALT.
COLL. SH Prater

*Type*.—Adult female, B.M., Nos. 12, 11, 24, 1. Collected 15th October 1912 by S. H. Prater. Presented to the National Museum by the Bombay Natural History Society.

This handsome bat forms one of the most showy and striking discoveries of recent years, so far as Indian Mammalogy is concerned, and it is with great pleasure that I attach to it the name of my friend Mr. R. C. Wroughton, the prime-mover and manager —at least at the English end—of the Bombay Society's Mammal Survey, and the author of the reports that have appeared on the results. Mr. Wroughton's keen co-operation in all the Mammal work that has been done in the British Museum has been of the greatest service to us, and his coming temporary absence will be greatly felt by those who have been wont to rely with confidence on his knowledge and labours for anything connected with either Indian or African Mammalogy.

*Nyctinomus wroughtoni* as a species is readily distinguishable by its great size, its strikingly contrasted coloration, its large ears with aborted antitragus and by the various cranial and dental peculiarities above enumerated.

In size, as gauged by the forearm, it is the largest of the genus *Nyctinomus*, and of the Family *Molossidæ* is only exceeded by *Cheiromeles torquatus* and *Promops perotis* and *trumbulli*. The nearest approach to it in *Nyctinomus* is made by *N. martiensseni*, Matschie, of German East Africa, which has a forearm of 66mm., somewhat similar coloration and similarly aborted antitragus. Indeed when the cranial characters of this bat are known we may find it is really the nearest ally of *N. wroughtoni*, just as the East African *Taphozous hildegardeæ* is related to the Indian *T. melanopogon*.

But the most important feature about the discovery of *N. wroughtoni* is the upset it causes in the current grouping of the bats which were formerly included in *Nyctinomus*, but which have of recent years, notably by Miller, been divided into two genera, *Nyctinomus* and "*Chærephon*," according to the characters of the premaxillæ, those with these bones separated being put into *Nyctinomus* and those with them undivided into "*Chærephon*."

It may first be noted that if this grouping were followed the name of *Chærephon* (1874) should be replaced by that of *Mops*, (Lesson 1842), the type of the latter, *Dysopes mops*, F. Cuv., being a member of "*Chærephon*," with united premaxillæ and all the other characters of the most typical members of that group.

But secondly the peculiarities of *N. wroughtoni* convince me that this character of the premaxillæ is not here one of generic value, for while the new species has the closed premaxillæ of *Mops*, all its other characters are those of typical *Nyctinomus*, and it is evident that either *Nyctinomus* and *Mops* must be united, or some

other character found for their distinction. I may note also that all sorts of intergradations are found in the premaxillæ and that it is often almost impossible to decide whether a given specimen should be referred to one genus or the other by this character of the premaxillæ.

A typical *Nyctinomus* has a long, smooth, flattened skull, with a sinuate upper profile, aborted sagittal and reduced lambdoid crests, open premaxillæ, well spaced premolar region, palate ending level with the last molar, and with normal, unreduced $m^3$ provided with four cusps and their connecting commissures. Looked at from its inner side such a tooth shows (above the internal lobe), two well developed main cusps side by side, the posterior often (as in *N. wroughtoni*) but little smaller than the anterior.

Of the Indian species *N. tragatus* corresponds with this description in all respects, while, with the one exception of the premaxillæ, *N. wroughtoni* and *N. plicatus* are equally referable to the genus *Nyctinomus*.

On the other hand typical species of the *Mops* group have the premaxillæ closely united, the skull shortened, convex above, with well developed sagittal and lambdoid crests, shortened premolar region, the large $p^4$ commonly almost or quite touching the canine; and, most important of all, a reduced $m^3$, which is compressed antero-posteriorly and has nearly or quite lost its posterior cusp and commissures.

Of *Mops* as thus defined the following are typical in all respects: *mops*, *miarensis*, *demonstrator* and *midas*, while various others may be assigned to the genus on what I consider its most important character, the reduced $m^3$, even when they diverge in other respects.

*P. S.—February* 1913.—Since writing the above I have been able to make the more complete examination of the African members of this group demanded for its proper arrangement into genera. As I expected, the character of the structure of the last upper molar ($m^3$) proves to be far more important than that of the junction or separation of the premaxillæ, and may be used for the primary division of the group. The premaxillæ and other characters are then available for a natural division into genera, of which I should now recognize four, one, formed for *Nyctinomus wroughtoni*, being new. Their characters may be briefly put as follows:—

A. $M^3$ complete, its ridges forming a Z of which the posterior limb or commissure extends inwards as far as the anterior angle.

*a.* Premaxillæ separated ... ... *Nyctinomus*, Geoff.

*b.* Premaxillæ united.

*a.*[2] Basi-occipital pits well defined, with overhanging edges. A prominent vertical projection on zygoma. ... *Otomops*, g. n.

b.² Basi-occipital pits scarcely defined. No projection on zygoma ... ... ... *Chærephon*, Dobs.

B. $M^3$ reduced, its posterior commissure obsolete, or at most extending less than half as far inwards as the anterior angle.

Premaxillæ open or closed ... ... *Mops*, Less.

The chief species which fall into these several genera are as follows:—

1. *Nyctinomus*—
   - Indian species ... *tragatus*.
   - African ... ... *teniotis*, *aegyptiacus* (type), *africanus*, *fulminans* *lobatus*, *bocagei*, *brunneus*, *anchiatæ*, *cisturus*.
   - All American and Australian species.
2. *Otomops*—
   - Indian ... ... *wroughtoni*. (type).
   - African ... ... *martiensseni*.
3. *Chærephon*—
   - Indian ... ... *plicatus*, *johorensis*. (type).
   - African ... ... *bivittatus*, and all *pumilus* group.
4. *Mops*—
   - Indian ... ... *mops* (type).
   - African ... ... *midas*, *miarensis*, *demonstrator*, *angolensis*, *thersites*, *leonis*, *brachypterus*.

It will thus be seen that the striking new bat named after Mr. Wroughton proves to represent a new genus, to which I should also provisionally assign the African *martiensseni*. This new genus is readily distinguishable by the obsolescence of the tragus and antitragus, the peculiar shape of the skull, the projections on the zygomata, the elongated tympanics projecting forwards to touch the pterygoids and the deep and partly covered in basi-phenoid pits in addition to the combination of complete $m^3$ with united premaxillæ which it shares with the otherwise very different *Chærephon*.

Its alliance, as indicated in the earlier part of the paper, is, no doubt, most close with true *Nyctinomus*, but its many peculiarities amply justify its erection as a special genus.

# THE COMMON BUTTERFLIES OF THE PLAINS OF INDIA

## (INCLUDING THOSE MET WITH IN THE HILL STATIONS OF THE BOMBAY PRESIDENCY).

BY

T. R. BELL, I.F.S.

PART XIII.

[*Continued from page 1157 of Volume XXI.*)

FAMILY—PIERIDÆ.

**92. Pieris brassicæ.**—♂. *Upperside*: Creamy white with a somewhat farinaceous appearance. Forewing: an irroration of black scales at base and along costa for a short distance; apex and termen above vein 2 more or less broadly black, the inner margin of the black area with a regular even curve; in one or two specimens a small, longitudinally narrow, black spot in interspace 3. Hindwing: uniform, irrorated with black scales at base, a large, black, subcostal spot before the apex and in a very few specimens indications of black scaling on the termen anteriorly. *Underside*: forewing: white, slightly irrorated with black scales at base of cell and along costa, apex light ochraceous brown; a large, black spot in outer half of interspace 1, and another quadrate, black spot at base of interspace 3. Hindwing light ochraceous brown closely irrorated with minute, black scales; the subcostal, black spot before the apex shows through from the upperside. Antennæ black, white at apex; head, thorax and abdomen black, with some white hairs; beneath: whitish.—♀. *Upperside*: similar to that of the ♂, but the irroration of black scales at the bases of the wings more extended; the black area on apex and termen of forewing broader, its inner margin less evenly curved; a conspicuous large, black spot in outer half of interspace 1, and another near base of interspace 3. On the hindwing the subcostal black spot before apex much larger, more prominent. *Underside*: similar to that of the ♂ but the apex of the forewing and the whole surface of the hindwing light ochraceous yellow, not ochraceous brown; the black discal spots on forewing much larger. Antennæ, head, thorax and abdomen as in the male. Expanse: 62-78 mm.

The larva and pupa of this butterfly do not seem to be known; at least records are not available. The butterfly is said to have

* By mistake the block of *Aporia agathon* was given as Fig. 21 on page 1133, Vol. XXI, instead of that of *Pieris brassicæ* which is now reproduced.

been caught at Umballa and other places in North India but it is merely a struggler and hardly should come into these papers. It is found in Europe; Northern and Central Asia; the Himalayas from Chitral to Bhutan, up to 10,000 feet; descending in North-West India to as low as Umballa (*fide Land*) as given by Colonel Bingham.

**93. Pieris canidia.**—♂. *Upperside*: white to pale cream-colour. Fore wing: base and basal portion of costa, and base and upper margin of cell irrorated with black scales; apex and terminal margin to about the middle, decreasingly black, on the latter the black extended for a very short distance triangularly along the veins; a round, black spot in inter-space 3. Hind wing: a subcostal, black spot (as in *P. rapæ*, but generally larger and more conspicuous) and a series of four or five terminal, black spots that vary in size at the apices of the veins. *Underside*: fore wing white; cell and costa lightly irrorated with black scales; apex somewhat broadly tinged with ochraceous yellow; interspaces 1, 3, and 5 with conspicuous, subquadrate, black spots, the spot in interspace 1 sometimes extended into interspace 1*a*, that in 5 ill-defined. Hind wing: from pale, almost white, to dark ochraceous, thickly irrorated all over (with the exception of longitudinal streaks in the cell, and in the darker specimens similar longitudinal streaks in the interspaces) with black scales; costa above vein 8 chrome-yellow. Antennæ black with minute white specks; the long hairs on head and thorax greenish-grey; abdomen black; beneath: head, thorax and abdomen white.—♀. *Upperside*: similar to that of the ♂ but the irroration of black scales more extended and prominent, the black on the apex and termen of the fore wing and the black spots on the termen of the hind wing broader, more extended inwards; on the fore wing there is an additional spot in the interspace 1, and both this and the spot in interspace 3 in many specimens are connected by a line of black scales along the veins to the outer black border; also the spot in interspace 1 often extends across vein 1 into the interspace below. *Underside*: similar to that in the ♂. Expanse: 32-60 mm.

*Larva and Pupa.*—The larva has not been described. Colonel Bingham says of the pupa: "as represented in Mackinnon's figure is a light ochraceous brown with the wing-cases prominent, and with some tubercular darker brown spines midway on the abdominal side." This means that the pupa is of the angulated type of *Appias*, as would be supposed from those of its relations in Europe.

*Habits.*—The butterfly is altogether confined to the hills but has been brought in here as it exists both in the Himalayas and the hills of Southern India. It certainly does not exist in the Bombay Presidency. Its distribution is the Himalayas from Chitral to Sikhim and Bhutan from 2,000 to 11,000 feet; the hills of Southern India; Assam; Upper Burma; the Shan States; extending to China. Nothing is known to the author of its habits.

**94. Pieris glauconome.**—♂. *Upperside*: white. Fore wing: basal half of costa narrowly irrorated with black scales; a broad, irregularly quadrate, black spot over the discocellulars; apex and termen anteriorly above vein 3, broadly black, with a subterminal series of spots of the ground-colour, prolonged as fine lines to the terminal margin. Hind wing; uniform, the markings on the underside showing faintly through; a costal spot before the apex indicated by irrorated black scaling; a series of four, small, black,

terminal spots at the apices of veins 3 to 6, the anterior three joined on the inner side by black loops. *Upperside* : white. Fore wing : the form of the markings as on the upperside, but the base of the cell with an irroration of green scales, the black, discocellular spot extended to the costa, often washed with green or with a green centre to the black ; an apical green patch including the termen anteriorly which is broadly traversed by short lines of white that extend to the terminal margin and are faintly lined with yellow. Hind wing : white with the basal area dusky green with large, pyriform spots of the ground-colour in cell and interspace 7 ; beyond this a subterminal series of green loops continued along the veins to the margin, leaving a broad, white, curved, discal band and a series of large, white, terminal spots in the interspaces ; the veins conspicuously lined with yellow. Antennæ ashy brown ; head, thorax and abdomen whitish.—♀. *Upper* and *Undersides* : similar to those of the ♂, but the markings larger and more clearly defined. Expanse : 40-50 mm.

*Larva*.—Greenish yellow, with two longitudinal yellow bands and five transverse lines of minute, black dots on each segment ; head yellow-green with black dots.

*Pupa*.—Brown ; head with a beak-like, curved process ; thorax somewhat compressed, with a large tubercle on the ventral side and two smaller posterior tubercles on each side.

The descriptions of larva and pupa are from Colonel Bingham's book. The larva is probably like that of an *Appias* ; the pupa likewise as it has the lateral points and the head-process.

*Habits*.—The author knows nothing about the butterfly except that a few specimens were caught in Karachi in Sind. It is certainly not common there. Its distribution is given as "within our limits recorded from the North-West of India, the Punjab and Baluchistan. Found also in Arabia ; Persia ; the Pamirs ; Egypt and North Africa."

**95. Synchloe lucilla.**—♂. *Upperside* : lemon-yellow ; base of wings irrorated by black scales. Fore wing : discocellulars with a broad, short transversely oblique bar that does not extend to the costal margin, apex from above the apical third of the costa in a curve (angulate at middle) to the tornus, black, traversed obliquely by a more or less obscure, maculate, narrow band of ground-colour ; cillia yellow, alternated with black. Hind wing : uniform immaculate. *Underside* : duller, paler yellow. Fore wing : the black discocellular mark shorter, the apical, black area of the upperside showing through by transparency and irrorated with minute, black scales, often an obscure, pink line along the costal and terminal margins ; the costa towards apex with a series of small white spots, each spot inwardly defined by a minute black dot. Hind wing : densely irrorated with black scales ; a small, white discocellular spot and a series of white transverse spots along the costal margin as in fore wing, but more distinct. Antennæ yellowish brown, head fuscous, collar pinkish, thorax fuscous, abdomen black on sides, yellow beneath. ♂. *Upperside* : very pale sulphur-yellow. Fore wing : black, markings as in the male but the discocellular bar broader and longer ; the preapical, maculate band of the ground-colour in the black area more distinct. Hind wing uniform, immaculate. *Underside* : ground-colour and markings as in the male. Antennæ, head and thorax, abdomen similar to those of the male. Expanse : 33-42 mm.

*Habits*.—Larva and pupa unknown, or at least not chronicled. The insect exists in the Punjab where it has been taken at Cambellpore ; Attock ; Khairabad. Perhaps it should not

have been mentioned here. There is another species, *S. daphalis*, Moore, from the Western Himalayas, Chitral, &c., in both sexes of which the ground-colour is white.

**96. Huphina nerissa.**—*Wet season brood*—♂. *Upperside*: white, a greyish-blue shade at base of wings and along the veins, due to the dark markings on the underside that show through. Fore wing: veins black; apex and termen black, the inner margin of that colour extended in an irregular curve from middle of costa to base of terminal third of vein 4, thence continued obliquely outwards to the tornal angle; interspaces 6 and 9 with short narrow greyish-white streaks of the ground-colour that stretch into the black apical area but do not reach the margin; a short black, subterminal bar between veins 3 and 4 and another, less clearly defined, between veins 1 and 2. Hind wing: veins 4 to 7 with outwardly-dilated, broad, black edgings that coalesce sometimes and form an anterior, irregular, black, terminal margin to the wing. *Underside*: fore wing: white, the veins broadly margined on both sides by dusky black; costal margin broadly and apex suffused with yellow; subterminal black bars between veins 1 and 2 and 3 and 4 as on the upperside but less clearly defined. Hind wing: entirely suffused with yellow, the veins diffusely bordered with black; a more or less incomplete, subterminal series of dusky spots in interspaces 1 to 6; more often than not the spot in 5 entirely absent; a conspicuous chrome-yellow spot on the precostal area. Antennæ black, obscurely speckled with white; head and thorax bluish grey; abdomen dusky black; beneath: the palpi and abdomen white, the thorax yellow. ♀ similar to the ♂ but very much darker. *Upperside*: veins more broadly bordered with black; in many specimens only the following portions of the white ground colour are apparent:—Fore wing: a broad streak in cell and beyond it a discal series of streaks in interspaces 1 to 6, 9 and 10; the streak in interspaces 1 and 3 very broadly interrupted by the transverse black bars; that in 6 more or less obsolescent. Hind wing: broad streak in cell, a discal series of streaks in interspaces 2 to 7, and a posterior, more or less obsolescent, subterminal series of greyish-white, double spots. *Underside*: similar to that of the ♂, only the veins much more broadly margined with diffused black scaling. Antennæ, head, thorax and abdomen as in the ♂.

*Dry-season brood.*—♂ ♀: differ from the wet-season brood as follows:—♂. *Upperside*: fore wing: the apical and terminal black area much restricted; veins concolorous; black, subterminal bars less clearly defined; the lower one often obsolete. Hind wing: the black markings on the termen represented by short triangular irrorations of black scales at the apices chiefly of the anterior veins. *Underside*: as in the wet-season specimens, but the yellow much paler and somewhat ochraceous in tint.—♀ differs less from the wet-season ♀, but the black markings on both the upper and undersides are narrower and less pronounced, and on the latter the yellow suffusion is paler and ochraceous in tint. Expanse: 64-76 mm.

Variety *phryne*, Fabr.—Can be distinguished from the typical form as follows:—♂ ♀. Invariably smaller. *Wet-season brood—Upperside*: fore wing: in addition to the subterminal black bars between veins 1 and 2, and 3 and 4 another black bar above vein 5, that joins on to the black in the apex and completely isolates the short, narrow, preapical streaks of the ground-colour, that in the typical form are merely continuations of the colour at the bases of the interspaces in which the streaks lie. *Underside*: the above noted black markings or bars very conspicuous, especially between veins 5 and 6. Hind wing: the subterminal transverse series of dusky spots in the interspaces replaced by a nearly continuous prominent, dusky black band, interrupted only in interspace 5.

*Dry-season brood*— ♂ ♀. *Upperside* : fore wing : the black on apex and termen much restricted, the lower, subterminal black bar generally absent; the veins white, concolorous with the ground-colour, so that the bar between veins 3 and 4 does not coalesce with the black on termen. In the extreme dry-weather broods, this bar becomes obsolete. Hind wing: uniform dead white, sometimes the apices of one or two of the anterior veins with a little black scaling. *Underside* : the veins, except those that limit the cell of the fore wing, not bordered with black; the suffusion of yellow along costal margin, on apex of fore wing, and over the whole surface of the hind wing pale yellow, with a tendency in the extreme dry-season specimens to become almost white ; on the fore wing, the black, transverse subterminal bars between veins 1 and 2, and 3 and 4 are sometimes indicated by mere diffuse small patches of scales; at other times they are absent. Antennæ, head, thorax and abdomen in both seasonal broods much as in the typical form, but paler. Expanse: 44-56 mm.

Typical *H. nerissa* does not seem to have been bred; it is found in Nepal, Sikhim, Bhutan, Bengal, Assam, Upper and Lower Burma, Tenasserim; also in Siam and China. There is a race or species called *H. lichenosa*, Moore, inhabiting the Andamans which is distinguished from *H. nerissa* by the fact that the dusky black markings along the veins on the underside of the hindwings occupy more of the area than the ground-colour, while in *nerissa*, it occupies less.

The Bombay form of *Huphina nerissa* is *phryne*. It has been bred and the history is as follows :—

*Larva*.—The first two stages are oily yellowish green with a black head, all the tubercles prominent and comparatively large to what they become later on.

*Third stage*.—Body cylindrical, ending somewhat narrowly at anal end in two rounded knobs which bear longish white hairs, one on each side of dorsal line. The head is round, as broad or slightly broader than segment 2, the surface rough with minute tubercles, each one bearing a brown or white bristle-like hair, 2 or 4 tubercles on each lobe larger than rest and bearing each a longer hair which points forwards and slightly down. The surface of the body is transversely impressed, lined with 7 fine parallel lines to each segment, each interval between every two lines having a single, central row of minute white tubercles, each tubercle bearing a short hair or bristle; the main tubercles (one subdorsal, one dorsolateral and one supraspiracular as usual) being very little larger than others but bear each a somewhat longer hair which often bears a globule of transparent, clear liquid at its tip; the whole surface is, besides, clothed with extremely minute, brown, erect hairs; the bristles on segment 2 perhaps longer than on other segments; a fringe of rather long, fine, white hairs all round the body on the subspiracular and lateral ventral regions. Colour of body dark green; belly much lighter, grey-green.

*Fifth stage*.—Nearly the same as the 4th. Body cylindrical; anal segment narrow behind, slightly thickened at extremity, the extremity being coarsely bilobed, each lobe short, rounded. Head rounded, face somewhat flattened, slightly less in diameter than segment 2; surface finely rough with many, small, white, conical, glassy, setiferous tubercles which are most numerous on the upper portion, the setæ erect, brown; one, dorsolateral, longer than rest, just below vertex of each lobe; lower part of face sparsely covered with fine, white, erect setæ. The surface of body is transversely lined as in last stage, the intervals with a central row of small, white, conical tubercles, bearing each a brown, short hair; whole surface covered with minute, red-brown tubercles, each bearing a short brown bristle; subspiracular regions set with long, fine, erect, white hairs forming a fringe round body,

the ones on knobs of anal segment slightly longest. Spiracles small, oval, white with thin, shiny black margins. Colour of larva dark bluish green, light greyish green on ventrum; true legs glassy green; prolegs yellowish with wedge-shaped, lobed feet. L: 27mm; B: 4 mm.

*Pupa.*—Is of the agulated type of *Appias* (*vide* Pl. 1, fig. ). Head short, as broad as segment 2 by which it is nearly completely hidden; produced into a long snout in front, which snout is cylindrical, rounded at end, slightly down-curved and rugose as to surface; eyes slightly prominent. Segment 2 flat on dorsum, keeled in dorsal line and produced into two sharp points, one subdorsal, on each side, which lie separated by a rounded sinus, close together over the base of the snout. Thorax broader than segment 2, the wings (lateral outline of pupa) run back from the shoulders parallel to longitudinal axis of pupa and to each other as far as segment 6; the dorsal portion of thorax slopes up from the wings to a dorsal carina occupying its whole length, the lateral outline of which is triangular, the somewhat thickened apex being the highest part of pupa; the hinder margin is straight on each side between dorsal line and wing, the two halves meeting in a wide angle, the half on each side meeting the wing in a rounded right angle. Segment 4 dorsally somewhat convex, short, also slightly carinated in dorsal line. Segment 5 is dorsally flat, short. Segment 6 and the anterior half of segment 7 are dorsally quite flat and are produced thinly laterally out over the wings into a ledge; this ledge is continued thinly above spiracles to the cremaster along abdomen; this flat part is bordered posteriorly by a slight, straight ridge across pupa at centre of segment 7, the ridge being produced out at each end into a strong, recurved, angular tooth, the tooth being flattened above and below, its front margin formed by the anterior margin of segment 7; the lateral ledge of segment 6 is also toothed slightly but to a far less degree at the anterior corners; and there is small, rounded tooth besides, between these two, at common margin of segments 6, 7 in the same plane. From the posterior base of the large teeth the abdomen tapers off to the cremaster in converging straight lines, the dorsal abdominal line being rather convexly curved and slightly carinated, the carination rising into a small tooth at the anterior margins of segments; cremaster narrow, square at extremity, very shortly bifid; the head snout, abdominal, supraspiracular ledge and the ledge in continuation anteriorily with a covering of very short, bristle-like hairs; surface of pupa besides is somewhat roughened by pitting with the exception of wings; segment 4 with a somewhat raised, small, roughened, dorsal patch. The wings are only slightly convex ventrally. Spiracles of segment 2 indicated by an oval, flat surface facing forward formed by the raising, convexly, of a small portion of the front margin of segment 3 above the hinder margin of segment 2; the rest rather large, oval, white, situated below the ledge or segments 6, 7 and a yellowish line along abdomen. Colour of body a darkish bluish green or grass-green, wings greenish white as also ventrum of abdomen; segment 2 as well as top of snout whitey-brown; the carina of thorax the same whitey-brown with a fine, double, black line along summit which is not continued anteriorly beyond apex; carina of segment 4 similar in colour with similar black line; flat portions of segments 6 and 7 whitey-brown; the points of all teeth black; a yellow, supraspiracular, abdominal line along the narrow ledge. L: 20 mm.; L. of snout 1-5 mm.; B: 7 mm. between points of teeth of segment 7; 4-5 mm. at shoulders; H: 5 mm. at apex of thorax.

*Habits.*—*Huphina phryne* is a very common butterfly in nearly the whole of its range. The larvæ are easy to find wherever it exists. The eggs are always laid singly anywhere upon the

foodplant, sometimes even on a dead stick close by it; a favourite place is the top of a thorn. The caterpillar always lies in the centre of the upperside of a leaf, of a young one when very small, of an old one when full grown, clothing the surface with a covering of glistening silk for its bed. The pupa is formed on the upperside of a leaf, sometimes on the underside also, upon a perpendicular surface as that of a tree-trunk or stone, or anywhere else that is convenient. It is fixed firmly by the tail to a pad made by the larva and the body-string is short, so that the ventrum of the chrysalis touches the surface of suspension. The perfect insect emerges in about ten days and remains quiescent for several hours afterwards if left undisturbed. It is a fairly active butterfly once it gets on the wing, flies fast and fairly strongly in, generally, a more or less straight line, is fond of the sun and likes open spaces in the vicinity, however, of vegetation. It is frequently found at flowers, often rests on the ground or on the upperside of a leaf or a blade of grass low down near the ground and hardly ever rises any distance from the earth. When at rest the wings are closed over the back, the front ones drawn into the hinder ones; but sometimes it sits in the sun with them half open. It is not difficult to catch with a net. The foodplants of the larva are all capers and it has been bred upon *Capparis sphylla*, *C. sepiaria*, *C. heyneana*, *and C. horrida*; it will probably eat any caper. These foodplants being found in all sorts of country, dry, wet, open, jungle-covered; the butterfly also exists there. It is distributed over the N. W. Himalayas, up to 4,000 feet; Nepal; Sikhim; Bhutan; Bengal; Central, Western and Southern India; Ceylon.

**97. Huphina remba,** *Moore.—Wet-season brood.—* ♂. *Upperside*: ground colour white. Forewing: outer half from the middle of costa obliquely, to before the tornal angle, intense black, the base with a bluish shade. Hindwing: base, terminal margin broadly below vein 5 and costal margin above vein 6, irrorated with black scales; termen anteriorly from apex to vein 4 decreasingly black. *Underside*: white, costal margin and apex broadly suffused with greenish-yellow; a large, prominent, bright yellow, preapical spot, below which is a larger, black, irregular patch, angulated at, and touching, the lower apex of cell. Hindwing: greenish-yellow, the veins black; a dense irroration of scales across the middle of wing, its anterior margins sharply defined and extended from costa through cell to vein 1; the lower discal and tornal areas less densely covered with the irrorated black scaling; a bright, greenish-yellow, irregular spot in middle of interspace 6. Antennæ dark brown; head and thorax anteriorly with greenish-yellow pile; thorax medially and posteriorly with long, bluish-grey hairs; abdomen black; beneath: palpi and thorax yellow, abdomen white. ♀. *Upperside*: dark brownish black. Forewing: base of cell and upper basal half of interspace 1 white, densely irrorated with black scales; the apical half of cell, base of interspace 3, basal two-thirds of interspace 2, a subterminal, large, round spot in interspace 1 and a pretornal, short stripe on the dorsum, white. Hindwing: a more or less triangular, central area

white, its lower margin abruptly transverse, its base and posterior half irrorated with black scales. *Underside*: much as in the male, but on the forewing the dusky, purplish-black patch below the preapical, yellow spot larger and more prominent. On the hindwing the dark, irregular, discal area also more prominent. Antennæ, head, thorax and abdomen as in the male.

*Dry-season brood.*—♂. *Upperside*: similar to that of the male of the wet-season brood, but the black area on the forewing much restricted so that it occupies little more than the apical third instead of the apical half of the wing. On the hindwing the terminal black edging much narrower. *Underside*: forewing: white; the costal margin and apex broadly dull ochraceous with a yellow tint, this colour on the apex margined on its inner side by an irregular dusky, blackish, subtriangular patch. Hindwing; dull ochraceous with a yellow tint as on the costa and apex of the forewing; an irregular transverse dusky discal band that does not reach the costa or the dorsum, somewhat sparsely irrorated with black scales.—♀. Similar to the male but darker, the black markings on both fore and hind wings on the upperside similar but slightly broader; on the underside all the markings paler and duller than in the male. Expanse: 52-62mm.

This is a more or less variable insect. Ceylon specimens differ in the relative width of the black markings and in the general paleness and dull tint of the greenish-yellow on the underside; these Moore has separated off as *cingala*. Colonel Bingham writes the above and considers this species as a race of *H. nadina*, Lucas. He also mentions *H. andamana* from the Andamans, a much blacker insect than any of these, as another race.

*Egg.*—Spindle-shaped, truncated at base where fixed; with 12 longitudinal ridges, every two anastomosing before apex and ending together in a single small tooth, the teeth forming a small ring round the top of egg. Surface shiny. L: 1·25 mm.; B: ·30 mm. Colour light yellow mottled with rosy red.

*Larva.*—Cylindrical, narrowing to the anal end, very slightly to head; the anal segment ending squarely, slightly indented in centre of terminal margin. Head round, very nearly the same diameter as segment 2, the surface covered with some white tubercles and longish, white hairs. Surface of body as in *H. phryne*; a fringe of fine, rather long, white hairs along the subspiracular and lateral ventral region; covered all over with small, white tubercles, each bearing a short hair. L. 32 mm.; B: 4 mm. The larva is very like that of *H. phryne*.

*Pupa.*—Like that of *H. phryne*. Head quadrate, provided with a long, porrect beak, slightly down-curved; this beak consists of two parts: one, the basal, cylindrical with the end triangularly cut out from which end the top piece, also cylindrical, springs and ends in a rounded extremity. The front margin of segment 2 is produced forwards into a subdorsal, small point on each side these points separated by a narrow sinus at base and ending over base of snout. Thorax quadrate seen from above, broader than pupa at segment 2, highly carinated in dorsal line and with a small tubercular point on each shoulder. The dorsa of segments 6 and 7 are flat as in *H. phryne* and dilated into a ledge that overhangs the wings and a ridge running along centre of segment 7 at right angles to pupal length ends in a sharp tooth in the same way, the flat portion is limited in front by the anterior margin of segment 6 where the ledge is also produced out laterally into a smaller, sharp tooth. Segment 4 is short and carinated in dorsal line. Segment 5 is flattened on dorsum. The abdomen is carinated in dorsal line behind segment 7, gradually decreases to cremaster in width and is somewhat laterally compressed; the carina is toothed on segments 8, 10, 11.

Colour of pupa is green or brownish green, the flat dorsal portions yellow or brown as are the vertex of head and the snout; the carina of thorax is tipped with brown and a thin black line runs from hinder margin up to the apex along its top (the carina is triangular from lateral view as the apex is angled); teeth of abdomen white, tipped with black; ventrally the prominent eyes and the somewhat bulged wings are light green. L: 17·5 to 20 mm; B: 7 mm. between the points of teeth of segment 7; 4·5 mm. at shoulders; in fact the same measurements as *H. phryne*.

*Habits.*—The egg is laid on a thorn, on a leaf, anywhere on the plant; the larva eats the young leaves at first and lies in the middle of a leaf, always on the upperside along the midrib, clothing the surface with silk. The pupa is formed on a leaf either on the upper or underside, on a branch, a stone or a tree-stem, pretty nearly anywhere; the tail-fixing is strong and the body-string short. The egg is laid in a shady place in the underwood and the larva avoids the sun. The butterfly is confined to the hills and regions of heavy rainfall but is plentiful where it occurs, especially in the monsoon months. It will be found all along the Western Ghats in Bombay. It is very active and somewhat devious in its line of flight, keeping a good deal to the thick underwood in the large jungles. It does not frequent flowers very much and rests on leaves but rarely in open places so that it is not easy to catch. It is found mostly in the evergreen jungles and does not rise to any great height from the ground. The resting position is the same as for *H. phryne*. The foodplant of the larva is *Capparis heyneana*, *C. moonii*, *C. roxburghii*; all the capers, in fact, that are found in its habitat. The eggs are laid generally low down on the plant, rarely at any height from the ground. The insect is limited in its distribution to Southern India and Ceylon.

*(To be continued).*

# TERMITES FROM BRITISH INDIA (NEAR BOMBAY, IN GUJERAT AND BANGALORE) COLLECTED BY Dr. J. ASSMUTH, S.J.

BY

NILS HOLMGREN (STOCKHOLM).

PART II.

*(With Plates E, F, G.)*

*(Continued from page 793, Vol. XXI.)*

I have again received two consignments of termites (43 tubes in all) from Dr. Assmuth to work them out for publication in the Journal of the Bombay Natural History Society, the one coming from Bombay, Hubli, Bangalore, and Krishnarajapuram, the other from Borivli (near Bombay), and the province of Gujerat (Anand, Godhra, Vadtal, Tuwa).

Hubli is situated in 15°-20′ N. and 75°-9′ E., 2,500 feet above the level of the sea, and about 470 km. south of Bombay.

Bangalore is situated in 12°-58′ N. and 77°-35′ E., 3,500 feet above the level of the sea, and 850 km. south of Bombay.

Krishnarajapuram is the first station after Bangalore on the line Bangalore-Madras, about 13 km. east of Bangalore.

The province of Gujerat is for the greater part lowland; thus Anand is but 135 feet above the level of the sea and the elevation of the other places in Gujerat mentioned above is more or less the same. The greater portion of the province is cultivated land ("the garden of India"), jungle occurs but sporadically (*e. g.*, between Godhra and Tuwa). Anand, one of the most important places in the Kaira District, is situated in 22°-33′ N. and 72°-58′ E., 435 km. almost directly north of Bombay, Vadtal (Wartal) is nearly 15 km. north-west of Anand, Tuwa about 70 km. and Godhra 80 km. east of the same place.

The special value of both collections consists in this that they are the first more extensive ones from the said parts of India. Our knowledge of Indian termites was up to now based on collections made in Bombay and its environments, in the Wallon district, in Sind, and near Madras. From Bangalore I had so far seen only one species (*Odontotermes bangalorensis*), and from Gujerat none at all were known.

The Gujerat collection was rather poor; this was due to the remarkable drought of 1910 and 1911 which had forced the termites to repair to greater depths in the soil. In spite of this, Assmuth was able to procure no less than 16 tubes from there.

The Bangalore collection is much richer; it is specially valuable on account of the detailed collecting notes referring to the single nests. The same is true of the Gujerat collection.

The two collections contain the following species :—

PROTERMITIDÆ : *Calotermes (Neotermes) Assmuthi*, n. sp., from Bangalore.

MESOTERMITIDÆ : *Leucotermes indicola*, Wasm., from Borivli.
*Coptotermes parvulus*, n. sp., from Anand and Vadtal.

METATERMITIDÆ : *Odontotermes obesus*, Ramb., from Borivli, Godhra, Vadtal, Anand, and Tuwa.
,, *bangalorensis*, Holmgr., from Hubli, Bangalore, and Krishnarajapuram.
,, *wallonensis*, Wasm., from Bangalore, Krishnarajapuram, and Tuwa.
,, *Feæ*, Wasm., from Bombay and Borivli.
,, *Assmuthi*, n. sp., from Borivli.
*Microtermes anandi*, n. sp., from Anand.
*Eremotermes paradoxalis*, n. sp., from Bangalore.
*Microcerotermes tenuignathus*, n. sp., from Tuwa.

In addition to the species just mentioned, I propose to discuss two forms of *Microtermes* belonging to the East Indian fauna, *viz.*, *M. incertoides*, n. sp., and *M. anandi* f. *curvignathus*. The former of these was reported by Wasmann as *M. incertus* from Wallon, while the latter which had been sent to me by Assmuth on a former occasion (cf. Journ. Bombay Nat. Hist. Soc., Vol. XXI, No. 3), had been considered by me as belonging possibly to the same species (*M. incertus*).[1]

## Fam. PROTERMITIDÆ, Holmgr.

### *Calotermes (Neotermes) Assmuthi*, n. sp.

IMAGO.—Very close to *C. Greeni* from Ceylon, but somewhat bigger, with broader pronotum, a little larger facetted eyes and ocelli, 3rd joint of antennæ a trifle longer than 2nd, 4th shorter than 2nd.

| | | |
|---|---|---|
| Length with wings ... | ... | 14 mm. |
| ,, without ,, ... | ... | 7·2 ,, |

[1] Assmuth wishes to thank all who have helped him in his work, especially the Fathers of the Catholic Mission in Gujerat and the Sisters of the Good Shepherd in Bangalore who generously gave permission to examine all nests on their grounds.

| | |
|---|---|
| Length of fore wings ... | ... 11 mm. |
| Breadth of head ... | ... 1·48 ,, |
| ,, of pronotum ... | ... 1·56 ,, |
| Length of ,, ... | ... ·76 ,, |

SOLDIER.—Smaller than that of *C. Greeni*.

Head relatively longer and thinner than that of *C. Greeni*, just beyond the middle slightly constricted so that the posterior part of the head is somewhat narrower than the anterior. Mandible larger than that of *Greeni*. Inner teeth of left mandible stronger than with *Greeni*. Antennæ same as in *Greeni*.

Pronotum broader than head, much shorter than half its width, posterior margin distinctly excavated in the middle.

| | |
|---|---|
| Length of body ... | ... 9·55-9·8 mm. |
| Head with mandibles | ... 4·6-4·83 ,, |
| ,, without ,, | ...2·89-3·12 ,, |
| Width of head ... | ...1·98-2·05 ,, |
| ,, of pronotum | ... 2·2-2·09 ,, |
| Length of ,, | ... 1·03-·95 ,, |

WORKER.—

| | |
|---|---|
| Length of body ... | ... 6·5 mm. |
| Width of head ... | ... 1·67 ,, |
| ,, of pronotum ... | ... 1·56 ,, |

*Geographical Distribution*.—East India: Bangalore.

**Collector's Report :—**

BANGALORE, 8-11-1911.—"Termites in dry trunk of tree in garden of Convent of the Good Shepherd. Few soldiers in proportion to workers. Tunnels built irregularly in wood and these, strange to say, altogether without inner lining of earthy material as is usually the case with termites." (Assmuth.)—The said lining of tunnels is very often wanting with *Calotermes*, a species frequently found even on live trees.

Fam. **MESOTERMITIDÆ**, Holmgr.

Subfam. LEUCOTERMITINÆ, Holmgr.

Gen. **LEUCOTERMES**, Silv.

*Leucotermes indicola*, Wasm.

A couple of workers which are of a strikingly dark colour, are present.

*Locality*.—Borivli, near Bombay.

**Collector's Report :—**

BORIVLI JUNGLE (SALSETTE ISLAND), 13-12-1911.—"In pillars of mound of *Odontotermes obesus*, in middle of nest, quite close to royal cell." (Assmuth.)

Subfam. COPTOTERMITINÆ, Holmgr.

Gen. COPTOTERMES, Silv.

*Coptotermes parvulus*, n. sp.

IMAGO.—Not known.

SOLDIER.—Closest to *C. travians*, Hav.; on an average however smaller, with relatively shorter and broader head. Submentum in the middle considerably constricted.

| | | |
|---|---|---|
| Length of body ... | ... | 3·5-4 mm. |
| Head with mandibles | ... | 1·75-1·98 ,, |
| ,, without ,, | ... | 1·18-1·25 ,, |
| Width of head | ... | 1·06-1·1 ,, |
| ,, of pronotum | ... | ·68-·72 ,, |

WORKER.—Similar to that of *C. travians*, but with broader head and narrower pronotum.

| | | |
|---|---|---|
| Length of body | ... | 3·3 mm. |
| Width of head | ... | 1·06 ,, |
| ,, of pronotum | ... | ·57 ,, |

*Geographical Distribution.*—Gujerat: Anand and Vadtal.

**Collector's Report :—**

ANAND, 21-12-1911.—"Termites on trunk of tree, in tunnels like those of No. 127 (*Odontotermes Assmuthi*, n. sp.). Nest itself at foot of tree among roots, inaccessible." (Assmuth.)

VADTAL, 31-12-1911.—"In tunnels in dry fire-wood. The tunnels of these termites were for the most part simply cut in the wood just below the bark; no inner lining (of earthy material) to be seen." (Assmuth.)—Some *Coptotermes* dwell in live trees; these species do not line their galleries.

**Note.**—This species is well separated from the Bombay form, *C. Heimi* Wasm., but is rather close to the Indo-Chinese *C. travians*, Hav.

Fam. **METATERMITIDÆ**, Holmgr.

TERMES SECTION.

Gen. ODONTOTERMES, Holmgr.

*Odontotermes obesus*, Ramb.

Specimens from Bombay, Anand, Godhra, Vadtal, and Tuwa are present.

The soldiers vary rather considerably in size, as previously stated.

**Collector's Report :—**

BORIVLI JUNGLE, 13-12-1911.—"Typical hillock-nest. Royal cell in middle of mound, slightly higher than surrounding ground. 1 king and 1 queen taken. Nest abounding in guests: though hardly

Fig. 1.—Royal cell of *Odontotermes bengalensis* Holmgr.

Fig. 2.—Fungus beds of *Odontotermes bengalensis* Holmgr.

Fig. 3.—Mound of *Odontotermes bengalensis* Holmgr., more than 8 feet high.

one-third of fungus beds examined, yet more than 550 guests taken." (Assmuth).

GODHRA, 28-12-1911.—"Termites on trunk of tree in covered galleries. No trace of nest rising above ground to be seen, but underground between roots of tree several holes with small bits of fungus-beds found." (Assmuth.)—This is the first time when Assmuth saw fungus-growing termites in galleries on tree. It seems, however, not to be quite so rare an occurrence, for I previously received such termites from Ceylon, Malacca, and Java. Fungus-growing termites are met with as noxious insects on india-rubber trees in Java as well as Malacca (DANNEMANN, VON BUTTEL-REEPEN). Moreover, *Odontotermes Assmuthi* described below, is undoubtedly a fungus-grower, yet the specimens were collected in galleries on a tree.

GODHRA, 28-12-1911.—"In dry cow-dung hollowed out by termites." (Assmuth.)

GODHRA, 28-12-1911.—Tall mound abandoned by termites. Fungus-beds found only in portion of nest below level of surrounding ground. "There big hole divided into chambers by thin partitions like folding screens; I looked in vain for some definite plan in arrangement of chambers in which fungus-beds were stored." (Assmuth.)—Build of nest same as in *O. bangalorensis*.

VADTAL, 31-12-1911.—In logs of fire-wood; tunnels coated with earthy material.

ANAND, 4-1-1912.—"Nest under well developed shrub in Cactus hedge, by side of foot-path. No overground structure, which seems to be wanting everywhere in cultivated districts of Gujerat. That such is really the case I have repeatedly been told by persons well acquainted with the country. (See also *Haviland*, Observations on Termites, Linn. Journ. Zool. Vol. XXVII, p. 368, ". . . . the appearance and shape of the nests are much modified by conditions; thus the mound-builders can live without a mound in cultivated ground, where mounds are not permitted.") Fungus beds underground from about 2 feet downwards. Guests the same as with *Odontotermes obesus* generally. Shrub as well as Cactus above the nest covered with galleries and extensive coatings of earthy material, under which surface of bark had been gnawed by termites." (Assmuth.)

TUWA, 4-1-1912.—"In galleries of earthy material, on pipul tree." (Assmuth.)

TUWA, 4-1-1912.—"In half dried cow-dung, hollowed out by termites." (Assmuth.)

*Odontotermes bangalorensis*, Holmgr. (nec *bengalensis*, Holmgr).

IMAGO.—Very similar to *O. Redemanni* from Ceylon, but much lighter in colour: yellowish brown to pale yellow. T-shaped mark of the pronotum broader; light-coloured parts otherwise about the

same. Wings slightly yellow or completely hyaline, with faint yellowish "subcostal line". Basal portion of clypeus hairless in the middle. For the rest, hair somewhat shorter.

Structure of body as in *Redemanni*. Last third of mediana (towards tip of wing) divided.

| | | |
|---|---|---|
| Length | with wings | 29-30 mm. |
| ,, | without ,, | 13 ,, |
| ,, | of fore-wings | 24 ,, |
| ,, | ,, head | 2·93 ,, |
| Breadth | ,, ,, | 2·93 ,, |
| ,, | ,, pronotum | 2·47 ,, |
| Length | ,, ,, | 1·25 ,, |

QUEEN.—Sides of abdomen pigmented.

SOLDIER.—Very similar to those of *O. obesus* and *Redemanni*, differing only in size.

| | | |
|---|---|---|
| Length of body | 3·8-4 | mm. |
| Head with mandibles | 1·75-1·79 | ,, |
| ,, without ,, | 1·03-1·1 | ,, |
| Width of head | ·95—·99 | ,, |
| ,, of pronotum | ·76 | ,, |

BIG WORKER.—As in *O. obesus* and *Redemanni*.

| | | |
|---|---|---|
| Length of body | 3·8 | mm. |
| Width of head | 1·33 | ,, |
| ,, of pronotum | ·76 | ,, |

SMALL WORKER.—

| | | |
|---|---|---|
| Length of body | 3·4 | mm. |
| Width of head | ·84 | ,, |
| ,, ,, pronotum | ·57 | ,, |

*Geographical Distribution*.—Bangalore, Krishnarajapuram, Hubli.

**Collector's Report**:—

BANGALORE, 4-11-1911.—"Nest lying by itself in garden of Good Shepherd Convent. Solid superstructure, rather smooth, not showing the slightest external aperture. Mound broad at base, tapering towards top, and ending in a few separate massive pointed peaks; total height 4'-2". No fungus-beds whatever had been constructed in overground portion of nest; they began only level with the surrounding ground and continued downwards for a considerable depth. King and queen (the latter rather thick but only 6 cm. long) in cell almost at bottom of superstructure, i.e., nearly level with surrounding ground, in centre of nest. In block of red soil containing royal cell no chambers, neither for eggs nor larvas, only some widened galleries (see photo 1). Strikingly great number of soldiers in royal cell. The bite of the soldiers is not excessive, but their secretion stains very strongly.

Fig. 4.—Low, but rather broad, mound of *Odontotermes bengalensis* Holmgr.

Fig. 5.—Royal cell of *Odontotermes bengalensis* Holmgr.

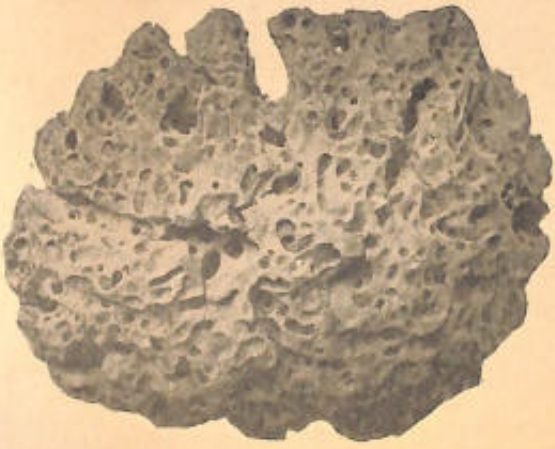

Fig. 6.—Fungus beds of *Odontotermes bengalensis* Holmgr. with remarkable indentations.

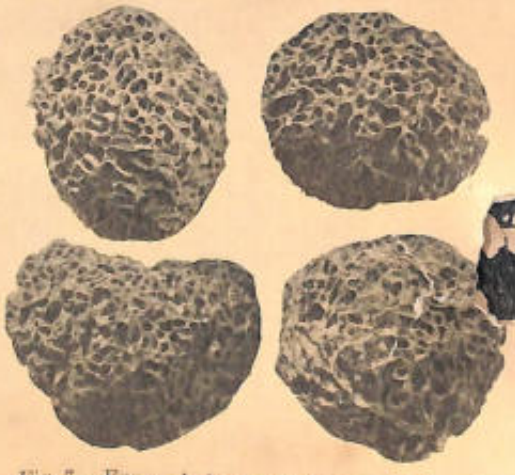

Fig. 7.—Fungus beds of *Odontotermes wallonensis* Wasm.

Fungus-beds (photo 2) separated from each other by thin layer of earthy material forming a sort of loose cover surrounding the different lumps, after the manner of a folding screen. Fungus-beds of this species, therefore, not in excavated hollows of ground as with *O. obesus* and other kinds. The space below overground structure of nest in question was but a single big hole which had its roof supported by some few fairly strong pillars of red soil and was divided by thin partition walls, into a great many irregularly arranged smaller compartments. Overground mound to all appearance merely the accumulation of earthy material (rendered extremely hard by secretions) brought up by termites from below when widening the underground portion of nest.

The tallest mounds I have so far seen belong to this kind. At Krishnarajapuram I measured one about 7, and another more than 8 feet high (photo 3)." (Assmuth.)

BANGALORE, 11-10 and 2-11-1911.—" Nest in enclosure in front of Convent of the Good Shepherd. Mound leaning against wall, several feet distant from a big tree. At first only some fungus-beds examined from upper portion of nest, later on whole nest dug out. Rather extensive but not very high overground structure crowned by blunt peaks (photo 4). Outside appearance of mound more like that observed at Kirkee (*O. brunneus*); peaks, however, not perforated like those of the just mentioned species, nor smooth and turret-like as at Khandala (*O. obesus*), but with rough and warty surface.[1] As many as *six* queens yet only one king taken. All the queens somewhat smaller in size and less bulky than common fullgrown specimens of this kind, their length being hardly 6 cm.; king, on the other hand, more powerfully developed than usual. Groundfloor of royal cell exceptionally large, 20·5 × 25 cm., with very many small holes for passage of termites. In the clod of earth containing royal cell, a number of egg—as well as nursery-chambers." (Assmuth.)

Assmuth's observation that egg and nursery-chambers (" Ei-und Brutkammern ") are arranged round the royal cell, is of great interest; it perfectly agrees with my view, *viz.*, that the typical nursery zone which is of common occurrence, *v.g.*, in the *Syntermes* series, is likewise found with the different species of *Termes* and *Odontotermes*. The zone is, however, in the majority of cases rudimentary in the *Termes*-series since its importance has been lessened by the fungus-beds which largely serve as nursery quarters (against *Escherich*, Termitenleben auf Ceylon).

BANGALORE, 28-10-1911.—" Mound built against garden wall

[1] It would be interesting to know whether the roughness of the surface was not perhaps due to repairs consequent upon partial destruction of the mound; for in such cases rough and warty surfaces of nests are observed also with other species. This would, at the same time, well account for the different form of the nest.

of St. Martha's Hospital ; construction same as preceding one, but nest bigger and overground structure higher. 1 king and 1 queen (the latter 7·5 cm. long) taken, 1-2 feet below level of surrounding ground. Egg—as well as nursery-chambers in clod of earth containing royal cell (photo 5)." (Assmuth.)

BANGALORE, 30-10-1911.—" Nest lying by itself in grass-grown part of garden of St. Martha's Hospital. Neither mound, nor cupola, turret or the like visible. The only sign that made me suspect presence of termites, was a portion of ground which in the midst of a luxuriant growth of grass was absolutely bare. Further examination of this area showed several well marked, clay-brown spots, of the size of a saucer to a plate, the surface of which was conspicuously smooth, very slightly convex, and perforated all over. All these sieve-like patches proved to be the outer coverings of underground tubes which led downwards either perpendicularly or more or less obliquely, growing gradually broader towards their base like sugar-loaves ; their depth varied from 1-4.' Fungus-beds had been constructed at the base of all the tubes, the biggest of them in central tube having the comparatively enormous height of 2'. Nearly all the fungus-beds showed laterally curious, deep indentations (photo 6). Royal cell about 3' underground." (Assmuth.)—The strange outer structure of this nest was probably due to its being situated on cultivated ground which would naturally bring about the repeated destruction of any mound raised above ground.

BANGALORE, 20-10-1911.—" Nest with open chimneys if I am not mistaken (workmen had already destroyed upper part of nest when I arrived). Small nest ; fungus-beds 2-3' below ground." (Assmuth.)

BANGALORE, 23-10-1911.—"Termites coming probably from underground nest ; they had during night covered with friable crust of red soil and eaten up dry leaves and bits of wood. Galleries built round about foot of big tree on road outside garden of St. Martha's Hospital." (Assmuth.)

BANGALORE, 27-10-1911.—" Nest under small parapet of bridge built of masonry work, by side of dry drain in garden of St. Martha's Hospital. Build of mound same as in nests examined 11-10 and 2-11-1911. Small nest. 1 king and 1 queen taken in royal cell about 2' underground." (Assmuth.)

HUBLI, 7-10-1911.—" Low mound with open chimneys if I remember right. Stopped only a couple of hours at this station ; therefore no time to dig up whole nest, could take but a small number of termites from upper portion of it." (Assmuth.)

KRISHNARAJAPURAM, 7-11-1911.—" Termites in mound, the common superstructure of which was scarcely more than 1-2' high ; on it were raised many, in all about 30, blunt cones projecting

more or less 1 foot above surface. Outside of cones not smooth but warty. Took only a few fungus-beds out of nest." (Assmuth.)

KRISHNARAJAPURAM, 7-11-1911.—"Construction of nest same as that examined, 4-11-1911, but mound very low, hardly more than 1 foot high. Whole nest taken out; in it 1 young queen (3·5 cm. long, with slender abdomen) but 2 kings which is, I believe, quite remarkable; it is certainly the first and only experience of this sort I ever had. Not more than two separate fungus-beds in nest, neither of them big but both containing numerous eggs." (Assmuth.)

*Odontotermes wallonensis*, Wasm.

*Habitat.*—Tuwa (Gujerat), Bangalore, Krishnarajapuram.

**Collector's Report :—**

TUWA, 4-1-1912.—"Mound fully 4' high, leaning against small babul tree or rather built round its trunk. Nest similar to those of *O. brunneus* yet cupolas not so regular nor perforated, but solid. King and queen (the latter about 8·25 cm. long, the longest I have so far seen) found, curious to say, 2' above ground. Perhaps originally in this place a heap of mud or earth on which the pair alighted after the flight from the parent colony, thus giving rise to the unusual position of the royal cell. Overground portion of mound almost completely desiccated, only royal cell and its near surroundings still moist. In consequence of this, fungus-beds (photo 7) of mantle region nearly all deserted; the larvas had been taken down to lower portions of nest where they were found in great numbers. The reason for this strange occurrence is, I believe, to be found in the fact that the rainy season of last year (1911) was very poor in Gujerat. I experienced a similar state of things in nearly all the nests I saw in this province; their mantle was much decayed, and the upper portion of the mound was more or less abandoned by the termites which had withdrawn to the deeper and damper parts of the nest." (Assmuth.)—The drought seems to explain sufficiently the abnormal structure of this nest as compared with others of the same species.

BANGALORE, 30-10-1911.—"Nest with open chimneys, lying by itself in garden of St. Martha's Hospital, surrounded on all sides by high grass, but upper portion of nest quite bare (photo 8). Measured depth of one of the chimneys which reached as far as 4' below ground; lumen of mouth of chimney 10-12 cm. in diameter; chimney extending nearly vertically downwards. 1 king and 1 queen (the latter 7·5 cm. long, several workers as well as soldiers fastened to her abdomen by their mandibles) taken in cell more than 2' below ground. These are the fiercest termites I have so far come across in India: their bite drew blood." (Assmuth.)

BANGALORE, 20-10-1911.—"Nest with typical open chimneys (photo 9) in garden of Convent of the Good Shepherd. 2 kings and 2 queens in royal cell about 2' below surface. Here, as in all nests with open chimneys observed in Bangalore city, a common overground mound was scarcely apparent. The cause of this is in all probability the repeated destruction of the superstructure of nests which are undesirable in gardens; in the open country, however, the nests have well defined (2-3' high) overground mounds with projecting chimneys (photo 10)." (Assmuth.)

BANGALORE, 25-10-1911.—Nest as above. "Round about royal cell, in hard block of soil, numerous small chambers with eggs and larvas." (Assmuth.)

KRISHNARAJAPURAM, 6-11-1911.—"Termites in tunnels and galleries constructed on surface of ground over dry wood and leaves." (Assmuth.)

**Note.**—This species has been identified by comparison with a type specimen from Wasmann's collection. Though the latter is not yet quite fully coloured and consequently appears somewhat lighter as well as smaller than Assmuth's specimens, still in all other respects they are both so strikingly alike that I take the identification to be correct. Nevertheless, to settle this point beyond all doubt it would be necessary to make a close study of the respective imagos.

WASMANN considers *wallonensis* to be a subspecies of *O. obesus*. I cannot agree with him in this but am more inclined to group *O. wallonensis* together with *O. brunneus*; the former might in my opinion be taken as a subspecies of the latter rather than of *obesus*. This view is confirmed by the structure of the nest of both types (*wallonensis* and *brunneus*).

*Odontotermes Feæ*, Wasm.

*Habitat.*—The species was taken in Bombay and surroundings: St. Xavier's College grounds, Borivli, Khandala.

**Collector's Report:—**

BOMBAY, 20-11-1911.—"Termites taken in garden of our College. The imagos were just swarming from their nest, at 6·30 p.m., about sunset. On a space of 4-5 m. in diameter I observed from 15-20 holes in the surface of the ground, to all appearances newly opened, the biggest of them about as large as a shilling piece. I had so far not had the slightest idea that at this particular spot a termite nest was to be found; there had been nothing to indicate its presence: the ground was perfectly smooth, and no trace of a mound or any other superstructure was to be noticed. Now I saw the whole area teeming with termites and, strange to say, apart from the winged individuals, they were exclusively

Fig. 8.—Low nest of *Odontotermes wallonensis* Wasm., with "chimneys."

Fig. 9.—Low nest of *Odontotermes wallonensis* Wasm., with "chimneys."

Fig. 10.—High mound of *Odontotermes wallonensis* Wasm., with "chimneys."

workers moving actively about in all directions. Imago after imago emerged in close succession from the holes; after running about for a very short time, they took wing and disappeared in a westerly direction following, I believe, the drift of the breeze. Towards 7-15 o'clock the number of imagos coming out of the openings grew gradually smaller, at last it stopped altogether and the workers began to return into the holes; at 7-25 they started closing the apertures. Shortly before this the soldiers, not a single one of which—as stated above—had till then been noticed in spite of the most careful search, had made their appearance. A good many of them were to be seen in every hole, lining the circular opening, and protruding their heads just above its margin without, however, coming out completely. The workers wedged their way through them and by and by covered up the mouths of the different tunnels with thin convex lids of earthy material. Towards 7-30 all was over: the termites had disappeared and all the holes were closed. It had become quite dark by this time; the last part of the observations had to be made by lamplight." (Assmuth.)

**Note.**—There are males as well as females among the winged individuals taken from this nest, a clear proof that the swarming of the two sexes takes place simultaneously. It goes without saying that inbreeding is thereby greatly favoured.

The fact that this species of termites closes the nest-openings with a convex cover, is interesting because the South American *Eutermes* do the same when walling up the exits of their dwellings. The nests of the latter often present a warty surface after the swarming of the imagos, a peculiarity brought about by the mode of closing the openings; later on, when dry, the surface appears quite flat. Had the coverings been made level at the very outset, they would burst during the process of drying.

KHANDALA, 22-10-1911.—"Imagines of *O. Feæ* swarming at sunset; taken by Fr. Dreckmann." (Assmuth.)

BOMBAY, 30-9-1911.—"Taken in compound of our College near wall of house. A big dry leaf of a fan-palm lying there had been partly plastered over with tunnels of friable earthy material and eaten up, as far as covered, by termites. I observed (as I have done repeatedly before) that the soldiers of this species are not nearly so numerous as the workers, the proportion in the present case being about 1 : 8 or 10. The soldiers are not so nimble either as the workers, they bite however most readily. The workers bite likewise (though not so frequently as the soldiers); such is hardly or not at all the case with other Indian termites, as far as my experience goes." (Assmuth.)

BORIVLI JUNGLE, 13-12-1911.—"Termites in half dry cow-dung completely hollowed out by them." (Assmuth.)

*Odontotermes Assmuthi*, n. sp.

IMAGO.—Not known.

SOLDIER.—Belongs to the *ceylonicus-oblongatus* group but is smaller than either of these two species.

Head yellow. Mandibles of a dark colour, with the exception of the light basal portion. Antennæ yellowish. Abdomen white to whitish yellow.

Head with short scattered setæ. Abdominal tergites with rather setaceous hair.

Head quadrate with posterior rounded angles; the part in front of antennæ somewhat narrowed, considerably longer than broad, slightly arched. Fontanelle fairly distinct, but without fontanelle-gland. Basal portion of clypeus rather short. Labrum tongue-shaped, somewhat triangular, pointed. Mandibles rather short and strong. Tooth of left mandible placed at anterior limit of second third of mandible, heel-shaped ("absatzfœrmig"). Tooth of right mandible rudimentary, a trifle in front of the middle of mandible. Antennæ of 16 (?) joints, 2nd as long as 3rd and 4th together, 4th much shorter than 3rd and a little shorter than 5th.

Pronotum saddle-shaped, narrower than head, distinctly indented in front.

| | | |
|---|---|---|
| Length of body... ... | 5·5 | mm. |
| Head with mandibles. | 2·47 | ,, |
| ,, without ,, ... | 1·6 | ,, |
| Width of head ... ... | 1·18 | ,, |
| ,, pronotum ... | ·85 | ,, |

LARGE WORKER.—Head yellow (somewhat rusty). Antennæ growing gradually darker towards the tip, brown.

Head slightly hairy. Hair of abdominal tergites rather dense.

Head quadrate, with strongly rounded posterior angles, a little longer than broad. Fontanelle small, placed in the middle of the head. Basal portion of clypeus shorter than half its own width, lentiform, rather convex. Antennæ of 17 joints; 2nd joint nearly as long as 3rd and 4th together, 3rd shorter than 4th.

Pronotum somewhat excised in front.

| | | |
|---|---|---|
| Length of body... ... | 3·5—3·7 | mm. |
| Width of head ... ... | 1·29 | ,, |
| ,, of pronotum ... | ·65 | ,, |

SMALL WORKER.—Colour and hair as above.

Head oval. Base of clypeus relatively longer than in large worker. Antennæ of 16 joints; 2nd joint nearly as long as 3rd and 4th together, 4th shorter than 3rd.

Pronotum excised in front.

| | | |
|---|---|---|
| Length of body... | ... | 2·8 mm. |
| Width of head ... | ... | ·89 ,, |
| ,, of pronotum | ... | ·53 ,, |

*Habitat.*—Borivli Jungle near Bombay.

**Collector's Report :—**

BORIVLI JUNGLE, 13-12-1911.—"Termites on trunk of tree, in tunnels and covered galleries built of friable greyish-black material. Not many specimens taken, termites seem to have quickly retreated to subterranean nest when galleries were opened." (Assmuth.)

**Note.**—The species appears to be a representative of the *ceylonicus*-group. Whether this kind, however, lives in *obesus*-nests like *ceylonicus* in those of *Redemanni*, is to be seen.

Gen. MICROTERMES, Wasm.

*Microtermes Incertoides*, n. sp.

(Syn. M. INCERTUS, Wasm., from Wallon.)

IMAGO.—Not known.

SOLDIER.—Head yellow. Outer half of mandibles brown. Abdomen whitish.

Head with scanty fine hair. Abdominal tergites rather densely hairy.

Head oval, distinctly narrowed in front. Fontanelle-spot ("Fontanellplatte") placed a little behind middle of head. Basal portion of clypeus somewhat obliquely quadrate, small. Upper lip lancet-shaped, reaching beyond two-thirds the length of mandibles, somewhat pointed in front. Mandibles relatively short, slender, slightly curved. Antennæ 14-jointed; 2nd joint about as long as 3rd and 4th together, 3rd and 4th of equal length.

Pronotum narrow, anterior margin slightly excavated.

| | | |
|---|---|---|
| Length of body ... | ...3·4—3·5 | mm. |
| Head with mandibles | ... 1·22 | ,, |
| ,, without ,, | ... ·84 | ,, |
| Breadth of head ... | ... ·68 | |
| ,, of pronotum | ... ·46 | ,, |

LARGE WORKER.—Head light yellowish. Abdomen whitish. Hair same as in soldiers.

Head quadrate-oblong. Base of clypeus relatively large. Condyles of mandibles large. Antennæ 14-jointed, of same structure as in soldiers.

Pronotum excised in front.

| | | | |
|---|---|---|---|
| Length of body ... | ... | 3·7 | mm. |
| Breadth of head ... | ... | ·87 | ,, |
| ,, of pronotum | ... | ·46 | ,, |

SMALL WORKER.—Colour and hair as above.

Head oval. Base of clypeus large. Antennæ same as in large worker.

| | | |
|---|---|---|
| Length of body ... | ... | 2·9 mm. |
| Breadth of head ... | ... | ·68 ,, |
| ,, of pronotum | ... | ·42 ,, |

*Geographical Distribution.*—Wallon (Heim), found together with *Odontotermes wallonensis*, Wasm.

**Note.**—WASMANN regarded this species as identical with *Microtermes incertus*; it is however smaller.

*Microtermes anandi*, n. sp.

IMAGO.—Not known.

SOLDIER.—Very close to *M. incertoides*. Labrum, however, broader, rounded at the tip. Mandible straight, with but slightly curved extremity.

| | | |
|---|---|---|
| Length of body ... | ... | 3 mm. |
| Head with mandibles | 1·25—1·33 | ,, |
| ,, without ,, | ... | ·84 ,, |
| Width of head ... | ...·72—·76 | ,, |
| ,, of pronotum | ... | ·49 ,, |

WORKER.—Scarcely different from that of *M. incertoides*.

| | Small worker. | Large worker. |
|---|---|---|
| Length of body .. .. .. .. | 2·5 mm. | 3 mm. |
| Width of head .. .. .. .. | ·72 ,, | ·99 ,, |
| ,, pronotum .. .. .. | ·42 ,, | ·49 ,, |

*Geographical Distribution.*—Anand (Gujarat).

**Collector's Report :—**

ANAND, 6-1-1912.—"Termites together with *O. obesus* in some half-burnt boards of deal-wood lying on ground in garden. Boards covered by termites (whether by *O. obesus* or the other species [*Microt. anandi*] or both, I cannot say) with tunnels of earthy material." (Assmuth.)

*Microtermes anandi*, forma ; *curvignathus*, n. f.

IMAGO.—Not known.

SOLDIER.—Mandibles more strongly curved than in principal form, with very long, inwardly bent tip.

WORKER.—Same as in principal form.

*Geographical Distribution* —Bombay.

## HAMITERMES SECTION.

### Gen. EREMOTERME, Silv.

(Syn. PSEUDOMIROTERMES, Holmgr. in litt.)

*Eremotermes paradoxalis*, n. sp.

IMAGO.—Not known.

SOLDIER.—Head yellow. Outer half of mandibles brownish black. Thorax yellowish. Abdomen whitish.

Head as well as abdomen with rather dense fine hair.

Head seen from above quadrate, somewhat longer than broad, almost imperceptibly narrowed in front, rather thick, frontal torus ("Stirnwulst") *Cubitermes*-like, hairy. Beneath the torus a very large fontanelle with a big gland. From fontanelle, forehead sharply receding (more so than with *Eremotermes indicatus*, Silv., from Tunis). Clypeus relatively large, obliquely quadrate, basal portion of it anteriorly slightly bilobed. Labrum short, triangular. Mandibles of same length as head, nearly rod-shaped ("staebchenfoermig"), their outer margin slightly depressed in the middle (as in *Synhamitermes quadriceps*). Basal part of both mandibles strongly developed, distinctly heel-shaped, apical part slightly bent inward. In the middle of inner margin of mandibles a small tooth pointing inward. Antennæ 13-jointed; 1st joint a little longer than 2nd and 3rd together, 2nd as long as 3rd, 4th a trifle shorter than 3rd.

Pronotum narrow, distinctly saddle-shaped, anterior margin barely excised.

Abdomen short and stout, its sides bulging out in shape of little bladders ("blæschenartig ausgestuelpt") as in *Globitermes globosus*.

| | | |
|---|---|---|
| Length of body ... | ... | 3-3·25 mm. |
| Head with mandibles | ... | 1·79 ,, |
| ,, without ,, | ... | ·95-1·03 ,, |
| Width of head ... | ... | ·76 ,, |
| ,, of pronotum | ... | ·42 ,, |

WORKER.—Two sizes.

Whitish, with yellowish head.

Hair fine and rather dense.

Head quadrate, with rounded angles. Basal portion of clypeus large, its length equal to half its width, flat. Antennæ of 13-14 joints; the entire antennæ as well as the single joints are very short with the small, longer with the large workers. 2nd joint of antennæ at least as long as 3rd and 4th (both of which are short) together, 5th as long as 4th; joints from 5th onward gradually increasing in length.

Pronotum saddle-shaped, slightly indented in front.

Abdomen short and stout.

| | Small worker. | Large worker. |
|---|---|---|
| Length of body .. .. .. .. | 2·5 mm. | 2·5 mm. |
| Width of head .. .. .. .. | ·68 „ | ·76 „ |
| „ pronotum .. .. .. | ·39 „ | ·46 „ |

Nymph.—Long and slender, white. Basal portion of clypeus large, flat. Ocelli distant from the eyes by more than their diameter. Antennæ 14-jointed. Pronotum narrower than head, its posterior margin somewhat excavated.

Length of body... ... 5·5-6 mm.
Width of head ... ... ·72 „
„ of pronotum ... ·65 „

*Geographical Distribution.*—British India: Bangalore.

**Collector's Report :—**

Bangalore, 30-10-1911.—" In remarkably flat tunnels (transverse section oblong-ovate) constructed in pillars of mound of *O. bangalorensis*. The tunnels extended further into solid ground beyond *bangalorensis*-mound ; there also the main nest apparently-situated." (Assmuth.)

**Note.**—*Eremotermes* belongs to the *Hamitermes*-series and is, apart from the species just described, represented only by one other species, viz., *Eremotermes indicatus*, Silv., from Tunis. It would be interesting to know whether this genus—like *Mirotermes*—contains forms jumping by the aid of their mandibles ; in this case the parallelism with *Mirotermes* would be nearly complete.

## MICROCEROTERMES SECTION.

Gen. MICROCEROTERMES, Silv.

*Microcerotermes tenuignathus*, n. sp.

Imago.—Not known.

Soldier.—Head yellow, slightly tawny towards the front. Mandibles brown. Abdomen white.

Head very sparsely covered with hair. Abdominal tergites rather densely hairy.

Head rather thick, quadrate, with rounded angles, longer than broad. Forehead sloping, slightly impressed. Fontanelle in horizontal portion of head. Basal portion of clypeus lense-shaped. Labrum tongue-shaped, rounded at tip. Mandibles rather long, slender, somewhat falcate, with barely perceptible serrate teeth.

Antennæ slender, 13-jointed; 2nd joint somewhat shorter than 3rd and 4th together, 3rd much shorter than 4th.

Pronotum saddle-shaped, slightly excised in front.

| | | |
|---|---|---|
| Length of body | ... ... | 4-4·5 mm. |
| Head with mandibles | ... | 1·9 ,, |
| ,, without ,, | ... | 1·14 ,, |
| Width of head | ... ... | ·8 ,, |
| ,, ,, pronotum | ... ... | ·53 ,, |

LARGE WORKER.—Head yellowish. Abdomen whitish.

Head very sparsely covered with hair. Abdominal tergites finely hairy.

Head thick, quadrate-oval, longer than broad. Facetted eyes present as brownish spots. Fontanelle indistinct. Basal portion of clypeus nearly as long as half its breadth, moderately arched. Antennæ 13-jointed: 2nd joint as long as 3rd and 4th together, 3rd very short.

Pronotum very slightly excised in front.

| | | |
|---|---|---|
| Length of body | ... ... | 3·8 mm. |
| Width of head | ... ... | ·91 ,, |
| ,, ,, pronotum | ... ... | ·53 ,, |

SMALL WORKER.—Similar to large worker.

| | | |
|---|---|---|
| Length of body | ... ... | 3·8 mm. |
| Width of head | ... ... | ·76 ,, |
| ,, ,, pronotum | ... ... | ·42 ,, |

*Geographical Distribution.*—Gujerat: Vadtal.

**Collector's Report :—**

VADTAL.—31-12-1911.—"In dry fire-wood." (Assmuth.)

[1] This article as well as the other in Vol. XXI, No. 3, by Dr. Holmgren, have both been translated from the German.—Ed., Journ. B. Nat. Hist. Soc.

# PLANTS OF THE PUNJAB.

## A BRIEF DESCRIPTIVE KEY TO THE FLORA OF THE PUNJAB, NORTH-WEST FRONTIER PROVINCE AND KASHMIR.

BY

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*Indian Medical Service.*

### PART XI.

*(Continued from page 1059 of Volume XXI.)*

HERBS, ERECT, WITH ALTERNATE EXSTIPULATE SIMPLE LEAVES

LEAF MARGINS ENTIRE.

PETALS UNUNITED.

**Arabis glabra,** see Herbs, Erect, Unbranched, Exstipulate, Simple.

**Arabis nuda,** see Herbs, Erect, Unbranched, Exstipulate, Simple.

**Notoceras canariense,**
CRUCIFERÆ.
F. B. I. i. 140.
The Plains.
Baluchistan (Stocks).

small, covered with flattened gray hairs, stiff; leaves small, linear-oblong; flowers white in short, many-flowered, leaf-opposed racemes, sepals 4, equal below, covered with flat-laid hairs, petals 4, small linear-oblong stamens 6, 4 inner longer in opposite pairs, style short, stigma round; capsule ¼ in. long, nearly sessile, erect, linear-oblong, valves with a keel ending at the tip in a horn, seeds 4-8.

**Alyssum minimum,**
CRUCIFERÆ.
F. B. I. i. 141.
Kashmir, 4-6,000 ft.
Baluchistan (Boissier).

small, grey with star-shaped hairs or scales except on the petals and pods, stems and branches many; leaves linear-oblong or ovate with a broad tip, entire; flowers small, yellowish or white in many-flowered bractless racemes, sepals 4, short, equal at the base, petals 4, linear, minute, with short stalks, stamens 6, 4 inner, longer in opposite pairs, all winged, style very short, pointed; pod short, smooth orbicular, slightly notched, seeds 2-10, flattened.

**Sisymbrium mollissimum,**
CRUCIFERÆ.
F. B. I. i. 147.
Himalaya, 8-10,000 ft.
Kashmir.

small to medium size, biennial or perennial, branched or not, smooth or hairy; leaves 1-2 in., lanceolate-ovate with a broad tip, shortly stalked, entire or toothed, stem leaves oblong, stem-clasping, shaped like an arrow-head, flowers small, purple or white in long racemes, minor flower stalks. ¼-½ in., erect, slender, sepals 4, short or long, equal at the base; or two-pouched, petals 4, long-stalked, stamens like the last species, style short, stigma 2-20 bed; pod ½-1½ in., erect, slender, straight, smooth, valves convex, veins indistinct, stalk slender, seeds many, 1-seriate, not margined.

HERBS, ERECT, WITH ALTERNATE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNUNITED.

**Sisymbrium Thalianum,** see Herbs, Erect, Alternate, Exstipulate, Simple, Toothed.

**Sisymbrium rupestre,** see Herbs, Erect, Alternate, Exstipulate, Simple, Toothed.

**Erysimum repandum,** see Herbs, Erect, Alternate, Exstipulate, Simple, Toothed.

**Erysimum odoratum,** see Herbs, Erect, Unbranched, Alternate, Exstipulate, Simple.

**Diplotaxis Griffithii,** see Herbs, Erect, Alternate, Exstipulate, Lobed.

**Moricandia tortuosa,**
CRUCIFERÆ.
F. B. I. i. 158.
Salt Range,
The Plains of N. W. F. Province (Fleming).

medium size, perennial, smooth with a bluish-green waxy gloss, stem below thick, woody, sometimes twisted; leaves lower 3-5, with a broad stalk, oblong with rounded ends, thick, entire or toothed, stem-leaves sessile; flowers large, pink, few erect in a long raceme, sepals 4, erect, lateral pouched below, petals 4, nearly twice as long as the sepals, stalked, stamens as in the last species, style short, pointed conical; pod linear, erect or turning upwards, beak ¼ in. cylindric, one-seeded, valves convex, with minute lines, margins prominent, seeds many, nearly round, in one series.

**Thlaspi alpestre,** see Herbs, Erect, Unbranched, Alternate, Exstipulate, Simple.

**Neslia paniculata,**
CRUCIFERÆ.
F. B. I. i. 164.
Himalaya 5-6,000 ft.
West of the Beas River.
Hazara (Stewart).
Kashmir.
Baluchistan (Boissier).

medium size, annual, slender, branched above; leaves ½-2 in., lanceolate-oblong, stem leaves arrow-head-shaped; flowers small, yellow, many on long slender spreading smooth stalks in branched racemes without bracts, sepals 4, spreading, equal at the base, petals 4, entire, stamens as in the last described species, style slender, sharp; pod nearly round, a little broader than long, slightly flattened, smooth, seed solitary.

**Euclidium syriacum,**
CRUCIFERÆ.
F. B. I. i. 164.
The Plains west of the Jhelum to 6,000 ft.
Peshawaur, Rawalpindi Kashmir, Baluchistan (Boissier).

small, annual, velvety with forked hairs, branched, branches stout, stiff when old; leaves 1-4 in., oblong lanceolate, stalked; flowers small, white in terminal or lateral bractless racemes, sepals, petals and stamens as in the last species, pod ½ in., nearly round, erect, nearly sessile, hairy, pitted, crowned by an awl-shaped oblique beak, septum thick, seeds 2, oblong.

**Physorhyncus brahvicus,** see Shrubs, Alternate, Exstipulate, Simple.

**Chorispora tenella,**
CRUCIFERÆ.
F. B. I. i. 166.
The Salt Range, Kashmir, 5-6,000 ft.

small, annual, hairy or rough glandular, rarely smooth, much branched; leaves oblong-lanceolate or broad narrowed to the base, shortly stalked, lower leaves sometimes lobed; flowers small, purple on short stalks in long bractless racemes, sepals 4, erect, lateral pouched below, petals 4, stamens as in the last species, pod 1½ in., hardly constricted, ascending, curved, slender, cylindric, seeds many, 2-series.

HERBS, ERECT, WITH ALTERNATE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNUNITED.

**Cleome papillosa,**
CAPPARIDACEÆ.
F. B. I. i. 168.
The Plains West of the Ravi.
Karana Hills (Douie)
Baluchistan (Boissier)

small to medium size, strongly scented, hairy, often glandular; leaves ½-1½ in., ovate-heart-shaped penninerved, blunt, with nipple shaped projections and flattened stiff hairs, lowers, long-stalked, upper nearly sessile; flowers very small, pinkish to dirty yellow in racemes lengthening in fruit, with oblong small bracts, sepals 4, spreading, petals 4, stamens 6, sessile, style short; capsule 1-1½ in., nearly sessile, very slender, 2-valved, seeds many, kidney-shaped, granular.

**Cleome quinquenervis,**
CAPPARIDACEÆ.
F. B. I. i. 168.
The Plains West of the Ravi.

small to medium size, woody, stiff, sticky, strongly scented; leaves 1 in. diam., nearly circular, blunt or short-pointed, base heart-shaped or rounded, stalks and edges glandular, softly velvety, palmately 5-nerved; flowers small in racemes, lengthened in fruit, bracts leafy nearly sessile, sepals and petals as in the last species, stamens 4 or 6; capsules 1-1½ by ¼ in., sharp at both ends, narrowly oblong, sessile hairs short, stiff with broad bases with soft black glandular hairs, seeds minute, smooth.

**Linum usitatissimum,**
Flax, linseed.
*Alsi*
LINACEÆ.
F. B. I. i. 410.
The Plains to 6,000 ft.
Baluchistan (Hughes-Büller).

medium size, annual, stem cylindric; leaves narrow, nearly 3-nerved; flowers 1 in. diam., blue in broad terminal clusters, sepals 5, ovate, long-pointed, 3-nerved, margins white, without glands; petals 5, twisted, soon falling off, stamens 5, alternating with 5 small staminodes, united below, styles 5; capsule 5-celled, scarcely longer than the sepals, seeds 10, brown, flattened, polished. This plant is widely cultivated for its seeds, from which linsed oil (alsi ka tel) is extracted, in India it is not grown for the fibre, flax, from which in Europe linen is woven.

**Linum perenne,**
LINACEÆ.
F. B. I. i. 411.
Himalaya 9-13,000 ft.
Lahoul (Jaeschke)
Baluchistan (Boissier).

medium size, perennial, stems many; leaves ½-¾ in., all lanceolate, or lower oblong blunt, and upper linear short-pointed; flowers 1 in. diam., blue in few-flowered racemes, sepals ovate with glandular margins, capsule much larger than the white margined sepals; otherwise like the last species.

**Linum strictum,**
LINACEÆ.
F. B. I. i. 411.
The Plains 1-6,000 ft.
Peshawaur, Rawalpindi, Baluchistan (Lace).

small, annual, or biennial, slender, smooth or slightly velvety; leaves ¼-½ in. linear, linear-oblong, or lanceolate, long-pointed, 1-nerved; flowers ¼-⅜ in. diam., yellow shortly stalked in flat-toped terminal clusters, sepals with long green rigid points, margins glandular, capsule ¼ in., round, much shorter than the sepals; in other characters like the last species.

HERBS, ERECT, WITH ALTERNATE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNUNITED.

**Linum mysorense,**
LINACEÆ.
F. B. I. i. 411.
Himalaya 3-5,000 ft.
Dharmpur.

small, annual, smooth, slender; leaves ⅛-⅜ in., oblong with rounded ends, or short-pointed, 3-nerved; flowers ¼ in. diam. yellow in large branching flat-topped clusters made up of one-sided racemes, sepals short, petals longer than the sepals, stamens and styles united below, stigmas round, capsule round, equal to the sepals, otherwise like the last species.

see Shrubs, Erect, Alternate, Exstipulate, Simple.

**Crotalaria albida,**
**Sedum Rhodiola,**
CRASSULACEÆ.
F. B. I. ii. 417.
Himalaya 12-17,000 ft.
Kashmir.

small to medium size, rootstock perennial thick smelling of roses crowned with scales, stems thick; leaves ½-1½ in. long, ovate with broad tip or broadly oblong, often toothed towards the tip, green with a waxy gloss; flowers small, male or female, yellow in close terminal often branched clusters, calyx 5, often 4-fid, lobes narrow, oblong, petals 5, often 4, long in males, short in females, stamens twice as many as the petals, long, projecting, styles 5-4 short, recurved in fruit, carpels 5-4, ⅛ in. long, not narrowed at the base, seeds many oblong with rounded ends, flattened.

**Sedum tibeticum,**
CRASSULACEÆ.
F. B. I. ii. 418.
Himalaya 12-14,000 ft.
Lahoul (Jaeschke).

small, smooth; leaves ⅛-½ in., loosely overlapping, upper oblong, lower often ovate, flowers often in fives as petals and sepals, pink or purple, sepals on fruit triangular long-pointed, other characters like the last species.

**Sedum quadrifidum,**
CRASSULACEÆ.
F. B. I. ii. 418.
Himalaya 11-18,000 ft.
Kashmir.

very like the last species, but stems many; leaves nearly cylindrical, flowers red, often with four petals and sepals, the latter oblong, styles short, sometimes straight.

**Sedum elongatum,**
CRASSULACEÆ.
F. B. I. ii. 419.
Himalaya 10-12,000 ft.
Kashmir.

like the last species, but larger; leaves ¾-2 in. oblong, narrowed at the base or oblong with rounded ends, sessile, clusters large, sepals lanceolate-linear, petals black-purple lanceolate, carpels hardly ⅛ in. each; flowers both male and female.

**Sedum linearifolium,**
CRASSULACEÆ.
F. B. I. ii. 420.
Himalaya 7-10,000 ft.
Matiana,
The Chor (Collett),
Jaku, Simla.

small, smooth or nearly so, rootstock thick, stems tufted; leaves ½-¾ in., sessile, narrowly oblong, rarely a few teeth, blunt radical leaves few, stem leaves many; flowers ⅛ in., white, in 2-8 flowered clusters, sepals oblong-lanceolate, petals ⅛ in. long, broadly lanceolate; otherwise like the last species.

**Sedum Jaeschkei,**
CRASSULACEÆ.
F. B. I. ii. 421.
Lahoul, Kangra Dist.

small, annual, branches crowded; leaves, lower crowded, upper scattered or crowded at the end of branches, oblong prolonged into the stalk, short-pointed; flowers nearly ⅛ in. long, golden yellow solitary at the end of branches or in small plants clustered, sepals ¼-⅓ in. long, green fleshy, petals twice the sepals, lanceolate, blunt, stamens half as

HERBS, ERECT, WITH ALTERNATE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNUNITED.

long as the petals, follicles erect in fruit, 5 ; otherwise like the last species.

**Sedum multicaule,**
CRASSULACEÆ.
F. B. I. ii. 422.
Himalaya 4-7,000 ft.
Simla (Collett) Kashmir.

small, smooth, much divided from the base ; leaves ⅓-1 in. long, linear-oblong, short-pointed, flowers yellow, nearly sessile in clusters, follicles spreading in fruit, not rough, seeds rough, ovate with a broad top ; otherwise like the last species.

**Drosera peltata, var. lunata.**
DROSERACEÆ.
F. B. I. ii. 424.
Himalaya 4-8,000 ft.
Simla (Collett).

small to medium size, perennial, sometimes unbranched, slender, glandular ; leaves ¼ in. across, semi-lunar, covered above and on margins with sticky glandular hairs, radical leaves smaller, soon falling-off ; flowers ¼ in. diam., white interminal branching racemes, calyx 5-toothed glandular, petals 5, stamens 5, styles 3, stigmas minutely fringed ; capsule 3-valved, enclosed in the calyx and petals, seeds many, minute, united to the valves. This plant is allied to the English sundew and is an insectivorous plant, the remains of insects are found sticking to the leaves.

**Ammania baccifera,**

see Herbs, Erect, Opposite, Exstipulate, Simple, Entire.

**Epilobium latifolium,**

see Herbs, Erect, Opposite, Exstipulate, Simple, Entire.

**Epilobium origanifolium,**
ONAGRACEÆ.
F. B. I. ii. 586.
Himalaya 9-14,000 ft.
Kashmir.

small to large, stem cylindrical with 2 lines of hairs, sometimes velvety all over ; leaves vary much, mid stem leaves opposite, sessile or shortly stalked, ovate or ovate-oblong, 1 in. long, sometimes 3 in. ; flower usually few, at the end of branches, petals less than ¼ in. ; stigma club-shaped, capsule 1½-3 in., seeds narrow, long, somewhat narrowed at the top, seeds minutely dotted ; otherwise like E. latifolium.

BUPLEURUM—FLOWERS ON STALKS FORMING THE RADII OF A CIRCLE (UMBELS).

**Bupleurum lanceolatum, Buplever or Hare's ear,**
UMBELLIFERÆ.
F. B. I. ii. 674.
Himalaya 4-9,000 ft.
Fagu (Collett).
The Galis (Douie).
Kashmir.

medium size to large, perennial, smooth ; leaves, lower lanceolate, long-stalked middle stem-ones 3-5 by ½-3 in., ovate, long-pointed, bracts none or only one, ½ in., linear, bracteoles 2-6, narrowly lanceolate, much shorter than the umbels, soon falling-off ; flowers very small, yellow on short stalks 5-6 combined on 5-8 unequal rays forming a compound umbel, calyx teeth none, petals 5, ovate with a broad tip, the latter inflexed, the outer petals of an umbel enlarged, stamens 5, styles 2 ; fruit ¼ in. of 2 one-seeded carpels hanging on to a central undivided stalk (carpophore), each carpel, which is convex externally, has 5 longitudinal obscure ridges with 3 oil canals

HERBS, ERECT, WITH ALTERNATE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNUNITED.

(vittæ) in each furrow; seeds plane, or concave on the inner side.

**Bupleurum Candollii.**
UMBELLIFERÆ.
F. B. I. ii. 674.
Himalaya 8-12,000 ft.
Simla, Mahasu Matiana (Collett).

leaves, lower stem 2-5 by $\frac{1}{5}$-$\frac{1}{2}$ in., linear-oblong, upper 1-4 by $\frac{1}{4}$-$\frac{3}{4}$ in., oblong or ovate, nearly sessile and stem-clasping, bracts 2-3 or none, $\frac{1}{4}$-$1\frac{1}{4}$ in. ovate or oblong, short-pointed, leafy, angular, bracteoles 2-5, $\frac{1}{10}$-$\frac{1}{5}$ in., leafy, oblong with or without, rounded ends, as long as the flowering minor umbel (umbellule), carpel $\frac{1}{8}$ in., ridges on ripe carpels distinct; otherwise like the last species.

**Bupleurum jucundum,**
UMBELLIFERÆ.
F. B. I. ii. 675.
Kashmir 7-10,000 ft.
Budrawur(C.B.Clarke).
Lahoul (Jaeschke).

medium size; leaves, lower stem 1-$1\frac{1}{2}$ in., circular, very shortly stalked, upper stem-ones ovate, deeply heart-shaped, stem-clasping, bract one or none, $\frac{1}{2}$-$\frac{3}{4}$ in., ovate, leafy, often stem-clasping, or heart-shaped, bracteoles 4-5, $\frac{1}{8}$ in., often none, oblong short-pointed, usually shorter than the umbellule, fruit $\frac{1}{12}$ in., otherwise like the last species.

**Bupleurum Thomsoni.**
UMBELLIFERÆ.
F. B. I. ii. 675.
Himalaya 7-9,000 ft.
Sonamerg(C.B.Clarke).

large; leaves, stem linear, upper stem 2-4 in., lanceolate, long-pointed or ovate stem-clasping, heart-shaped, bracts none or 1-2, lanceolate, bracteoles 5-9, lanceolate long-pointed or linear, as long as the flowering umbellules, rays of the umbels 6-10, 1-$2\frac{1}{2}$ in., rays of the umbellule often 20, fruit $\frac{1}{8}$ in., oblong, carpels cylindrical, with a bluish green waxy gloss, 5-winged, furrows containing 4-3 oil canals, carpel stalk divided, very thin; otherwise like the last species.

**Bupleurum divorsifolium,**
UMBELLIFERÆ.
Himalaya 7-9,000 ft.
Kashmir 9-12,000 ft.

medium size to large; leaves, upper stem lanceolate long-pointed, base ovate nearly stem-clasping, hardly heart-shaped, middle stem quite stem-clasping, lower stem linear, bracts none, or one, small, lanceolate, bracteoles 5-8, narrow lanceolate, long-pointed, shorter than the fruiting umbellules, rays of the umbel 8-14, fruit $\frac{1}{8}$ in., ridges distinct, furrows with 3 oil canals; otherwise like the last species.

**Bupleurum falcatum,**
UMBELLIFERÆ.
F. B. I. ii. 676.
Himalaya 3-12,000 ft.
Kashmir
Simla
Mashobra (Collett).
Baluchistan (Lace).

leaves radical linear, broader upwards, stem usually curved, half stem-clasping or sessile, long-pointed, middle stem linear short-pointed, narrowed at the base, more or less stem-clasping, bracts usually none or 1-5 lanceolate, hardly $\frac{1}{4}$ in., lanceolate, branches 4-5, narrowly lanceolate, distinctly shorter than the fruiting and not longer than the flowering umbellules, rays 5-8, $1\frac{1}{2}$ in; fruit $\frac{1}{12}$-$\frac{1}{8}$ in. brown; otherwise like the last species.

**Bupleurum longicaule,**
UMBELLIFERÆ.
F. B. I. ii. 677.
Himalaya 8-13,000 ft.
Kashmir.

small to medium size; leaves very variable, lower stem leaves linear or lanceolate, short-pointed, upper often wider at the base, ovate, bracts 1-3, bracteoles 5-8 oblong, long-pointed, leaflike, longer than the flowering or fruiting umbellule, rays 3-8,

HERBS, ERECT, WITH ALTERNATE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNUNITED.

1-2½ in., stoutish, streaked, petals usually black; otherwise like the last species.

**Bupleurum tenne,**
UMBELLIFERÆ.
F. B. I. ii. 677.
The Plains to 9,000 ft.
Simla, Mashobra (Collett).
Murree.

leaves, lower linear, sessile 1-3 by ¼ in., upper linear-oblong round tipped, bristle-pointed, base narrowed, bracts 1-4, ¼ in., lanceolate, short-pointed, bracteoles 4-5, lanceolate-ovate with a broad tip, longer than the umbellules, rays 3-8, less than an inch, never stout, fruit $\frac{1}{10}$-$\frac{1}{8}$ in., broadly oblong, yellowish-brown, ridges distinct, furrows with one or no oil canals; otherwise like the last species.

**Bupleurum Maddeni,**
UMBELLIFERÆ.
F. B. I. ii. 678.
Himalaya, 6-8,000 ft.
Simla (Collett).

medium size, stems several, leaves small, linear, long-pointed, bracteoles few, not prominent, furrows of fruit with 2-3 oil canals; otherwise like the last species.

**Bupleurum setaceum,**
UMBELLIFERÆ.
F. B. I. ii. 678.
Kashmir, 4,500 ft.
Kishtwar (C.B. Clarke).

annual, slender; leaves 1-2½ in. uppermost ¼ in., bristle-like, umbels simple, few-flowered bracts 1-4, ⅛-½ in., narrowly linear-lanceolate, usually longer than the fruiting umbel, fruit $\frac{1}{10}$ in., rough between the ridges, one large oil canal in each furrow; otherwise like the last species.

**Commelina coelestis,**
*Spider wort,*
COMMELINACEÆ.
F. B. I. vi. 369.
Himalaya, 6-7,000 ft.
Simla (Collett).

medium size, annual, robust, succulent, velvety or felted; leaves 2-5 in. long, lanceolate long or short-pointed, nerves parallel, bases sheathing; flowers ⅔ in., sky-blue in a small cluster, flowering in succession, enclosed in a leaf-like, folded bract (spathe), spathe broadly ovate, ½-¾ in. long, heart-shaped, pointed, sepals 3, green, thin, free or united at the base, persistent, petals 3, bright blue free, longer than the sepals, one larger blade circular, spreading, stamens 6, not hairy, anthers bright yellow, style spirally twisted, stigma small; capsule 3-valved, seeds few, usually angular wrinkled. A native of Mexico, cultivated in flower gardens and found as an escape.

**Commelina Hasskarlii,**
COMMELINACEÆ.
F. B. I. vi. 370.
The Plains, east of the Sutlej, Delhi.

small, much branched, rough or smooth, leaves 1-3 by ½-¾ in., narrowly lanceolate, nearly short-pointed or blunt, spathes ½-1 in., axillary, stalked, folded, clusters velvety, upper branch 2-4, lower 1-2-flowered, seeds cylindric, smooth, abrupt at one end, almost pointed at the other; for other characters see the last species.

**Commelina obliqua.**
COMMELINACEÆ.
F. B. I. vi. 372.
Himalaya, 1-6,000 ft.
Simla (Collett).
Kasauli.

medium size to large, stem stout, branched, leaves 4-7 by 1-2 in., lanceolate, sessile or stalked, short or very long-pointed, smooth or woolly beneath, sheaths ⅝ in. margins often bearded, spathes ¾-1½ in. sessile or stalked, solitary or crowded, funnel-shaped, capsule, three angled, seeds lead-coloured; for other characters see Commelina co-elestis.

HERBS, ERECT, WITH ALTERNATE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNUNITED.

**Juncus bufonius,**
*Toad rush*
JUNCACEÆ.
F. B. I. vi. 392.
The Plains to 13,000 ft.
In wet places.

small, annual, pale green, smooth, stems tufted, slender, branched from the base upwards; leaves bristle-like, few, channelled above, base sheathing, pale, flowers ½-¼ in. long, pale green in axillary or terminal clusters, sepals 3 with a broad thin margin, persistent, long-pointed with a broad thin margin, persistent, petals 3, like the sepals but without the midrib, stamens 6 or 3, half as long as the sepals, 6 in the open lateral flowers, 3 in the closed terminal flowers; capsule ovoid with a broad top, blunt, pale, shorter than, and enclosed in, the persistent sepals and petals, seeds very minute, finely net veined, tips almost rounded.

PETALS UNITED.

POLYGALA—FLOWERS SOMEWHAT LIKE THOSE OF A PEA.

**Polygala triphylla,**
*Milkwort.*
POLYGALACEÆ.
F. B. I. i. 201.
Himalaya, 4-8,000 ft.
Simla, Syree (Collett).
Dharmpur.

small, annual, slender, smooth; leaves ½-2½ in., circular or oblong contracted into the stalk, stalk often winged, membranous, smooth, blunt; flowers ⅓ in., pink in slender many-flowered terminal racemes 1½-2 in., bracts 3, soon falling off, sepals 5, unequal 2 inner, petal-like, in colour equal to the petals, 3 outer smaller, green, failing off after flowering, petals 3, unequal, united at the base, 2 upper small, the lowest (keel) longset, concave, 2-lobed at the tip, not crested at the tip with a fringed brush, stamens 8, united in two sets of 4 each, joined to the petals, style long, incurved; capsule $\frac{1}{16}$-½ in., 2-celled, round, narrowly winged, membranous, seeds black, hairy, one in each cell, prolonged at the base by 2 minute appendages.

**Polygala crotalarioides,**
POLYGALACEÆ.
F. B. I. i. 201.
Himalaya 4-7,000 ft. east of the Ravi.
Simla (Collett).

perennial, densely hairy, rootstock woody, often tuberous, stems short, thick, sometimes reclining; leaves ½-2 in., ovate or oblong-ovate, tip rounded with or without an abrupt point, with few scattered hairs; flowers ¼-½ in. long, purple, very shortly stalked in very short, dense-flowered, rarely terminal racemes, bracts minute, awl-shaped, sepals persistent, inner wing sepals ovate with a broad tip, twice as long as the capsule, keel petal crested, capsule heart-shaped, broader than long, fringed with bristles, seeds with 2 small appendages; otherwise like the last species.

**Polygala abyssinica,**
POLYGALACEÆ.
F. B. I. i. 202.
Himalaya, 3-8,000 ft.
Simla (Collett).
Matiana Multan (Edgeworth).

small to medium size, smooth, branches many; leaves ½-¾ in., narrow linear, long-pointed, almost sessile, flowers ¼ in. long, pink on one side of long terminal slender loose-flowered racemes 2-6 in. long, bracts ovate, soon falling off, wing sepals yellowish green, capsule narrowly winged near the top, seeds densely hairy, not appendaged; otherwise like the last species.

HERBS, ERECT, WITH ALTERNATE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

**Polygala leptalea,**
POLYGALACEÆ.
F. B. I. i. 202.
Himalaya, 2-5,000 ft.
Kashmir.

very much like the last species, but the stem deeply furrowed, the lower leaves often oblong-lanceolate, racemes 1-2 in., dense-flowered flowers smaller, seeds silky.

**Polygala Hohenhackeriana,**
POLYGALACEÆ.
F. B. I. i. 202.
The Plains west of the Jhelum to 3,500 ft. in Waziristan (Stewart).
Attock (Vicary).
Baluchistan (Stocks).

very small, with grey hairs or velvety, stems and branches many from a perennial stock; leaves $\frac{1}{3}$-$\frac{2}{3}$ in., grey hairy, thin smooth, oblong-lanceolate or lanceolate-ovate with a broad tip, blunt or nearly short-pointed; flowers $\frac{1}{4}$ in., drooping on short stalks in nearly sessile dense-flowered terminal racemes $\frac{1}{2}$-$\frac{1}{4}$ in. long, bracts small, sepals with broad thin margins, upper outer one much the largest, linear-ovate with a broad tip, 2 lateral very small oblong blunt, wings white; capsule $\frac{1}{4}$ in. circular smooth with a broad membranous wing, seeds densely silky with 2 appendages; otherwise like the last species.

**Polygala persicariæfolia,**
POLYGALACEÆ.
F. B. I. i. 202.
Himalaya east of the Sutlej, 5-9,000 ft.
Valleys below Simla (Collett).
Dharmpur.

small, annual, slender, much branched, slightly velvety; leaves 1-2 in., linear or lanceolate-oblong with rounded ends, nearly sessile flaccid, bracts awl-shaped, stalks curved, racemes 1-2 in., slender, loose flowered, terminal and extra axillary, flowers pink, wing sepals yellowish grey, capsule notched, ovate, minutely fringed, narrowly winged near the tip, seeds woolly with the 2 appendages; otherwise like the last species.

**Polygala erioptera.**
POLYGALACEÆ.
F. B. I. i. 203.
The Plains.

like the last species, but the leaves $\frac{1}{3}$-1 in., racemes axillary or extra-axillary, wing sepals oblong with a strong green midrib.

**Polygala chinensis,**

see Prostrate Herbs, Alternate, Exstipulate, Simple.

**Polygala sibirica,**
POLYGALACEÆ.
F. B. I. i. 205.
Himalaya, 1-6,000 ft.

small to medium-size, velvety, stems many, slender from a perennial stock; leaves $\frac{1}{2}$-2 in., circular or lanceolate-oblong with rounded ends or linear, shining and netted above, margins turned down, wing sepals oblong or ovate with a broad tip, capsule broadly winged, smooth, seeds hairy with 3 appendages; otherwise like the last species described above.

**Cotyledon Oreades,**
CRASSULACEÆ.
F. P. I. ii. 416.
Kashmir.
Pir Panjal (Jacquemont) Marbul Pass, (C. B. Clarke).

very small, annual, fleshy, smooth, stems many curved, branches leafy; leaves $\frac{1}{4}$ in., radical arranged in a rosette narrow lanceolate bristle-pointed flowers small, white nodding in small clusters at the top of branches, sepals $\frac{1}{4}$ in., oblong short-pointed, petals 5, united at the base, a little longer than the sepals, stamens 5, styles 5; carpels 5, tapering into the thread-like styles, seeds many oblong with rounded ends, covered with minute tubercles.

HERBS, ERECT, WITH ALTERNATE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

FLOWERS MINUTE IN HEADS.

FLOWERS ALL TUBULAR.

**Vernonia Cinerea,** see Herbs, Erect, Alternate, Exstipulate, Simple, Toothed.

**Conyza viscidula,** see Herbs, Erect, Alternate, Exstipulate, Simple, Toothed.

**Conyza stricta,** see Herbs, Erect, Alternate, Exstipulate, Simple, Toothed, Inner tubular, outer ligulate.

**Filago germanica,**
*Cudweed.*
COMPOSITÆ.
F. B. I. iii. 277.
The Plains to 8,000 ft.
Valleys below Simla, Suni (Collett).
Kashmir.
N. W. F. Province.
Baluchistan (Lace).

small, annual, woolly, widely branched from the base, sometimes prostrate; leaves ½ in., oblong ovate with a broad tip, stalked or sessile, flowers minute, yellow tubular in clusters of heads ¼-½ in. sessile in the forks of branches, surrounded by leaf-like bracts, heads 6-20, ⅛ in. long, glistening, discoid, calyx of hairs (pappus) corollas inner 2-3 toothed, outer 4-5 toothed, little concave scales at the base passing into bracts round the heads of 2-many series, long pointed, thin, anther bases forked, style-arms oblong or linear blunt; seeds (achenes) minute crowned by the pappus, rough.

**Filago arvensis,**
COMPOSITÆ.
F. B. I. iii. 277.
Kashmir, 7-9,000 ft.
Quetta. (Hughes-Buller).

very like the last species, but leaves linear-lanceolate, leaflike bracts round the clusters of heads are shorter, bracts of the heads not long-pointed.

**Ifloga Fontanesii,**
COMPOSITÆ.
F. B. I. iii. 277.
The Plains.
Baluchistan (Boissier).

small, annual, branched from the base, woolly or smooth, densely leafy, leaves narrowly linear, short-pointed, spreading, margins rolled in; flowers all tubular in reddish heads ⅛ in. long, glistening, smooth, sessile in the axils of the leaves, forming leafy spikes, bracts of the heads reddish, few, bristle-pointed, thin, pappus red, corollas, inner barely, outer 5-toothed, anther bases forked: achenes (seeds) oblong, smooth.

**Anaphalis araneosa,**
COMPOSITÆ.
F. B. I. iii. 283.
Himalaya, 5-8,000 ft.
Simla (Collett).
Murree.

large, perennial, much branched, velvety and glandular, or white felted, leafy, the leaf-bases running down the stem as wings; leaves, radical leaves lanceolate with broad tips, stem leaves 1½-2 by ¼-½ in. linear, short-pointed. Margins turned down; flowers minute, white in nearly globose heads ⅛-¼ in. diam. in nearly round or broad much branched flat-topped clusters, bracts of the heads $\frac{1}{12}$-$\frac{1}{10}$ in. blunt, white, erect in flower, spreading in seed, pappus white, corollas of inner flowers 5-toothed, of outer 2-4 toothed, anther bases forked; achenes (seeds) minute, oblong smooth.

HERBS, ERECT, WITH ALTERNATE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

FLOWERS MINUTE IN HEADS.

FLOWERS ALL TUBULAR.

**Anaphalis contorta,**
COMPOSITÆ.
F. B. I. iii. 284.
Himalaya, 7—10,000 ft. Simla (Collett).
Kashmir.

small to medium size, branches often prostrate; leaves ½-1 by ⅛ in., linear, heads ⅓ in. diam. in dense terminal flat-topped clusters, outer bracts of the heads often purple ; for other characters see the last species.

**Phagnalon niveum,**
COMPOSITÆ.
F. B. I. iii. 288.
Himalaya, 6-8,000 ft.
Kashmir.

small, annual, snow-white with dense cottony wool, branches short and leafy or slender and less leafy ; leaves 1-1½ in., ovate with a broad tip to oblong with rounded ends or linear-oblong sometimes toothed ; flowers minute, yellow and tubular in axillary solitary or clustered heads ¼-½ in., diam. on slender stalks, 1-3 in., bracts of the heads awl-shaped, straight ending in a needle-like point, purplish, outer smaller, grey cottony, pappus hairs slender rigid, corollas, inner 5-fid, outer 2-3-toothed, anther bases forked or entire ; achenes small, not ribbed.

**Gnaphalium iuteo-album,**
*Jersey cudweed,*
COMPOSITÆ.
F. B. I. iii. 288.
The Plains to 10,000 ft.
Simla (Collett).
Kashmir.
Baluchistan (Lace).

small, annual, very variable, woolly, much branched ; leaves 1-2 by ⅛ in., oblong with blunt tips, base often ½ steam-clasping, both surfaces woolly, upper leaves lanceolate short-pointed ; flowers minute whitish, yellowish or brownish in heads, ⅛ in., diam. in leafless dense glistening flat-topped clusters, bracts of the heads oblong, blunt, transparent, yellowish glistening, pappus hairs scanty, short, outer corollas 3-4-toothed, inner larger 5-toothed, anther bases forked, cells with slender tails ; achenes oblong, slender, rough with tubercles or minute curved bristles.

**Gnaphalium hypoleucum,**
COMPOSITÆ.
F. B. I. iii. 288.
Himalaya, 3-7,000 ft.
Simla (Collett).
Kashmir.

very like the last species, but taller and stouter, leaves longer, long-pointed only woolly beneath and often with widely projecting bases.

**Gnaphalium indicum,**
COMPOSITÆ.
F. B. I. iii. 289.
The Plains to 1,000 ft.

annual, slender, more or less covered with white wool, stems many, leafy branches slender ; leaves ½-1½ in., linear-ovate with broad tips or oblong, narrowed to the base with rounded tips and an abrupt point, woolly on both surfaces, lower leaves shortly stalked, heads ⅛ in., diam. in simple or branched leafy spikes or in ovoid clusters, bracts of the heads linear-oblong, short-pointed, pale reddish-brown or yellow, inner nearly smooth, achenes minutely rough ; for other characters see the last species.

HERBS, ERECT, WITH ALTERNATE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

FLOWERS MINUTE IN HEADS.

FLOWERS ALL TUBULAR.

**Pulicaria foliolosa,**
COMPOSITÆ.
F. B. I. iii. 298.
The Plains.
Baluchistan (Lace).

medium-size, annual, velvety or felted, much branched; leaves 1-6 in., linear-oblong, or lanceolate with a broad tip, tips recurved short-pointed, base broad or contracted, ½ stem-clasping; flowers minute, yellow, all tubular in solitary woolly glandular heads, ¼ in. diam., on very slender stalks, bracts of the heads narrow almost bristle-like, double pappus inner of hairs, very few, white, equal to the achenes, outer consists of short-gagged teeth, outer corollas 2-3-toothed, inner 5-toothed, achenes hairy, minute.

**Pulicaria glaucescens,**
COMPOSITÆ.
F. B. I. iii. 300.
The Plains west of the Jhelum.
The Salt Range.
Waziristan.
Baluchistan (Boissier).

medium size, woody, saline succulent; leaves 1-2½ in., linear fleshy, margins flat or rolled in, tips recurved; flowers in heads ⅓ in diam. shortly stalked, shining from the pale yellow pappus, bracts of the heads lanceolate, smooth, short-pointed, stiff, pappus long, achenes short, oblong, silky; for other characters see the last species.

**Carpesium trachelifolium**

see Herbs, Erect, Alternate, Exstipulate, Simple, Toothed.

**Carpesium abrotanoïdes,**
COMPOSITÆ.
F. B. I. iii. 301.
Himalaya, 4-6,000 ft.
Kashmir, Valleys below Simla (Collett).

large, velvety or smooth, branches leafy, long, slender; leaves 3-5 by ½-1 in. lanceolate, long-pointed, nearly sessile, flowers yellow in many heads ¼ in. diam. along the branches or in short axillary racemes, strongly scented, bracts of the heads many, inner broad, blunt, outer green, leafy, margins white, corollas inner 5-toothed, outer 3-toothed, pappus hairs none, anther bases forked; achenes smooth, long, ribbed, beaked. The flowers are used in Kashmir to dye silk.

**Artemisia Dracunculus,**

see Herbs, Erect, Alternate, Exstipulate, Lobed.

**Arctium Lappa,**
**Burdock.**
COMPOSITÆ.
F. B. I. iii. 359.
Himalaya, 6-9,000 ft.

large, rough; leaves 3-12 in. across, broadly ovate-heart-shaped, margin wavy or wavy-toothed, smooth or grey or white-cottony beneath; flowers purple in cottony or smooth terminal globose clustered heads ¾-1½ in. diam., bracts of the heads stiff, angled, spreading, hooked, receptacle flat, very bristly, corollas 5-toothed, anther-bases forked, style-arms white, united, pappus hairs many, short, minutely barbed; achenes large smooth, finely ribbed, angled.

**Saussurea candicans,**

see Herbs, Erect, Alternate, Exstipulate, Lobed.

**Saussurea albescens.**

see Herbs, Erect, Alternate, Exstipulate, Lobed.

HERBS, ERECT, WITH ALTERNATE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

FLOWERS MINUTE IN HEADS.

FLOWERS ALL TUBULAR.

**Saussurea Jacea,** COMPOSITÆ. F. B. I. iii. 375. Kashmir, 9-15,000 ft. (Falconer).

large, stiff, stem cylindrical, not grooved, branches very leafy ; leaves 3-4 by 1½-2½ in., ovate or oblong, blunt or short-pointed, sessile, half stem-clasping, rough on both surfaces or pinnately divided, terminal lobe largest; flowers purplish ⅔ in., in heads ½-⅔ in diam. solitary, terminal on straight rather slender stalks or in flat-topped clusters, bracts of the heads few, stiff, broad, margins purple, outer bracts ovate, blunt or short-pointed, inner lanceolate, receptacle flat with long flattened bristles, curved, stiff, corollas 5-toothed, pappus hairs ½ in. brown, anthers forked ; achenes ¼ in., smooth, shining, ribs slender, tops abruptly cut off.

**Jurinea modesta,** COMPOSITÆ. F. B. I. iii. 378. N. W. F. Province. Peshawar (Vicary).

small, annual, cottony, branched from the base, branches short ending in very long leafless slender one-headed stalks; leaves 2-3 in. lanceolate, short-pointed, sessile running down the stem, sometimes widely toothed ; flowers ½ in. purple in solitary heads 1 in. diam., bracts of the heads in many series, overlapping, inner narrow, erect, sometimes red, outer shorter, ovate, long-pointed, green with thin margins, bristles of the receptacle ½ as long as the flowers, corollas slender, 5-toothed, anther bases forked, pappus hairs ½ in., white, shining, inner hairs stiff, two much longer, flattened, achenes ¼ in. flattened angles thickened, pale, smooth, shining.

**Volutarella divaricata,** see Herbs, Erect, Alternate, Exstipulate, Lobed.

**Centaurea Cyanus,** see Herbs, Erect, Alternate, Exstipulate, Lobed.

**Centaurea depressa,** see Herbs, Erect, Alternate, Exstipulate, Lobed.

**Centaurea polycephala,** see Herbs, Erect, Alternate, Exstipulate, Lobed.

**Carthamus tinctorius,** see Herbs, Erect, Alternate, Exstipulate, Simple, Toothed.

**Dicomma tomentosa,** COMPOSITÆ. F. B. I. iii. 387. The Plains.

small to medium size, annual much branched, covered with white cottony wool; leaves 1-3 in., linear, blunt or short-pointed ; flowers ¼ in. white or pale yellow, in many solitary, nearly axillary and terminal heads ⅔-1 in. diam., bracts of the heads ½-⅔ in. linear-lanceolate, spinous, shining, tips yellow, stiff, corollas 5-toothed, anther-bases forked, bearded, pappus hairs ¼ in., pale brown, outer slender, inner lanceolate-awl-shaped, ribbed.

HERBS, ERECT, WITH ALTERNATE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

FLOWERS MINUTE IN HEADS.

FLOWERS, INNER TUBULAR, OUTER LIGULATE.

margins wavy, achenes $\frac{1}{8}$ in., short, broad, top-shaped densely silky.

**Solidago Virga-aurea,** see Herbs, Unbranched, Alternate, Exstipulate, Simple.

**Rhyncospermum verticillatum,**
COMPOSITÆ.
F. B. I. iii. 248.
Himalaya 5-6,000 ft.
Valleys below Simla (Collett).
Kashmir.

medium-size to large, velvety, branches slender, spreading; leaves 1-3 in., lanceolate, long-pointed thin, narrowed into a very slender stalk, sometimes toothed, flowers all white or inner pale yellow, very minute in small heads, $\frac{1}{8}$ in. diam., on short stalks or one in every axil of the branches, bracts of the heads few lanceolate, edges thin, dry receptacle flat, bare, corollas, outer in 2-3 series, white, shortly ligulate, male, inner short, tubular bell-shaped, 4-5-toothed, anther-bases blunt or 2-lobed, pappus hair 3-5 or none soon falling off; achenes flattened, beaked.

**Aster Pseudamellus,**
COMPOSITÆ.
F. B. I. iii. 249.
Himalaya, 8-9,000 ft.
Lahoul (Jaeshke).

small to medium-size, rootstock perennial, stems many, undivided below, branched above, slender leafy, rough; leaves 1-2½ by $\frac{1}{3}$-$\frac{3}{4}$ in., green, oblong, short-pointed or blunt, sometimes toothed, sessile; flowers outer 12-16, $\frac{1}{2}$-$\frac{1}{4}$ in., purplish, inner yellow, in heads 1$\frac{3}{4}$ in. diam., forming flat topped clusters, bracts of the heads few, outer large, blunt, green, anther-bases blunt, entire, pappus hairs longer than the achenes, white, slender, few; achenes $\frac{1}{10}$ in., flattened, velvety, one to three ribbed.

**Aster Amellus, Michaelmas Daisy,**
COMPOSITÆ.
F. B. I. iii. 249.
The Plains to 8,000 ft.
Cultivated.

very like the last, but with smaller outer bracts. This plant may be found as an escape near gardens

**Aster molliusculus,**
COMPOSITÆ.
F. B. I. iii. 251.
Himalaya, 5-8,000 ft.
Simla (Collett).
Kashmir.

medium size, velvety or hairy, rootstock perennial, woody, stem many, leafy, slender, stiff; leaves $\frac{1}{2}$-1 in., linear or lanceolate, sometimes toothed, nearly sessile, flowers like the last species, the heads smaller $\frac{1}{2}$-$\frac{3}{4}$ in., solitary, long-stalked, bracts of the heads long-pointed, ligules very many pappus reddish; otherwise like the last species.

**Aster altaicus,**
COMPOSITÆ.
F. B. I. iii. 251.
Himalaya, 9-13,000 ft.
Kashmir, Lahoul, Baluchistan.

very like the last, but much larger, stem grooved, much branched leaves sessile.

HERBS, ERECT, WITH ALTERNATE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

FLOWERS MINUTE IN HEADS.

INNER TUBULAR, OUTER LIGULATE.

**Brachyactis umbrosa,** COMPOSITÆ. F. B. I. iii. 253. Himalaya, 8-12,000 ft. Kashmir, Lahoul, Baluchistan (Lace).

small, annual, glandular and softly hairy, branched from the base, leafy; leaves ½-¾ in., ovate with a broad tip, or with small lobes or wedge-shaped; flowers pale blue or pink in many sessile or long-stalked heads ½ in. diam., one in nearly every leaf-axil, bracts of the heads ½ as long as the flowers in 2-3 series, narrow, outer often leafy, corollas inner tubular, 5 toothed, outer ligulate minute in one to many series, anther-bases blunt, entire, style-arms narrow, flattened, tips lanceolate, pappus hairs ⅛ in., reddish, scanty; achenes ⅛ in., quite flat.

**Brachyactis robusta,** see Herbs, Erect, Alternate, Exstipulate, Simple Toothed.

**Erigeron linifolius,** see Herbs, Erect, Alternate, Exstipulate, Simple Toothed.

**Erigeron canadensis,** COMPOSITÆ. F. B. I. iii. 254. The Plains to 3,000 ft.

small to large, annual, slender, much branched, velvety, hairy or nearly smooth, leafy; leaves 1-3 in., narrowly linear, or linear-lanceolate, long-pointed, sometimes remotely toothed, smooth or hairy; flower, inner yellow, outer pink or purplish in stalked heads, ⅛-¼ in. diam. in long-branched racemes, bracts of the heads narrow, long-pointed, smooth, or hairy, margins thin, corollas, inner tubular 5-toothed, outer ligulate, in several series, hardly longer than the pappus; anther-bases blunt, pappus hairs white, becoming reddish; achenes ⅛ in., narrow, flat, smooth.

**Ergeron asteroides,** see Herbs, Erect, Alternate, Exstipulate, Simple, Toothed.

**Erigeron alpinus, var. multicaulis.** COMPOSITÆ. F. B. I. iii. 255. Himalaya, 3-10,000 ft. Simla (Collett.)

small to medium-size, biennial or perennial, hairy or velvety, stems many, often tufted, much branched from the base, branches slender, leaves, radical oblong stalked spreading, stem leaves sessile, lanceolate 1-2½ by ⅛-⅜ in. or ovate with a broad tip 2 by ¾ in sometimes toothed, short-pointed or blunt, heads long-stalked, solitary or in flat-topped clusters ½-¾ in. diam., bracts of the heads velvety or woolly; otherwise like the last species.

**Erigeron multiradiatus,** COMPOSITÆ. F. B. I. iii. 256. Himalaya, 7-9,000 ft. Hattu (Collett). Kashmir.

very like the last species, but the heads are much larger, 2-3 in. diam., ligules purple, very many, much longer than the pappus.

HERBS, ERECT, WITH ALTERNATE, EXSTIPULATE, SIMPLE LEAVES,

LEAF MARGINS ENTIRE.

PETALS UNITED.

FLOWERS, MINUTE, IN HEADS.

INNER TUBULAR, OUTER LIGULATE.

**Conyza viscidula,**

see Herbs, Erect, Alternate, Exstipulate, Simple, Toothed.

**Conyza stricta,**

see Herbs, Erect, Alternate, Exstipulate, Simple, Toothed.

**Inula graveolens,**
COMPOSITÆ.
F. B. I. iii. 292.
N. W. F. Province, Peshawaur (Stewart).

medium size, annual, slender, much branched, velvety and sticky; leaves 1-1½ by $\frac{1}{16}$-$\frac{1}{8}$ in. linear, short-pointed, one-nerved, sessile, spreading; flowers yellow, inner tubular, outer ligulate in top-shaped heads $\frac{1}{3}$ in. diam., terminating many slender branches, bracts of the heads few, linear, short or long-pointed, erect, outer green, velvety, and glandular, corollas inner tubular, 5-toothed, outer ligulate, 3-toothed, anther-bases forked, long-tailed, pappus hairs 1-2 series, coarse, on the edge of the cup-shaped top of the achenes; achenes ¼ in., hairy, sticky, usually ribbed.

**Vicoa auriculata,**
COMPOSITÆ.
F. B. I. iii. 297.
The Plains to 6,000 ft.
Simla (Collett).
Dharmpur, Thanesar, Lahore.

medium size, annual, stiff, stems often red, much branched, velvety and sticky, or almost smooth, leafy; leaves 2-7 by ½-1½ in., narrowly lanceolate, sessile, base stem-clasping, prolonged into 2 processes, sometimes toothed, long-pointed; flowers yellow, in long-stalked terminal or leaf-opposed heads ¼-½ in. diam., bracts of the heads many, narrow, edges thin, corollas inner tubular, 5-toothed, outer ligulate, 1 or 2-toothed, short, broad, recurved, anther-bases forked, tails slender, pappus hairs scanty; achenes small, cylindric, silky.

**Pulicaria vulgaris,**
COMPOSITÆ.
F. B. I. iii. 298.
N. W. F. Province.
Peshawaur (Stewart).
Kashmir, 5-6,000 ft. (Falconer).

medium size, annual, velvety or softly felted, much branched towards the top; leaves ½-1 in., oblong-lanceolate, sessile, base half-stem-clasping, lower leaves stalked; flowers yellow, inner tubular, outer ligulate in short stoutly stalked heads, ⅓-½ in. diam., bracts of the heads woolly, narrow, awl-shaped, erect, or nearly turned back, corollas inner, 5-toothed, outer erect, narrow, very short, anther-bases forked, tails very slender, pappus hairs dirty white, $\frac{1}{10}$ in., outer of jagged scales; achenes very minute.

**Pulicaria dysinterica, Flea bane,**
COMPOSITÆ.
F. B. I. iii. 298.
Kashmir, 5-6,000 ft. (Falconer).

like the last species, but perennial, more robust, woolly, leaves oblong-heart-shaped, ligules much longer, pappus more copious and much longer.

HERBS, ERECT, WITH ALTERNATE, EXSTIPULATE, SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

FLOWERS, MINUTE, IN HEADS.

INNER TUBULAR, OUTER LIGULATE.

**Pulicaria angustifolia,** COMPOSITÆ. F. B. I. iii. 299. The Plains. Delhi. Baluchistan.
like Pulicaria, vulgaris, but leaves linear-oblong, tips blunt or abruptly pointed and recurved, bracts of the heads green, lanceolate, long-pointed, achenes nearly smooth.

**Calendula officinalis, Marigold.** COMPOSITÆ. F. B. I. iii. 357. The Plains. Peshawaur (Aitchison).
medium size, annual, velvety; leaves 1-3 in. lower oblong narrowed to the stalk, upper lanceolate, base heart-shaped stem-clasping toothed or nearly entire, short-pointed, hairy on both surfaces; flowers bright orange yellow, inner tubular, outer ligulate in heads 1-2 in. diam. terminal-stalked, bracts of the heads ¾ in., incurved and pressed against the ripe achenes, linear, long-pointed, corollas, inner tubular, 5-toothed, outer ligulate, many, 3-toothed, anther-bases forked, pappus hairs none; achenes long, not hairy, curved; boat-shaped, rough, not beaked. This plant is hardly indigenous.

**Calendula arvensis,** COMPOSITÆ. F. B. I. iii. 258. Kashmir (Stoliczka).
very like the last species, but the flowers are sulphur-yellow, and the achenes are beaked, the outer ones prickly.

FLOWERS ALL LIGULATE.

**Kœlpinia linearis,** see Herbs, Unbranched, Alternate, Exstipulate, Simple.

**Crepis acaulis,** see Herbs, Unbranched, Alternate, Exstipulate, Simple.

**Hieracium crocatum,** see Herbs, Erect, Unbranched, Alternate, Exstipulate, Simple.

**Hieracium prenantholdes,** see Herbs, Erect Alternate, Exstipulate, Simple, Toothed.

**Lactuca dissecta,** see Herbs, Erect, Alternate, Exstipulate, Lobed.

**Lactuca longifolia,** see Herbs, Erect, Alternate, Exstipulate, Lobed.

**Lactuca rapunculoides,** see Herbs, Erect, Alternate, Exstipulate, Lobed.

**Lactuca decipiens,** see Herbs, Erect, Alternate, Exstipulate, Lobed.

**Lactuca macrorhiza,** see Herbs, Erect, Alternate, Exstipulate, Lobed.

**Lactuca Lessertiana,** see Herbs, Erect, Alternate, Exstipulate, Lobed.

**Lactuca sagittariodes,** see Herbs, Erect, Alternate, Exstipulate, Lobed.

**Lactuca polycephala,** see Herbs, Erect, Alternate, Exstipulate, Lobed.

**Prenanthes Brunoniana,** see Herbs, Erect, Alternate, Exstipulate, Lobed.

**Prenanthes violæfolia,** see Herbs, Erect, Alternate, Exstipulate, Lobed.

**Sonchus asper,** see Herbs, Erect, Alternate, Exstipulate, Lobed.

**Sonchus oleraceus,** see Herbs, Erect, Alternate, Exstipulate, Lobed.

**Sonchus maritimus,** see Herbs, Erect, Alternate, Exstipulate, Lobed.

**Tragopogon pratense,** see Herbs, Unbranched, Alternate, Exstipulate, Simple.

HERBS, ERECT, WITH ALTERNATE, EXSTIPULATE, SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

FLOWERS, MINUTE, IN HEADS.

FLOWERS ALL LIGULATE.

**Tragopogon porrifolium,** scear Herbs, Unbranched, Alternate, Exstipulate, Simple.

**Scorzonera divaricata,** COMPOSITÆ. F. B. I. iii. 418. Himalaya, 9-15,000 ft. Kashmir. smaall to medium size, perennial, smooth, root woodyn, stem slender, rarely unbranched, grooved, branches very divergent, leaves 2-6 by $\frac{1}{10}$—$\frac{1}{6}$ in., linear, slender, curved, margins incurved; flowers yellow in large long-stalked cylindric heads 1-1½ in. diam. 5-8 flowered, bracts of receptacles 4-8 in several rows, outer short, broad, inner long, linear, smooth or velvety, achenes ⅜ in., very slender, pale, smooth, not winged, longer than the pappus, pappus hairs feathery below.

**Scorzonera purpurea,** COMPOSITÆ. F. B. I. iii. 418. Kashmir, Banahal, 8,000 ft. like the last species, but sometimes woolly, flowers purple, achenes angled, shorter than the pappus.

FLOWERS NOT IN HEADS.

**Cephalostigma hirsutum,** see Herbs, Erect, Alternate, Exstipulate, Simple, Toothed.

**Wahlenbergia gracilis,** see Herbs, Erect, Alternate, Exstipulate, Simple, Toothed.

**Codonopsis ovata,** CAMPANULACEÆ. F. B. I. iii. 433. Himalaya, 8-12,000 ft. Kashmir. small, perennial, root woody, spindle-shaped leaves ¼-⅔ by ⅛-⅓ in., ovate, blunt or short-pointed, hairy on both surfaces, stalk ¼-¾ in.; flowers sky-blue, 1-1½ by ¼-⅜ in., on long, terminal stalks, 3-6 in long, calyx lobes 5, ⅓ by ⅛ in., oblong with rounded ends, minutely hairy; corolla widely bell-shaped, 5-toothed, stamens 5, style 3-lobed; capsules ⅜-½ in. broad, depressed, conical with the broad base above, beaks ⅓ in. long, seeds very many, slightly flattened, smooth, brown.

**Sphenoclea zeylanica,** CAMPANULACEÆ. F. B. I. iii. 437. The Plains in swamps. medium size to large, annual, smooth, branched, or unbranched, stout; leaves 2-3 in., lanceolate, narrowed at both ends, sessile or shortly stalked, smooth, flowers small, greenish-yellow in dense bracteate and bracteolate, spikes ¾-2 in. long on stalks 1-2 in. long, calyx lobes 5, $\frac{1}{10}$ in. in fruit $\frac{1}{10}$ in., triangular, closely-bent in, corolla bell-shaped, 5-lobed, stamens 5, on the corolla and alternate with its lobes, style short, hardly 2-lobed; capsule ⅛ in diam. wedge-shaped and angled below crowned with the calyx-lobes, seeds minute, rough with very minute papillæ or scales.

**Phyteuma Thomsoni,** see Herbs, Unbranched, Alternate, Exstipulate, Simple.

HERBS, ERECT, WITH ALTERNATE, EXSTIPULATE, SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

FLOWERS NOT IN HEADS.

**Lysimachia lobelioides,**
PRIMULACEÆ.
F. B. I. iii. 502.
Himalaya, 4-8,000 ft
Simla (Collett).
Kashmir.

medium size, annual, smooth, stem angular, branched from the base; leaves 1-1½ in. ovate-lanceolate, tapering into a short stalk, short-pointed, margin gland-dotted; flowers ½-⅔ in. long, pale purple or white, sweet-scented, solitary, or pairs in the axils of leaves or bracts forming terminal racemes 3-6 in., calyx 5-lobed, nearly as long as the corolla, margins thin, bracts awl-shaped, corolla ¼ in. diam., funnel-shaped, segments 5, ovate with a broad tip, longer than the calyx, stamens 5, ununited, without glands, anthers oblong, protruding, style thread-like; capsule ⅛ in. diam. round, splitting by 5 valves, seeds many, minute.

**Lysimachia pyramidalis,**
PRIMULACEÆ.
F. B. I. iii. 503.
Himalaya, 5-8,000 ft.
East of the Sutlej, Simla (Collett).

medium size, annual, smooth, much-branched; leaves 1-2½ in., linear-lanceolate, minutely gland-dotted and margined, all sessile or nearly so; flowers white or pale purple, ¼ in. long, in long terminal racemes 6-10 in., bracts linear, lower 1 in., sepals narrowly lanceolate with slender thin margins, corolla lobes toothed, stamens shorter than the corolla, capsule opens irregularly; for other characters see the last species.

**Lysimachia chenopodioides,**
PRIMULACEÆ.
F. B. I. iii. 503.
Himalaya, 5-9,000 ft.
Valleys below Simla (Collett).

medium size, sometimes prostrate, leaves ½-1 in., ovate-lanceolate, short or long pointed, tapering into a rather long stalk; flowers ¼ in., pale purple sessile or nearly so, solitary, axillary, calyx equal to the corolla, long glands in series down the sepals, stamens short; for other characters see the last species.

**Centunculus tenellus,**
PRIMULACEÆ.
F. B. I. iii. 506.
Himalaya, 1-6,000 ft.
Dalhousie.

small, annual, sometimes unbranched; leaves ¼ in., sometimes nearly opposite, ovate, short-pointed sessile; flowers minute, white or pink, solitary, axillary, stalks shorter than the leaves, lengthening in fruit, calyx 4-5-lobed, corolla pitcher-shaped, lobes 4-5, wheel-shaped ovate-lanceolate, stamens 4-5, on the corolla throat, anthers protruding, style thread-like; capsule globular, opening by a circular fissure round the middle, seeds many, target-shaped.

**Samolus Valerandi, Brookweed.**
PRIMULACEÆ.
F. B. I. iii. 506.
Himalaya, 3-4,000 ft.
Sutlej Valley Suni on marshes (Collett.)
Baluchistan (Boissier).

small to medium size, perennial, rootstock short, smooth, sometimes prostrate, rooting at the base; leaves 1-4 in., ovate with a broad tip or narrowed to the base, lower crowded, spreading, stalked, upper smaller, nearly sessile; flowers ⅛ in. diam., white in terminal racemes or flat-topped clusters, afterwards lengthening, stalks bracteate about the middle, calyx-tube half spherical, lobes 5, triangular, corolla-tube bell-shaped, deeply 5-lobed, lobes spreading, stamens 5, on the base of corolla, short alternating with 5 minute scales, style short; cap-

HERBS, ERECT, WITH ALTERNATE, EXSTIPULATE, SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

sule ¼ in. diam., ovoid, crowned with the calyx teeth, splitting from the top in 5 valves, seeds many, minute, wrinkled.

**Swertia alternifolia,**
GENTIANACEÆ.
F. B. I. iv. 128.
Himalaya, 11-12,000 ft.
The Chor (Collett).

medium size to large, rootstock only perennial, stems angled, hollow, ⅛ in. thick; leaves 5 by 2 in., radical long-stalked, stem leaves oblong-lanceolate, stem-clasping, flowers 1½ in. diam., bright grey, sometimes said to be yellow, in branching racemes, sepals 5, ¼ by ⅛ in., ovate, short-pointed, toothed, corolla-lobes 5, ⅜ by ⅛ in., oblong narrowed to the base, short-pointed, two glandular depressions at the base of each lobe, long-fringed, stamens 5, style short, stigma 2-lobed; capsule ⅜-½ by ⅛ in., sessile oblong, seed ⅛ in. diam., smooth.

**Heliotropium Zeylanicum,**
BORAGINACEÆ.
F. B. I. iv. 148.
The Plains.

medium size to large, annual, roughly hairy; leaves 1½ by ¼ in., narrowly-lanceolate, sessile, nearly entire; flowers ⅛ in. diam., white sessile in long bractless spikes 2-6 in., often branching in twos, curled up as it lengthens, flowers 1-2-ranked, calyx 5-lobed, lobes $\frac{1}{12}$ in., ovate, short-pointed, corolla-tube ⅛ in. wider above, minutely bristly without lobes 5, $\frac{1}{12}$ in. spreading, long pointed, stamens 5 on the corolla tube, short, style longer than the stigma, stigma short oblong, very hairy, not protruding; fruit $\frac{1}{12}$ in., of 2-wrinkled pitted 2-seeded nutlets.

**Heliotropium dasycarpum,**
BORAGINACEÆ.
F. B. I. iv. 148.
N. W. F. Province.
Peshawar (Stewart).
Baluchistan (Boissier).

small to medium size, perennial, woody, stiff, roughly hairy; leaves ⅜ by ⅛ in., wedge-shaped at both ends, nearly entire, sessile, flowers ⅛ in., whitish in short few flowered spikes, calyx lobes $\frac{1}{16}$ in., oblong-lanceolate, corolla ⅛ in., cylindric, stamens longer than those of the last species, style short, stigma rough; fruit small, sometimes silky; for other characters see the last species.

**Heliotropium Eichwaldi,**
BORAGINACEÆ.
F. B. I. iv. 149.
The Plains.
Kashmir, Srinagar.
Baluchistan (Lace).

small, perennial, woody, branching from the base, softly hairy; leaves ⅛-1½ in., ovate with a broad tip or oblong with rounded ends, silky, nearly entire, stalks ⅛-1 in., flowers ⅛ in., in 2 ranks on dense bractless spikes, 2 in. long, calyx lobes $\frac{1}{12}$ in., ovate-lanceolate, hairy, narrow, not covering the fruit, corolla lobes slightly toothed, small, round, style short, nutlets $\frac{1}{12}$ in. not spreading, forming an ovoid 4-pointed mitre-like fruit with a small hole at the top; for other characters see the last species.

**Heliotropium rariflorum,**
BORAGINACEÆ.
F. B. I. iv. 152.
The Plains.
Jhelum (Aitchison).
Baluchistan (Boissier).

small, annual; leaves 1 by ⅛ in., linear, nearly entire, rough, hairy; flowers sessile in spikes 1-3 in., bracts scattered, leaflike, stigma a very depressed cone, fruit four-lobed, bristly; for other characters see the last species.

HERBS, ERECT, WITH ALTERNATE, EXSTIPULATE, SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

**Heliotropium indicum.** — see Herbs, Erect, Alternate, Exstipulate, Simple, Toothed.

**Cynoglossum furcatum,**
BORAGINACEÆ.
F. B I. iv. 155.
The Plains to 9,000 ft.
Simla Mashobra (Collett).

medium size, biennial or perennial, hairy with hairs flat to the stem, hairs often bulbous based; leaves radical long-stalked, large, present when flowering, stem-leaves 4 by 1 in., narrowly lanceolate, or oblong, sessile, smooth or very minutely rough above; flowers ½ in. diam., pale blue or white in long-forked one-sided racemes without bracts, calyx deeply 5-lobed, persistent, enlarged in fruit, corolla-tube short with 5 scales at the mouth, lobes 5, blunt, spreading, stamens 5, within the corolla-tube, style short; nutlets 4, small, 1-seeded, covered with minute hooked bristles.

**Cynoglossum micranthum,** — see Herbs, Erect, Alternate, Exstipulate, Simple, Toothed.

**Cynoglossum lanceolatum,** — see Herbs, Erect, Alternate, Exstipulate, Simple, Toothed.

**Cynoglossum denticulatum,** — see Herbs, Erect, Alternate, Exstipulate, Simple, Toothed.

**Cynoglossum Wallichii.** — see Herbs, Erect, Alternate, Exstipulate, Simple, Toothed.

**Cynoglossum microglochin,**
BORAGINACEÆ.
F. B. I. iv. 158.
Himalaya, 7-11,000 ft.
Kashmir, Dalhousie.

medium size, softly velvety; leaves 4 by 2 in., ovate short-pointed, upper surface with long white bulbous-based hairs, lower with soft white, velvet; flowers ½-¾ in. diam., dark blue in dense racemes, calyx lobes ½ by $\frac{1}{10}$ in., blunt, hairy, corolla tube shorter than the calyx-lobes, lobes ½ in., nutlets bristly on the margin; for other characters see *Cynoglossum furcatum*.

**Cynoglossum nervosum,**
BORAGINACEÆ.
F. B. I. iv. 158.
Himalaya, 10-12,000 ft.
Jalouri, Pass Kulu.
The Chor Pangi.

very like the last species, but leaves more narrowly lanceolate, looser racemes, larger flowers, nutlets more densely bristly on the margins.

**Lindelofia spectabilis.**
BORAGINACEÆ.
F. B. I. iv. 159.
Himalaya, 10-12,000 ft.
Kashmir, Pir Panjal.

medium size, perennial, hairy, leaves, radical 2-4 in., long-stalked lanceolate, lower stem leaves stalked 3 in., nearly heart-shaped, upper stem leaves oblong, sessile, stem-clasping, hairy on both surfaces; flowers ¼ in. deep blue in dense long bractless racemes, calyx-lobes 5, ⅓ in. blunt or nearly short-pointed, slightly hairy or woolly, corolla tube ¼ in., one to 3 times as long as the calyx, lobes 5, ⅛ in., crowned with scales in the mouth forming a cone, lobes blunt round spreading, stamens 5, scarcely protruding above the mouth scales, style long, stigma small; nutlets 4, depressed, rounded at the base, margins bristly.

HERBS, ERECT, WITH ALTERNATE, EXSTIPULATE, SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

**Lindelofia Benthami,**
BORAGINACEÆ.
F. B. I. iv. 159.
Kashmir, 11-15,000 ft.

very like the last species, but the leaves narrower; flowers on branching racemes, corolla lobes nearly erect.

**Solenanthus circinnatus,**
BORAGINACEÆ.
F. B. I. iv. 160.
Himalaya, 12,000 ft.
Pangi (Watt).

medium size, perennial, hairy; leaves, radical 6 by 2¾ in., heart-shaped, thin, stalk 8 in., stem-leaves 3 by 1¼ in., oblong-lanceolate almost stem-clasping; flowers blue, ¼ in., in branching terminal racemes, calyx lobes 5, ⅛ by $\frac{1}{12}$ in., oblong, corolla-tube ¼ in., scales in the mouth, lobes 5, $\frac{1}{10}$ in., nearly erect, stamens 5, long, protruding far, style long, threadlike, stigma small, nutlets 4, forming a pyramid ⅛-¼ in diam., densely bristly, especially at the margins.

**Paracaryum heliocarpum,**
BORAGINACEÆ.
F. B. I. iv. 161.
Himalaya, 7-9,000 ft.
Ka[illegible]mir, Lahoul
S[illegible] (Thomson).

medium size, perennial or biennial, softly hairy; leaves, radical long-stalked, 6 by 1 in., lanceolate prolonged down the stalk, stem-leaves 2½ by ⅓ in. oblong or lanceolate, softly hairy on both surfaces; flowers ⅛-¼ in., blue in long loose bractless racemes 4-10 in., calyx lobes 5, ⅛ in., narrowly oblong silky, little enlarged in fruit, corolla-tube closed by scales, ⅛-¼ in. lobes 5, ⅛ in., almost erect, blunt stamens 5 under the mouth scales, style ⅛ in. in fruit, nutlets 4, ⅛-¼ in. forming a pyramid with stiff persistent style, bristly, strongly margined.

**Paracaryum glochidiatum,**
BORAGINACEÆ.
F. B. I. iv. 161.
Himalaya, 9-12,000 ft.
Matiana Hill.
Hattu (Collett).
Kashmir.

like the last species, but radical, leaves ovate, heart-shaped, not prolonged down the stalk, stem-leaves ovate, or orbicular, only hairy on the nerves beneath, corolla-tube much shorter, style only $\frac{1}{12}$ in., nutlets forming a larger pyramid, hooked bristles much longer, linear.

**Paracaryum microcarpum,**
BORAGINACEÆ.
F. B. I. iv. 162.
Himalaya, 8,000 ft.
Pangi, Kashmir.

like the last species, but much smaller, spreading, flowers much smaller, leaves oblong, much smaller, nutlets very small, forming a pyramid, with only minute hooked bristles on the disc, not on the margins of the nutlets.

**Echinospermum minimum,**
BORAGINACEÆ.
F. B. I. iv. 162.
N. W. F. Province.
Peshawar.
(Vicary).
Kashmir Valley.

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small, stiff, bristly; leaves 1½ by ¼ in. linear-oblong, lower leaves with the blade prolonged into the stalk; flowers ¼ in., blue on stalks ¼ in. in racemes 2-3 in. with bracts ⅓-⅔ in., leaflike, often reaching to the end of the racemes, calyx-lobes 5, ⅛-¼ in., linear corolla-tube short, mouth closed by 5 scales, lobes 5, blunt, spreading a little longer than the calyx-lobes, stamens 5 within the corolla-tube; nutlets 4, erect, ⅛-¼ in., forming a pyramid, margin thickened with one row of hooked bristles, nutlets firmly united.

HERBS, ERECT, WITH ALTERNATE, EXSTIPULATE, SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

**Echinospermum barbatum,**
BORAGINACEÆ.
F. B. I. iv. 163.
Himalaya, 7-12,000 ft.

like the last species, but leaves oblong $\frac{1}{2}$-2 in., racemes longer, bracts smaller, usually none at the top of the raceme, calyx lobes $\frac{1}{10}$ in., oblong, nutlets $\frac{1}{10}$-$\frac{1}{8}$ in., forming a pyramid of which the nutlets can be separated, two rows of hooked bristles on the margins.

**Eritrichium strictum,**
BORAGINACEÆ.
F. B. I. iv. 164.
Himalaya, West of Sutlej, 7-13,000 ft.
Kashmir.

small, perennial, rootstock woody, stems many, white silky, stiff; leaves $1\frac{1}{2}$ by $\frac{1}{8}$ in., linear, lower stem leaves larger, hardly stalked, radical leaves stalked, whithered when flowering, flowers $\frac{1}{4}$ in. diam., blue on stalks $\frac{1}{8}$-$\frac{1}{4}$ in. in branched racemes, 1-3 in., bracts minute in the upper part of the racemes, calyx lobes 5, oblong, corolla-tube short throat with 5 scales, lobes 5, blunt, spreading, stamens 5 in corolla-tube, nutlets 4, erect, $\frac{1}{12}$-$\frac{1}{10}$ in. pyramidal, margins thin with the minute hooked bristles which are united at their bases, apices of most nutlets divided, hooked.

**Eritrichium basifixum,**
BORAGINACEÆ.
F. B. I. iv. 165.
Himalaya, 13-15,000 ft.
Kashmir.

annual, stems one or two, leaves $\frac{3}{4}$ by $\frac{1}{4}$ in., broadly lanceolate with long weak hairs, sessile lower tufted, upper apart, flowers purplish blue, racemes $1\frac{1}{2}$ in., with many bracts, $\frac{1}{8}$ in. long, nutlets $\frac{1}{12}$ in., thin smooth.

**Rochelia stylaris,**
BORAGINACEÆ.
F. B. I. iv. 166.
The Plains above 1,000 ft.
Kashmir Valley.

small, annual, with long weak hairs pressed to the plant surface; leaves 1 by $\frac{1}{2}$ in., narrowly oblong prolonged into the very short stalk; flowers $\frac{1}{8}$ by $\frac{1}{10}$ in., blue or white on stalks bent down in fruit in racemes 2 or 12 in. in fruit, bracts leaflike; smaller upwards, calyx lobes 5, linear, $\frac{1}{12}$ in., in fruit $\frac{1}{4}$ in., corolla-tube with or without scales, lobes 5 small, spreading, stamens 5 within the corolla tube, style much longer than nutlets, nutlets 2, white, rough with minute processes.

**Bothriospermum tenellum,**

see Prostrate Herbs, Alternate, Exstipulate, Simple.

**Gastrocotyle hispida,**
BORAGINACEÆ.
F. B. I. iv. 168.
The Plains at 1,000 ft.
Baluchistan.
(C. B. Clarke).

small, spreading with bristly hairs, leaves 1-2 in. oblong, lowest prolonged into the stalk; flowers small, solitary and shortly stalked or in small axillary racemes, calyx lobes 5, $\frac{1}{8}$-$\frac{1}{4}$ in., coarsely bristly, corolla 1-5 in. diam., tube short closed with scales, lobes 5, blunt, spreading, stamens 5 within the corolla tube, nutlets 4, $\frac{1}{8}$-$\frac{1}{6}$ in., ovoid, incurved, rough, apex with 4 ridges.

**Lycopsis arvensis,**
BORAGINACEÆ.
F. B. I. iv. 168.
Himalaya, 3-8,000 ft.
Near Peshawar,
Kashmir.

medium size, annual, bristly; leaves 2 by $\frac{1}{4}$ in., oblong, short-pointed, upper stem-clasping, lower stalked; flowers $\frac{1}{4}$ in. white, less commonly blue on stalks 1-5 in. in terminal racemes, bracts $\frac{1}{2}$ in., lanceolate or lower leaf-like, calyx lobs 5, linear, bristly, $\frac{1}{8}$ in., in fruit, $\frac{1}{4}$ in., coroll

HERBS, ERECT, WITH ALTERNATE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

tube $\frac{1}{4}$ in., curved, lobes 5, nearly equal, $\frac{1}{8}$ in., blunt spreading stamens 5, nearly at the bottom of the corolla tube; nutlets 4, $\frac{1}{8}$-$\frac{1}{4}$ in., ovoid, wrinkled.

**Monea Pulla,**
BORAGINACEÆ.
F. B. I. iv. 169.
The Plains.

medium size, much branched, hairy and bristly; leaves 2 by $\frac{1}{4}$ in., oblong, short-pointed, upper nearly stem-clasping, lower stalked; flowers $\frac{1}{4}$ in., blackish-purple, on stalks $\frac{1}{8}$-$\frac{1}{4}$ in., in racemes, dense-flowered, 2-5 in., bracts 1 in., leaflike, calyx $\frac{1}{4}$ in., in fruit $\frac{1}{2}$ in. nearly globular, enclosing the nutlets, lobes 5, long-pointed, corolla-tube $\frac{1}{4}$ in., straight without scales at the mouth, lobes 5, in., blunt, half spreading, stamens 5 enclosed in the corolla-tube; nutlets 4, $\frac{1}{8}$ in. curved inwards, ovoid, wrinkled in a network.

**Mertensia elongata,**
BORAGINACEÆ.
F. B. I. iv. 170.
Kashmir, 5-8,000 ft.

small, rootstock stout, perennial, stems annual, hairy with the hairs laid against the stem and with broad bases; leaves oblong radical 2 by $\frac{3}{4}$ in., long-stalked with the blade, prolonged into the stalk, stem leaves 2 by $\frac{1}{2}$ in., sessile; flowers $\frac{1}{4}$ in., purplish blue on stiff nearly erect stalks $\frac{1}{2}$ in. in racemes many-flowered long-stalked lengthened in fruit, to $3\frac{1}{2}$ in., calyx lobes 5, $\frac{1}{8}$ in. linear, in fruit, $\frac{1}{4}$ in., corolla $\frac{1}{8}$ in. diam., tube $\frac{1}{8}$ in. long, lobes spreading, a little longer than the calyx, scales in the throat very small, stamens 5, included in the corolla-tube, style thread-like, very long, nutlets 4, $\frac{1}{16}$ in., ovoid-oblong, smooth, slightly angular, white or pale, shining.

**Mertensia moltkioides,**
BORAGINACEÆ.
F. B. I. iv. 170.
Himalaya, 8,000 ft.
Pangi (Dr. Watt).
Kashmir.

like the last species, but with hairs not pressed to the stem, corolla-tube twice as long as the calyx, nutlets $\frac{1}{8}$ in., brown-black.

**Mertensia echioides,**
BORAGINACEÆ.
F. B. I. iv. 170.
Kashmir, 5-12,000 ft.

small to medium size, perennial, softly hairy, leaves $1\frac{1}{2}$ by $\frac{1}{2}$ in., nearly blunt, racemes 1-3 in. on long stalks corolla-tube, $\frac{1}{4}$ in. longer than the calyx-lobes, corolla-lobes erect, no scales in the throat, stamens protruding beyond the throat of the corolla-tube; otherwise like the last species.

**Mertensia racemosa,**
BORAGINACEÆ.
F. B. I. iv. 171.
Himalaya, 7-10,000 ft.
Simla.
Mashobra (Collett).

nearly smooth, or minutely hairy, stems small, weak, leaves ovate radical long-stalked, stem leaves often stalked, lanceolate, racemes nearly sessile, bracteate, few-flowered, corolla $\frac{1}{2}$-$\frac{2}{3}$ in. diam., tube $\frac{1}{2}$ as long again as the calyx, scales in the throat, stamens not protruding, otherwise like the last species.

**Moltkia parviflora,**
BORAGINACEÆ.
F. B. I. iv. 171.
Kashmir, 6-8,000 ft.

very like Mertensia echioides, but leaves linear-oblong, 2 by $\frac{1}{4}$ in., minutely hairy, racemes without bracts; flowers all on one side, corolla hardly projecting beyond the calyx, no scales in the throat.

HERBS, ERECT, WITH ALTERNATE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

**Myosotis cæspitosa,**
*Forget-me-not.*
BORAGINACEÆ.
F. B. I. iv. 173.
Himalaya, 9-13,000 ft.
Kashmir.

small to medium size, hairy, or nearly smooth, hairs pressed against stem; leaves 1½ by ½ in., oblong, lowest with blade prolonged into the stalk; flowers ¼ in. diam., bright blue with a yellow centre, on stalks longer than the calyces in racemes 2-8 in., flowers all on one side, calyx lobes triangular-lanceolate as long as the tube, hairy, corolla-tube short, mouth closed with scales, lobes 5, blunt, spreading, stamens 5, enclosed in the corolla tube, style shorter than the calyx-lobes, nutlets 4, ovoid-oblong, smooth.

**Myosotis sylvatica,**
*Wood forget-me-not.*
BORAGINACEÆ.
F. B. I. iv. 173.
Himalaya, 7-12,000 ft.
Simla, Fagu (Collett).
Kashmir.

small to medium size, hairy, hairs spreading; leaves 1½ by ¼ in., oblong but narrower, lowest broader, and stalked, racemes often divided, corolla ⅛ in. diam., lobe flat, calyx smaller, teeth lanceolate longer than the tube, hairs erect and spreading; for other characters see the last species.

**Myosotis arvensis,**
BORAGINACEÆ.
F. B. I. iv. 173.
Kashmir Valley.

very like the last species, but corolla smaller ⅛-¼ in. diam., lobes concave, calyx teeth curving over nutlets.

**Myosotis stricta,**
BORAGINACEÆ.
F. B. I. iv. 174.
Kashmir, 5-6,000 ft. (Falconer).
Pangi (Dr. Watt).
Baluchistan (Boissier).

very like the last species, but smaller, leaves narrowed at both ends, lower nearly sessile, flowers often crowded on racemes which hook like spikes.

**Lithospermum arvense,**
BORAGINACEÆ.
F. B. I. iv. 174.
Kashmir.
N. W. F. Province.
Peshawaur.
Baluchistan (Lace).

medium size, annual, bristly; leaves lanceolate, stem-leaves 1 by ⅓ in., lower stalked oblong-ovate with a broad tip; flowers ¼ in. long, white rarely blue, on stalks $\frac{1}{16}$ in. in racemes 4-10 in., bracts leaflike smaller upwards, calyx-lobes 5, linear, corolla hairy upwards, tube not longer than the calyx, lobes 5, blunt, spreading, stamens 5, enclosed in the corolla-tube, stigma usually 2-fid; nutlets 4, ⅛ in., stony, rough, narrowed upwards.

**Lithospermum tenuiflorum,**
BORAGINACEÆ.
F. B. I. iv. 175.
Kashmir, 5-7,000 ft.
Rawalpindi (Aitchison)
Baluchistan (Lace).

very like the last species, but smaller, lower leaves scarcely stalked; flowers usually blue, nutlets more pointed.

**Lithospermum officinale**
BORAGINACEÆ.
F. B. I. iv. 175.
Kashmir, 5-8,000 ft.

medium size to large, perennial, roughly hairy; leaves 2 by ½ in., oblong-lanceolate, roughly hairy, nerves somewhat prominent; flowers ¼ in., white turning yellowish on stalks ⅛ in. in racemes 1-4 in., bracts leaflike, smaller upwards, nutlets shining white, smooth; otherwise like the last species.

HERBS, ERECT, WITH ALTERNATE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

**Arnebia hispidissima,**
BORAGINACEÆ.
F.B. I. iv. 176.
The Plains, Lahore.
Baluchistan (Boissier).

small, annual or biennial, very roughly hairy as the specific name implies; leaves 2 by $\frac{1}{3}$ in., lanceola, hairs white from prominent bases; flowers $\frac{1}{2}$ in., yellow, nearly sessile on one-sided spikes, 2-4 in. long, bracts $\frac{1}{4}$-$\frac{1}{3}$ in., linear, calyx-lobes 5, linear, o in., stamens 5, in some plants short, included in the corolla tube, in others long, just protruding, style long or short the inverse to the length of the stamens; nutlets 4,, $\frac{1}{10}$-$\frac{1}{14}$ in., conical, sharply-pointed, prominences on all sides.

**Arnebia Griffithii, The Prophet's flower,**
*Panjakka paghambri phul.*
BORAGINACEÆ.
F. B. I. iv. 176.
The Plains.
West of the Jhelum.
Pindigheb.
Futtehganj (Douie).
Campbellpur.
Peshawaur.
Baluchistan (C. B. Clarke).

very like the last species, but a little larger, hairs softer, calyx lobes $\frac{1}{3}$-$\frac{1}{2}$ in., corolla-tube $\frac{3}{4}$-1 by $\frac{1}{3}$-$\frac{1}{2}$ in. lobes yellow with a brown spot at the base of each fading during the day, nutlets much larger, more triangular and blunter, prominences on all sides.

**Arnebia Thomsoni,**
BORAGINACEÆ.
F. B. I. iv. 176.
Spiti Valley, Ladakh.

very like *A. hispidissima* above, but often perennial, softer, leaves narrowly oblong, bracts oblong, blunt, longer than the calyx, nutlets larger and smoother.

**Arnebia tibetana,**
BORAGINACEÆ.
F. B. I. iv. 176.
Northern Kashmir, 7-12,000 ft.

very like the last species, but hairs more bristly, spikes longer, nutlets rougher.

**Onosma echioides,**

see Herbs, Unbranched, Alternate, Exstipulate, Simple.

**Onosma Thomsoni,**

see Herbs, Unbranched, Alternate, Exstipulate, Simple.

**Onosma bracteatum,**

see Herbs, Unbranched, Alternate, Exstipulate, Simple.

(*To be continued.*)

# THE FUNGI OF INDIA.

BY

F. THEISSEN, S. J.

PART II.

*With Plates V to IX.*

*(Continued from page 1303 of Vol. XXI.)*

## 10.—TUBEROIDEÆ.

**Trichocoma paradoxa,** Jungh. Syll. X, p. 82.
Syn.: *Trichoscytale paradoxum,* Corda.
On rotten wood, Neilgherries, Nepal, Himalaya, New Zealand, Java

## 11.—HEMIASCINEÆ.

**Protomyces macrosporus,** Ung. Syll. VII, p. 319.
Syd., p. 372, on *Coriandrum sativum,* Pusa.—Known from Europe, North America, Africa.

**Exoascus deformans** (Berk ), Fuck. Syll. VIII, p. 816.
Syd., l. cit., on leaves of *Prunus Persica,* Shillong, Assam.—Known from Europe and North America.

**Exoascus Pruni,** Fuck. Syll. VIII, p 817.
Syd., p. 373, on fruits of *Prunus Padi.,* (Tadi,) Murree.—Known from Europe, Siberia, North America.

**Taphrina Cornu-cervi,** Giesh. Syll. XI, p. 437.
On leaves of *Aspidium aristatum,* Nepal, Ceylon.

**Taphrina ? Laurencia,** Giesh. l. cit.
On leaves of *Pteris quadriaurita,* Assam ; Ceylon.

**Taphrina rhomboidalis,** Syd. et Butl.—Syd., p. 373.
On leaves of *Pteris quadriaurita,* Kumaon, Himalaya.

**Taphrina aurea** (Pers.), Fr. Syll. VIII, p. 812.
Syd., p. 373, on leaves of *Populus ciliata,* Murree.—Known also from Europe and North America.

**Taphrina maculans,** Butl.
Syd., p. 373, on leaves of *Curcuma longa,* Dehra Dun; on *Curcuma Amada,* Saharanpur; on *Curcuma angustifolia,* Kumaon, Himalaya; on leaves of *Zingiber Casumunar,* Rangpur; on *Zingiber zerumbet,* Behar.

## 12.—LABOULBENIACEÆ.

**Sphaleromyces indicus,** Thaxt. Syll. XVI, p. 692.
On *Pinophilus,* Malabar.

**Ceraiomyces Selinæ,** Thaxt. Syll. XVII, p. 918.
On *Selina Westermanni,* India ; (locality unknown).

**Enarthromyces indicus,** Thaxt. Syll. XIV, p. 726.
On *Pteropsophus sp.*; locality unknown.

**Dichomyces hybridus,** Thaxt. Syll. XVI, p. 678.
On various species of *Philonothus,* India, China, Ceylon, North America, Europe.

**Laboulbenia Kunkelii,** (Giard), Thaxt. Syll. XI, p. 451.
Syn.: *Thaxteria Kunkelii,* Giard.
On the elytræ and thorax of *Mormolix phallodes*; locality unknown.

**Laboulbenia assamensis,** Thaxt. Syll. XVI, p. 683.
On *Catascopus* ( ? ), Assam.

A

B

C

D

A.—*Simblum sphaerocephalum.*

B.—*Clathrus chrysomycelinus.*

C.—*Jansia truncata.*

D.—*Lycoperdon nigrescens.*

**Laboulbenia coarctata,** Thaxt. ib.
On *Orectochilus*, Bengal.
**Laboulbenia Dineutis,** Thaxt. ib., p. 684.
On *Dineutes subspinosus*, India, Bengal, Ceylon, Madagascar.
**Laboulbenia distincta,** Thaxt. ib.
On *Pericallus cæruleo-virens*, Singapore.
**Laboulbenia finitima,** Thaxt. Syll. XVI, p. 685.
On *Pericallus guttatus*, Singapore, Java.
**Laboulbenia fissa,** Thaxt. ib.
On *Pericallus guttatus* and (*flavoguttatus,*) India (locality unknowa); Java.
**Laboulbenia maculata,** Thaxt ib., p. 686.
On *Serrimargo guttiger*; locality unknown.
**Laboulbenia malayensis,** Thaxt. ib.
Singapore.
**Laboulbenia microsoma,** Thaxt. ib.
On *Serrimargo guttiger*; locality unknown.
**Laboulbenia Serrimarginis,** Thaxt. ib., p. 688.
On *Serrimargo guttiger*, Penang.
**Laboulbenia tenuis,** Thaxt. ib., p. 689.
On *Catascopus*, India (locality unknown), Java, New Guinea.
**Laboulbenia tuberculifera,** Thaxt. ib.
On *Serrimargo guttiger*, Penang.
**Laboulbenia acanthophora,** Thaxt. Syll. XVII, p. 918.
On *Pericallus*; locality unknown.

## *B.*—BASIDIOMYCETES.

### PROTOBASIDIOMYCETES.

**Auricularia tremellosa,** Fr. (Laschia) Syll. VI, 407.
East India, Ceylon, Java, Mexico. (Cfr. T. Petch. Revisions of Ceylon Fungi II, p. 416.)
**Auricularia subvelutina,** Berk. (Laschia) Syll. VI, p. 410.
Darjeeling.
**Auricularia epitricha,** Berk. Syll. XI, p. 143.
Bombay; Neilgherries.
**Hirneola porphyrea** (Lév.) Fr. Syll. VI, p. 768.
Singapore.
**Hirneola blepharistoma,** B. et C.
Grevill. VIII, p. 96, Belgaum.
**Hirneola nobilis** (Lév.), Fr. Syll. VI, p. 765.
Mussoorie, Dehra Dun.
**Exidia bursiformis,** Berk. Syll. VI, p. 773.
Darjeeling.
**Guepinia ramosa,** Curr. Syll. VI, p. 810.
Arracan and Howrah District; P. Henn., F. Ind. or. II, p. 323, Saharanpur Garden.
**Tremella protensa,** Berk. Syll. VI, p. 782.
Sikkim and Darjeeling.

### AUTOBASIDIOMYCETES.

#### 1.—THELEPHORACEÆ.

**Corticium incarnatum** (Pers.), Fr. Syll. VI, p. 625.
P. Henn. F. Indiæ or II, p. 323, Mussoorie, Arnigadh, Europe, North America, Australia, Ceylon.

**Corticium cæruleum** (Schrad.), Fr.
Theissen, F. Bombay. Khandala.
**Corticium ? (Coniophora) indica,** Mass. Syll. IX, p. 241.
Bombay.
**Corticium (Coniophora) membranacea** (DC.), Syll. VI, p. 649.
Grevill. VIII, p. 93, on walls of gaol, Simla.—European species.
**Thelephora Sowerbyi,** Berk. Syll. VI, p. 522.
P. Henn. II, p. 324, Saharanpur Garden, on roots and trunks.—Occurs also in Europe and Australia.
**Thelephora sparassoides**, P. Henn. II, p. 324.
Mussoorie, Arnigadh (5,500 ft.)
**Thelephora ? aurantiaca**, Pers. Syll. VI, p. 526.
P. Henn. l. cit. on the ground, Saharanpur.—The species is known only from Cuba and South America.
**Thelephora pusilla**, Curr. Syll. VI, p. 532.
Sikkim, Himalaya.
**Stereum rimosum**, Berk. Syll. VI, p. 568.
Darjeeling ; Ceylon.
**Stereum scytale**, Berk. Syll. VI, p. 573.
Sikkim ; Khasia ; Cuba ; Brazil.
**Stereum medicum**, Curr. Syll. VI, p. 582.
Sikkim.
**Stereum lobatum**, Fr. Syll. VI, p. 568.
Theissen, F. Bombay. Khandala ; Syll. l. cit. : Ceylon India, Jav Malacca, Australia, New Zealand, South Africa, North America, Cuba, South America—Cfr. Theissen. Hymenomyc. riogr. n. 99 (Broteria, 1912), Brazil.
**Stereum hirsutum** (Willd.) Fr. Syll. VI, p. 563.
Cosmopolitan ; Theissen, F. Bombay. Khandala ; P. Henn. II, p. 323, Mussoorie.
**Stereum purpureum,** Pers. Syll. VI, p. 563.
P. Henn. II, p. 323, Mussoorie, f. *laevis*.—Known from Europe, N. America, Australia, Java, Patagonia.
**Stereum elegans,** Mey. Syll. VI, p. 553.
P. Henn. II, p. 323, Saharanpur Garden, on roots ; Theissen, F. Bombay. Khandala ; Syll. l. cit. ; Ceylon, Australia, North America, Cuba, Brazil, Africa—Cfr. Theissen, Hymenom. riogr. n. 97 (Broteria, 1912).
**Stereum nitidulum,** Berk. Syll. VI, p. 552.
P. Henn. I, II, p. 323, Saharanpur Garden, on roots and trunks of Casuarina equisetifolia, known from Ceylon, Australia and Brazil.
**Stereum annosum,** B. et Br. Syll. IV, p. 586.
Theissen, F. Bombay. Santa Cruz on Salsette near Bombay ; Syll. l. cit., Neilgherries ; Ceylon ; Malacca.
**Lloydella bicolor,** (Pers.) v. Höhn. et L.
Syn. : *Stereum bicolor* (Pers.), Quél. Syll. VI, p. 565.
*Lloydella fusca* (Schrad.) Bres.
Cosmopolitan ; cfr. Theissen, Hymenom. riogr. n. 89 (Broteria, 1912)—Sikkim.
**Hymenochaete cacao,** Berk. Syll. VI, p. 572.
Khasia ; Cuba ; Venezuela.
**Hymenochaete Carteri,** Berk. Syll. VI, p. 603.
Grevill. VIII, p. 150, Bombay.
**Hymenochaete tenuissima,** Berk. Syll. VI, p. 593.
Syn. : *H. elegantissima* Speg. Syll. VI, p. 594.
Grevill. VIII, p. 146, India (locality unknown) ; cosmopolitan, cfr. Theissen, Hymenom. riogr. n. 88 (Broteria, 1912).

**Hymenochaete strigosa,** B. et Br. Syll. VI, p. 1592.
Theissen, F. Bombay. Khandala—Known from Ceylon, Malacca and Australia.
**Hymenochaete rubiginosa,** (Schrad.), Lév. Syll. VI, p. 589.
East India, Borneo, Australia, North America, Patagonia, Europe.
**Hymenochaete depallens,** B. et C. Syll. VI, p. 596.
P. Henn. ii, p. 324, Saharanpur Garden.—Known from Ceylon and Singapore.
**Cladoderris mussooriensis,** P. Henn. II, p. 324.—On the ground, Mussoorie, Arnigadh (5,500 ft.)

## 2.—CLAVARIACEÆ.

**Clavaria Gollani,** P. Henn.
P. Henn. I, p. 151, II, p. 324—Saharanpur Garden.
**Clavaria pyxidata,** (Pers.) Syll. VI, p. 698.
P. Henn., ibid, Mussoorie, Arnigadh.—Known from Europe, N. America Cuba, Australia.
**Lachnocladium Hookeri,** Berk. Syll. VI, p. 738.
Khasia.
**Lachnocladium mussooriense,** P. Henn. II, p. 324.
Mussoorie, Arnigadh, on the ground.
**Calocera viscosa,** Fr. Syll. VI, p. 732.
Grevill. VIII, p. 96, Belgaum—Occurs in Europe, N. America and Malacca.

## 3.—HYDNACEÆ.

**Lopharia mirabilis,** (Berk.) Pat.
Syn.: *Radulum mirabile,* B. et Br. Syll. VI, p. 496.
*Thwaitesiella mirabilis* (B.) Mass.
P. Henn., II, p. 325, Saharanpur Garden. Cfr. T. Petch. Revisions of Ceylon Fungi, II, p. 410—Ceylon, Borneo.
**Radulum Emerici,** Berk. Syll. XI, p. 111.
Neilgherries.
**Radulum neilgherrensis,** Berk. l. cit.
Neilgherries.
**Radulum spongiosum,** Berk. l. cit.
Nepal.
**Sistotrema ochroleucum,** Lév. Syll. VI, p. 481.
See *Lenzites* (*Polyporaceæ*).
**Hydnum delicatulum,** Kl. Syll. VI, p. 458.
East India; Australia.
**Hydnum gilvum,** Berk. l. cit., p. 459.
Darjeeling.
**Hydnum Thwaitesi,** B. et Br. l. c., p. 433.
Neilgherries; Ceylon.
**Hydnum Vespertilio,** Berk. l. c., p. 442.
Nunklow (Khari Hills).
**Hydnum repandum,** L. Syll VI, p. 435.
P. Henn. II, p. 325—Mussoorie, Arnigadh, Europe, North America, Tasmania.
**Hydnum Aitchesoni,** Berk. Syll. VI, p. 454.
Grevill. IV, p. 137, Gulmarg (8,500 ft.) during the rains, September. Esculent; vernacular name "Ryle-gub."
**Hydnum flabelliforme,** Berk. Syll. VI, p. 457.
Sikkim; North America; Cuba.

**Hydnum lachnodontium,** Berk. Syll. XI, p. 108.
Neilgherries.
**Hydnum analogum,** Berk. l. cit., p. 108.
Neilgherries.
**Irpex flavus** Kl. Syll. VI, p. 486.
Syn.: *Polystictus flavus* Jungh.
P. Henn. I, II, p. 325, Bilaspore; Saharanpur Garden.—Theissen, F. Bombay. Khandala et Salsette—The species is also found in Africa, Australia, Ceylon, Java, Samoa, North America.
**Irpex canescens,** Fr. Syll. VI, p. 485.
Theissen, F. Bombay. Khandala—Often quoted as the *forma canescens* of *Irpex lacteus* Fr., cfr. Theissen, Hymenomyc. riogr. n. 36 (Broteria, 1912). It occurs also in Europe and Brazil.
**Irpex vellereus,** B. et Br. Syll. VI, p. 489.
Theissen, F. Bombay. Khandala. Type from Ceylon.
**Irpex zonatus,** Berk. Syll. VI, p. 489.
F. minor, Sikkim; Nepal.

## 4.—POLYPORACEÆ.

For practical reasons we follow the alphabetical order in the enumeration of the genera and species. Where not otherwise stated, the habitat is always 'on wood, on branches.'

The following abbreviations are used when referring to the chief literature.

Lloyd, Polyst.—C. G. Lloyd, Synopsis of the sections Microporus, Tabacinus and Funales of the genus Polystictus, August 1910.

Lloyd, Hexag.—C. G. Lloyd, Synopsis of the genus Hexagona, June 1910.

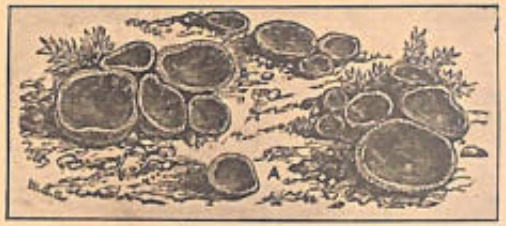
Murr. I-XIII—William A. Murrill, The Polyporaceæ of North America (contributions from the New York Botanical Garden, No. 29, etc., 1902-1906).

Romell—L. Romell. Hymenomycetes Austro-Americani I (Bihang K. Sv. Vet.-Akad. Handl., vol. 26, III, No. 16).

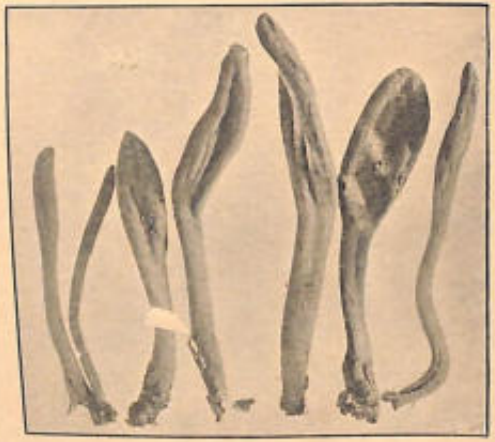
Theissen, Polyp. F.—Theissen S. T., Polyporaceæ austro-brasilienses (Denkschr. K. Akad. Wissensch. Wien 1911, Vol. 83).

**Boletus areolatus,** Berk. Syll. VI, p. 44, Kala Panee, Khasia, on the ground.
**Boletus delphinus,** Berk. Syll., p. 28, Darjeeling, on the ground.
**Boletus emodensis,** Berk. Syll., p. 20, Darjeeling, on the ground.
**Boletus flavipes,** Berk. Syll., p. 28, Myrong, Khasia, on the ground.
**Boletus fragicolor,** Berk. Syll., p. 29, Khasia, on the ground.
**Boletus furfuraceus,** Berk. Syll., p. 28, Moflong, Khasia, on the ground.
**Boletus gigas,** Berk. Syll., p. 33, Lachen river.
**Boletus pusillus,** Berk. Syll., p. 46, Khasia, on the ground.
**Boletus scrobiculatus,** Berk. Syll., p. 37, Moflong, Khasia, on the ground.
**Boletus ustalis,** Berk. Syll., p. 20, Darjeeling, on the ground.
**Boletus verrucarius,** Berk. Syll., p. 33, Sikkim, on the ground
**Cyclomyces fuscus,** Kze. Syll. VI, p. 389.
Cfr. Lloyd, Mycol. Notes No. 36, East India.—Type from Mauritius.
**Cyclomyces turbinatus,** Berk., l. cit., p. 390.
Syn.: *Cyclomyces javanicus,* Pat. Syll. XIV, p. 195, from Java. Nunklow, East India. Lloyd, l. cit., thinks this species might be identical with *Cyclomyces Greenii,* Berk., from North America, whilst Murrill VIII takes the latter as the type of quite a different genus *Cycloporus.*
**Dædalea emodensis,** Berk. Syll. VI, p. 374, Lebong.
**Favolus intestinalis,** Berk. Syll. VI, p. 400, Darjeeling.

A



D



C

B

A.—*Cyathus vernicosus.*

B.—*Microglossum olivaceum.*

C.—*Leotia stipitata.*

D.—*Peziza Chateri.*

**Favolus tenerrimus**, Berk. Syll. VI, p. 396, Darjeeling.

**Favolus tesselatus**, Mont. Syll. VI, p. 393, Darjeeling.

P. Henn. II, p. 327, Saharanpur Garden, on wood of *Barringtonia acutangula*.—Ceylon, East India, Borneo, Central and South America, Africa. (Cfr. Theissen, Polyp. No. 16.)

**Fomes adamantinus**, Berk. Syll. VI, p. 204, Khasia, Sikkim and Darjeeling.

**Fomes applanatus**, (Pers.), Wallr. Syll. VI, p. 176.

P. Henn. II, p. 325, Saharanpur Garden; Theissen, F. Bombay, Khandala. (Cfr. Synonyms, Theissen, Polyp. No. 18.)—Europe, Siberia, North and South America, Africa, Australia, East India.

**Fomes australis** Fr. Syll. VI, p. 176.

P. Henn. II, p. 325, Mussoorie, Arnigadh (5,500 ft.); Saharanpur Garden, on *Casuarina*. (See Synonyms, Theissen, Polyp. No. 18).—Europe, Africa, South America, Australia, East India, New Zealand, New Guinea.

**Fomes cinereo-fuscus**, Curr. Syll. VI, p. 203, Pegu.

**Fomes cornu-bovis**, Cooke Syll. VI, p. 164, Khasia; Malacca.

**Fomes endophæus**, Berk. Syll. VI, p. 178, Khasia.

**Fomes hemitephrus**, Berk. Syll. VI, p. 199, Coromandel Coast.

**Fomes inamœnus**, Mont. Syll. VI, p. 191, Nilgherries.

**Fomes introstuppeus**, B. et C. Syll. VI, p. 170, East India and Malacca on *Juglans*.

**Fomes peguanus**, Mont. Syll. VI, p. 179, Pegu, on *Nauclea*.

**Fomes pudens**, Berk. Syll. VI, p. 162, Khasia.

**Fomes rimosus**, Berk. Syll. VI, p. 181.

P. Henn. I, Kalsia, on *Dalbergia Sissoo*. For synonyms see Theissen, Polyp. No. 28.—East India, Australia, New Guinea, South Africa, South America.

**Fomes scopulosus**, Berk. Syll. VI, p. 201, Sikkim and Australia.

**Fomes semitostus**, Berk. Syll. VI, p. 200, Khasia.

**Fomes spadiceus**, Berk. Syll. VI, p. 193, locality unknown.

**Fomes Thomsoni**, Berk. Syll. VI, p. 170, Simla.

**Fomes zelandicus**, Cooke Syll. VI, p. 181, Coromandel.

**Ganoderma lucidum** (Leys.), Fr. Syll. VI, p. 147.

P. Henn. I, Kalsia; II, p. 325, Saharanpur Garden; Theissen, F. Bombay. Victoria Garden, Bombay; *forma resinaceum* (Bond.) Andheri, Salsette and Bandra. (For synonyms, see Theissen, Polyp. No. 63), Cfr. Murrill I; Petch, Circulars "On Cocoanut-root disease"—Cosmopolitan.

**Gloeoporus corrugatus**, Berk. Syll. XI, p. 103, Neilgherries.

**Hexagona apiaria**, Pers. Syll. VI, p. 358.

Syn.: *H. Wightii*, Kl., ib. p. 357.

Lloyd, Hexag. p. 6: Philippines, Ceylon, East India, Australia, New-Guinea, Guadeloupe, Borneo.

**Hexagona glabra**, Lév. Syll. VI, p. 364.

Reported from Bombay. This species is not an *Hexagona*, but an hexagonal form of *Lenzites ochroleuca*. (Cfr. Lloyd, Hexag., p. 44.)

**Hexagona Kurzii**, Curr. Syll. VI, p. 360.

Mutlah. Cfr. Lloyd., p. 21.

**Hexagona macrotrema**, Jungh. Syll. VI, p. 369.

Syn.: *H. Molkenboeri*, Lév. Syll. l. cit.

Reported from Java and "various points" of East India; localities desired. It is but a form of *H. albida*. Lloyd knows only three specimens, from Java, New Guinea, and tropical Africa.

**Hexagona polygramma**, Mont. Syll. VI, p. 367.

Theissen, F. Bombay. Khandala. This species is a form of *H. tenuis* with larger pores; it occurs also in Ceylon, Borneo, Australia, South Africa, Mexico, Cuba and South America.

**Hexagona scutigera,** Fr. Syll. VI, p. 362.

Reported from Brazil, Paraguay and East India. I doubt, whether the latter statement is quite certain; for *scutigera is* only a form of *H. variegata,* which is an exclusively American plant. (Cfr. Lloyd, Hexag., p. 13.)

**Hexagona sinensis,** Fr. Syll. VI, p. 357.

Reported from China, Mauritius and East India. "This species in reality is merely a change of name of *Boletus favus* of which no type exists." (Lloyd, Hexag., p. 45).

**Hexagona subtenuis,** Berk. Syll. XI, p. 99.

East India, Central America, Australia. Lloyd (Hexag., p. 26) considers it as a form of *H. tenuis.*

**Hexagona tenuis,** Hook. Syll. VI, p. 366.

P. Henn. II, p. 327, Saharanpur Garden; I, f. *minor,* Bilaspore on dead branches of *Mangifera indica*; Theissen. F. Bombay. Khandala and Bassein. "Widely distributed plant in most warm countries of the world." (Lloyd, Hexag., p. 23.)

**Lenzites acuta,** Berk. Syll. V., p. 643, Khasia, Himalaya, Philippines.

**Lenzites betulina** (L.), Fr. Syll. V, p. 638.

P. Henn. II, p. 328, Mussoorie, Armigadh (5,500 ft.), Europe, Siberia, North America, Australia.

**Lenzites eximia,** Berk. Syll. V, p. 648, Sikkim and Himalaya.

**Lenzites ochroleuca,** Lév.

Syn. : *Sistotrema ochroleucum,* Lév. Syll. VI, p. 481.
*Dædalea Hobsoni,* Berk. Syll. VI, p. 379.
*Trametes lobata,* Berk. Syll. VI, p. 343.
*Dædalea ochracea,* Kalch. Syll. VI, p. 372.
*Dædalea flabellum,* Berk. Syll. IX, p. 200.
*Lenzites ochrophylla,* Berk. Syll. V, p. 650.
*Hexagona glabra,* Lév. Syll. VI, p. 364.
*Hexagona picta,* Berk. Syll. VI, p. 361.

Cfr. Lloyd, Hexag., p. 31, where the other synonyms of this most polymorphic species may be found. It is very common in East India, Ceylon, Australia, Philippines, etc. Theissen, F. Bombay. Bombay, Khandala and Salsette.

**Lenzites repanda** (Mont.), Fr. Syll. V, p. 650.

Syn. : *Lenzites applanata,* Fr. Syll. V, p. 644.
*Lenzites Palisoti,* Fr. Syll. V, p. 650.
*Lenzites pallida,* Berk. Syll. V, p. 650.
*Lenzites polita,* Fr. Syll. V, p. 649.
*Lenzites deplanata,* Fr. Syll. V, p. 644.

Theissen, F. Bombay. Dehra Dun and Simla. In Syll. ll. cit. *repanda,* reported from Sikkim (India), Ceylon, Borneo, New Zealand, North America, Cuba; *applanata,* from Brazil, Guyana, Ceylon, Perak, Mauritius; *Palisoti* from South Africa and Australia; *pallida* from Khasia (India) and Philippines; *polita* from Brazil and the Isle of Bourbon; *deplanata* from Ceylon, Nepal, Australia, Cuba, Brazil, Guinea and South Africa. (Cfr. Theissen, Polyp. No. 38, Romell, p. 11, Murr. X.)

**Lenzites rugulosa,** Berk. Syll. V, p. 649, Darjeeling.

**Lenzites subferruginea,** Berk. Syll. V, p. 643, Khasia, Himalaya.

**Merulius lignosus,** Berk. Syll. VI, p. 420, Darjeeling.

**Merulius pseudolacrymans,** P. Henn. II, p. 328.

Saharanpur Garden, on roots of trees.

**Polyporus adustus** (Willd.), Fr. Syll. VI, p. 125.

Sikkim, Europe, North America, Cuba, Australia, New Zealand, East and South Africa, Brazil, Patagonia, China. (Cfr. Theissen, Polyp. No. 42.)

**Polyporus anthelminticus,** Berk. Syll. VI, p. 79.
On culms of *Bambusa*, Pegu; "vulgo, 'Wamo' or, 'Jhan-mo'; ab indigenis ut anthelminticus adhibetur."
**Polyporus arcularius** (Batsch.) Fr.
P. Henn. II, p. 326, Mussoorie, Arnigadh, Europe, Siberia, North and Central America, Ceylon, Australia, New Zealand.
**Polyporus bambusicola,** P. Henn. II, p. 326.
Saharanpur Garden, on roots of *Bambusa*.
**Polyporus campbellii,** Berk. Syll. VI, p. 61.
On the ground, Poona.
**Polyporus cochleariformis,** Cooke, Syll. VI, p. 91.
Malacca.
**Polyporus corium,** Berk. Syll. VI, p. 111.
Sikkim (4,000 m.).
**Polyporus cremoricolor,** Berk. Syll. VI, p. 71.
Darjeeling.
**Polyporus cubensis,** Mont. [Trametes].
Theissen, F. Bombay, Dehra Dun. (Cfr. Synonymy, Theissen, Polyp. No. 80.)— Cosmopolitan species.
**Polyporus digitalis,** Berk. Syll. VI, p. 123.
Sikkim.
**Polyporus elatinus,** Berk. Syll. VI, p. 141.
Sikkim and East Nepal.
**Polyporus flammans,** Berk. Syll. VI, p. 103.
Sikkim and Darjeeling.
**Polyporus gilvus,** Schw. Syll. VI, p. 121.
Syn : *P. isidioides*, Berk., ibid.
P. Henn., I, II, p. 325, Kalsia, on *Shorea robusta*; Mussoorie, Arnigadh. Theissen, F. Bombay. Khandala. Ell. et Ev. (Syll. IX, p. 188) ascribes it to *Mucronoporus*, Romell, p. 14, to *Chætoporus*. *Polyporus scruposus* Fr. is said to be merely a form of *Polyporus gilvus*. Cosmopolitan. For synonymy and distribution, see Theissen, Polyp. No. 54.)
**Polyporus grammocephalus,** Berk. Syll. VI, p. 92.
P. Henn. I, II, p. 326, Kalsia; Saharanpur Garden; Theissen, F. Bombay. Poona, Ceylon, Philippines, Australia, New Zealand, Cuba, South America, Africa. Cfr. Theissen, Polyp. No. 56.
**Polyporus hispidus,** (Bull.) Fr.
P. Henn. II, p. 326, Saharanpur Garden.—Europe, N. America.
**Polyporus Hobsoni,** Berk. Syll. VI, p. 135.
Bombay.
**Polyporus medullaris,** Berk. Syll. VI, p. 140, Behar.
**Polyporus nodipes,** Berk. Syll. VI, p. 57, Khasia.
**Polyporus Persoonii,** Fr. Syll. VI, p. 272.
Rather *Fomes*, Cfr. Theissen, Polyp. No. 27, with synonymy and distribution. Cosmopolitan.
**Polyporus platyporus,** Berk. Syll. VI, p. 83, Darjeeling.
**Polyporus resinosus,** (Schrad.) Fr. Syll. VI, p. 137.
P. Henn. II, p. 325, Saharanpur Garden. Europe, N. America.
**Polyporus rubricus,** Berk. Syll. VI, p. 98, Sikkim.
**Polyporus saharanpurensis,** P. Henn. II, p. 325.
Saharanpur Garden, on the ground near roots.
**Polyporus satpoorensis,** de Beck Syll. XI, p. 85.
Satpoora mountains.
**Polyporus senex,** N. et Mont. Syll. VI, p. 164.
Theissen, F. Bombay. St. Xavier's College, Bombay—Sikkim (Syll. l. cit.), Ceylon, Malacca, Cuba, Venezuela, Brazil.

**Polyporus squamosus,** (Huds.) Fr. Syll. VI, p. 79.
P. Henn. I, N. W. Himalaya, Pangi District (6,000 ft.), Europe, N. America.

**Polyporus squamoso-maculatus,** Berk. Syll. IX, p. 161.
Syn.: *P. maculatus,* Berk. nec Beck.
Locality desired.

**Polyporus sulphureus,** (Bull.) Fr. Syll. VI, p. 104.
Sikkim, Europe, Siberia, N. America, Cuba, Ceylon, Tasmania.

**Polyporus tubulæformis,** Berk. Syll. VI, p. 76; locality desired.

**Polyporus umbilicatus,** Berk. Syll. VI, p. 68.
Tonglo and Sinchtul; St. Xavier's College, Bombay (Theissen, F. Bombay.).

**Polyporus vallatus,** Berk. Syll. VI, p. 77, Khasia.

**Polyporus vivax,** Berk. Syll. IX, p. 171; locality unknown.

**Polyporus zonalis,** Berk. Syll. VI, p. 145.
P. Henn. I, Kalsia, on dead trunks of *Cedrela Toona;* Ceylon, Borneo, Australia, Mexico, Cuba, Brazil. Cfr. Romell, p. 36; Theissen, Polyp. n. 85,

**Polystictus affinis,** Nees Syll. VI, p. 219.
Syn: *Polystictus licmophorus,* Mass. from India.
Cfr. Lloyd, Polyst., p. 53, 57.—Philippines, East India, Java, Sumatra, Australia, Brazil.

**Polystictus albidus,** Mass. Syll. XI, p. 92.
Bonhomme valley.

**Polystictus beharensis,** Berk. Syll. VI, p. 289, Soane River, Behar.

**Polystictus cichoriaceus,** Berk. Syll. IX, p. 188.
Syn.: *Polystictus intybaceus,* Berk. "The most common species (of this genus) in the East Indies" (also Samoa and Philippines), Lloyd Polyst., p. 62.

**Polystictus cingulatus,** Fr. Syll. VI, p. 268, reported from India and Brazil.

**Polystictus cineraceus,** Lév. Syll. VI, p. 261—Neilgherries.

**Polystictus cinnamomeus,** Jacq. Syll. VI, p. 210.
Syn.: *Polystictus oblectans,* Berk. Syll. VI, p. 211.
P. Henn. II, p. 327. Mussoorie, Arnigadh (5,000 ft.); Europe, Ceylon, Tasmania, New Zealand, Australia, N. and South America. Cfr. Murrill VII.

**Polystictus coriaceus,** Lev. Syll. VI, p. 270—Neilgherries.

**Polystictus cupreus,** Berk. Syll. VI, p. 272; locality desired.

**Polystictus elongatus,** Berk. Syll. VI, p. 231.
India, Ceylon, Java, Philippines, Japan, N. America, Mexico.

**Polystictus flabelliformis,** Kl. Syll. VI, p. 216.
Sikkim; Pegu; Perak.—Ceylon, Borneo, Australia.
Samoa, Cuba, South America, Cfr. Lloyd. Polyst., p. 55.

**Polystictus flavidus,** Berk. Syll. VI, p. 278, East Nepal.

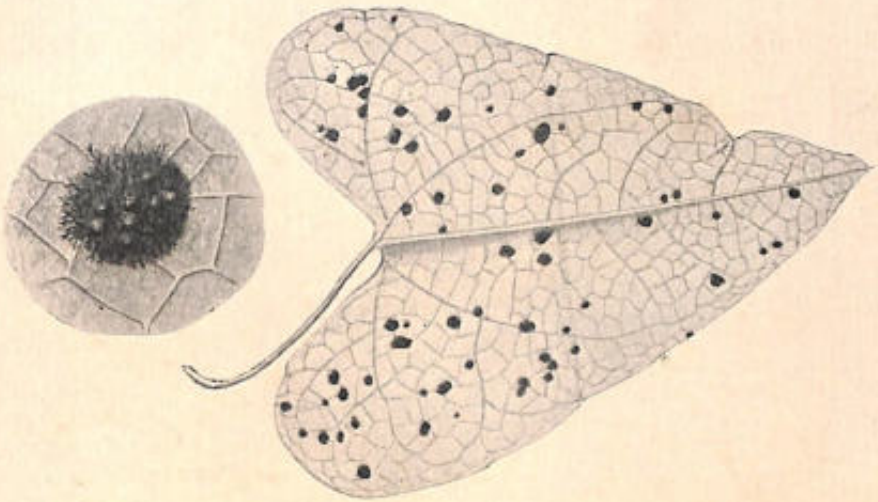
**Polystictus florideus,** Berk. Syll. VI, p. 215.
Sikkim; Pegu; East Nepal. According to Lloyd, Polyst., p. 51, a dark form of *Polystictus xanthopus.*

**Polystictus floridanus,** Berk. Syll. VI, p. 251.
Theissen, F. Bombay. Dehra Dun., N. and South America, Australia Polynesia—Cfr. Theissen, Polyp. No. 96; Romell, p. 31; Murrill XIII.

**Polystictus Gollani,** P. Henn. II, p. 327.
Siwalik Range, on trunk of *Terminalia tomentosa.*

**Polystictus inquinatus,** Lév. Syll. VI, p. 270, Neilgherries.

**Polystictus leoninus,** Kl. Syll. VI, p. 235.
Syn.: *Polytictus funalis,* Fr. from Africa.
*Polystictus mons veneris,* Jungh. from Java.



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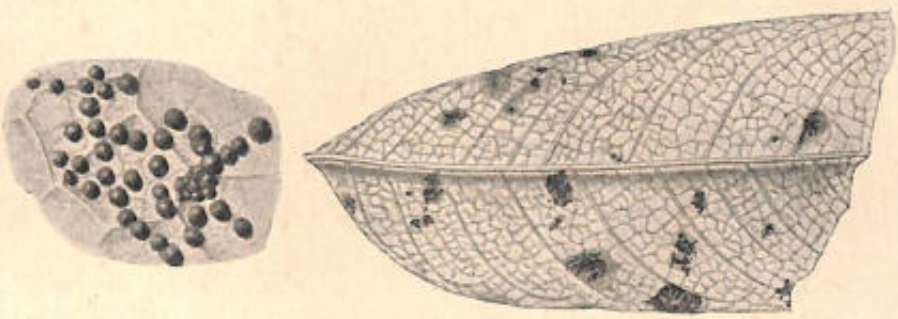

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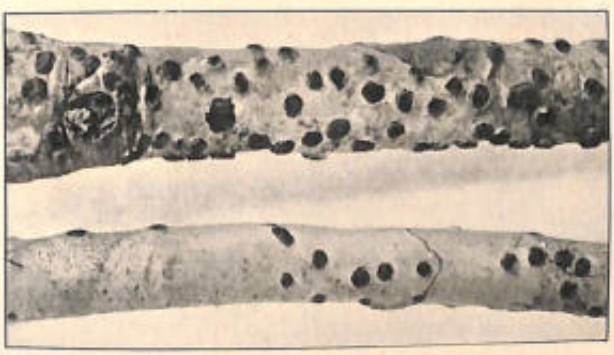


C

A.—*Meliola amphitricha* (natural size and a single spot enlarged).
B.—*Phyllachora Balanse* (natural size and a single spot enlarged).
C.—*Nummularia diatrypeoides.*

East India, Ceylon and Africa.—P. Henn. II, p. 327, Saharanpur Garden; Theissen F. Bombay. Anand.—It occurs also, but rarely, in America. Cfr. Lloyd, Polyst., p. 64.

**Polystictus licnoides,** Mont. Syll. VI, p. 281.

Sikkim—East India, Ceylon, Java, Cuba, N. and South America. Cfr. Romell, p. 15 (as *Chætoporus*); Theissen, Polyp. No. 99.

**Polystictus nepalensis,** Berk. Syll. VI, p. 228, East Nepal.

**Poiystictus nigro-cinctus,** Berk. Syll. VI, p. 268; locality desired.

**Polystictus nilgherrensis,** Mont. Syll. VI, p. 231.

Neilgherries; also in N. and Central America.

**Polystictus occidentalis,** Kl. Syll. VI, p. 274.

P. Henn. II, p. 327, Mussoorie (5,500 ft.); Theissen, F. Bombay. Bandora and Bombay.—It occurs throughout the tropics; Cfr. Theissen, Polyp. No. 107.

**Polystictus ozonioides,** Berk. Syll. VI, p. 236, Darjeeling.

**Polystictus pectunculus,** Lév. Syll. VI, p. 261, Neilgherries; Cuba.

**Polystictus Peradeniæ,** B. et Br. Syll. VI, p. 269.

Neilgherries; Ceylon, Borneo, Australia, Brazil. Cfr. synonymy Theissen, Polyp. No. 109.

**Polystictus pinsitus,** Fr. Syll. VI, p. 262.

Throughout the tropics. Cfr. Lloyd, Mycological Notes, Aug. 1910, p. 47; Murrill XIII; Theissen, Polyp. No. 111.

**Polystictus russogramme,** Berk. Syll. VI, p. 229.

Theissen, F. Bombay. Khandala.—Moluccas, New Guinea.

**Polystictus sanguineus,** (L.) Mey. Syll. VI, p. 229.

P. Henn. I, II, p. 327, Bilaspore on *Shorea robusta*; Saharanpur Garden, on roots; Theissen, F. Bombay. Dehra Dun. Throughout the tropics.

**Polystictus setiporus,** Berk. Syll. VI, p. 402.

"Common species in the East Indies and the East in general" (Lloyd, Polyst., p. 60, who considers it to be a form of *Polystictus cichoriaceus*).

**Polystictus tabacinus,** Mont. Syll. VI, p. 280.

(not *tabacinus* Lév., which is = *cichoriaceus*).

Syn.: *Polystictus barbatulus,* Murr.
*Polystictus microcyclus,* Lev.
*Polystictus xerampelinus,* Kalch.

Cfr. Lloyd, Polyst., p. 59; Theissen, Polyp. No. 81; Romell, p. 15.

Distribution: Chile, Brazil, Africa, East India, Australia, New Zealand, Java, Philippines.

**Polystictus tephroleucus,** Berk. Syll. VI, p. 275, Nangki and East Nepal.

**Polystictus tomentosus,** Fr. Syll. VI, p. 208.

P. Henn. I, Kalsia, on dead wood of *Shorea robusta*—European species.

**Polystictus versatilis,** Berk. Syll. VI, p. 244.

Syn.: *Trametes Zollingeriana,* Lév. (Bresadola in litt.)
*Polystictus cilicioides,* Fr.
*Polystictus Spegazzinii* Bres. (*Polystictus Drummondi,* Speg.)

Cfr. Theissen, Polyp. No. 83, 140; Romell p. 35.

P. Henn. I, Bilaspore—Philippines, Borneo, Australia, Java, South America.

**Polystictus versicolor,** (L.) Fr. Syll. VI, p. 253.

P. Henn. II, p. 327, Mussoorie—Cosmopolitan species.—Cfr Theissen, Polyp. No. 119; Romell, p. 35; Murrill XIII.

**Polystictus virgineus,** Schw. Syll. VI, p. 224.

P. Henn. I, Bilaspore.—North America; Malacca.

**Polystictus xanthopus,** Fr. Syll. VI, p. 215.

Syn.: *Polystictus crassipes* Curr.
*Polystictus cupreo-nitens,* Kalch.

*Polystictus Katui* Ehrb.
*Polystictus saccatus*, Pers.
Cfr. Lloyd, Polyst., p. 50.
Theissen, F. Bombay, Simla.—East Indies, Australia, Ceylon, Java, Polynesia, Africa. It is said (Syll. l. cit.) to occur also in N. and S. America, but according to Lloyd (l. cit.) there are only two species of this section (*Microporus*) known from America, viz. *pterygodes* and *porphyritis*.

**Polystictus xerantheus,** Berk. Syll. VI, p. 279, Lebong.
**Polystictus zeylanicus,** Berk. Syll. VI, p. 271.
Theissen, F. Bombay. Khandala.—Type from Ceylon.
**Polystictus zonatus** (Koen.), Berk. Syll. VI, p. 260.
Theissen, F. Bombay. Bombay.—Cosmopolitan species. (Cfr. Theissen, Polyp. No. 120.)
**Poria arenaria,** Kl. Syll. VI, p. 331; locality unknown.
**Poria Carteri,** Berk. Syll. VI, p. 309, Bombay.
**Poria cerea,** Berk. Syll. VI, p. 320, East Nepal.
**Poria gallo-grisea,** Berk. Syll. VI, p. 306, Neilgherries.
**Poria hypolateritia,** Berk. Syll. VI, p. 297; locality desired.
**Poria porriginosa,** Berk. Syll. VI, p. 318, Bombay.
**Strobilomyces montosus,** Berk. Syll. VI, p. 50, Sikkim.
**Strobilomyces nigricans,** Berk. Syll. VI, 50, Khasia, Kala Panee, Australia.
**Strobilomyces polypyranus,** Hook. Syll. XI, p. 81, Jillapahar.
**Trametes Carteri,** Berk. Syll. IX, p. 196, Bombay.
**Trametes cinnabarina**, Jacq. Syll. VI, p. 353.
Syn.: *Polystictus cinnabarinus* (Jacq.) Fr.
Europe, Siberia, China, East Indies, Ceylon, Sumatra, Australia, Tasmania, New Zealand, North America, Brazil (Romell, p. 37).
**Trametes crenulata,** Berk. Syll. VI, p. 336, Darjeeling.
**Trametes Hookeri,** Berk. Syll. VI, p. 336, Darjeeling.
**Trametes immutata,** Berk. Syll. VI, p. 343, Khasia.
**Trametes serpens,** Fr. Syll. VI, p. 355.
Syn.: *Trametes bombycina*, Quèl.
*Polyporus stephensii*, B. et Br.
P. Henn. II, p. 327, Saharanpur Garden.—Europe, North and South America, Africa, Malayan Archipelago, East Indies, Ceylon. (Cfr. Theissen, Polyp. No. 141.)

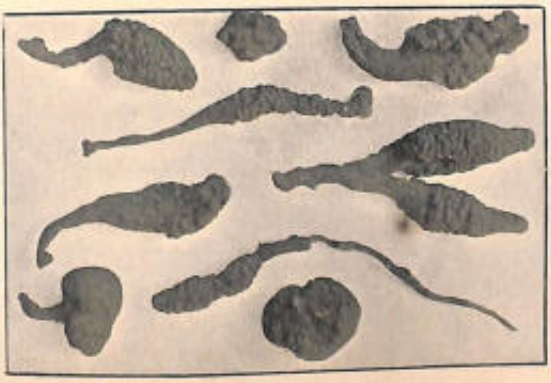
## 5.—AGARICACEÆ.

**Agaricus exaltatus,** Berk. Syll. V, p. 993, Darjeeling (2,100 m.).
**Agaricus fulvipes,** Berk. Syll. V, p. 1010, Sikkim.
**Agaricus latipes,** Berk. Syll. V, p. 1000, Nunklow, Khasia (1,200 m.).
**Amanita cæsarea,** Scop. Syll. V, p. 8, Himalaya.—Europe, North America.
**Amanitopsis Berkeleyi** (Hook.), Sacc. Syll. V, p. 24, Darjeeling (2,400 m.).
**Amanitopsis eriophora** (Berk.), Sacc. Syll. V, p. 26, Darjeeling (2,400 m.).
**Amanitopsis fritillaria** (Berk.), Sacc. Syll. V, p. 26, Khasia.
**Amanitopsis regalis** (Berk.), Sacc. Syll. V, p. 25, Himalaya (2,300 m.). Jillapahar.
**Armillaria adelpha,** Berk. Syll. V, p. 84, Darjeeling (2,300 m.).
**Armillaria dichupella,** Berk. Syll. V, p. 83, Darjeeling (2,300 m.).
**Armillaria duplicata,** Berk. Syll. V, p. 83, Darjeeling (2,300 m.).
**Armillaria horrens,** Berk. Syll. V, p. 82, Darjeeling (2,300 m.).
**Armillaria mellea,** Vahl. Syll. V, p. 80, India, Australia, Europe, North and South America.
**Armillaria multicolor,** Berk. Syll. V, p. 84, Jillapahar, Himalaya (2,300 m.).
**Armillaria omnituens,** Berk. Syll. V, p. 84, Darjeeling (2,590 m.).

A

B

C



A.—*Cordyceps Klenei* on a Caterpillar.
B.—*Daldinia exsurgens.*
C.—*Xylaria anisopleura.*

**Armillaria vara,** Berk. Syll. V, p. 83, Sinchul, Himalaya (2,600 m.).
**Anthracophyllum nigritum,** (Lév.), Kalch. Syll. V, p. 1139.
Syn.: *Panus melanophyllus,* Fr.
*Xerotus nigrita,* Lév.
*Anthracophyllum Beccarianum,* Ces.
Known from Ceylon, Borneo, Philippines, South Africa, Cuba, North America.—According to Lloyd (in litt.) it is probably the same as *Xerotus lateritius* (Cfr. the same below which occurs in East India.)
**Cantharellus cibarius,** Fr. Syll. V, p. 482.
P. Henn. II, p. 328, Mussoorie, Arnigadh (5,500 ft.)—Europe, North and South America, Australia.
**Chalymotta campanulata,** (L.), Karst. Syll. V., p. 1121.
Syn.: *Panaeolus campanulatus,* L.—Europe, Ceylon, North America, South Africa.
P. Henn. I, II, p. 329, Saharanpur Garden.
**Clitocybe laccata** (Scop.), Sacc. Syll. V., p. 197.
P. Henn. II, p. 335, Mussoorie, Arnigadh (5,500 ft.).—Europe, North America, Asia, Africa, Australia, common.
**Collybia antitypa,** Berk. Syll. V, p. 230, Darjeeling (2,600 m.).
**Collybia blandula,** Berk. Syll. V, p. 219, Sikkim (3,300 m.).
**Collybia camptopoda,** Berk. Syll. V, p. 231, Darjeeling (2,200 m.).
**Collybia macra,** Berk. Syll. V., p. 236, Sikkim (3,300 m.).
**Collybia macrura,** Scop. (*radicata,* Batch).
P. Henn. II, p. 335, Mussoorie.—European species.
**Collybia napipes,** Berk. Syll. V, p. 201, Darjeeling, Brazil.
**Collybia papaveracea,** Berk. Syll. V, p. 225, Darjeeling (2,300 m.).
**Collybia podagrosa,** Berk. Syll. V, p. 211, Sinchul (2,400 m.).
**Collybia raphanipes,** Berk. Syll. V., p. 202, Jillapahar (2,200 m.).
**Collybia rhodella,** Berk. Syll. V, p. 237, Darjeeling (2,300 m.).
**Collybia stipitaria,** Fr. Syll. V, p. 216.
P. Henn. I, II, p. 335, Saharanpur Garden on culms of grasses; Theissen, F. Bombay. Simla, on wood.—Europe, North America, South America, Brazil. (Cfr. Rick S. J., Contributio ad monogr. Agaric. et Polyp. p. 72 Broteria 1907.)
**Collybia triplicata,** Berk. Syll. V, p. 221, Sikkim.
**Collybia undabunda,** Berk. Syll. V, p. 201, Darjeeling (2,300 m.).
**Collybia ustipes,** Berk. Syll. V. p. 234, Darjeeling (2,400 m.).
**Cortinarius flammeus,** Berk. Syll. IX, p. 127, Sikkim.
**Cortinarius vinosulus,** Berk. Syll. IX, p. 121, Sikkim.
**Crepidotus applanatus,** Pers. Syll. V, p. 878.
P. Henn. II, p. 331, Mussoorie, Arnigadh (5,500 ft.), Europe, Africa.
**Crepidotus alveolus,** Lasch. Syll. V, p. 877.
P. Henn. ib., Saharanpur Garden.—Europe, North America.
**Eccilia Blanfordii,** P. Henn. I, p. 153.
Kalsia; II, p. 333, Saharanpur Garden.
**Eccilia griseo-rubella,** Lasch. Syll. V, p. 730.
P. Henn. l. cit., Saharanpur Garden—European species.
**Entoloma cystopodum,** Berk. Syll. V, p. 698, Darjeeling (2,500 m.).
**Entoloma euthelum,** Berk. Syll. V, p. 694, Sikkim (3,400 m.).
**Entoloma goliath,** Berk. Syll. V, p. 680, Darjeeling (2,300 m.).
**Flammula chrysomyces,** Berk. Syll. V, p. 825, Darjeeling (2,300 m.).
**Flammula macroptala,** Berk. Syll. V, p. 817, Darjeeling (2,300 m.).
**Flammula phlegmatica,** Berk. Syll. V, p. 815, Sikkim (3,400 m.).
**Flammula sapinea,** Fr. Syll. V, p. 824.
Simla, P. Henn. II, p. 333, Saharanpur Garden.—Europe, North America, Cuba, Australia, New Zealand, Ceylon.

**Galera lateritia,** Fr. Syll. V, p. 800.
P. Henn. II, p. 331, Saharanpur Garden.—Europe, Ceylon.
**Hebeloma catervarium,** Lév. Syll. V, p. 804, Neilgherries, Madras.
**Hebeloma Thomasianum,** Cooke Syll. IX, p. 102, Belgaum.
**Hygrophorus fulvus,** Berk. Syll. V, p. 420, Sikkim (3,500 m.).
**Hygrophorus Hobsoni,** Berk. Syll. V, p. 390, Central India.
**Hypholoma appendiculatum,** Bull. Syll. V, p. 1039.
Syn. : *Stropharia spintrigera,* Fr.
*Agaricus stipatus,* Pers.
P. Henn. II, p. 330, Saharanpur Garden.—Europe, South America.
**Hypholoma atrichum,** Berk. Syll. V, p. 1035, Darjeeling (2,300 m.).
**Hypholoma condensum,** Berk. Syll. V, p. 1042, Darjeeling (2,300 m.).
**Hypholoma hemisodes,** Berk. Syll. V, p. 1035, Darjeeling (2,300 m.).
**Hypholoma castanophyllum,** B. Syll. V, p. 1035, Jillapahar.
**Inocybe echinata,** Roth. Syll. V, p. 773.
P. Henn. II, p. 332, Saharanpur Garden.—European species.
**Lactarius princeps,** Berk. Syll. V, p. 448, Kullung, Khasia.
**Lentinus alopecinus,** Fr. Syll. V, p. 589: locality unknown.
**Lentinus Berteri,** Fr. Syll. V, p. 572 ; locality unknown.
**Lentinus coadunatus,** Hook. Syll. V, p. 601, Darjeeling.
**Lentinus Decaisneanus,** L v. Syll. V, p. 610, Bombay.
**Lentinus hepaticus,** Berk. Syll. V, p. 603, Darjeeling (2,500 m.).
**Lentinus Hookerianus,** Berk. Syll. V, p. 573, Darjeeling and Ceylon.
**Lentinus inquinans,** Berk. Syll. V, p. 583, Sikkim, Pegu, East Nepal.
**Lentinus melanophyllus,** Lév. Syll. V, p. 575.
P. Henn. I, Bilaspore, on *Shorea robusta* ; type from Sumatra.
**Lentinus pergameneus,** Lév. Syll. V, p. 600, India, Malacca, Australia.
**Lentinus prærigidus,** Berk. Syll. V, p. 587, Behar, Soane River.
**Lentinus squarrosulus,** Mont. Syll. V, p. 585, Neilgherries.
**Lentinus subdulcis,** Berk. Syll. V, p. 611, Darjeeling.
**Lentinus subnudus,** Berk. Syll. V, p. 583.
Theissen, F. Bombay. Khandala, Ceylon, Australia.
**Lepiota alliciens,** Berk. Syll. IX, p. 7, Masulipatam.
**Lepiota anax,** Berk. Syll. V, p. 28, Nunklow.
**Lepiota Badhami,** Berk. Syll. V, p. 35, India, Europe, North America.
**Lepiota cepæstipes,** Sow. Syll. V, p. 43, common ; also in Europe and Brazil.
**Lepiota clypeolaria,** Bull. Syll. V, p. 36.
P. Henn. II, p. 335, Saharanpur Garden.—Europe, North America, Australia ; Brazil (Rick S. J., Contr. ad Monogr. Agaric., p. 67, Broteria 1907).
**Lepiota cristata,** A. et Schw. Syll. V, p. 39.
P. Henn. l. cit., Saharanpur Garden. Europe, North America, Tasmania.
**Lepiota deliciolum,** Berk. Syll. V, p. 44, Darjeeling (2,400m.).
**Lepiota excoriata,** Schaeff Syll. V, p. 31.
Punjab.—P. Henn. II, p. 336, Saharanpur Garden—Europe, Australia, S. Africa ; Brazil (Rick l. cit., p. 67).
**Lepiota holosericea,** Fr. Syll. V, p. 42.
P. Henn., l. c. ibid., Europe.
**Lepiota implana,** Berk. Syll. V, p. 41, Moflong, Khasia.
**Lepiota longicauda,** P. Henn. I, p. 153.
Kalsia ; II, p. 335, Saharanpur.
**Lepiota malleus,** Berk. Syll. IX, p. 3, Masulipatam.
**Lepiota mammosa,** P. H. II, p. 335, Saharanpur.
**Lepiota meleagris,** Sow. Syll. V, p. 36.
P. Henn, l. cit., Saharanpur. Europe ; Brazil (Rick. l. c.)
**Lepiota montosa,** Berk. Syll. V, p. 41, Sikkim.

*Xylaria turgida.*

**Lepiota procera,** Scop. Syll. V, p. 28.
P. Henn, l. c.—Europe, N. America, Ceylon, Australia, S. Africa.
**Lepiota rhacodes,** Vitt. var. *puellaris,* Fr.
P. Henn. I, Kalsia.—The type (Syll. V, p. 29) occurs in Europe, North America, Brazil (*celebia,* P. Henn., cfr. Rick. l. c., p. 67).
**Lepiota seminuda,** Lasch., Syll. V, p. 50.
P. Henn. II, p. 335, Saharanpur.—European species.
**Lepiota sistrata,** Fr. l. cit.
P. H., l. cit. ibid. European species.
**Lepiota sordescens,** B. et C. Syll. V, p. 66.
Theissen, F. Bombay, Salsette.—Type from Cuba ; also in Brazil (Rick. contrib. ad Mon. Agar., p. 69, Broteria, 1907).
**Marasmius** (not considering some species reported by Hennings of doubtful identification).
**Marasmius graminum** (Lib.), Berk. Syll. V, p. 542.
P. Henn. I, II, p. 329, Saharanpur garden on culms of grasses.—Europe, N. America.
**Marasmius hæmatodes,** Berk. Syll. V, p. 529, Sikkim (3,500m.).
**Marasmius Hookeri,** Berk. Syll. V, p. 514, Khasia (1,700m.).
**Marasmius ramealis,** (Bull.) Fr. Syll. V, p. 531.
P. Henn., II, p. 328, Saharanpur.—Europe, N. America.
**Marasmius rotula,** (Scop.) Fr. Syll. V, p. 541.
P. Henn. l. cit. ibid., on culms of grasses.—Europe, Australia, South Africa.
**Marasmius spaniophyllus,** Berk. Syll. V, p. 568.
Theissen, F. Bombay, Khandala.—Type from Brazil.
**Marasmius subomphalodes,** P. Henn., II, p. 329, Saharanpur.
**Marasmius urens,** Fr. Syll. V, p. 504.
P. Henn., l. cit., Mussoorie.—European species.
**Mycena arata,** Berk. Syll. V, p. 269, Sinchul.
**Mycena bicrenata,** Berk. Syll. V, p. 279, Jillapahar.
**Mycena Broomeiana,** Berk. Syll. V, p. 281, Darjeeling.
**Mycena colligata,** Berk. Syll. V, p. 271, Sikkim (3,400m.).
**Mycena conocephala,** P. Henn., II, p. 334, Saharanpur.
**Mycena dentosa,** Berk. Syll. V, p. 282, Sikkim (3,400m.).
**Mycena discors,** Berk. Syll. V, p. 264, Sikkim (3,400m.).
**Mycena flavo-miniata,** Berk. Syll. V, p. 289, Sikkim (3,400m.).
**Mycena incommiscibilis,** Berk. Syll. V, p. 281, Sikkim (3,400m.).
**Mycena macrothela,** Berk. Syll. V, p. 294, Khasia.
**Mycena manipularis,** Berk. Syll. V, p. 272, Sinchul (2,500m.).
**Mycena myriadea,** Berk. Syll. V, p. 271, Sikkim (3,400m.).
**Mycena nubigena,** Berk. Syll. V, p. 269, Darjeeling (2,200m.).
**Mycena prasia,** Berk. Syll. V, p. 264, Sikkim.
**Mycena puberula,** Berk. Syll. V, p. 284, Sikkim (3,400m.).
**Mycena rubiaetincta,** Berk. Syll. V, p. 291, Darjeeling (2,600m.).
**Mycena rufata,** Berk. Syll. V, p. 272, Darjeeling (2,400m.).
**Mycena rufo-picta,** Berk. Syll. V, p. 294, Darjeeling (2,400m.).
**Mycena russulina,** Berk. Syll. V, p. 272, Darjeeling (2,600m.).
**Mycena xanthophylla,** Berk. Syll. V, p. 272, Darjeeling (2,100m.).
**Naucoria descendens,** Berk. Syll. V, p. 849, Sikkim (3,400m.).
**Naucoria fusispora,** P. Henn. II, p. 332, Mussoorie (5,500 ft.)
**Naucoria khasiensis,** Berk. Syll. V, p. 837, Khasia.
**Naucoria micromegala,** Berk., Syll. V, p. 833, Khasia.
**Naucoria pediades,** Fr. Syll., p. 844.
P. Henn. II, p. 332, Saharanpur Garden,—Known from Europe, Siberia, Ceylon, Australia, S. Africa, N. America.

**Naucoria scrupea,** Berk. Syll. V, p. 851, Darjeeling (2,250m.).
**Omphalia calycinoides,** P. Henn. II, p. 334, Saharanpur.
**Omphalia radiatilis,** Berk. Syll. V, p. 323, Sikkim (3,400m.).
**Omphalia ranunculina,** Berk. Syll. V, p. 325, Lachen (4,200-47,800m.).
**Panus rudis,** Fr. Syll. V, p. 616.
Syn.: *Agaricus hirtus,* Secr.
*Panus Hoffmanni,* Fr.
*Lentinus Lecomtei,* Fr.
*Lentinus Swainzonii,* Lév.
*Lentinus Martianoffianus,* Kalch.
Grevillea IV, p. 137, Kashmir on decomposed wood during rain. Eaten by the natives. The specimen sent in its dry state is about 2½ inches across, but it is stated to grow in large masses, and is sometimes twenty times as large. The vernacular name is Sibry. The species occurs in Europe, Siberia, N. America. S. America (cfr. Theissen, Hymenomyc. riogr. No. 7 ; Romell, p. 13), Cuba, South Africa, Ceylon, Australia.
**Paxillus chrysites,** Berk. Syll. V, p. 986, Darjeeling.
**Paxillus pinguis,** Berk. Syll. V, p. 987, Darjeeling.
**Paxillus sulphureus,** Berk. Syll. V, p. 986, Darjeeling.
**Pholiota examinans,** Berk. Syll. V, p. 742, Darjeeling.
**Pholiota Gollani,** P. Henn. II, p. 333, on *Tamarindus indica,* Saharanpur.
**Pholiota granuloso-verrucosa,** P. Henn., l. cit. ibid. on the ground.
**Pholiota microspora,** Berk. Syll. V, p. 742, Darjeeling.
**Pholiota præcox,** (Pers.) Fr. Syll. V, p. 738.
Syn.: *Ph. candicans,* Schæff.
P. Henn. l. cit., Saharanpur.—Europe, N. America, Siberia, Australia.
**Pleurotus anserinus,** Berk. Syll. V, p. 362, Jillapahar (2,300 m.).
**Pleurotus cous,** Berk. Syll. V, p. 361, Sikkim.
**Pleurotus hapalosclerus,** Berk. Syll. V, p. 351, Darjeeling (2,300 m.).
**Pleurotus placentodes,** Berk. Syll. V, p. 359, Sikkim (3,400 m.).
**Pleurotus ninguidus,** Berk. Syll. V, p. 361, Sikkim.
**Pleurotus verrucarius,** Berk. Syll. V, p. 351, Darjeeling (2,300 m.).
**Pleurotus subpalmatus,** Fr. Syll. V, p. 343.
P. Henn. II, p. 334, Mussoorie, Arnigadh (5,500 ft.).—European species.
**Pluteus cuspidatus,** Berk. Syll. V, p. 677, Khasia.
**Pluteus palumbinus,** Berk. Syll. V, p. 677, Darjeeling (2,300 m.).
**Psalliota** (*Agaricus*), **campestris,** (L.), Fr. Syll. V, p. 997.
P. H. I, N. W. Himalaya, Pangi (6,000 ft). Occurs all over the world.
**Psalliota comosa,** P. Henn. II, p. 331, Saharanpur.
**Psalliota rimosa,** P. Henn. II, p. 331, Saharanpur.
**Psathyra calvescens,** Berk. Syll. V, p. 1067, Darjeeling (2,100 m.).
**Psathyra flavo-grisea,** Berk. Syll. V, p. 1063, Darjeeling.
**Psathyra Nassa,** Berk. Syll. V, p. 1061, Darjeeling.
**Psathyra obtusata,** Fr. Syll. V, p. 1066, Saharanpur. Known from Europe and Ceylon., P. Henn. II, p. 329.
**Psathyrella,** P. Henn. II, p. 329. Three species of doubtful identification.
**Psilocybe atrorufa,** Schæff. f. *minor* P. Henn. II, p. 330, Saharanpur.
**Psilocybe cæspiticia,** Berk. Syll. V, p. 1053, Darjeeling (2,250m.).
**Psilocybe tristis,** P. Henn., l. cit., Saharanpur.
**Russula alutacea,** Fr. Syll. V, p. 479.
Grevill. IV, p. 137, Gulmarg, Kashmir, in the woods during the rains. Known from Europe, N. America.
**Schizophyllum alneum,** (L.) [*Sch. commune,* Fr.] Syll. V, p. 655. Occurs all over the world—P. Henn. II, p. 328.—Saharanpur and Mussoorie; Theissen, F. Bombay, Poona and Bombay.
**Stropharia aureo-fulva,** Berk. Syll. V, p. 1015, Jillapahar (2,300m.).

**Stropharia Gollani,** P. Henn. I, p. 153, Saharanpur ; II, p. 330 ; ibid.

**Stropharia Mephistopheles,** Cooke Syll. IX, p. 139, Belgaum; reported also from Brazil (Rick, contrib. Monogr. Agar., p. 80, Broteria, 1907.)

**Stropharia pygmæa,** P. Henn. I, p. 152, Saharanpur Garden.

**Tubaria asperata,** P. Henn. II, p. 331, Saharanpur Garden.

**Tubaria furfuracea,** (Pers.) Sacc. Syll. V., p. 872.

P. Henn., l. cit., Saharanpur; known from Europe, N. America, Ceylon, Australia, Tasmania.

**Tubaria saharanpurensis,** P. Henn., l. cit. ibid.

**Volvaria liliputana,** P. Henn. II, p. 333, Saharanpur.

**Volvaria media,** (Schum.) Fr. Syll. V, p. 662.

P. Henn. l. cit. ibid.—European species.

**Volvaria Thwaitesii,** Hook. Syll. V, p. 656, Darjeeling (2,200 m.).

**Volvaria volvacea,** Bull. Syll. V, p. 657.

P. Henn., l. cit., Mussoorie, Arnigadh (5,500 ft.). Known from Europe, N. America, Ceylon.

**Xerotus cantharelloides,** Berk. Syll. V, p. 630, Jillapahar.

**Xerotus lateritius,** B. et C. Syll. V, p. 634.

Theissen, F. Bombay, Khandala. Known from Cuba, N. America, Chile, Brazil (Theissen, Hymenomyc. riogr. No. 9, Broteria, 1912). According to Lloyd *Xerotus nigritus,* Fr. [*Anthracophyllum nigritum* (Lév.) Kalch] is probably the same species.

# DESCRIPTIONS OF INDIAN MICRO-LEPIDOPTERA.

BY

E. MEYRICK, B.A., F.R.S., F.Z.S.

## XVI.

(*Continued from page 877 of Volume XXI.*)

GELECHIADÆ.

*Tituacia*, Walk.

Characters of *Chelaria*, but forewings with 3 and 4 stalked from angle of cell; hindwings with 3 and 4 connate. *Stomylia*, Snell, is a synonym.

*Tituacia deviella*, Walk.

(*Tituacia deviella*, Walk., Cat. XXIX, 812; *Stomylia erosella*, Snell., Tijd. v. Ent. XXII, 14, pl. VIII, 1-6.)

Maskeliya and Madulsima, Ceylon (Pole, Green); in March, April, and September. Also from Java and Borneo.

*Palintropa*, n.g.

Head with appressed scales; ocelli absent; tongue developed. Antennæ $\frac{2}{3}$, in ♂ serrulate, basal joint moderate, without pecten. Labial palpi very long, recurved, second joint thickened with dense scales above, beneath with broad rough tuft of projecting scales, terminal joint longer than second, thickened with scales, posteriorly with dense rough projecting scales except at apex, acute. Maxillary palpi very short, filiform, appressed to tongue. Posterior tibiæ with rough scales above. Forewings with 2 from angle, 3 absent, 6 to apex, 7 and 8 stalked, 11 from middle. Hindwings $\frac{3}{4}$, narrowly elongate-trapezoidal, apex pointed, produced, termen beneath apex bisinuate, very oblique, cilia 3; 3 absent, 4 and 5 connate, 6 and 7 stalked.

A development of *Chelaria*.

*Palintropa hippica*, n. sp.

♂. 13-14 mm. Head and thorax fuscous irrorated with whitish. Palpi clothed with series of grey white-tipped scales, tuft of second joint mixed with grey and whitish. Abdomen whitish-ochreous irrorated with fuscous and brownish. Forewings elongate, very narrow, costa slightly arched, apex round-pointed, termen extremely obliquely rounded; fuscous irrorated with whitish; a dark brown patch irregularly irrorated with blackish extending along costa from $\frac{1}{4}$ to near apex, and reaching more than half across wing, limited beneath before middle by a large tuft of scales on fold; a silvery-grey-whitish line crossing wing at $\frac{2}{3}$, on lower half dilated into a spot preceded and followed by light brownish-ochreous spaces and margined anteriorly by a dark fuscous tuft of scales; a silvery-whitish angulated transverse line immediately before apex: cilia fuscous irrorated with whitish, towards base tinged with whitish-ochreous. Hindwings dark grey, thinly scaled and semi-transparent in disc anteriorly; cilia fuscous, suffused with whitish-ochreous towards base on lower $\frac{3}{4}$ of termen.

Maskeliya and Madulosima, Ceylon (Pole, Green); in December and March, two specimens.

*Chelaria*, Haw.

Labial palpi with second joint clothed beneath with single or double tuft of scales, rarely with scales appressed beneath but rough above, terminal joint longer than second, thickened with scales usually forming a more or less distinct projection posteriorly, acute. Forewings often

with tufts of scales, 2 and 3 remote, 6 to apex or termen, 7 and 8 stalked, or 7 and 8 out of 6, or rarely 7 absent. Hindwings elongate-trapezoidal, termen beneath apex more or less bisinuate, oblique; 3-5 more or less approximated at base, 6 and 7 stalked.

I have extended the essential characters of this genus as above; from a careful study of considerable material I am convinced it is justifiable. It is exceptional to find the origination of veins 7 and 8 of forewings out of 6 an insufficient character for generic distinction from forms with 6 separate (though the origination of 6 from the stalk of 7 and 8 is seldom if ever of generic value), but in this instance the transition is practically complete, vein 6 in certain forms being very closely approximated to 7; the reason seems to be due to the frequently apical termination of 6 (an unusual structure). By this extension of characters the Australian and African genera *Allocota*, *Deuteroptila*, *Semodictis*, and *Cymatomorpha* become synonyms of *Chelaria*. The species are often very similar in general appearance, and the structural distinctions must therefore be carefully noticed; a tabulation into groups based on these is given below, which may assist determination. Besides the seventeen species described here there is another, *indica*, Wals., which I have not yet been able to identify.

Tuft double, 7 and 8 out of 6 — *anguinea*.
Tuft double, 6 separate, 7 and 8 stalked—*isoptila*, *ericta*, *corynetis*, *iophana*, *lactifera*.
Tuft single, 7 absent—*scriniata*.
No tuft, 6 separate, 7 and 8 stalked—*tonsa*.
Tuft single, 7 and 8 out of 6—*caryodora*, *silvestris*.
Tuft single, 6 separate, 7 and 8 stalked—*scopulosa*, *spathota*, *verticosa*, *phacelota*, *tortuosa*, *paroctas*, *particulata*.

*Chelaria anguinea*, n. sp.

♂. 16 mm. Head and thorax whitish, irrorated with grey and fuscous. Palpi whitish irrorated with grey and dark fuscous, second joint with two moderate rounded tufts beneath tinged with ochreous, terminal joint with median band of dark fuscous suffusion and strong median projection of scales posteriorly. Abdomen whitish irrorated with grey and dark grey. Forewings elongate, very narrow, costa gently arched, with scales rather prominent at $\frac{1}{3}$, apex round-pointed, termen extremely obliquely rounded; 7 and 8 out of 6; scattered tufts of scales, and a large tuft on fold at $\frac{1}{2}$ of wing; light brownish irrorated with white, and irregularly sprinkled with dark fuscous; a short black dash beneath costa near base; a narrow dark fuscous patch extending along costa from $\frac{1}{5}$ to $\frac{2}{3}$, cut by two oblique white strigulæ; some indications of irregularly scattered small undefined dark fuscous marks; two or three black dashes towards apex: cilia grey irrorated with whitish. Hindwings pale grey, paler and thinly scaled anteriorly; cilia whitish-ochreous.

Khasis; in May, one specimen.

*Chelaria lactifera*, n. sp.

♂. 14 mm. Head and thorax ochreous-whitish, patagia brown. Palpi whitish, second joint with long rough projecting basal and apical tufts beneath and ochreous-brown bands sometimes sprinkled with blackish traversing these, terminal joint with indistinct fuscous oblique subbasal and median rings, and projecting scales posteriorly towards middle. Abdomen dark grey, anal tuft ochreous-whitish. Forewings elongate, narrow, widest at $\frac{1}{4}$, costa gently arched, apex pointed, termen extremely obliquely rounded; 6 separate, to apex, 7 and 8 stalked; chocolate-brown, becoming deeper towards costa and apex; an ochreous-whitish patch

on base of costa, including a small dark brown spot on base of costa, and a black subcostal dot near base; a streak of ochreous-white suffusion along dorsum from base to tornus; stigmata represented by undefined blackish dashes, plical rather before first discal, preceded by a blackish dot on fold; a black dot on tornus; some irregular pale grey irroration on apical third; a black dash resting on termen beneath apex: cilia fuscous, towards base mixed with dark fuscous and sprinkled with whitish, on costa brownish. Hindwings grey, thinly scaled and iridescent anteriorly, veins and termen darker; cilia grey.

Khasis; in June and October, two specimens.

*Chelaria iophana*, n. sp.

♂ ♀. 14-16 mm. Head and thorax whitish irrorated with dark grey. Palpi whitish irrorated with dark grey, second joint beneath with two moderate rounded ochreous-tinged tufts, terminal joint ochreous-tinged towards middle, posteriorly with projections of dark fuscous scales above and below middle. Abdomen whitish-ochreous irrorated with dark grey. Forewings elongate, very narrow, costa gently arched, with scales rather prominent at $\frac{2}{3}$, apex obtuse, termen very obliquely rounded; 6 separate, to apex, 7 and 8 stalked; brownish mixed with grey and raised whitish scales, strewn with irregular black longitudinal marks on veins; some irregular tufts of scales, especially a large tuft in disc at $\frac{2}{3}$; a triangular blackish blotch occupying median third of costa, and reaching $\frac{3}{4}$ across wing; cilia fuscous sprinkled with whitish points. Hindwings fuscous, thinly scaled and subhyaline anteriorly, with strong violet-blue iridescence; veins, apical area, and termen suffused with dark fuscous; cilia grey.

Central Provinces, Ceylon (de Mowbray); in December, three specimens.

*Chelaria corynetis*, n. sp.

♂ ♀. 15-16 mm. Head grey suffusedly mixed with white. Palpi brown irrorated with whitish, second joint with moderate rounded basal and apical tufts beneath, lower portion of each crossed by a band of black irroration, terminal joint with well-marked median and subapical projections of blackish scales posteriorly. Thorax fuscous irrorated with whitish and sprinkled with blackish. Abdomen whitish-ochreous irrorated with grey. Forewings elongate, very narrow, costa gently arched, with scales rather prominent at $\frac{2}{3}$, apex obtuse, termen very obliquely rounded; 6 separate, 7 and 8 stalked; brown, sometimes tinged with ferruginous in disc, variably mixed and sometimes posteriorly wholly suffused with dark fuscous; basal area irregularly mixed or suffused with white, with some irregular dark fuscous marks, and a black subcostal dash; a narrow elongate black patch extending along costa from $\frac{1}{4}$ to $\frac{2}{3}$, cut by three oblique white strigulæ; an irregular outwardly oblique transverse black patch from dorsum before middle, nearly reaching costal patch, edged with raised whitish scales; an irregularly triangular fuscous blackish-edged spot on tornus, reaching half across wing, surrounded with white suffusion extending to costa; some irregular whitish irroration towards apex: cilia fuscous, towards base sprinkled with whitish, with indications of dark fuscous bars round apex. Hindwings light fuscous, thinly scaled and semihyaline, darker along termen and towards apex, veins rather dark fuscous; cilia fuscous.

Maskeliya, Ceylon (Pole, de Mowbray); in June, six specimens.

*Chelaria ericta*, n. sp.

♂ ♀. 15 mm. Head and thorax whitish. Palpi whitish, partially sprinkled with grey, second joint with moderate rough basal and apical tufts beneath, lower part of each crossed by a blackish band, terminal joint with upper $\frac{2}{3}$ blackish except apex, with submedian and supramedian

projections of blackish scales posteriorly. Abdomen greyish, anal tuft ochreous-whitish, in ♂ with two long expansible whitish genital hair-pencils above. Forewings elongate, very narrow, costa gently arched, apex tolerably pointed, termen extremely obliquely rounded; 6 closely approximated, 7 and 8 stalked; light fuscous, suffusedly irrorated with whitish points; a black dot beneath costa near base; a dark fuscous streak along costa from $\frac{1}{4}$ to $\frac{3}{5}$, cut by two oblique whitish strigulæ; an elongate dark fuscous spot in disc at $\frac{2}{5}$, and another at $\frac{3}{4}$, representing discal stigmata; a similar spot representing plical, rather before first discal, connected with a black subdorsal dash beneath it; a blackish dash on fold beneath middle, and another at tornus beneath second discal; an oblique whitish strigula edged with dark fuscous from costa beyond $\frac{3}{4}$; a black dash resting on termen beneath apex: cilia fuscous sprinkled with whitish. Hindwings iridescent-grey, paler and semihyaline anteriorly, veins and termen darker grey; cilia grey.

Maskeliya, Ceylon (Pole); in March, May, and October, three specimens.

*Chelaria isoptila*, n. sp.

♂ ♀. 16-21 mm. Head and thorax whitish sprinkled with fuscous. Palpi white somewhat mixed with fuscous, second joint with moderate rounded basal and apical tufts beneath, lower portion of each crossed by a dark fuscous band, terminal joint with rough scales posteriorly forming median and subapical projections, mostly suffused with dark fuscous except base. Abdomen whitish-fuscous sprinkled with dark fuscous. Forewings elongate, very narrow, costa gently arched, scales rather prominent at $\frac{2}{3}$, apex obtuse, termen very obliquely rounded; 6 separate, 7 and 8 stalked; fuscous, much mixed and suffused with white, with some scattered dark fuscous scales, and small tufts of raised scales; a blackish dash near base above middle; a streak of blackish irroration along basal fourth of dorsum; a very irregularly triangular dark fuscous blotch mixed with blackish occupying median third of costa and reaching half across wing; a rather inwardly oblique narrow streak of dark fuscous suffusion from tornus reaching more than half across wing, and a spot of dark fuscous suffusion on costa beyond this; a slender dark fuscous streak along termen: cilia fuscous irrorated with whitish, towards base whitish-ochreous. Hindwings grey, thinly scaled and subhyaline anteriorly, veins, apical area, and termen suffused with dark fuscous; cilia grey.

Kandy, Ceylon, in February (Mackwood); Khasis, in October; three specimens.

*Chelaria scriniata*, n. sp.

♂. 17 mm. Head and thorax whitish sprinkled with dark fuscous, thorax with light brownish expansible posterior crest. Palpi dark fuscous, second joint with apical margin and a fine submedian ring white, with moderate triangular apical tuft beneath, terminal joint thickened with scales somewhat projecting posteriorly beneath apex, white with four dark fuscous oblique rings. Abdomen whitish-ochreous. Forewings elongate, very narrow, costa gently arched, faintly sinuate in middle, apex obtuse, termen obliquely rounded; 6 separate, 7 absent; fuscous much mixed and suffused with white; three elongate dark fuscous marks on costa anteriorly, two posteriorly, a flattened-triangular spot in middle, and three small spots towards apex; some scattered blackish scales on margins of cell anteriorly; slender black interrupted plical and median streaks on posterior half of wing, and two or three black dashes towards costa posteriorly: cilia fuscous irrorated with whitish. Hindwings grey, paler and thinly scaled anteriorly, veins dark grey; cilia whitish-grey.

Pundaluoya, Ceylon (Green); in May, one specimen.

*Chelaria tonsa*, n. sp.

♀. 14-15 mm. Head and thorax pale glossy whitish-ochreous, shoulders brownish sprinkled with dark fuscous. Palpi ochreous-whitish, second joint with scales appressed beneath, expanded towards apex above, with basal and supramedian bands of dark fuscous irroration, terminal joint thickened with projecting scales posteriorly except at apex, with two rings of blackish irroration. Abdomen ochreous-whitish irrorated with fuscous. Forewings elongate, narrow, costa gently arched, apex pointed, termen extremely obliquely rounded; 6 separate, 7 and 8 stalked; light brownish, faintly purplish-tinged, sprinkled with fuscous; a dark purplish-fuscous triangular blotch with indigo-blue reflections occupying nearly median third of costa, reaching more than half across wing, edged anteriorly with whitish-ochreous suffusion; a small blackish dot on fold at $\frac{1}{4}$ of wing, one towards dorsum beyond this, one below middle at $\frac{2}{3}$, and one obliquely beyond and above this; some minute ill-defined blackish dots round posterior part of costa and termen: cilia pale ochreous tinged with brownish, more brownish round apex. Hindwings grey, paler and thinly scaled anteriorly; cilia pale ochreous.

Khasis; in October and March, two specimens.

*Chelaria caryodora*, n. sp.

♂ ♀. 15-16 mm. Head and thorax greyish-ochreous more or less sprinkled with dark fuscous. Palpi pale whitish-ochreous, second joint with whorls of fuscous pale-tipped scales, with long rough broad tuft of projecting scales beneath, terminal joint with apical $\frac{2}{3}$ fulvous, thickened posteriorly with projecting scales to near apex. Abdomen whitish-ochreous irrorated with dark fuscous. Forewings elongate, very narrow, costa gently arched, with scales rather prominent at $\frac{2}{3}$, apex round-pointed, termen extremely obliquely rounded; 7 and 8 out of 6; pale fulvous irrorated with dark fuscous; costa, fold, and dorsum irrorated with whitish towards base; two dark fuscous dots beneath costa near base; a triangular dark fuscous blotch occupying median third of costa, reaching half across wing, partially edged with whitish suffusion; four violet-whitish oblique strigulæ on costa posteriorly; a pale violet inwardly oblique mark from tornus, an outwardly oblique mark from termen below middle, and two small marks in disc above these; a black dash resting on termen beneath apex: cilia light fuscous, mixed with darker and sprinkled with violet-whitish towards base. Hindwings whitish-ochreous, veins, apex, and termen suffused with fuscous; cilia pale ochreous-yellowish, round termen tinged with fuscous.

Khasis: in June, eight specimens.

*Chelaria silvestris*, n. sp.

♂ ♀. 15-16 mm. Head and thorax whitish-fuscous, face whitish. Palpi whitish, second joint with whorls of fuscous white-tipped scales, with subbasal and median blackish bars, beneath with moderate tuft of long loose rough projecting scales, terminal joint with blackish subbasal ring, and supramedian band clothed with projecting scales posteriorly. Abdomen grey, anal tuft whitish-ochreous. Forewings elongate, narrow, costa gently arched, apex round-pointed, termen extremely obliquely rounded; 7 and 8 out of 6; fuscous, irrorated with whitish points; two blackish dots towards costa near base; a dark fuscous triangular blotch occupying nearly median third of costa, reaching half across wing, preceded on costa by a small dark fuscous spot separated by a whitish strigula; costa posteriorly dark fuscous, with several fine whitish oblique strigulæ; a short black dash in disc at $\frac{4}{5}$, one resting on termen beneath apex, and a minute one just above tornus: cilia light fuscous irrorated with whitish. Hindwings grey, lighter and thinly scaled

towards base, veins darker; cilia whitish-ochreous, tinged with fuscous round apex.

Khasis; in August and November, three specimens.

*Chelaria spathota*, n. sp.

♂. 15-17 mm. Head and thorax pale whitish-ochreous, patagia blackish-fuscous. Palpi ochreous-whitish, second joint with lower ⅔ fuscous with two suffused blackish-fuscous bands, apical portion with whorls of fuscous whitish-tipped scales, beneath with very long broad rough tuft of projecting scales, terminal joint with oblique blackish ring towards base and three towards middle, posteriorly with median projection of dark fuscous scales. Abdomen grey, anal tuft ochreous. Forewings elongate, very narrow, costa gently arched, apex round-pointed, termen extremely obliquely rounded; 6 separate to apex, 7 and 8 stalked; dark purple-fuscous longitudinally streaked with black; a dark brown streak above fold from base to ⅘ of wing; a rather broad ochreous-whitish streak along dorsum from base to tornus, thence attenuated almost to apex, including short blackish dashes on each side of tornus, its upper edge with a short ochreous-whitish dash adjacent at ⅔, and a similar but transverse mark at ⅘; a fine white longitudinal line above apical portion: cilia pale fuscous, basal half suffused with ochreous-whitish, above apex suffused with dark fuscous. Hindwings fuscous, paler and thinly scaled anteriorly, veins and termen suffused with darker; cilia light fuscous.

Konkan (Young); Khasis; in August, two specimens.

*Chelaria tortuosa*, n. sp.

♂. 14 mm. Head and thorax light greyish-ochreous sprinkled with whitish, shoulders mixed with fuscous. Palpi whitish sprinkled with fuscous, second joint suffused with dark fuscous except towards apex, beneath with long dense projecting brownish scales throughout sprinkled with dark fuscous, terminal joint thickened with scales except towards apex, with broad median dark fuscous band. Abdomen whitish-ochreous sprinkled with fuscous. Forewings elongate, rather narrow, widest near base, costa moderately arched, apex round-pointed, termen extremely obliquely rounded; 6 separate, 7 and 8 stalked; brown, sprinkled with dark fuscous; undefined irregular longitudinal streaks of ochreous-whitish suffusion above and below fold throughout; a streak of dark fuscous suffusion along fold throughout; rest of wing irregularly marked with broken logitudinal streaks of dark fuscous suffusion; costa suffused with dark fuscous from before middle to ⅘: cilia fuscous sprinkled with whitish. Hindwings grey, thinly scaled and subhyaline anteriorly, veins and termen dark fuscous; cilia pale ochreous-fuscous.

Matale, Ceylon (Pole); in December, one specimen.

*Chelaria scopulosa*, n. sp.

♂. 12 mm. Head and thorax brownish mixed with dark grey and sprinkled with whitish. Palpi brownish, second joint irrorated with dark grey, with moderate rounded tuft beneath, terminal joint clothed with dense rough dark grey scales posteriorly almost throughout, with five blackish rings. Abdomen fuscous. Forewings elongate, narrow, costa gently arched, faintly sinuate in middle, apex obtuse, termen very obliquely rounded; 6 separate, 7 and 8 stalked; four strong conical erect tufts along costa, a small tuft near base in middle, and a large one in disc at ⅔; brown irregularly mixed with fuscous and sprinkled with whitish; a small darker brown basal patch, and two small spots transversely placed in disc beyond this; a suffused dark grey triangular blotch occupying median third of costa and reaching ¾ across wing, its apical portion with several irregular black marks; a short black mark resting on termen in middle: cilia brown sprinkled with whitish. Hindwings grey,

paler and thinly scaled anteriorly, darker towards apex and termen; cilia grey.

Karwar, Kanara (Maxwell); in August, one specimen.

*Chelaria verticosa*, n. sp.

♂. 14 mm. Head and thorax ochreous-whitish slightly sprinkled with grey, shoulders blackish. Palpi ochreous-whitish, second joint with basal half dark fuscous, with long rough projecting scales beneath throughout, terminal joint with median fuscous band, and projection of scales posteriorly. Abdomen grey, sides blackish-fuscous, anal tuft fulvous-ochreous. Forewings elongate, very narrow, costa gently arched, apex round-pointed, termen extremely obliquely rounded; 6 separate, to apex, 7 and 8 stalked; ochreous-whitish, irrorated with light brownish and fuscous; a black white-circled dot near base above middle; a blackish white-edged triangular patch occupying more than median third of costa, its costal extremities cut off by fine oblique white strigulæ, apex truncate and reaching half across wing; a black elongate mark resting on termen beneath apex: cilia ochreous-whitish tinged with brownish, round apex sprinkled with dark fuscous. Hindwings grey, thinly scaled and subhyaline anteriorly, veins and termen suffused with dark fuscous; cilia pale fuscous.

N. Coorg, 3,500 feet (Newcome); in June, one specimen.

*Chelaria phaselota*, n. sp.

♀. 12 mm. Head and thorax grey irrorated with whitish. Palpi whitish sprinkled with dark fuscous, second joint dark fuscous except towards apex, with moderate rounded apical tuft beneath, terminal joint with three blackish rings, with slightly projecting scales posteriorly towards middle. Abdomen ochreous-whitish irrorated with grey. Forewings elongate, narrow, costa gently arched, apex obtuse, termen very obliquely rounded; 6 separate, to apex, 7 and 8 stalked; grey irrorated with whitish, with some scattered black scales; a slender black dash beneath costa near base; a blackish semioval spot on middle of costa: three small blackish-grey spots on costa posteriorly: cilia grey sprinkled with whitish. Hindwings grey, paler and thinly scaled anteriorly, veins and termen darker; cilia pale grey tinged with ochreous towards base.

Peradeniya, Ceylon (Green); in February, one specimen.

*Chelaria parvotas*, n. sp.

♂. 13-14 mm. Head and thorax grey irrorated with whitish. Palpi whitish irrorated with grey, second joint with blackish subbasal and median bands, with short projecting apical tuft beneath, terminal joint rather thickened with scales except towards apex, with three oblique blackish bands. Abdomen dark grey sprinkled with whitish, anal tuft pale whitish-ochreous. Forewings elongate, very narrow, costa gently arched, with projecting scales at ⅓, apex obtuse, termen very obliquely rounded; 6 separate, 7 and 8 stalked; grey irrorated with whitish; a series of small ochreous-brown spots mixed with black along costa, one before middle rather larger; an ochreous-brown spot beneath costa near base, and some blackish irroration towards base; a transverse series of three blackish marks at ⅓, and another at ⅔; an irregularly 8-shaped mark outlined with blackish in disc at ½, and another at ¾; some small ochreous-brownish spots between these, and a larger one in disc beyond second; a blackish spot on dorsum beneath first, touching it; an ochreous-brown streak just before termen, touching a terminal series of small blackish spots: cilia grey sprinkled with whitish. Hindwings grey, thinly scaled and subhyaline anteriorly, veins and termen dark fuscous; cilia fuscous.

Maskeliya, Ceylon (Pole, de Mowbray); from August to October, and in February, five specimens.

*Chelaria particulata*, n. sp.

♂. 10-12 mm. Head and thorax grey irrorated with whitish. Palpi whitish, second joint blackish except apex, with short projecting apical tuft beneath, terminal joint somewhat thickened with scales except apex, with three blackish rings. Abdomen grey, anal tuft greyish-ochreous. Forewings elongate, narrow, costa gently arched, apex tolerably pointed, termen extremely obliquely rounded; 6 separate, 7 and 8 stalked; grey, irrorated with whitish; a series of small dark fuscous spots along costa, one before middle rather larger and elongate; an elongate dark fuscous mark on fold at $\frac{2}{5}$ of wing; a small dark fuscous spot in disc at $\frac{3}{4}$; some brownish suffusion and irregular dark fuscous irroration towards apex: cilia grey sprinkled with whitish. Hindwings dark grey, thinly scaled anteriorly; cilia grey.

Maskeliya, Ceylon (Pole); in January, February, May and September, five specimens.

*Encolapta*, n. g.

Head with appressed scales; ocelli absent; tongue developed. Antennæ $\frac{4}{5}$, in ♂ simple, basal joint moderately elongate, without pecten. Labial palpi long, recurved, second joint with short apical tuft beneath, terminal joint longer than second, somewhat thickened with scales except at apex, acute. Maxillary palpi very short, filiform, appressed to tongue. Posterior tibiæ clothed with long hairs above. Forewings with 2 from towards angle 3 absent, 4 from angle, 6 and 8 stalked, 6 to apex, 7 absent, 11 from middle. Hindwings $\frac{4}{5}$, elongate-trapezoidal, apex round-pointed, termen beneath apex somewhat bisinuate, oblique, cilia $1\frac{1}{2}$; 3-5 closely approximated at base, 6 and 7 long-stalked.

Allied to the early forms of *Chelaria*, but differing essentially in the absence of vein 3 of forewings.

*Encolapta metorcha*, n. sp.

♂. 14-15 mm. Head and thorax dark grey irrorated with white. Palpi whitish, second joint dark fuscous except apex, terminal joint with subbasal and supramedian blackish rings. Abdomen grey, anal tuft whitish-ochreous. Forewings elongate, narrow, costa moderately arched, apex pointed, termen extremely obliquely rounded; grey or fuscous irrorated with white, with some scattered blackish scales; a series of small blackish spots along costa, one in middle rather larger and elongate; some irregular scattered groups of dark fuscous scales in disc; a præmarginal series of cloudy dark fuscous spots round posterior part of costa and termen: cilia grey sprinkled with whitish, basal half barred with dark fuscous. Hindwings grey, paler and thinly scaled anteriorly, veins and termen darker; cilia grey.

Maskeliya, Ceylon (de Mowbray, Pole); in January and April, two specimens.

*Anarsia*, Zell.

I have referred Stainton's *Anarsia candida* to the genus *Dactylethra*, but I have described one true Indian *Anarsia, ephippias*, Meyr.; I now describe eight more, and refer one of Walker's species here.

*Anarsia phortica*, n. sp.

♂ ♀. 13-15 mm. Head and thorax ochreous-whitish, variably irrorated with grey. Palpi in ♂ dark fuscous, in ♀ whitish, second joint irrorated with dark fuscous, terminal joint with blackish subbasal ring and submedian and supramedian subconfluent bands. Abdomen grey. Forewings elongate, rather narrow, widest at $\frac{1}{3}$, costa moderately arched, apex obtuse, termen very obliquely rounded; white, irregularly mixed with grey; a dark grey median band extending from $\frac{1}{4}$ to $\frac{3}{4}$, widest on dorsum, posterior $\frac{2}{3}$ of this band occupied by a black blotch reaching from costa to fold; an irregular

dark grey apical patch: cilia grey sprinkled with whitish, round apex obscurely barred with blackish on basal half. Hindwings grey, iridescent-hyaline in disc and towards base, veins and termen dark grey; in ♂ an expansible tuft of very long grey hairs in disc near base; cilia grey. Undersurface of forewings in ♂ with an expansible tuft of very long grey hairs in disc near base.

Maskeliya, Kegalle, Haldamulla, and Undugoda, Ceylon (Alston, Green, de Mowbray); N. Coorg, 3,500 feet (Newcome); Kuching, Borneo (Hewitt); in May, and from August to October, ten specimens.

*Anarsia tricornis*, n. sp.

♂ ♀. 11-14 mm. Head and thorax ochreous-white, sides of face mixed or suffused with blackish, shoulders black. Palpi white, second joint black except towards apex, terminal joint with black submedian and supramedian bands. Abdomen grey, anal tuft in ♂ ochreous-whitish. Forewings elongate, rather narrow, costa moderately arched, apex obtuse, termen extremely obliquely rounded; a triangular black blotch occupying nearly median third of costa, and reaching ¾ across wing; several variable small spots of blackish irroration round posterior part of costa and termen: cilia grey sprinkled with white. Hindwings grey, thinly scaled and semihyaline towards base, darker towards apex; cilia grey.

Maskeliya, Peradeniya, and Haldamulla, Ceylon (Pole, Green, Alston); in January and May, three specimens.

*Anarsia stylota*, n. sp.

♂. 15-16 mm. Head and thorax ochreous-white, shoulders black. Palpi blackish, towards apex whitish. Abdomen grey, anal tuft whitish-ochreous. Forewings elongate, narrow, costa gently arched, apex round-pointed, termen very obliquely rounded, ochreous-white; markings black: five spots at equal distances along costa, and one at apex; three subdorsal spots on anterior half; a three-lobed mark in disc before middle, tending to be connected with third costal and subdorsal spots; an inverted V-shaped mark in disc beyond ⅔; a spot on dorsum at ¾, and one on termen above tornus: cilia pale grey irrorated with whitish. Hindwings grey, lighter and thinly scaled anteriorly; cilia grey, paler and ochreous-tinged towards tornus. Undersurface of forewings with a long expansible subdorsal hairpencil from base lying beneath costa of hindwings.

Maskeliya and Patipola, Ceylon (Alston, Pole); in February and April, two specimens.

*Anarsia patulella*, Walk.

(*Gelechia patulella*, Walk. Cat. XXIX, 635.)

Maskeliya and Peradeniya, Ceylon (Pole, Green); Nilgiris, 3,500 feet (Andrewes); in March, and from June to August. Walker's type is a ♀, not ♂ as stated.

*Anarsia pensilis*, n. sp.

♂ ♀. 14-17 mm. Head and thorax ochreous-whitish, sprinkled with light grey. Palpi whitish, second joint blackish except towards apex, terminal joint with blackish median and supramedian bands. Abdomen dark grey, anal tuft whitish-ochreous. Forewings elongate, narrow, costa gently arched, apex round-pointed, termen very obliquely rounded; whitish irrorated with light grey, with a few scattered black scales; two slight blackish marks on costa anteriorly, and one beyond middle; a black triangular spot on middle of costa, whence a black streak runs to dorsum before middle, and is slenderly extended along dorsum towards base; a small irregular grey spot with some black scales in disc at ¾; indications of grey spots with some black scales round posterior part of apex and termen: cilia light grey sprinkled with whitish. Hindwings rather dark grey, almost hyaline in disc towards base; cilia grey. Undersurface of forewings with

a long expansible median hairpencil from base lying beneath costa of hindwings.

Maskeliya, Ceylon (Pole, Green); in May and September, two specimens.

*Anarsia acrotoma*, n. sp.

♂. 10 mm. Head and thorax light greyish-ochreous irrorated with whitish, shoulders narrowly blackish. Palpi blackish, towards apex whitish. Abdomen grey, anal tuft ochreous-whitish. Forewings elongate, narrow, costa gently arched, apex round-pointed, termen extremely obliquely rounded; light greyish-ochreous irrorated with whitish, with a few scattered fuscous and blackish scales; a short black dash beneath costa near base; a triangular blackish patch occupying median third of costa, apex truncate, reaching more than half across wing; a very small dark fuscous spot on costa at ⅔, and a black dot or dash beneath it; indications of blackish dots round posterior part of costa and termen: cilia grey sprinkled with whitish. Hindwings grey, becoming iridescent-hyaline anteriorly; cilia light grey. Undersurface of forewings with expansible tuft of very long hairs from disc near base.

N. Coorg, 3,500 feet (Newcome); in May, one specimen.

*Anarsia isogona*, n. sp.

♂. 12 mm. Head and thorax light greyish-brown irrorated with whitish, shoulders narrowly blackish. Palpi blackish, towards apex whitish. Abdomen grey, anal tuft ochreous-whitish. Forewings elongate, very narrow, costa gently arched, faintly sinuate in middle, apex obtuse, termen very obliquely rounded; greyish-ochreous irrorated with whitish, with some scattered fuscous and blackish scales; several slight blackish marks on costa; a triangular blackish blotch occupying median fourth of costa and reaching more than half across wing; obscure small spots of dark fuscous suffusion in disc towards base, near dorsum at ⅓, on dorsum at ⅔, and at tornus: cilia pale greyish. Hindwings grey, becoming hyaline anteriorly; cilia pale greyish.

Nilgiris, 3,500 feet (Andrewes); in April, one specimen.

*Anarsia acerata*, n. sp.

♂. 10-12 mm. Head and thorax ochreous-whitish more or less mixed with fuscous. Palpi dark fuscous, towards apex whitish. Abdomen dark grey, anal tuft whitish-ochreous sometimes mixed with fuscous. Forewings elongate, narrow, widest at ⅓, costa gently arched, apex round-pointed, termen extremely obliquely rounded; fuscous irregularly mixed and irrorated with whitish; about six small dark fuscous spots or marks along costa, one beyond middle larger; dorsal area irregularly suffused with dark fuscous throughout, especially a transverse dark fuscous spot at ⅓ edged posteriorly with whitish suffusion; an undefined elongate patch of dark fuscous suffusion in middle of disc; some irregular brown or fuscous marking towards apex: cilia fuscous sprinkled with whitish. Hindwings subhyaline, suffused with fuscous along termen and towards apex, veins dark fuscous; cilia fuscous. Undersurface of forewings with expansible tuft of very long whitish hairs from disc near base.

N. Coorg, 3,500 feet (Newcome); in May, September, and October, three specimens.

*Anarsia trienota*, n. sp.

♀. 12 mm. Head and thorax grey irrorated with whitish, shoulders narrowly black. Palpi white, second joint blackish except apex, terminal joint with three blackish bands. Abdomen whitish irrorated with grey. Forewings elongate, rather narrow, costa gently arched, apex round-pointed, termen very obliquely rounded; grey irregularly sprinkled with white; markings black partially edged with white suffusion; two oblique strigulæ from costa anteriorly, an oblique spot in middle, and several small marks

posteriorly; subcostal, median, submedian, and subdorsal longitudinal streaks, each broken irregularly into about three segments; some black scales along termen: cilia pale grey sprinkled with whitish and on basal half with black. Hindwings grey, thinly scaled anteriorly, veins and termen darker; cilia whitish-grey.

Gooty (Campbell); one specimen. Allied to the European *lineatella*.

*Paraspistes tabellata*, n. sp.

♂. 14 mm. Head and thorax grey sprinkled with whitish, shoulders dark fuscous. Palpi whitish, second joint dark fuscous except apical edge, above with scales broadly expanded towards apex, terminal joint shorter than second, with a few dark grey scales towards apex. Abdomen dark grey, two basal segments pale ochreous, anal tuft ochreous-whitish. Forewings elongate, very narrow, costa anteriorly gently arched, posteriorly straight, apex round-pointed, termen extremely obliquely rounded; grey irrorated with white, with scattered black scales, towards costa suffused with white; costal edge finely black anteriorly; a narrow elongate dark brown patch extending along costa from ⅓ to near apex, attenuated to extremities; a dark fuscous spot on tornus; a fine irregular dark fuscous streak along termen not quite reaching this: cilia grey sprinkled with whitish. Hindwings dark grey, thinly scaled in disc anteriorly; a hyaline space in cell, but covered by a fringe of grey hairs; cilia grey.

N. Coorg, 3,500 feet (Newcome); in August, one specimen.

*Paraspistes aprica*, n. sp.

♂. 10 mm. Head and thorax deep yellow-ochreous. Palpi whitish ochreous, second joint ferruginous-ochreous except apex, above with scales shortly expanded towards apex, terminal joint hardly shorter than second. Antennal ciliations 1. Abdomen dark grey, anal tuft pale ochreous. Forewings elongate, narrow, widest at ⅓, costa anteriorly slightly arched, posteriorly almost straight, apex round-pointed, termen extremely obliquely rounded; yellow-ochreous, tinged with ferruginous; several shorrt oblique blackish strigulæ on costa between ⅓ and ⅔; dorsal half obscurely suffused with ferruginous and irrorated with fuscous: cilia ochreous-yellowish. Hindwings dark grey, lighter and thinly scaled anteriorly; cilia grey.

N. Coorg, 3,500 feet (Newcome); in November, two specimens.

*Nothris citharista*, n. sp.

♂ ♀. 12-14 mm. Head and thorax pale whitish-ochreous more or less tinged with grey, shoulders narrowly dark fuscous. Antennal ciliations in ♂ 5. Palpi whitish, second joint brown except towards apex, with long rough projecting tuft beneath and scales roughly expanded above, terminal joint much longer than second, anterior edge dark fuscous. Abdomen grey, anal tuft pale whitish-ochreous. Forewings elongate, very narrow, costa gently arched, apex acute, termen extremely obliquely rounded; pale whitish-ochreous, sprinkled with grey or fuscous; costa dark fuscous towards base; an indistinct dark fuscous dot on fold beyond ½, and one obliquely beneath and before this; stigmata small, black, accompanied with some ferruginous or fuscous scales, discal approximated, plical beneath first discal, second discal placed on a slender transverse fuscous sometimes ferruginous-mixed fascia, expanded anteriorly on costa; posterior area of wing more or less streaked longitudinally with dark fuscous: cilia whitish-fuscous. Hindwings grey, thinly scaled anteriorly, veins and termen darker-suffused; cilia grey.

N. Coorg, 3,500 feet (Newcome); in May, October, and November, four specimens.

*Nothris incondita*, n. sp.

♂ ♀. 14-18 mm. Head and thorax whitish, sometimes with a few black-

ish-grey scales. Palpi whitish, second joint with blackish subbasal and median bands, with long rough projecting tuft beneath, terminal joint with three blackish rings. Abdomen in ♂ whitish-ochreous, in ♀ whitish. Forewings elongate, costa gently arched, apex obtuse, termen very obliquely rounded; whitish, irregularly sprinkled with blackish scales, veins streaked obscurely with pale ochreous; a black dot towards costa near base; stigmata obscurely indicated by some irregular grey markings, variable and undefined, plical beneath first discal; apical area clouded with grey; several very small dark grey marks on costa posteriorly: cilia ochreous-whitish, with several grey lines. Hindwings and cilia ochreous-whitish.

Madulsima, Ceylon (Vaughan); in May and August, four specimens. Nearly allied to the South African *siccifolii*, Wals.

*Hypelictis*, Meyr.

Founded on a single species, *acrochlora*, Meyr.; the four additional species here described are clearly congeneric, but require some enlargement of the generic characters as under, *viz.*, terminal joint of palpi varying from as long as second to much shorter, variably thickened with scales sometimes roughly projecting posteriorly, rarely slender; forewings with 6 to termen or apex, 7 to costa, 8 out of 7 or absent, 9 seldom out of 7. Notwithstanding these differences they have a peculiar and characteristic facies, and are nearly related together.

*Hypelictis thyrsicola*, n. sp.

♀. 16-17 mm. Head and thorax greyish-ochreous sprinkled with whitish. Palpi greyish-ochreous sprinkled with dark grey and whitish, second joint very long, straight, porrected, above with long rough projecting white-tipped scales, terminal joint much shorter, obliquely ascending, slender. Abdomen grey, anal tuft mixed with ochreous-whitish. Forewings elongate, rather narrow, posteriorly somewhat dilated, costa gently arched, apex obtuse, termen faintly sinuate, rather oblique; 6 to termen, 8 absent, 7 and 9 stalked; greyish-ochreous, with a few scattered black scales; costa suffused with dark grey except towards apex, where it is tinged with crimson; stigmata indicated by small indistinct spots of grey suffusion, discal approximated, plical rather before first discal; cilia whitish-ochreous tinged or suffused with pale crimson except towards tornus, tips dark fuscous except towards tornus. Hindwings rather dark grey; cilia greyish-ochreous, with light fuscous subbasal shade.

Khasis; in August and November, two specimens.

*Hypelictis frenigera*, n. sp.

♂ ♀. 13-14 mm. Head and thorax dark violet-fuscous. Palpi dark bronzy-fuscous, second joint with scales somewhat rough above towards apex, terminal joint moderately thickened with scales. Abdomen dark fuscous, anal tuft in ♂ whitish-ochreous. Forewings elongate, narrow, costa gently arched, apex obtuse, bent down, termen very obliquely rounded; 6 to apex, 8 absent; dark violet-fuscous, with slaty-grey reflections; a very fine whitish curved or bent line from ⅔ of costa to tornus; an ochreous yellow or orange apical patch, anterior edge somewhat convex, enclosing two or three fuscous wedge-shaped spots on termen; a more or less developed fine black line round apex and termen: cilia light ochreous-yellowish, on costa and round apex dark violet-fuscous with basal half ochreous-yellow cut by a fuscous bar beneath apex, beneath termen infuscated. Hindwings rather dark fuscous; cilia whitish-ochreous, more or less suffused with fuscous.

Khasis; in May, three specimens.

*Hypelictis lupata*, n. sp.

♂ ♀. 16-18 mm. Head and thorax rather dark violet-fuscous, head with strong purple-blue gloss. Palpi bronzy-fuscous, second joint with scales

somewhat rough above towards apex, terminal joint slightly thickened with scales. Abdomen dark fuscous. Forewings elongate, rather narrow, costa gently arched, apex round-pointed, bent down, termen faintly sinuate, in ♂ rather strongly oblique, in ♀ less oblique; 6 to apex, 7 and 8 stalked; glossy dark violet-fuscous; an oblique ochreous-whitish strigula on costa at $\frac{3}{4}$, and faint line from this to tornus; an ochreous-yellow streak along termen from apex to near tornus, attenuated downwards, with three acute projecting teeth anteriorly: cilia rather dark violet-fuscous, basal third ochreous-yellow on apical part of costa and termen. Hindwings dark fuscous; cilia fuscous, darker towards base.

Khasis; in June, four specimens.

*Hypelictis charoncea*, n. sp.

♂ ♀. 13-14 mm. Head, palpi, and thorax dark purplish-fuscous, second joint of palpi densely scaled, somewhat rough at apex above, terminal joint as long as second, clothed with rough projecting scales posteriorly except at base. Abdomen fuscous. Forewings elongate, rather narrow, costa slightly arched, apex obtuse, termen almost straight, rather oblique; 6 to termen, 7 and 8 stalked; dark purplish-fuscous, with a leaden gloss sprinkled with blackish, without defined markings: cilia purplish-fuscous with rows of blackish points, extreme base ochreous-whitish. Hindwings fuscous; cilia light fuscous.

Puttalam, Ceylon (Pole); in November, two specimens.

*Dichomeris* Hb.

I agree with Durrant and Busck that it is advisable to adopt this name for the genus which I have hitherto called *Ypsolophus*. I have recorded four Indian species, *viz.*, *ianthes*, Meyr. (= *ochrophanes*, Meyr.), *decusella*, Walk, (= *alternella*, Walk.), *eridantis*, Meyr., and *bisignella*, Snell. (=*deltaspis*. Meyr.), and now describe twelve more.

*Dichomeris summata*, n. sp.

♂ ♀. 12-16 mm. Head and thorax whitish-ochreous, shoulders fuscous. Palpi ochreous-whitish, second joint more or less suffused with fuscous except towards apex, above with triangularly projecting scales, beneath with very long projecting apical tuft, terminal joint with anterior edge blackish. Antennal ciliations of ♂ 1. Abdomen grey. Forewings elongate, very narrow, costa slightly arched, apex round-pointed, termen extremely obliquely rounded, whitish-ochreous or yellow-ochreous, sometimes strewn with strigulæ of fuscous irroration; a streak of dark fuscous suffusion or irroration along costa from base to $\frac{4}{5}$; a black dot beneath costa near base, in one specimen enlarged into a black dash; stigmata black, discal approximated, plical often little marked, beneath first discal; a small apical spot of dark fuscous suffusion: cilia ochreous-yellowish. Hindwings pale grey, thinly scaled anteriorly; cilia whitish-ochreous, round apex tinged with grey.

Khasis; in June, July, and October, seven specimens.

*Dichomeris metrodes*, n. sp.

♂. 10-12mm. Head whitish-ochreous, forehead and a central line of crown irrorated with grey. Palpi white, second joint blackish except apex, with long triangular apical tuft beneath, terminal joint with anterior edge black. Thorax light yellow-ochreous. Abdomen whitish-ochreous sprinkled with grey. Forewings elongate, narrow, costa gently arched, apex round-pointed, termen very obliquely rounded; whitish-ochreous, partially suffused with pale yellow-ochreous tinged with grey; a black mark on base of costa, and several black dots between this and $\frac{3}{4}$; a spot of blackish irroration towards dorsum at $\frac{1}{2}$; stigmata black, discal approximated, plical obliquely before first discal; a grey spot towards costa before middle, one beneath first discal stigma, and some suffusion along

median portion of dorsum, sometimes confluent; a patch of dark grey suffusion on costa at ⅔, and one on dorsum beneath second discal stigma; a streak of dark grey suffusion along termen: cilia pale yellow-ochreous, at apex with a grey bar. Hindwings whitish-grey, thinly scaled anteriorly; cilia ochreous-grey—whitish.

Hambantota, Ceylon (Fletcher); Bombay (Fletcher); in March and October, two specimens.

*Dichomeris ferruginosa*, n. sp.

♂. 15-16 mm. Head ochreous, sometimes brownish-tinged. Palpi whitish, second joint brownish except apex, above clothed with very long fine expansible whitish hairs, beneath with very long projecting apical tuft, terminal joint with anterior edge blackish. Antennæ sinuate towards base, ciliations 1½. Thorax ochreous, shoulders suffused with dark fuscous. Abdomen grey, anal tuft whitish-ochreous. Forewings elongate, very narrow, costa slightly arched, apex round-pointed, termen very obliquely rounded; yellow-ochreous; costa and dorsum suffused with ferruginous and strigulated with dark leaden-fuscous irroration; stigmata black, moderately large, discal approximated, plical beneath first discal; an oblique narrow transverse fascia of ferruginous suffusion and dark leaden-fuscous irroration crossing wing between first discal and plical stigmata; streak of ferruginous suffusion and dark leaden-fuscous irroration along ermen: cilia yellow-ochreous. Hindwings grey, thinly scaled and irridescent-semihyaline, veins and termen suffused with darker; cilia light grey, towards base tinged with purplish-ochreous.

Khasis; in July and August, five specimens.

*Dichomeris intensa*, n. sp.

♂♀. 11-14 mm. Head and thorax bronzy-fuscous irrorated with pale ochreous, face shining grey, shoulders dark fuscous. Palpi with second joint dark bluish-fuscous, above with triangularly projecting scales, beneath with long broad rough projecting tuft, terminal joint whitish, anterior edge black. Antennal ciliations of ♂ minute. Abdomen dark grey, faintly purplish-tinged. Forewings elongate, very narrow, costa moderately arched, apex obtuse, termen very obliquely rounded; brownish, variably sprinkled or irrorated with dark fuscous; costa more or less broadly and irregularly suffused with dark leaden-fuscous from base to near apex, sometimes marked with several fine oblique pale strigulæ towards middle; a narrow dark leaden-fuscous terminal fascia, preceded on costa by a small pale ochreous patch, these markings limited anteriorly by an angulated pale ochreous or brownish transverse line sprinkled with dark fuscous: cilia light fulvous-ochreous, with a fine dark grey median line, on tornus with a patch of grey suffusion. Hindwings dark grey, in ♂ thinly scaled and violet-subhyaline in disc, cilia dark grey.

Maskeliya and Puttalam, Ceylon (Pole); Cuddapah, 4,000 feet (Campbell); N. Coorg, 3,500 feet (Newcome); in March, May, November, and December, five specimens.

*Dichomeris crepitatrix*, n. sp.

♂. 15 mm. Head rather dark bronzy-grey. Palpi dark grey sprinkled with minute whitish points, second joint with strong dense projecting tuft beneath and scales triangularly expanded towards apex above, terminal joint whitish, anterior edge blackish. Antennæ sinuate above base, ciliations ⅔. Thorax brown, dorsally suffused with grey, shoulders dark fuscous. Abdomen fuscous. Forewings elongate, very narrow, costa slightly arched, faintly sinuate in middle, apex obtuse, termen slightly rounded, oblique; ochreous-brown, with scattered dark fuscous scales; a blackish streak irregularly interrupted and spotted with ground colour extending along costa from base to ¾; stigmata undefined, fuscous, discal

approximated, plical rather before first discal ; a streak of blackish irroration along termen, suffused with grey anteriorly : cilia light ochreous, base dotted with dark fuscous, on tornus with a grey patch. Hindwings iridescent-grey ; cilia light fuscous.

N. Coorg, 3,500 feet (Newcome) ; in December, one specimen.

*Dichomeris ferrata*, n. sp.

♂ ♀. 15-17 mm. Head shining grey, back of crown whitish-ochreous. Palpi dark fuscous, second joint slightly sprinkled with whitish points, especially on anterior edge, with long broad tuft beneath and scales triangularly expanded above towards apex, terminal joint white, with anterior edge black. Antennal ciliations of ♂ 2. Thorax ochreous-yellowish, shoulders dark grey. Abdomen grey. Forewings elongate, narrow, costa gently arched, apex round-pointed, termen sinuate, oblique ; yellow-ochreous, with scattered dark fuscous scales ; markings dark shining leaden-grey irrorated with blackish ; a thick streak along costa from base to middle, posterior portion dilated into a triangular blotch reaching nearly half across wing ; a small elongate-triangular patch on costa about $\frac{2}{3}$ ; an inwardly oblique wedgeshaped spot on dorsum before tornus, reaching half across wing ; stigmata minute, dark fuscous, discal approximated, plical rather before first discal ; a narrow streak along termen : cilia grey, on costa yellow-ochreous, basal half yellow-ochreous on termen. Hindwings grey, thinly scaled anteriorly ; cilia grey.

Khasis ; in October, three specimens.

*Dichomeris clarescens*, n. sp.

♂. 22 mm. Head bronzy-grey. Palpi dark fuscous, second joint whitish-sprinkled on apical edge, with long strong tuft beneath and scales triangularly expanded towards apex above, terminal joint whitish with anterior edge blackish. Antennal ciliations $1\frac{1}{2}$. Thorax rather pale fuscous, apex of patagia brown. Abdomen dark grey, beneath ochreous, anal tuft pale ochreous, with two long expansible projecting pencils of scales above. Forewings elongate, narrow, costa slightly arched, apex obtuse, termen nearly straight, oblique ; ochreous-brown, suffused with fuscous except towards costa before apex, where it is brighter ochreous ; median fourth of costa obscurely strigulated with dark fuscous ; stigmata obscure, dark fuscous, discal approximated, plical elongate, slightly before first discal ; an undefined triangular spot of dark fuscous suffusion on costa at $\frac{2}{3}$ ; a suffused dark fuscous streak along termen : cilia ochreous, with a fuscous postmedian shade, on tornus mixed with fuscous. Hindwings dark fuscous rather thinly scaled in disc anteriorly ; cilia pale ochreous, basal half tinged with fuscous.

Maskeliya, Ceylon (de Mowbray) ; in October, one specimen.

*Dichomeris excoriata*, n. sp.

♂. 22 mm. Head and thorax whitish-ochreous partially suffused with light brownish. Palpi with second joint dark fuscous with apical edge rather broadly ochreous-white, with strong acute-triangular apical tuft beneath and scales triangularly expanded towards apex above, terminal joint whitish, towards apex blackish, anterior edge sprinkled with blackish. Antennal ciliations $\frac{1}{2}$. Abdomen grey, anal tuft whitish-ochreous. Forewings elongate, narrow, costa slightly arched, slightly sinuate in middle, apex round-pointed, termen sinuate, oblique ; 7 to just above apex ; pale ochreous, suffusedly strigulated with brownish except towards costa anteriorly, with a few blackish scales ; about ten black marks on anterior half of costa, anteriorly remote, posteriorly closely approximated ; a spot of brownish suffusion in disc at $\frac{1}{3}$ ; an undefined triangular patch of brownish suffusion extending on costa, from about middle to $\frac{4}{5}$, its apex formed by dark fuscous second discal stigma ; some dark fuscous dots on

termen : cilia pale ochreous partially tinged with brownish. Hindwings iridescent-grey, veins darker; cilia light grey.

Khasis ; in November, one specimen.

*Dichomeris olivescens*, n. sp.

♂ ♀. 21-22 mm. Head grey. Palpi with second joint blackish, apical edge dark grey irrorated with white, with strong acute-triangular apical tuft beneath, and scales triangularly expanded towards apex above, terminal joint whitish irrorated with blackish anteriorly. Antennal ciliations of ♂ minute. Thorax pale ochreous with a faint greenish tinge, shoulders narrowly blackish. Abdomen dark grey. Forewings elongate, rather narrow, costa gently arched, faintly sinuate in middle, apex round-pointed, termen sinuate, rather oblique; 7 to apex : pale ochreous, with a faint greenish tinge, indistinctly strigulated with brownish except towards costa anteriorly ; anterior $\frac{2}{3}$ of costa closely marked with black dots or short strigulæ ; stigmata dark brown more or less edged with white posteriorly, discal approximated, plical rather before first discal ; a small dark brown spot on costa at $\frac{2}{3}$, and one on dorsum towards tornus ; a series of dark brown or blackish dots on termen and posterior part of costa : cilia light brownish-ochreous. Hindwings dark fuscous ; cilia grey, with dark fuscous subbasal shade.

Kandy and Maskeliya, Ceylon (Green, Alston) ; in May, two specimens.

*Dichomeris imbricata*, n. sp.

♂ ♀. 19-20 mm. Head dark fuscous, slightly sprinkled with whitish points, lower part of face and back of crown brownish. Palpi with second joint blackish sprinkled with whitish, with long broad projecting tuft beneath and scales triangularly expanded towards apex above, terminal joint whitish, anterior edge black. Antennal ciliations of ♂ $1\frac{1}{2}$. Thorax brown mixed with dark fuscous. Abdomen dark grey, anal tuft ochreous-yellowish. Forewings elongate, narrow, costa gently arched, apex round-pointed, termen sinuate, oblique; brown somewhat mixed with whitish-ochreous, with a whitish-ochreous patch occupying apical fourth of costa : anterior $\frac{2}{3}$ of costa suffused with blackish, obliquely strigulated with pale ochreous ; stigmata blackish, ill-defined, discal approximated, plical near beyond first discal ; some blackish suffusion on dorsum towards tornus ; a blackish dot on tornus, and one on termen beneath apex : cilia pale ochreous. Hindwings grey, veins and termen darker ; cilia greyish-ochreous.

N. Coorg, 3,500 feet (Newcome) ; in May, August, and November, three specimens.

*Dichomeris ptychosema*, n. sp.

♂ ♀. 14-17 mm. Head and thorax whitish-ochreous, shoulders narrowly dark fuscous. Palpi with second joint dark fuscous, apical edge white, with moderate triangular brown projecting tuft beneath, and scales triangularly expanded towards apex above, terminal joint white, anterior edge black. Antennal ciliations of ♂ 1. Abdomen whitish-ochreous irrorated with grey. Forewings elongate, rather narrow, costa gently arched, apex obtuse, termen straight, rather oblique ; 7 to apex, 8 and 9 out of 7 : whitish-ochreous, strigulated with fuscous and dark fuscous irroration ; a small dark fuscous spot on base of costa, a short mark in middle, another beyond $\frac{2}{3}$, and several dots between these ; a small blackish-fuscous spot on fold at $\frac{1}{3}$ of wing ; second discal stigma moderate, dark fuscous, plical and first discal minute or obsolete, plical beneath first discal : cilia whitish-ochreous or pale fulvous-ochreous. Hindwings iridescent-grey ; cilia greyish-ochreous.

Khasis ; in November, two specimens.

*Dichomeris ampliata*, n. sp.

♂ ♀. 22-23 mm. Head and thorax fuscous, faintly violet-tinged, sides of

crown ochreous-tinged or whitish-sprinkled. Palpi with second joint dark brown, apical edge ochreous-whitish, with rather short triangular apical tuft beneath and scales triangularly expanded towards apex above, terminal joint whitish, anterior edge suffused with dark fuscous. Antennal ciliations of ♂ 4. Abdomen dark grey, anal tuft of ♂ pale ochreous. Forewings elongate, costa gently arched, apex obtuse, termen somewhat sinuate, little oblique; 7 to apex; violet-fuscous; extreme costal edge pale ochreous except towards base; stigmata obscure, dark fuscous, discal approximated, plical slightly before first discal; a series of dark fuscous dots round posterior part of costa and termen: cilia fuscous, sometimes tinged with ochreous. Hindwings fuscous; cilia light fuscous, with darker subbasal shade.

Eppawela and Puttalam, Ceylon (Green, Pole); Khasis; from July to October, five specimens.

*Holaxyra*, n. g.

Head with appressed scales, sidetufts loose; ocelli present; tongue developed. Antennæ $\frac{3}{4}$, in ♂ ciliated, basal joint moderately elongate, without pecten. Labial palpi very long, porrected, second joint expanded with dense rough projecting scales above and beneath, longest towards base above and towards apex beneath, terminal joint much shorter than second, obliquely ascending, slender, acute. Maxillary palpi very short, filiform, appressed to tongue. Posterior tibiæ rough-haired above. Forewings with 2 and 3 stalked, 7 and 8 stalked, 7 to costa or apex, 11 from middle. Hindwings over 1, trapezoidal-ovate, apex obtuse, termen rather sinuate beneath apex, cilia $\frac{1}{2}$; 3 and 4 connate, 5 approximated, 6 and 7 approximated at base or short-stalked.

Type *H. ampycota*. Allied to *Dichomeris* and *Trichotaphe*, but with labial palpi differing from both.

*H. isoclera*, n. sp.

♂. 17-18 mm. Head and thorax fuscous sprinkled with whitish. Palpi dark fuscous slightly sprinkled with whitish, terminal joint whitish with dark fuscous supramedian ring. Antennal ciliations 2. Abdomen grey, anal tuft whitish-ochreous. Forewings elongate, rather narrow, slightly dilated posteriorly, costa gently arched, apex obtuse, termen slightly rounded, rather oblique; fuscous finely sprinkled with whitish; stigmata rather large, blackish, plical somewhat beyond first discal, an additional dot beneath and slightly before second discal: cilia whitish-ochreous mixed with grey, towards base spotted with grey. Hindwings grey; cilia light greyish.

Maskeliya, Ceylon (de Mowbray, Pole); in January and April, three specimens.

*Holaxyra ampycota*, n. sp.

♂. 26 mm. Head and thorax purplish-fuscous tinged with ferruginous. Palpi with second joint dark fuscous, upper and apical edges sprinkled with whitish, terminal joint whitish, anterior edge dark fuscous. Antennal ciliations $\frac{3}{4}$. Abdomen grey. Forewings elongate, narrow at base and posteriorly dilated, costa moderately arched, rather bent at $\frac{3}{4}$, apex obtuse, termen slightly rounded, hardly oblique; purplish-fuscous, suffused with ferruginous-brownish except towards costa anteriorly; costal edge and cilia ferruginous from $\frac{1}{3}$ to apex; stigmata obscure, dark fuscous, each marked with a grey-whitish dot, discal approximated, plical smaller, rather before first discal; a spot of dark fuscous suffusion on dorsum rather beyond second discal: cilia ferruginous. Hindwings and cilia grey.

Hakgala, Ceylon (Green); in April, one specimen.

*Trichotaphe*, Clem.

I have described two Indian species, *sandycitis* and *planata*, and now record sixteen more.

*Trichotaphe lissota*, n. sp.

♀. 22 mm. Head and thorax lilac-brown. Palpi dark fuscous, terminal joint ochreous-whitish except towards base and on anterior edge. Abdomen grey, apex whitish-ochreous. Forewings elongate, costa gently arched, sinuate in middle, appearing slightly bent at $\frac{2}{3}$, apex nearly rectangular, termen straight, rather oblique; glossy lilac-brown; an obliqueoval dark ochreous-brown spot in disc at $\frac{1}{3}$, obscurely whitish-edged; a small round blackish-fuscous whitish-edged spot representing second discal stigma; a dark fuscous mark along costa from middle to $\frac{2}{3}$, whence a slender dark ochreous-brown fascia crosses immediately beyond second discal stigma to dorsum before tornus, edged posteriorly by a pale ochreous slightly bisinuate line; a dark brown line along posterior part of costa and termen: cilia pale ochreous. Hindwings rather dark fuscous; cilia fuscous.

Khasis; one specimen.

*Trichotaphe fungifera*, n. sp.

♀. 22 mm. Head and thorax fuscous, coppery-tinged. Palpi brown, terminal joint whitish, anterior edge dark fuscous. Abdomen dark grey, apex yellow-ochreous. Forewings elongate-oblong, costa strongly arched on anterior half, sinuate in middle, rounded-prominent at $\frac{2}{3}$, apex rounded-obtuse, termen slightly rounded, little oblique; fuscous, partially tinged with reddish-brown; a pale whitish-green dot on fold near base, and a spot on dorsum at $\frac{1}{4}$; discal stigmata pale whitish-green, approximated, plical larger, rather dark fuscous mixed with pale whitish-green, very obliquely before first discal; a very obscure pale obtusely angulated shade crossing wing from $\frac{2}{3}$ of costa to dorsum before tornus; some minute dark fuscous dots on posterior part of costa and termen: cilia brownish. Hindwings rather dark grey; cilia grey.

Khasis; in December, one specimen.

*Trichotaphe procrossa*, n. sp.

♀. 22 mm. Head and thorax fuscous. Palpi brown irrorated with dark fuscous, apical edge of second joint ochreous-whitish, terminal joint ochreous-whitish, anterior edge sprinkled with blackish. Abdomen rather dark fuscous, apex pale ochreous. Forewings elongate, costa gently arched, somewhat sinuate in middle, cilia forming a strong rounded prominence at $\frac{2}{3}$, apex round-pointed, termen sinuate, rather oblique; brown mixed with fuscous; costal edge yellow-ochreous from base to a narrow blackish spot extending along median fourth of costa; stigmata small, blackish, discal approximated, plical very obliquely before first discal; a very obscure brownish-ochreous obtusely angulated line crossing wing from posterior extremity of blackish costal spot to dorsum before tornus; some small indistinct dark fuscous dots on posterior part of costa and termen: cilia ochreous. Hindwings grey, darker posteriorly; cilia pale ochreous, suffused with grey towards base.

Palni Hills (Campbell); one specimen.

*Trichotaphe corniculata*, n. sp.

♂ ♀. 21-23 mm. Head and thorax bronzy-brown or fuscous. Palpi dark fuscous, terminal joint whitish-ochreous except base and anterior edge. Antennal ciliations of ♂ 1. Abdomen fuscous, anal tuft pale ochreous. Forewings elongate, costa gently arched, slightly sinuate in middle, somewhat bent at $\frac{2}{3}$, apex obtuse, termen somewhat sinuate, rather oblique; fuscous or brownish, sometimes slightly reddish-tinged; costal edge yellow-ochreous from base to an elongate-triangular black spot on middle of costa, of which the lower part is sometimes brown; an oblique dark fuscous or ochreous-brown spot on fold before $\frac{1}{3}$, often nearly obsolete second discal stigma small, ochreous-brown or dark fuscous, sometimes accompanied by a few whitish scales, first discal sometimes also indicated;

a pale ochreous line from costa beyond black spot to dorsum before tornus, curved inwards beneath costa, sometimes almost obsolete, or edged anteriorly with ochreous-brown suffusion; some ill-defined dark fuscous dots round posterior part of costa and termen: cilia brownish-ochreous. Hindwings and cilia fuscous.

Khasis; in April, and from July to October, ten specimens. Very like *procrossa*, but without the strong rounded prominence of costal cilia, and the pale line of forewings differently formed.

*Trichotaphe chartaria*, n. sp.

♀. 16-17 mm. Head and thorax ochreous-whitish, face tinged with grey, posterior extremity of thorax blackish. Palpi ochreous-white, second joint dark fuscous except apical edge. Abdomen rather dark grey. Forewings elongate, costa gently arched, apex obtuse, termen almost straight, somewhat oblique; 8 and 9 out of 7, 7 to apex; ochreous-whitish, slightly infuscated except towards costa; stigmata black, ringed with white, first discal large, round, plical moderate, obliquely beyond it, sometimes united with it, second discal small; a dark fuscous mark on costa at $\frac{2}{3}$, and two or three small subconfluent marks towards apex: cilia yellowish. Hindwings rather dark grey; cilia grey.

Peradeniya and Kandy, Ceylon (Green, Mackwood); in July, two specimens.

*Trichotaphe immerita*, n. sp.

♀ 17-18 mm. Head and thorax light fuscous. Palpi with second joint dark fuscous, apical edge whitish, terminal joint ochreous-whitish, anteriorly irrorated with dark fuscous. Abdomen light fuscous, apex pale ochreous. Forewings elongate-oblong, costa gently arched, apex obtuse, termen hardly sinuate, little oblique; fuscous; costal edge whitish-ochreous; a very obscure darker oblique spot in disc before $\frac{1}{3}$, partially edged with some whitish scales, lower extremity representing plical stigma; discal stigmata indicated by a few whitish scales; a slightly bisinuate very obscure darker fuscous line from a spot on costa at $\frac{2}{3}$ to dorsum before tornus, accompanied by a few pale ochreous scales; some indistinct darker dots on posterior part of costa and termen: cilia whitish-fuscous, base whitish-ochreous. Hindwings fuscous; cilia light fuscous.

Puttalam and Maskeliya, Ceylon (Pole, Alston); in November, two specimens.

*Trichotaphe crambaleas*, n. sp.

♂ ♀. 20-21 mm. Head and thorax light brownish. Palpi brown mixed with fuscous, apical edge of second joint ochreous-whitish, terminal joint ochreous-whitish, anteriorly infuscated. Antennal ciliations of ♂ $\frac{3}{4}$. Abdomen light fuscous, anal tuft whitish-ochreous. Forewings elongate rather narrow, costa slightly arched, slightly sinuate in middle, apex round-pointed, termen sinuate, rather oblique; pale brownish-ochreous sometimes strewn with strigulæ of blackish irroration, sometimes partially suffused with ferruginous-brown in disc and towards dorsum, and on veins posteriorly; sometimes a round spot of blackish suffusion in disc at $\frac{1}{3}$, and an oblique spot from dorsum at $\frac{1}{3}$ directed towards it; stigmata blackish or dark ferruginous-brown, discal approximated, plical rather before first discal; a small blackish mark on costa at $\frac{2}{3}$; some blackish dots round posterior part of costa and termen: cilia pale brownish-ochreous, on costa sometimes barred with fuscous. Hindwings fuscous, darker towards apex; cilia light fuscous.

Khasis; in March, three specimens.

*Trichotaphe pseudometra*, n. sp.

♂ ♀. 12-13 mm. Head and thorax pale ochreous, face grey, sides blackish, shoulders blackish. Palpi blackish-grey, terminal joint whitish

except base. Antennal ciliations of ♂ ½. Abdomen grey. Forewings elongate, narrow, costa gently arched, apex round-pointed, termen very obliquely rounded; pale ochreous, with some scattered fuscous or blackish scales or traces of strigulæ; costal edge blackish at base; about eight very short black strigulæ on costa between base and an elongate black mark at ⅔; a blackish dot in disc at ¼, sometimes little marked; stigmata blackish, discal approximated, first discal minute, plical obliquely before first discal; a dot of blackish suffusion on dorsum before tornus; some indistinct dark fuscous dots round posterior part of costa and termen: cilia pale ochreous. Hindwings grey; cilia light grey.

N. Coorg, 3,500 feet (Newcome); in March, May, and November, five specimens.

*Trichotaphe malachias*, n. sp.

♀. 16-18 mm. Head and thorax light greenish-ochreous. Palpi with second joint brown, apical edge white, terminal joint whitish, anterior edge dark fuscous. Abdomen grey, apex light ochreous. Forewings elongate, costa slightly arched, faintly sinuate in middle, apex round-pointed, termen sinuate, rather oblique; 8 and 9 out of 7; light greenish-ochreous, towards costa whitish-ochreous with scattered dark fuscous scales; costa edge blackish towards base; a dark fuscous dot in disc at ⅓; stigmata dark fuscous, discal moderately large, whitish-ringed, plical smaller, beneath first discal; two or three small marks of dark fuscous irroration on costa posteriorly; a very undefined narrow fascia of faint brownish suffusion with dark fuscous irroration from ⅔ of costa close before termen to tornus; some dark fuscous terminal dots: cilia brownish-ochreous or whitish-ochreous. Hindwings grey; cilia ochreous-grey.

Khasis; in June and October, two specimens.

*Trichotaphe pelitis*, n. sp.

♂ ♀. 17-19 mm. Head and thorax pale brownish-ochreous. Palpi with second joint brown, upper half suffused with dark fuscous, apical edge whitish, terminal joint ochreous-whitish, anterior edge finely fuscous. Antennal ciliations of ♂ 1. Abdomen grey, anal tuft pale-ochreous. Forewings elongate, costa gently arched, apex round-pointed, termen somewhat sinuate, rather oblique; pale brownish-ochreous; costal edge pale ochreous-yellowish; stigmata blackish, discal moderate, plical small, rather beyond first discal; a small dark fuscous mark on costa beyond middle, and a row of dark fuscous dots round posterior part of costa and termen; a faint pale curved subterminal line, slightly indented opposite apex: cilia pale ochreous. Hindwings fuscous, cilia pale fuscous, with darker subbasal shade.

Khasis; from July to October, six specimens.

*Trichotaphe cocta*, n. sp.

♀. 17-18 mm. Head and thorax light ochreous-fuscous. Palpi with second joint brown, upper half suffused with dark fuscous, apical edge pale yellowish, terminal joint pale yellowish, anterior edge fuscous. Abdomen light fuscous, apex pale ochreous. Forewings elongate, rather narrow, costa gently arched, apex round-pointed, termen almost straight, oblique; ochreous-fuscous, costal edge suffused with yellow-ochreous; stigmata dark fuscous, discal approximated, plical obliquely before first discal; some dark fuscous dots round posterior part of costa and termen: cilia ochreous. Hindwings grey; cilia light ochreous-grey, with darker subbasal shade.

Khasis; in April and May, two specimens.

*Trichotaphe siranta*, n. sp.

♀. 16-17 mm. Head bronzy-fuscous. Palpi dark fuscous, terminal ochreous-whitish except base and anterior edge. Antennal ciliations ½. Thorax light fuscous tinged with ochreous, shoulders dark

purplish-fuscous. Abdomen grey, anal tuft of ♂ ochreous. Forewings elongate, costa gently arched, faintly sinuate in middle, apex round-pointed, termen slightly sinuate, rather oblique; 9 tolerably remote from stalk of 7 and 8; ochreous, sometimes tinged with fuscous; costal edge fuscous; stigmata dark fuscous, first discal conspicuous, others little marked, plical somewhat beyond first discal; a narrow fuscous terminal fascia, widest beneath apex and narrowed to tornus; an interrupted dark fuscous terminal line: cilia ochreous, towards tornus with indications of fuscous bars. Hindwings dark grey; cilia light greyish.

Khasis; in October and November, two specimens.

*Trichotaphe cellaria*, n. sp.

♀. 10-15 mm. Head and thorax light bronzy. Palpi bronzy-fuscous, apical edge of second joint white, terminal joint white, anterior edge dark fuscous. Abdomen grey. Forewings elongate, rather narrow, slightly dilated posteriorly, costa gently arched, apex round-pointed, termen faintly sinuate, oblique; light bronzy-fuscous, with faint purplish reflections; a suffused ochreous-white streak along costa from base to ⅔; first discal stigma rather large, blackish, plical hardly indicated, below first discal, second discal obsolete; a nearly straight or slightly curved white line from ⅔ of costa to dorsum before tornus, edged anteriorly with darker fuscous suffusion, and followed by a band of whitish-ochreous suffusion; a white line marked with dark fuscous dots running round posterior part of costa and termen: cilia whitish-ochreous. Hindwings rather dark grey; cilia light fuscous.

Khasis; in November and December, three specimens.

*Trichotaphe macroxyla*, n. sp.

♂ ♀. 18-20 mm. Head light shining grey, sides of crown ochreous. Palpi blackish-grey, terminal joint whitish except base and anterior edge. Antennal ciliations of ♂ 1½. Thorax whitish-ochreous, with broad central brown stripe. Abdomen dark grey. Forewings elongate, rather narrow, costa gently arched towards extremities, otherwise straight, apex obtuse, termen almost straight, somewhat oblique; whitish-ochreous; posterior ⅔ of costa, and dorsum and termen throughout rather broadly suffused with brown, darkest on margin of wing, cut at apex by a fine streak of ground colour; stigmata minute, blackish, plical slightly before first discal; a black line round apex and termen: cilia brown, outer half dark brown. Hindwings grey; cilia whitish-ochreous, more or less tinged with grey.

Khasis; from June to August, six specimens.

*Trichotaphe cærulescens*, n. sp.

♂. 14-15 mm. Head and thorax bronzy-fuscous, with prismatic reflections. Palpi dark fuscous, apical edge of second joint whitish, terminal joint whitish with anterior edge blackish. Antennal ciliations 1½. Abdomen dark fuscous, anal tuft ochreous-fuscous. Forewings elongate, costa gently arched, apex obtuse, termen obliquely rounded; dark fuscous, with strong bluish-leaden reflections; stigmata rather large, blackish, plical somewhat before first discal; an ochreous-whitish dot on costa at ⅔; a terminal series of blackish dots: cilia bronzy-fuscous. Hindwings grey; cilia light bronzy-fuscous.

Khasis; in August, two specimens.

*Trichotaphe plutelliformis*, Snell.

(*Ceratophora plutelliformis*, Snell. Tijd. v. Ent. XLIV, 84, pl. VI, 4.)

Puttalam, Ceylon (Pole); N. Coorg, 3,500 feet (Newcome); in January and May. Occurs also in Java and Australia.

*Phatnotis*, n. g.

Head with appressed scales; ocelli present; tongue developed. Antennæ ♀, sides nearly almost 1, in ♂ ciliated, basal joint moderately elongate, with whitish

pecten. Labial palpi very long, recurved, second joint with dense rather rough scales beneath and scales roughly expanded towards apex above, terminal joint longer than second, slender, acute. Maxillary palpi very short, filiform, appressed to tongue. Posterior tibiæ rough-sealed above and beneath. Forewings with 2 and 3 long-stalked, 7 to termen, 8-10 out of 7, 11 from beyond middle. Hindwings somewhat over 1, trapezoidal, apex obtuse, termen somewhat sinuate beneath apex, cilia ½; 3 and 4 connate or stalked, 5 approximated, 6 and 7 stalked.

Type *P. factiosa*. Perhaps more nearly related to *Brachmia* and *Lecithocera*.

*Phatnotis factiosa*, n. sp.

♂ ♀. 21-22 mm. Head and thorax pale ochreous, thorax partially suffused with light fuscous. Palpi brownish, second joint whitish-ochreous towards apex, terminal joint whitish-ochreous, anterior edge fuscous. Antennæ white ringed with dark fuscous, ciliations of ♂ ¾. Abdomen whitish-ochreous. Forewings elongate, posteriorly slightly dilated, costa slightly arched, faintly sinuate in middle, apex round-pointed, termen sinuate, rather oblique; light greyish-ochreous more or less tinged with fuscous, costal edge pale yellow-ochreous, suffused beneath with whitish-ochreous; an indistinct slender irregular fascia of dark fuscous suffusion at ⅔, interrupted above middle; second discal stigma dark fuscous; a slender rather incurved fascia of dark fuscous suffusion from ⅔ of costa to dorsum before tornus, dilated on costa, edged posteriorly with ochreous-whitish: cilia whitish-ochreous tinged with fuscous, with rather dark fuscous postmedian shade. Hindwings pale ochreous, termen tinged with fuscous; cilia whitish-ochreous.

Palni Hills, 6,000 feet (Campbell); two specimens.

*Phatnotis legata*, n. sp.

♀. 21-23 mm. Head whitish-ochreous, crown pale fuscous except on sides. Palpi with second joint ochreous-yellowish, upper longitudinal half suffused with fuscous, apex whitish, terminal joint whitish, anterior edge fuscous. Antennæ white. Thorax light fuscous, with a whitish-ochreous stripe across shoulder. Abdomen yellow-ochreous. Forewings elongate, costa gently arched, apex round-pointed, termen sinuate, somewhat oblique; fuscous, with a faint purplish tinge; costa slenderly ochreous-yellowish, edge dark fuscous towards base; small fuscous spots on costa at ⅔ and ⅓; a whitish-ochreous irregular nearly straight line crossing wing from immediately beyond second costal spot to close before tornus, terminal area beyond this paler and more or less suffused with whitish-ochreous, except terminal line: cilia pale ochreous somewhat tinged or mixed with fuscous. Hindwings pale fuscous suffused with whitish-ochreous anteriorly; cilia whitish-ochreous tinged with fuscous.

N. Coorg, 3,500 feet (Newcome); Cuddapah, 4,000 feet (Campbell); in May, six specimens.

*Carbatina*, n. g.

Head with appressed scales, side-tufts somewhat raised; ocelli present; tongue developed. Antennæ ⅘, in ♂ ciliated, basal joint moderate, without pecten. Labial palpi long, recurved, second joint clothed with dense appressed scales rather roughly expanded above towards apex, terminal joint shorter than second, thickened with appressed scales, acute. Maxillary palpi very short, filiform, appressed to tongue. Posterior tibiæ rough-haired above. Forewings with 2 and 3 stalked, 7 and 8 stalked, 7 to costa, 11 from middle. Hindwings over 1, trapezoidal, apex round-pointed, termen somewhat sinuate beneath apex, cilia ⅔; 3 and 4 connate, 5 approximated, 6 and 7 stalked.

Type *C. picrocarpa*.

*Carbatina picrocarpa*, n. sp.

♀♂. 15-18 mm. Head light bronzy-ochreous, with violet reflections. Palpi fuscous, second joint sometimes pale ochreous beneath, apex of terminal joint pale ochreous. Antennal ciliations of ♂ 1½. Thorax pale ochreous, shoulders narrowly dark violet-fuscous. Abdomen grey, anal tuft of ♂ whitish-ochreous. Forewings elongate, rather narrow, slightly dilated posteriorly, costa gently arched, apex round-pointed, termen faintly sinuate, rather oblique; light yellow-ochreous, sometimes with violet reflections, slightly sprinkled with fuscous points; costal edge dark fuscous except towards apex, dorsum also sometimes infuscated; stigmata dark fuscous, plical slightly beyond first discal; a narrow, rather dark fuscous fascia along termen, narrowed at apex, terminal margin dark fuscous, sometimes edged with white: cilia light yellow-ochreous with two or three indistinct whitish lines, on tornus light greyish. Hindwings grey; cilia light grey.

Khasis; Hakodate, Japan (Fletcher); in July and August, three specimens.

*Carbatina levigata*, n. sp.

♂♀. 12-13 mm. Head and thorax pale yellow-ochreous. Palpi fuscous, terminal joint ochreous-whitish towards apex. Antennal ciliations of ♂ 3. Abdomen whitish-grey, anal tuft of ♂ whitish-ochreous. Forewings elongate, rather narrow, costa gently arched, apex round-pointed, termen hardly sinuate, oblique; pale yellow-ochreous; a very small dark fuscous spot on base of costa, and an elongate dark fuscous mark at ⅔, costa between these obscurely dotted with dark fuscous; stigmata dark fuscous, plical rather large, slightly before first discal; a narrow rather dark purplish-fuscous terminal fascia, widest at apex and narrowed to tornus: cilia pale ochreous, with a purplish-fuscous tornal patch. Hindwings grey; cilia pale greyish.

Puttalam, Ceylon (Pole); in January, three specimens.

*Zomeutis*, n. g.

Head with appressed scales; ocelli present; tongue developed. Antennæ ¾, basal joint moderately elongate, without pecten. Labial palpi very long, recurved, second joint clothed with dense appressed scales expanded above towards apex, terminal joint longer than second, slender, acute. Maxillary palpi very short, filiform, appressed to tongue. Posterior tibiæ rough-scaled above. Forewings with 2 and 3 stalked, 7 to apex, 8 absent, 11 from middle. Hindwings over 1, oblong-ovate, apex obtuse, termen not sinuate, cilia ½; 3 and 4 connate, 5 parallel, 6 and 7 approximated towards base.

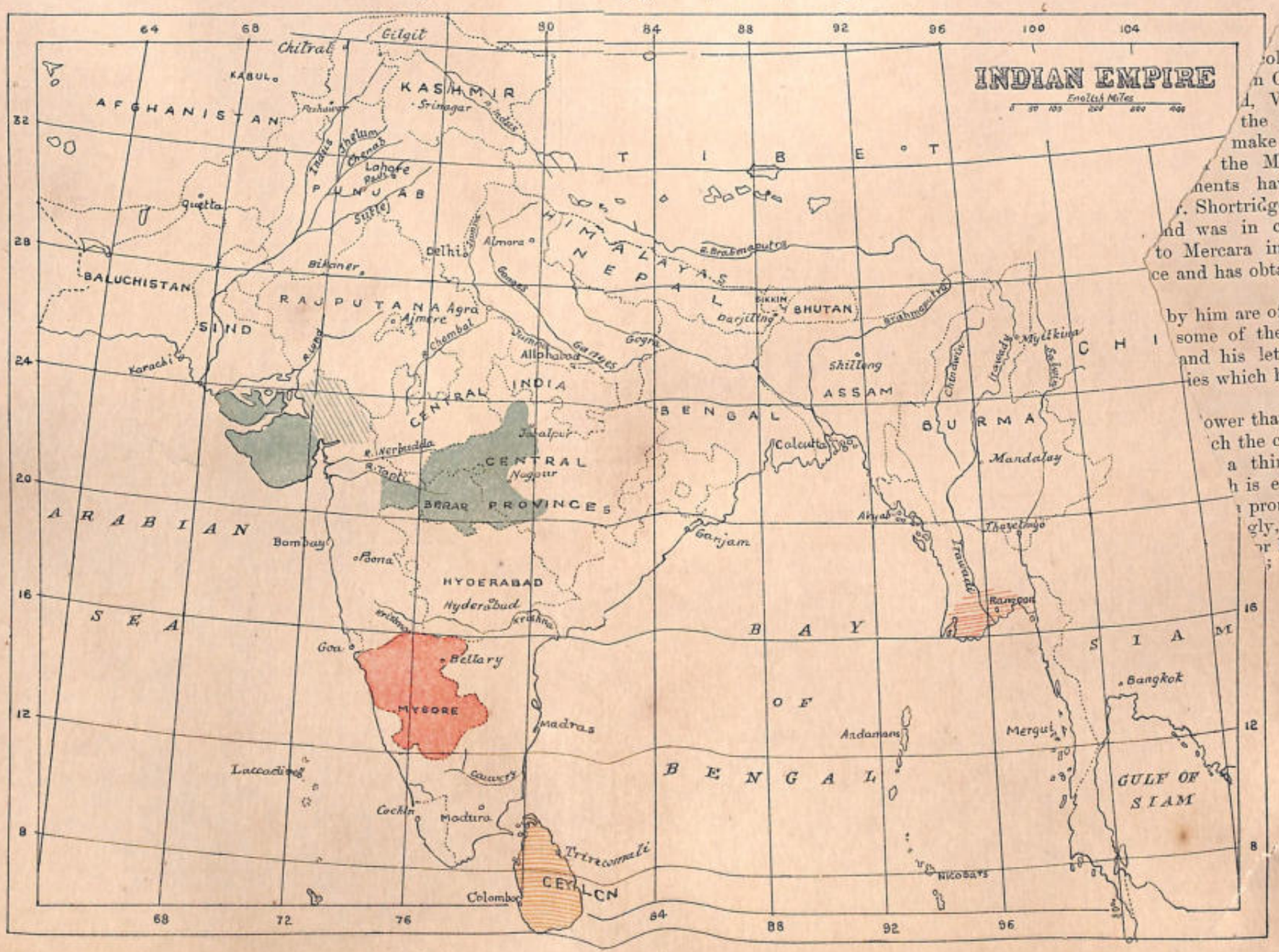
*Zomeutis dicaustæ*, n. sp.

♀. 19-21 mm. Head and thorax slaty-fuscous. Palpi fulvous-ochreous, terminal joint ochreous-whitish, anterior edge fuscous. Abdomen dark fuscous. Forewings elongate-oblong, costa anteriorly moderately arched, posteriorly straight, apex rounded-obtuse, termen slightly rounded, little oblique; slaty-fuscous; a narrow fulvous-brown streak along costa from middle to near apex, its costal edge dark fuscous; irregular narrow fulvous-brown streaks above and below middle from near base to ⅔; plical and second discal stigmata represented by a few green-whitish scales, latter preceded by a short obscure oblique longitudinal streak of fulvous-brown suffusion: cilia pale ochreous, with a faint brownish antemedian shade, on tornus suffused with fuscous. Hindwings dark fuscous; cilia fuscous, darker towards base.

Khasis; in April and October, two specimens.

(*To be continued.*)

*Map showing the districts already worked and in process of being worked by the Collectors for the Mammal Survey of India, Burma, and Ceylon.*




*The whole colours represent the districts finished and the lined areas where the Collectors are at present at work. Blue, Mr C. A. Crump. Red, Mr G. C. Shortridge. Yellow, Major E. W. Mayor.*

Survey
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# PROGRESS OF THE MAMMAL SURVEY OF INDIA, BURMA AND CEYLON.

In the last number of the Journal we reported that the Survey collectors were in Kathiawar and Mysore where good collections were being made. Mr. Crump, who went to Kathiawar in October, is still there and has collected at Junagadh, Keshod, Verawal, Tala, Sasan, Kudia, Rajkot, Dhrangadhra, and at the present moment at Wadhwan, from where he probably will make a move to Guzerat. He has made a fine collection of the Mammals of the District, and up-to-date three consignments have been sent home containing over 800 specimens. Mr. Shortridge, when we last wrote, was finishing off Mysore and was in camp at Sivisamudrum. From there he proceeded to Mercara in Coorg, and while we write is still in that Province and has obtained or sent in about 800 specimens.

The specimens at present being taken by him are of special interest as he is just on the border line of some of the South India species. From the specimens sent in and his letters we learn that he has obtained a number of species which have not so far been represented in the Survey.

As the rate of progress of the Survey is slower than was at first expected, owing to the thoroughness with which the collectors work each district, it has been decided to get out a third man. To do this a further sum of money is required which is estimated at Rs. 20,000, and of that sum Rs. 13,000 having been promised, it was decided to engage a third collector. Accordingly, on the recommendation of Mr. Oldfield Thomas, Major Mayor has been engaged and is expected to arrive here in the first week in March. Mr. Shortridge, having a greater experience of Eastern countries than either of the other two collectors, it has been decided to move him to Burma, and we hope to send him there in March. He will begin in the South and gradually work his way North, ultimately we hope ending up in Assam. While working out Mr. Shortridge's last collections, great difficulty was experienced from the want of Ceylon specimens, since in the Synonomy of South Indian Mammals are many species described by Kelaart, Blyth and others from Ceylon, of which either no or very poor specimens are in existence. It was therefore thought advisable, before doing any further collecting in South India, to move the collector from there to Ceylon; and accordingly, as Mr. Shortridge is going to Burma, Major Mayor is taking his place and going to Ceylon. With the co-operation of the Colombo Museum and k
Ki. iembers of the Society resident there, it is hoped to make a roughly representative collection of Ceylon Mammals.

rrangements are being made for the distribution of a large

number of specimens to different Museums in this country, and it is hoped that in the next Journal we shall be able to report that this has been done.

Some misconception appears to still exist as to the Survey and the reasons for which it was commenced, and we should like to take this opportunity of further explaining its object. The Survey was started so that a complete collection, as far as possible, could be got together of specimens, prepared in an up-to-date manner with skulls and full data, to enable the species and races of our Indian Mammals to be carefully worked out both as regards their distribution and relation to one another, and also to supply different Museums here and at home with sets of specimens of which they were much in need. When Dr. Blanford wrote his excellent Volume on the *Mammalia* in the *Fauna of British India*, he was much handicapped by the want of specimens, and in consequence overlooked certain distinct species and races. In many cases he had only spirit specimens to work with, which can hardly be called satisfactory. Should at any time a second edition of the *Mammalia* be brought out, there will be at hand a large collection of specimens which will enable the author to revise the work in a most up-to-date manner.

We have been told that some members consider that the Survey is encroaching on the field of the private or amateur collector, and taking away the hobby of a man who has to spend his life in the districts. This is a great mistake, and members can rest assured that even after our collectors have been in a district there is still a large amount of work to be done. It is impossible for our collectors to visit every part of the different districts and to make an absolutely complete collection of the species to be found. At some seasons it is very difficult to obtain specimens in traps and at others certain kinds leave the district, which means that it is very difficult to obtain a representative collection. As it is impossible to arrange to visit all places at the best time some districts are bound to be much better collected in than others. Again, in many districts it is almost impossible to get any assistance from the jungle tribes, while in others they come forward readily with specimens in return for rewards. From this it will be seen that it is very difficult or practically impossible not to miss things in some places.

In the present number of the Journal there is an excellent instance of how easy it is just to miss even a very distinct new species. Mr. Shortridge, when working in Dharwar District, collected on the Belgaum border, and some months later one of the Society's Museum assistants was sent to Castlerock on a holida with instruction to make a general collection of specimens of kinds. While there he by chance heard of a cave, about 15 n

away near one of the Salt posts in the Belgaum District. Through the kindness of the Range Officer of that beat, he was able to visit it and stay there a couple of days obtaining some bats from the cave. These bats included three specimens of the new species *Nyctinomus wroughtoni*, described and figured in the present number. The cave happened to be in the Belgaum District, about 40 miles away from the nearest part of the Dharwar District Mr. Shortridge collected in, and so as he was not working in that direction he did not come across it, and even had he worked in that district, it is quite possible that he might not have visited the particular cave and come across this bat.

It is hoped that this explanation will remove any objection that some members may feel, and that the co-operation of all members of the Society may be obtained, as it is only with the co-operation and help of members that this Survey can result in success.

EDITORS.

15*th February* 1913.

## MAMMAL FUND.

FURTHER LIST OF SUBSCRIBERS UP TO 28TH MARCH 1913.

| NAME. | Amount. | | |
|---|---|---|---|
| | Rs. | A. | P. |
| Amount previously acknowledged in Journal No. 4, Vol. XXI .. .. .. .. | 34,492 | 0 | 0 |
| Alston, G. P. .. .. .. .. | 15 | 0 | 0 |
| Alwar, H. H. The Maharaja .. .. .. | 500 | 0 | 0 |
| Balston, Capt. G. R. .. .. .. .. | 15 | 0 | 0 |
| Baroda, H. H. The Gaekwar, G.C.S.I. (2nd Donation) .. .. .. .. | 1,000 | 0 | 0 |
| Bhavnagar, H. H. The Maharaja, K.C.S.I. .. | 500 | 0 | 0 |
| Brandon, J. A. (2nd Donation) .. .. .. | 25 | 0 | 0 |
| Brooke, A. F. .. .. .. .. | 44 | 9 | 5 |
| Culbertson, T. M. S. (2nd Donation) .. .. | 10 | 0 | 0 |
| Dhrangadhra, H. H. The Raja Saheb .. .. | 300 | 0 | 0 |
| Fitz Gibbon, F. .. .. .. .. | 10 | 0 | 0 |
| Fraser, Donald .. .. .. .. | 50 | 0 | 0 |
| Fry, John T. (2nd Donation) .. .. .. | 10 | 0 | 0 |
| Fyson, Prof. P. F. (3rd Donation) .. .. | 10 | 0 | 0 |
| Government of India .. .. .. .. | 7,500 | 0 | 0 |
| Graham, J. H. .. .. .. .. | 50 | 0 | 0 |
| Hawley, Capt. W. G. B. .. .. .. | 14 | 8 | 0 |
| Kemp, Stanley .. .. .. .. | 50 | 0 | 0 |
| Kinloch, A. P. .. .. .. .. | 5 | 0 | 0 |
| Carried over .. | 44,601 | 1 | 5 |

| Names. | | Amount. | | |
|---|---|---|---|---|
| | | Rs. | A. | P. |
| Brought forward .. | | 44,601 | 1 | 5 |
| Kotah, H. H. The Maharao Sahib .. .. | | 500 | 0 | 0 |
| Mackwood, F. M. .. .. .. .. | | 150 | 0 | 0 |
| Macmichael, N. (I.C.S.) .. .. .. | | 100 | 0 | 0 |
| Mandlik, N. V. .. .. .. .. | | 100 | 0 | 0 |
| Mayne, Major H. B. .. .. .. .. | | 30 | 4 | 0 |
| McNeale, J. H. .. .. .. .. | | 10 | 0 | 0 |
| Millard, W. S. (3rd Donation) .. .. .. | | 200 | 0 | 0 |
| Morvi, H. H. The Thakor Sahib of .. .. | | 200 | 0 | 0 |
| Mosse, Capt. A. H. E. (I.A.) (2nd Donation) .. | | 25 | 0 | 0 |
| Moysey, E. L. .. .. .. .. | | 15 | 0 | 0 |
| Nizam of Hyderabad, H. H. The, G.C.B., G.C.S.I. (2nd Donation) .. .. .. .. | | 1,000 | 0 | 0 |
| Norman, Major H. H. (R.A.M.C.) .. .. | | 15 | 0 | 0 |
| Ogilvie, G. H. .. .. .. .. | | 5 | 0 | 0 |
| Oliver, A. W. L. .. .. .. .. | | 15 | 0 | 0 |
| Phipson, H. M. (2nd Donation) .. .. .. | | 500 | 0 | 0 |
| Pickersgill-Cunliffe, J. C. .. .. .. | | 50 | 0 | 0 |
| Powell, J. E. .. .. .. .. | | 10 | 0 | 0 |
| Rutlam, H. H. The Raja Saheb, K.C.S.I. .. | | 100 | 0 | 0 |
| Ryan, G. M. (I.F.S.) .. .. .. .. | | 100 | 0 | 0 |
| Simcox, A. H. A. (I.C.S.) .. .. .. | | 15 | 0 | 0 |
| Sinclair, R. L. (2nd Donation) .. .. .. | | 15 | 0 | 0 |
| Sladen, J. (I.C.S.) .. .. .. .. | | 25 | 0 | 0 |
| Stables, Alex .. .. .. .. .. | | 31 | 4 | 2 |
| Stanton, W. C. .. .. .. .. | | 15 | 0 | 0 |
| Sulivan, Col. G. D. F. (3rd Donation) .. .. | | 65 | 0 | 0 |
| Tweedie, A. G. (3rd Donation) .. .. | | 10 | 0 | 0 |
| Wallace, R. .. .. .. .. .. | | 50 | 0 | 0 |
| Ward, Major C. H. (3rd Donation) .. .. | | 10 | 0 | 0 |
| Wood, S. C. G. .. .. .. .. | | 15 | 0 | 0 |
| Total .. | | 47,977 | 9 | 7 |
| Promised. | | | | |
| | Rs. | | | |
| Mr. Ratan Tata .. .. .. | 1,000 | | | |
| H. H. The Rao of Cutch (2nd Donation) .. | 1,000 | | | |
| H. H. The Maharaja of Jodhpur .. | 1,000 | | | |
| Government of Burma .. .. .. | 1,000 | | | |
| Zoological Society of London .. .. | 750 | | | |
| | | 4,750 | 0 | 0 |
| Total .. | | 52,727 | 9 | 7 |

# MISCELLANEOUS NOTES.

## No. I.—A HYBRID BETWEEN A LION AND A PANTHER.

So far as I am aware there is no published description of a hybrid lion and leopard. I am greatly indebted, therefore, to Mr. W. S. Millard, the Honorary Secretary of the Bombay Natural History, for sending me a skin of a specimen, which, according to the testimony of Col. F. W. Wodehouse, was bred in the gardens at Kolhapur between a male panther, *i.e.*, a large leopard and a lioness. There were two cubs in the litter. One, whose skin is here figured, died when about two and a half months old, whereas the other, now about two years old is, I believe, still living.

At first sight this skin recalls that of a leopard in being covered with spots; but those on the sides of the body are much smaller and closer set than in typical Indian leopards, and also browner and altogether less distinct, as if beginning to disappear with age, as is the case with lions. On the head, down the spine, on the belly and the legs, they are however quite black and distinct. The tail is very confusedly spotted above, but striped below, and has a blackish tip covered with longer hairs. Another leonine feature is the dirty white—rather than clear white—tint of the underside, while the ears are fawn with a broad, black bar, but are without the white spot seen in leopards.

The nearest approach to this hybrid hitherto recorded is the one bred at Chicago between a male lion and a female cross between a jaguar and a leopard, the true story of which, accompanied by a good figure by Mr. Frowhawk, may be found in the *Field* for April 18 and 25, and May 9, 1908. The final episode in the history of that animal has, I believe, not yet been told. After being exhibited in the Zoological Gardens and at the White City it went to Glasgow, where, according to a sensational Press notice, it was killed by a lion, which broke down the partition between the cages and made short work of its opponent. That this story was of a piece with the original account of the hybrid given out when it first appeared on the market may be inferred from the condition of the dressed skin, which had no sign of a tear or scratch upon it in London shortly after the alleged tragedy.

The chief difference between this hybrid of three species and the lion-leopard born at Kolhapur lies in the size of the spots, those of the former being large and jaguar-like, as might be expected, while those of the latter are small and more leopard-like.

R. I. POCOCK.

ZOOLOGICAL GARDENS, REGENT'S PARK, LONDON, N. W.

[The above note appeared in the *Field* of 2nd November 1912, and is reprinted by the kind permission of the Editor.

The skin was presented to the Society by Colonel F. W. Wodehouse and is now in the Society's Museum.—EDS.].

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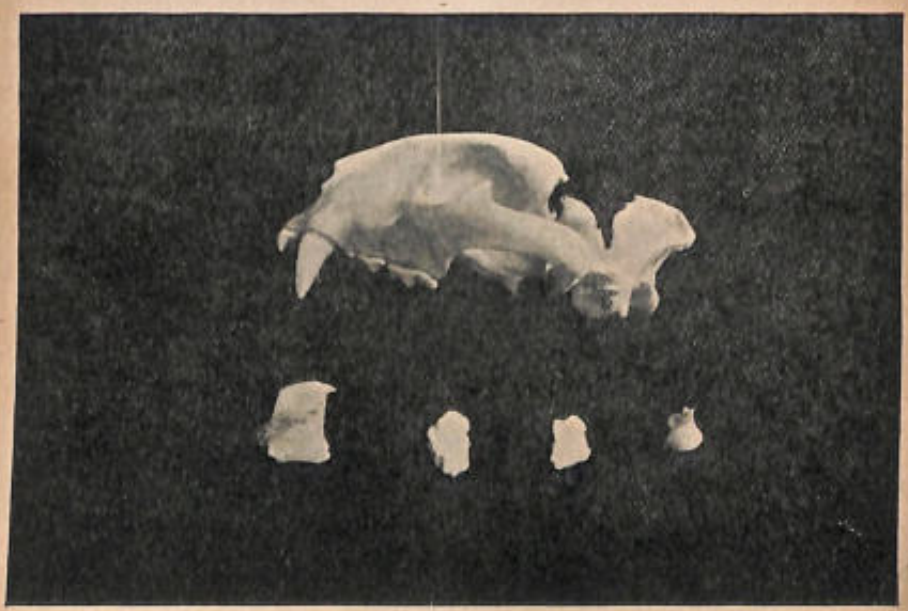
## No. II.—VITALITY OF A TIGER.



When passing through Bombay recently Mr. Clifford Batten gave us for reproduction the above photograph of a tigress' skull. A note in regard

to the killing of this animal and the long time it lived after being shot has already appeared in the *Indian Field*. All we need now say is that the animal was fired at by Mr. Clifford Batten, while sitting over a kill near Mussoorie, at 8 o'clock on Monday night and the last time she was heard alive was 4 o'clock on Tuesday morning. On Wednesday morning the tigress was found lying dead over half a mile from the place she was fired at. To quote Mr. Clifford Batten :—"She was struck with a 500 solid bullet (400 grains, 55 grains cordite, low velocity), this passed through her arm breaking the humerus causing a compound fracture, entered her head above the left eye and passed *through* the brain, and ultimately came out of skin on the right side of the neck.

The bullet entered the front part of the *left* half of the brain, passed obliquely through and broke off the *right* mastoid process, the nasal portions of the skull were not touched, but the parietal bones were broken into four pieces ; in fact, the whole of the cavity containing the brain was smashed and what was left of the brain was a pulp. Still with these frightful injuries she was, to my certain knowledge, alive eight hours, then (not taking into consideration the compound fracture of her left foreleg) was afterwards able to travel half a mile. Surely this is a record of vitality."

EDITORS.

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## No. III.—NUMBER OF CAUDAL VERTEBRÆ IN PANTHERS (*FELIS PARDUS*) TAIL.

On page 1319 of Vol. XXI I notice Captain Mosse has shot a small panther with 24 bones in the tail. On the 22nd of December I shot a small female panther measuring 5'-6" at Bhatkal in North Canara. The number of her caudal vertebræ was 23. It was a full grown panther.

W. W. KEYS, MAJOR, I.M.S.

KARWAR, *December* 1912.

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## No. IV.—A FIGHT BETWEEN A JACKAL (*CANIS INDICUS*) AND AN IMPERIAL EAGLE (*AQUILA HELIACA*).

An encounter between a jackal and an Imperial eagle *Aquila heliaca*, which I had the good fortune to witness some days ago while riding across the Samilzai plain, Hangu Valley, may perhaps be of interest to record. As I rode up, the eagle was on an open flat piece of ground defending itself vigorously with beak and tallons against the assaults of a jackal which was circling rapidly round it, first one way then the other, snapping at its neck the while but evidently fearing to put itself within reach of the powerful tallons.

Thinking the eagle must be injured, I rode up closer whereupon the jackal made off, but the eagle, after running and flapping along the ground, soared into the air and showed that it was quite unhurt. What the end of this unnsual combat would have been had no one appeared on the scene is hard to say. But the odds seemed in favour of jackal. The eagle, which must have been surprised and rushed by the jackal before it could take to flight, was obviously pinned to its ground by the superior mobility of its assailant. For, if for an instant it had abandoned facing its adversary, which it would necessarily have had to do in order to get on the wing, its seizure and discomfiture were a quick certainly. In all probability the

jackal, who, in addition, had all the advantages of the offensive, would by the rapidity of its movements have eventually exhausted its opponent and obtained the opening it so hungrily sought.

H. A. F. MAGRATH, LIEUT.-COL.

KOHAT, *December* 1912.

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## No. V.—TSAING (*BIBOS SONDAICUS*) FOUND WITH VILLAGE CATTLE.

The Tsaing will be noticed above with a small white cross above, the fourth animal from the left.

With reference to Mr. Hauxwell's letter, dated 26th February 1912, about a Tsaing found with village cattle, page 1072 of Vol. XXI, I herewith send you a photograph which I took after Mr. Hauxwell left Bammauk. This time the animal allowed me to get up to within 70 feet of him. He is absolutely harmless, and often sleeps quite near the village. He has been known even to have slept within the village fence. On one occasion, when he was paying marked attention to a particular cow, the owner, to keep him off, built a fence round his pen. The Tsaing was not to be daunted. He cleared the fence and got in. On another occasion, an aggressive village bull attempted to make a stand against the Tsaing, but one heave was sufficient to convince the foolish bull that he was no match to the Tsaing.

The belief in the village is that this Tsaing is the re-incarnation of a Phongyi (Buddhist priest) who used to cure people of ailments with the

aid of evil spirits, a practice which is strictly against the tenets of the Buddhist religion.

This Tsaing has been continually visiting the village for the three past hot seasons. During the rainy season he is never to be seen.

J. W. ADAMSON.

FALAM CHIN HILL, 19*th September* 1912.

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## No. VI.—LARGE OORIAL HEADS.

With reference to my note on Oorial in Vol. XXI, No. 3, page 1065, and your sub-note, I have been told that the Shapoo have practically no beard or only a small tuft under the chin. All Oorial I have shot both in the Salt Range and Trans-Indus (across Indus from Punjab) on the contrary had magnificent beards extending right down to between their forelegs, in spite of their living in warmer climates than the Shapoo.

I think Major Taylor's head of 39½" came from the Tochi Valley. Unless I am mistaken two heads of exactly of this size were obtained there in 1897 or 1898, one picked up and the other shot. If so, these would be Trans-Indus heads, though they would have then been correctly described as from the Punjab, since the N. W. F. Province had not then been formed and that part of the frontier was then under the Punjab Administration. I hear the latest record is 40½" obtained near Wave last (1911) hot weather. Heads run much bigger there than Cis-Indus, 35" to 37" being by no means uncommon in Waziristan, but it is of course at present a closed country to the ordinary sportsman.

H. V. BIGGS, COLONEL.

RAWALPINDI, 8*th September* 1912.

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[The 5th Edition of "Records of Big Game" which we quoted in our editorial note was published in 1907. We have now seen the latest edition, the 6th published in 1910, and in it Major Taylor's head is said to have been killed in Waziristan. Up to about August 1910 the following were the records of the different races of Oorial.

Shapoo or Ladak :—

Oorial, *Ovis vignei typicus.*

39 ins., locality unknown, Major-General Sir H. S. Rawlinson.

Kelat Oorial, *Ovis vignei blanfordi.*

37½ Kelat * Mr. A. O. Hume.

Punjab Oorial, *Ovis vignei cycloceros.*

39¼ no locality 27th Punjabis.

39½ Waziristan Major F. H. Taylor.

Kopet Dagh Oorial, *Ovis vignei arkal.*

45¼ N. Persia Capt. C. T. Daukes.

EDS.

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## No. VII.—FLYING SQUIRRELS AND WALNUTS.

Many years ago* correspondence appeared in the Journal, *re* empty walnut shells picked up by the writer in the Forest which had small holes bored through the shell. It was surmised in the absence of occular proof that some strong-billed bird like a woodpecker, crabs or rats had perforated the holes. When in the Himalayan Hills North of Simla, I picked up a number of empty walnut shells perforated in the way described in correspondence and I had occular proof in bright moonlight night that Flying squrrels were the

* Vol. XV, p. 712.

jackal, who, in addition, had all the advantages of the offensive, would by the rapidity of its movements have eventually exhausted its opponent and obtained the opening it so hungrily sought.

H. A. F. MAGRATH, Lieut.-Col.

Kohat, *December* 1912.

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## No. V.—TSAING (*BIBOS SONDAICUS*) FOUND WITH VILLAGE CATTLE.

The Tsaing will be noticed above with a small white cross above, the fourth animal from the left.

With reference to Mr. Hauxwell's letter, dated 26th February 1912, about a Tsaing found with village cattle, page 1072 of Vol. XXI, I herewith send you a photograph which I took after Mr. Hauxwell left Bammauk. This time the animal allowed me to get up to within 70 feet of him. He is absolutely harmless, and often sleeps quite near the village. He has been known even to have slept within the village fence. On one occasion, when he was paying marked attention to a particular cow, the owner, to keep him off, built a fence round his pen. The Tsaing was not to be daunted. He cleared the fence and got in. On another occasion, an aggressive village bull attempted to make a stand against the Tsaing, but one heave was sufficient to convince the foolish bull that he was no match to the Tsaing.

The belief in the village is that this Tsaing is the re-incarnation of a Phongyi (Buddhist priest) who used to cure people of ailments with the

aid of evil spirits, a practice which is strictly against the tenets of the Buddhist religion.

This Tsaing has been continually visiting the village for the three past hot seasons. During the rainy season he is never to be seen.

J. W. ADAMSON.

FALAM CHIN HILL, 19*th September* 1912.

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## No. VI.—LARGE OORIAL HEADS.

With reference to my note on Oorial in Vol. XXI, No. 3, page 1065, and your sub-note, I have been told that the Shapoo have practically no beard or only a small tuft under the chin. All Oorial I have shot both in the Salt Range and Trans-Indus (across Indus from Punjab) on the contrary had magnificent beards extending right down to between their forelegs, in spite of their living in warmer climates than the Shapoo.

I think Major Taylor's head of 39½" came from the Tochi Valley. Unless I am mistaken two heads of exactly of this size were obtained there in 1897 or 1898, one picked up and the other shot. If so, these would be Trans-Indus heads, though they would have then been correctly described as from the Punjab, since the N. W. F. Province had not then been formed and that part of the frontier was then under the Punjab Administration. I hear the latest record is 40½" obtained near Wave last (1911) hot weather. Heads run much bigger there than Cis-Indus, 35" to 37" being by no means uncommon in Waziristan, but it is of course at present a closed country to the ordinary sportsman.

H. V. BIGGS, COLONEL.

RAWALPINDI, 8*th September* 1912.

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[The 5th Edition of "Records of Big Game" which we quoted in our editorial note was published in 1907. We have now seen the latest edition, the 6th published in 1910, and in it Major Taylor's head is said to have been killed in Waziristan. Up to about August 1910 the following were the records of the different races of Oorial.

Shapoo or Ladak :—

Oorial, *Ovis vignei typicus.*

39 ins., locality unknown, Major-General Sir H. S. Rawlinson.

Kelat Oorial, *Ovis vignei blanfordi.*

37½ Kelat Mr. A. O. Hume.

Punjab Oorial, *Ovis vignei cycloceros.*

39¾ no locality 27th Punjabis.

39½ Waziristan Major F. H. Taylor.

Kopet Dagh Oorial, *Ovis vignei arkal.*

45¼ N. Persia Capt. C. T. Daukes.

EDS.

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## No. VII.—FLYING SQUIRRELS AND WALNUTS.

Many years ago* correspondence appeared in the Journal, *re* empty walnut shells picked up by the writer in the Forest which had small holes bored through the shell. It was surmised in the absence of occular proof that some strong-billed bird like a woodpecker, crabs or rats had perforated the holes. When in the Himalayan Hills North of Simla, I picked up a number of empty walnut shells perforated in the way described in correspondence and I had occular proof in bright moonlight night that Flying squrrels were the

* Vol. XV, p. 712.

operators. I was staying at a Dâk Bungalow near Chini-Bushahr State, Himalayas, and saw the performance from the Dâk Bungalow verandah. The noise made by the squirrel when boring the hole was like that of a minature steam saw. The Dâk Bungalow Chowkidar pointed out the squirrel to me as it sat on the branch of a large walnut tree and told me that the holes in the walnuts were made by flying squirrels only. No other kind of rodent eat walnuts in that way. I could see the squirrel with a nut in his forepaws rasping away like a sewing machine, but I could not see well enough to notice whether the teeth or tongue extracted the nut. I think the tongue, because it is only a flexible tongue that can go round corners for removing the whole of the nut. I picked up a shell just as it dropped from the squirrel's paws and found it most thoroughly cleaned out.

I was told by the Dâk Bungalow Chowkidar that flying squirrels come round for walnuts only on moonlight nights when they can see and choose their nuts. I am afraid this information is very belated.

A. CONLEY.

JAMACIA, 12*th September* 1912.

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## No. VIII.—RECOVERY OF ANIMALS FROM INJURIES.

Having seen the article on "Recovery of animals from injuries" by Mr. W. G. H. Ballantine in your Volume XXI, No. 3, if it will be of any interest to your readers, I may mention that I was present at the bagging of a Sambur with at least half a dozen slugs embedded under the skin, the result of an old shot. The skin had completely healed over the lead pellets, showing no external marks of any kind, and the beast did not seem in the least inconvenienced and was going very strong before being bagged.

Another instance I can remember is of a boar I bagged last year. He was also quite game. On mascerating his skull for the purpose of mounting I discovered that he had a slug embedded in the nasal bone a few inches from the tip. When properly mascerated the pellet and a piece of bone dropped out. The outer skull and the tissues had completely healed shewing no external injury before the masceration. I have the skull and the piece of bone but I have lost the pellet.

SYDNEY A. CHRISTOPHER.

RANGOON, 4*th September* 1912.

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With reference to the notes on "Recovery of animals from injuries" appearing in the Society's Journals the following may be of interest. Last December, I spent some days after Markhor *(Capra falconeri)* at Sheikh Budin, and my shikari informed me that there was a one-horned Markhor on the hill. Sure enough while stalking another animal one day my shikari pointed out a one-horned animal on the opposite side of a deep but narrow nullah. Although he was scarcely of shootable size, I killed him thinking him to be a "freak." On closer inspection, however, I found that one horn and standard was broken off on a level with the general surface of the skull having a still suppurating wound on the bone of skull, rather larger in diameter than the base of the horn. The animal appeared to be quite young and was very active. One would have thought a blow of sufficient force to cause this injury would have knocked the beast out altogether. Possibly the original injury caused a suppurating wound with subsequent sloughing of the horn and bone. Since then while shooting in Baltistan I have seen a one-horned ibex. In place of the second horn was a stump, a

few inches long, just visible with the aid of field glasses at about two hundred yards' distance.

LOUIS H. L. MACKENZIE, CAPT., I.M.S.

DERA ISMAIL KHAN, *14th September* 1912.

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## No. IX.—NOTES ON THE DRINKING HABITS OF WILD ANIMALS AND BIRDS.

These were all collected during 1910-1911 in the Central Provinces.

Tiger, *Felis tigris.* I never saw one actually drinking, but on two occasions from his tracks, he must have drunk between sunset and 7 p.m.

Panther, *Felis pardus.* Once observed at about 7-30 p.m. at a water hole at the bottom of a pit.

Hyæna, *Hyæna hyæna.* } Not observed.

Wolf, *Canis pallipes.* }

Wild Dog, *Cuon dukhunensis.* Observed at a tank one evening about 5 p.m. also 3 were seen drinking from a river at midday. The villagers said they drank twice a day: in the middle of the day and in the late afternoon. From all accounts they are very local and will drink regularly at one tank for some days and then move off to a fresh piece of jungle.

Jackal, *Canis indicus.* Usually fairly soon after dusk.

Sloth Bear, *Melursus ursinus.* I once saw two drinking at 5 p.m. from a tank half mile away from a village; and it was at that hour broad day light. I have often seen them drinking, or rather I should say sucking up, the water from a small pool at the bottom of a pit either just inside or at the edge of the jungle. The usual hours for visiting these are either from 8 to 10 p.m. or from 3 to 4 a.m.

Wild Boar, *Sus cristatus.* The Jungle Pig in the hot weather is usually to be found by water at all hours of the day; but this I fancy is more for "Wallowing" purposes than for drinking. I have watched them wallow at all hours of the day and night, and have often seen them come down in droves to drink at tanks about midnight and once at about 6-30 in the evening.

Gaur, *Bibos gaurus.* I saw a herd drink at about 3 in the afternoon and a solitary bull one day at midday.

Sambhur, *Rusa unicolor.* Nearly always drink in the early morning between midnight and 3-30. They are usually the last of all animals to come and drink.

Cheetal, *Axis axis.* Usually drink in the early morning between day break and 7-30: sometimes go down in immense herds to the water. I once saw one of about 300 coming up from a brook at the bottom of a deep ravine at about 7 in the morning.

When shooting in the Chanda District, C. P., in May and June 1911, I made rather a study of the drinking habits of various animals, and the following extracts may prove interesting to Mr. Dewar.

Black Buck, *Antilope cervicapra.* On the 24th December 1910, I saw a herd of about 40 does drinking at a river in the Hinganghat District, C. P., at about 8-30 in the morning. In 1911 on 9th, 10th, and 11th May I saw small herds of Bucks and Does drinking in the river Wainganga, S. Chanda, in the early morning, and also at about 4-30 in the afternoon. The villagers all used to tell one of the favourite spots where they went to drink; as native shikaris used to sit in "hides" by the water in order to shoot them.

Nilghai, *Boselaphus tragocamelus*. In S. Chanda, in 1911, on 13th May, I saw a Bull come and drink at a tank just after dawn. At one village I was shewn a tank where "Nila" or "Nil," as the villagers called them, used to drink at about 5 p.m., but I never saw any there, and I was also told that the "Nil" did not drink regularly. On the night of 23rd May, at the tank of another village I watched two Bulls drinking within a few yards of me at about 8-30. I have never seen the Does drinking: and from all accounts the Nilghai of the jungle is not a heavy or regular drinker.

Four-horned Antelope, *Tetracerus quadricornis*. I have come across these little animals drinking at tanks in S. Chanda any number of times. They do not drink at night and have no fixed drinking hours by day, as I have seen them coming to water at any time between dawn and sunset. I will quote a few instances from S. Chanda, May 1911:—

5th May 1911, when in camp by a roadside tank: watched a Doe drinking on the far side, through my glasses about 4-30 p.m.

Next day several came down singly and in pairs between 9 and 12 in the morning.

12th May, came on 4 Does drinking at a village tank at 8-30 in the morning and got within 30 yards of them. During the next ten days saw them, both Bucks and Does, drinking at this tank at all hours between 8 a. m. and 4 p. m.; in one instance a very fine Buck came down.

12th—23rd May while in camp by another tank, a party of three, a Buck and 2 Does, came twice daily at about 9 a.m., and 3 p.m., and drank not more than 80 yards from my tent: odd ones used to wander down to this tank and drink at all hours of the day and my servants used to call my attention to them, when I used to watch them with my glasses.

23rd and 24th May. At a tank by a different camp I saw some small parties drinking about midday and others late in the afternoon. I could quote many more instances but these should suffice.

Chinkara, *Gazella bennetti*. I will not repeat my notes about these animals: nor will I attempt to assert that these *Gazelles* cannot live without water: for I am perfectly convinced that quite 80 per cent. or more of these *Gazelles* roam in such places where they *cannot* get any water. Any moisture that they then require may possibly be obtained periodically from their food plants. But on the other hand, from what I have seen on three occasions in Chanda, I am quite certain that the "Chink" does drink water when it is plentiful in its habitat, and in such cases may even get into a regular habit of coming to drink.

Langur, *Presbytis entellus*. Seemed to drink when they wanted it: but usually once a day. I saw them drinking at various hours in the day. They drink like Deer and cattle with their mouths down to the water and do not lap like Canines or Felines.

Pea Fowl, *Pavo cristatus*. Used to drink every evening just before dusk: sometimes a few came out in the early morning.

Green Pigeon, *Crocopus chlorogaster*. Used to drink at dawn and occasionally in the evening about 4-30 or 5 p.m.

DERA ISMAIL KHAN,
*September* 1912.

C. R. S. PITMAN,
27th Punjabis.

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## No. X.—THE NUMBER OF TAIL FEATHERS IN THE GENUS *CRYPSIRHINA*.

In the Avifauna of British India, one of the characteristics of the Corvidæ mentioned is the possession of twelve rectrices or tail feathers, and no mention is made of any exception among any of the sub-families or genera.

On 2nd December 1911, I obtained a specimen of the Hooded Racket-tailed Magpie (*Crypsirhina cucullata*), which had only ten tail feathers. On 12th of the same month I shot another specimen of the same bird for examination and found the same number of tail feathers. The bird is not very common here, and it was not till 24th December 1912 that I obtained a third example and this showed the same condition. In none of these three cases could I find any traces of any of the rectrices being lost, so that I am brought to the conclusion that this species has only ten rectrices. I am forwarding a specimen for the Society's collection and shall look out for further specimens for examination. I don't know whether this characteristic has been recorded previously, but I am satisfied that there is no mistake in the counts made by me in these three cases.

F. E. W. VENNING, Capt.

Pyawbwe, 28*th December* 1912.

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## No. XI.—NESTING OF THE CHESTNUT-BELLIED NUTHATCH (*SITTA CASTANEIVENTRIS*, Frankl.) AT FEROZEPORE, PUNJAB.

As but little appears to be on record regarding the distribution and habits of *Sitta castaneiventris* in the Punjab, the following note may be of some interest.

On March 4th, I met with a pair of this species in a grove of trees—chiefly Cirus, Shisham, and Kikus—bordering a road near Ferozepore Cantonments. As it was the first occasion on which I had met with any Nuthatches in the plains I watched them for a time feeding. On March 27th, I was passing the same way and heard a pretty rippling whistle which on investigation proved to be the call of the male Nuthatch who was alone; I suspected the presence of a nest and accordingly watched the bird who was suddenly joined by the female; both birds started feeding, visiting the different species of trees impartially. A storm came up and drove me home before I had located the nest; the cockbird when alone had, it is true, paid a hasty visit to a small hole in a large wart like excrescence about 10 ft. from the ground on the trunk of a large Cirus, but that might have been merely in the course of insect hunting.

The next day I went to the spot and soon found the Cock Nuthatch, who was again alone, but after watching for a time lost him. I then took up a position opposite to the small hole he had visited on the previous day and waited. The Nuthatch soon appeared flying in my direction and I was delighted to see him go straight to the hole in the "wart" and put something in. This shewed that the nest was in the hole and the manner of his visits seemed to indicate that he was feeding the hen bird who was incubating her eggs; as if there had been young, the visits to the nest would have been more frequent and both birds would have taken part in the work.

Accordingly next morning, March 29th, I went to cut out the nest and found that the tiny hole on the top of the wart was really the entrance to a largish chamber. The entrance hole had been partly plastered up with mud; and the chamber was half filled with fragments of Shesham seed cases which formed a loose nest in which the female was sitting upon five half incubated and one addled egg.

The eggs were white speckled with dull lilac and brick red, the markings being somewhat thicker towards the larger end. They measure 1·75 × 1·35; 1·70 × 1·30; 1·70 × 1·30; 1·65 × 1·35; 1·70 × 1·30 cmm. [Egg Reg. Nos. 1378-1382]. As this was the only occasion I met with the species in the district I preserved both birds [♂ S. R. 567; ♀ S. R. 568].

The use of fragments of seed cases of the Shisham is remarkable as likely to have some connection with the English Nuthatch's habit of using pine bark in the construction of its nest; at any rate both materials would seem to have the same characteristics and presumably therefore the same (unknown) advantages.

H. WHISTLER,
Indian Police, Punjab.

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## No. XII.—OCCURRENCE OF *PRATINCOLA LEUCURA*, BLYTH, IN THE PUNJAB.

When collecting in the grass jungle on the banks of the River Sutlej at Ferozepore on April 6th, I secured a Chat which proved on examination to be The White-tailed Bush-Chat, *Pratincola leucura*, Blyth, F. I. No. 611. It was a male with the testes well developed. A few days later on April 17th I was in the same jungle and noticed a Chat that shewed a flash of white each time it fluted its tail; accordingly I shot the bird and found that, as I expected, it was a second *leucura*—a male in good plumage although the sex was not dicernible by dissection. On the same ground *Pratincola maura* was abundant at the time. Unfortunately I left the district at the end of the month without being able to settle the status of the bird which may prove to be a resident in the riverain area and moderately common. This species does not appear to have been recorded from the Punjab although Sind and the Terai are given in the Fauna as localities for it.

H. WHISTLER,
Indian Police, Punjab.

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## No. XIII.—OCCURRENCE OF THE RED-TAILED CHAT (*SAXICOLA CHRYSOPYGIA*, DE FILIPPI) IN THE VICINITY OF SIMLA.

My friend, Mr. Alec. Jones, has just sent me a specimen of the above which he shot on the 29th September last near Sairee (about 9 miles from Simla). Hitherto this species does not appear to have been recorded from the Punjab *east* of the River Jhelum.

P. T. L. DODSWORTH.

SIMLA, *2nd October* 1912.

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## No. XIV.—ON THE NESTING OF HODGSON'S GRANDALA (*GRANDALA CŒLICOLOR*).

It will be of interest to some of your readers to hear that the eggs of the Grandala have been at last secured. I recorded in the journal of May 20, 1911, the finding of the nest with two young and in June of that year my collector got a nest with two slightly incubated eggs from the same locality, securing both the parent birds. The eggs are distinctly meruline in appearance, being greenish white, spotted and marked with reddish brown and with purplish undermarkings: they measure 1·06×·81 and 1·12×·75 of an inch and there is some dissimilarity between the eggs, the shorter one being greener and the more heavily marked. The markings are distributed all over, there being no zinc or cap. The nest and its position was similar to that formerly described by me.

S. L. WHYMPER.

ENGLAND, *December* 1912.

## No. XV.—ROCK THRUSH AT LAHORE.

Through the kindness of Captain A. Cruickshank the Society has received the skin of the Rock Thrush, *Monticola saxatilis*, shot at Lahore. The bird was shot on 18th September and is in first plumage. As far as I know this bird has not been obtained so far south in India before, though Major Marshall shot one in January and another in April 1902 at Quetta.

Captain Whitehead has only once met with this bird near Kohat, *viz.*, on September 6th, 1909.

N. B. KINNEAR.

BOMBAY, *January* 1913.

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## No. XVI.—SOME NOTES ON THE NESTING AND PLUMAGE OF THE SHAHIN FALCON *(FALCO PEREGRINATOR)*, VEL. THE BLACK-CAP FALCON *(FALCO ATRICEPS.)*

The question whether the *Falco peregrinator* of Sundevall is identical with the *Falco atriceps* of Hume, or whether the latter is a geographical race of the former is still, I understand, a moot point. Hume was emphatic (Rough Notes, pp. 55-62 and S. F. Vol. VII, pp. 326-327) that his bird, which was confined to the central section of the Himalayas, was quite distinct, and was the northern representative in India of the Shahin. Assuming for the moment that the two birds are identical, I give below the following particulars relating to the nesting and plumage of a pair of these Falcons, in the hopes that these may be of some use hereafter to systematists, and also as an inducement to ornithologists in India generally to try and obtain skins (and if possible in various stages of plumage) of this somewhat rare species and to send them to our Society for comparison and note.

At the beginning of this year, one of my hunters reported that he had noticed a pair of "Neela Shahins" haunting a huge precipice in the vicinity of the Shogi Railway Station, K. S. Railway, elevation about 6,000 feet, and about nine miles from Simla, N. W. Himalayas. On the 18th March I visited the spot, and saw both the birds, which I at once identified as belonging to this species. From the noise the female made—her note was a prolonged "chir-r-r-r every now and then when the male flew close to her, and from other signs, there seemed no doubt that they intended nesting on the cliff. Between the 18th March and 19th April (the nest was discovered on the latter date), the locality was frequently visited, but though there must have been eggs *at least* by the first week in April (on 21st April 2 eggs had hatched), the strange thing was that both the old birds were always seen *sitting on the cliff*! And it was this behaviour on their part which misled us. However, on the 19th April the cock gave away the show by betraying the position of the nest. I mention these details because it seemed strange that these Falcons never appeared to sit on their eggs. The only way I can account for this is that during the middle of the day, the time we usually visited the spot, the birds deserted their nests, and trusted to the heat from the rocks as sufficient for the incubation of the eggs.

On the 21st April I laid siege to the nest, which was placed in a niche on the cliff. On my arrival the female was sitting on the precipice, and as she flew, I knocked her over. Shortly after this the male arrived on the scene, and flew straight into the nest. With a great deal of stone throwing and noise we got him off, and I shot him also.

The nest was a loose irregular platform of sticks, with a central depression, a few pieces of string, rope, some rags, and other odds and ends

were mixed up in the structure. It contained two young, about a couple of days old, and one egg on the point of hatching off. This egg, which was saved after a deal of trouble, measured 2·02″ × 1·53″. The ground colour was a deep reddish-brown, heavily spotted and blotched with brick-red. In addition to these markings, the large end had a few bold blotches and splashes of deep liver-colour.

The two young were clad in white down: their beaks and legs were creamy white; irides, light brown.

On laying the two adult birds side by side, the differences in their plumage and dimensions were so great that, anyone not acquainted with their history would certainly assign them to different species. I sent this unique pair of Falcons, shot off the same nest, to Mr. E. C. Stuart Baker, for comparison with specimens in Europe, and he returned the skins with the remark that he could make nothing of them!

Hume thought that the Himalayan birds constituted "a very distinct race" owing to their cheek-stripes being fused into a black cap with the black of the crown and nape. Now in my specimens the chief peculiarity is that, while in the female the cheek-stripe is *absolutely* fused with the black of the head and nape, in the male *it is quite distinct*. His ear-coverts, which bridge the cheek-stripes and nape on either side, are a light sooty-brown, with a good deal of white showing through. It is not safe to dogmatise on the strength of a single case, but nevertheless with the evidence before me, I cannot help thinking that the clear "homogeneous unbroken black cap" on which Hume laid so much stress, *is due entirely to age*, and is not a peculiarity of these birds. The cheek-stripe in the female measures 1·7″, while in the male it is only 1″.

Then again the colouration of the under and upper surfaces of the two birds is totally different. The female is a deep ferruginous, especially about the crop and sternum, and, excepting the crop, conspicuously barred throughout some of the bars on the underwing coverts are fully ·15″ in width. The male, on the other hand, has the corresponding parts a light salmon, slightly darker on the sternum, and only very faintly barred, except on the under wing-coverts, where these bars are darker. The upper parts of the female (excluding head, nape, and upper back) are a dark slatey-blue, and conspicuously barred with dusky slatey; while these parts in the male are a light slatey-blue, especially the rump, and only faintly barred. The female has only three or four very faint traces of fulvous on her nape, *a sign of age* (Blanford, F. B. I. Aves, Vol. III, p. 415); while the male has practically a rufous collar on the neck, indeed, the rufous feathers extend in regular lines from the nape almost to the back of the eyes, *a sign of immaturity* (Blanford, F. B. I. Aves, Vol. III, p. 415).

Lastly, the dimensions of the two birds compare as follows:—

♂ L. 14·7″; Ex. 34·7; W. 11·25″; Tl. 6″; Bill from gape 1·05″; Ts. 1·85″; Hind toe (without claw) 1·9″; weight 1 lb.

♀ L. 17·1″; Ex. 39·5″; W. 13·35″; Tl. 7″; Bill 1·32″; Ts. 2″, Hind toe 2″; weight 2 lbs.

Colours of soft parts (both male and female): Bill, pale leaden blue, blackish at tip, greenish-yellowish at base; cere, yellow; orbital skin, yellow; irides, dark-brown; tarsi and feet, bright yellow; claws, dark-brown horny.

In conclusion, it may be of some interest to mention that, from the iliac regions of the bodies of these two Falcons, I removed an enormous mass of parasitic worms resembling thin crumpled wire, and yellowish-white in colour.

P. T. L. DODSWORTH, F.Z.S., M.B.O.U.

SIMLA, W., 21*st December* 1912.

## No. XVII.—EARLY NESTING OF THE INDIAN PIED KINGFISHER (*CERYLE VARIA*) IN BURMA.

It is interesting to record that I have to-day (7-12-12) taken the eggs of this kingfisher here. The nest was the usual tunnel about two feet long situated from twelve to fifteen feet high in a sandy river bank. My attention was drawn to it by the two birds scolding and by one of them settling on the flat sand of the river bed close by. I watched and saw one of the birds enter the hole. At the end of the tunnel was a large chamber, measuring some 18 inches in length by 12 inches broad and high. In the middle of this were three eggs lying on soft sand mixed with tiny fish bones, among which I found the minute pharyngeal teeth of some species of carp. I was much surprised to find these teeth as the stream is merely the shallow outflow of a large tank here and has a sandy bottom and is far from any hills or rocks. The eggs were in an advanced stage of incubation, except one which was addled or infertile. These eggs must have been laid some time in November, surely a very early (? or late) date for this species to nest!

F. E. W. VENNING, Capt.

Pyawbwe, *7th December* 1912.

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## No. XVIII.—PAIRED OVARIES IN THE GENUS ASTUR.

On 21st December 1912, I shot a specimen of the Shikra (*Astur badius*) which on dissection proved to be a female with a well-developed pair of ovaries. In a recent communication to the Zoological Society* Mr. T. E. Gunn, F. L. S., has shown that this is by no means an uncommon condition in the Falconidæ, especially in the genera *Circus* and *Accipiter*. In the present case the two organs are symmetrically placed, one on either side of the vertebral region, parallel to each other and containing approximately an equal number of ova of even size. The questions whether both ovaries are functional or not, and the oviduct in use I have left to the examination of those more competent than I to decide. The dorsal wall of the body with the ovaries has been preserved in spirits and is sent herewith for the Society's Museum.

F. E. W. VENNING, Capt.

Pyawbwe, Burma, *28th December* 1912.

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## No. XIX.—OCCURRENCE OF THE CRAB-PLOVER (*DROMAS ARDEOLA*) IN THE MALAY PENINSULA.

The very abnormal Limicoine bird, the Crab-Plover (*Dromas ardeola, Payk.*) has never apparently been recorded from the Malay Peninsula, or indeed from any locality east of the Andamans where it appears to be fairly common. It may therefore be interesting to note that Mr. E. Seimund of this museum, while shore shooting at Pulau Pintu Gedong, a mangrove island at the entrance to Klang Straits on the Coast of Selangor, midway between Penang and Singapore, observed a flock of six individuals on

*See P. Z. S., 1912, Part I, pp. 63-79.

[It may perhaps be as well to note that some ornithologists consider that the genera *Astur* and *Accipiter* are inseparable. The bird Captain Venning has kindly sent is an example of the dark Assam and Burmese form *Astur badius poliopsis* (Hume.)—Eds.]

September 24th, 1911, of which he secured three, two adults and a somewhat younger bird. The shores in the vicinity are mostly deep mud, overgrown with various species of mangrove, but there are here and there sandy patches, while at low tides large mudfalts of various degrees of firmness are exposed. In the same locality several specimens of *Parus cinereus* (Parus atriceps, Faun. Brit. Ind., Birds, Vol. I, p. 46) were obtained. This tit is also known from the extreme north of the Peninsula and from Java, but does not appear to have hitherto been obtained south of Penang.

H. C. ROBINSON, C.M.Z.S., M.B.O.U.,
Director of Museums, F. M. S.

KUALA LUMPUR, F. M. S., *October* 1912.

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## No. XX.—TURNSTONE (*CALIDRIS ARENARIA*) IN LOWER BURMA.

In August 1912, Mr. A. W. Ogilvie sent for identification a flat skin of a Turnstone, which had been shot at Himuclongyi, Papun, in the Salween District. As this bird has only, I believe, been recorded in Burma from the Coast Line, I think it is worthwhile putting this occurrence on record, though it is not to be surprised at since the Valley of the Salween is probably a migration route of considerable importance.

N. B. KINNEAR.

BOMBAY, *August* 1912.

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## No. XXI.—GREY QUAIL (*COTURNIX COMMUNIS*) AT SEA.

To-day in lat. 18·1 and long. 66·42, 356 miles W. of Bombay, a common grey quail, *Coturnix communis*, flew abroad. He was fairly tired and allowed himself to be caught without resistance. After a rest of half an hour on the smoking-room table during which, though surrounded with sightseers he remained quite unconcerned, he flew off southwards, going strong.

I do not know whether other instances are recorded of migrating quail being found as far from land as this. The weather has been free from any storms these last few days, which might have blown the bird out to sea.

LEONARD BETHELL, CAPT.,
10TH G. R.

S. S. SALSETTE,
13*th October* 1912.

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## No. XXII.—COMMON GREY QUAIL (*COTURNIX COMMUNIS*) BREEDING IN THE LYALLPUR DISTRICT.

At the end of last April and beginning of May some 60 eggs of the common grey Quail were sent to me from the Lyallpur District. These eggs were all found in wheat fields during the harvesting operations within an area of some 50 acres and were nearly all hard set. It is impossible for me to say how many clutches there were, but the man who sent them said he found about 8 nests, one nest containing 20 eggs!!! Now there is nothing unusual about finding Quails' eggs in the Lyallpur District, I used to find numbers of them when I was stationed there some years ago, but what does appear to me extraordinary is the total disappearance of the Quail after the young have been hatched. Personally I have never seen a Quail between the latter end of May and the autumn migration. What

therefore happens to the young birds? It is hardly possible that they follow the migration of those that passed through earlier in the year and did not remain to breed in India, they would not be strong enough to undertake any such prolonged journey. Yet where do they go? The Lyallpur colony is practically all wheat and when this is cut there is not a blade of cover anywhere for them till the kharif crops grow up some months later. Do any of them reach maturity or do the bulk of them fall victims to beasts and birds of prey or die from the want of protection from the sun? I have discussed the matter with several sportsmen but none of them can throw any light on the subject, but as once the shooting season is over the ordinary "shikari" seldom goes out into the fields, this is not to be wondered at. Perhaps you will be able to give me some information on the subject or invite discussion through the medium of the Journal.

It is not as if there were only a few Quail bred in the Punjab, there must be some hundreds of thousands hatched out every year, and there must be some method of account for the total disappearance of such large numbers before they are much more than a month old.

Of course in other districts of the Punjab, where cultivation has not been brought to such a high pitch as in Lyallpur, there is probably plenty of cover for the young birds after the crops are cut.

Native zamindars all tell me that they frequently see young Quail when cutting the crops, but they all agree that they disappear entirely once the crops are cut.

I might also add that I have had every opportunity of studying the question as during the 5 years I was in Lyallpur I was touring practically the whole of May and June and as I am a keen egg collector I was out practically every day hunting for eggs.

J. LINDSAY SMITH, CAPT., I. A.

DALHOUSIE, 15*th September* 1912.

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## No. XXIII.—THE GREAT INDIAN BUSTARD (*EUPODOTIS EDWARDSI*).

As to the Indian Bustard, I am sorry your article does not contain the description of the way in which Bhils catch the hens. I remember telling Mr. C. A. Crump about it. The hen bustard is very devoted to her egg or newly hatched chick. The Bhils set out and find an egg or newly hatched chick, and the mother is never far off. They make a circular ring of dry grass and sticks round the egg or chicks, and set it on fire. The old bird sees this, comes up and tries to beat out the fire with her wings, the Bhils being in hiding. She may or she may not beat out the fire, but any how she singes her wings and cannot fly. The Bhils then run her down. I have not seen this done (or I should have stopped it) but have often been told of it.

A. H. A. SIMCOX, I.C.S.

DHULIA, E. KHANDESH, *April* 1912.

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## No. XXIV.—LESSER FLORICAN (*SYPHEOTIS AURITA*) IN BHUTAN DUARS.

In Vol. XXI, No. 3, page 728, Mr. E. C. Stuart Baker in his article on the Game Birds of India, Burma and Ceylon, states that *Sypheotis aurita*, the Lesser Florican, has never been obtained in any district east of the Teesta river. It may be of some interest to note that it does occur, some distance to the east of this river.

The Hasimara Tea Estate is situated on the east bank of the Toorsa river, some 50 miles east of the Teesta. I have in the course of the last three years seen this bird on several occasions near the garden. The only specimen I secured—a young male—was obtained in June 1911 when out shooting with a friend who knocked it over as it rose out of some grass. I unfortunately did not preserve the skin, as I was then under the impression that the bird had already been recorded from these parts.

The only months I have seen them in are April, May and June. They are decidedly uncommon and appear to be somewhat irregular in their visits to these parts.

H. V. O'DONEL.

HASIMARA, T. E. BHUTAN DUARS,
10*th December* 1912.

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## No. XXV.—LESSER FLORICAN *(SYPHEOTIS AURITA)* IN THE KONKAN.

Through the kindness of Mr. C. D. Baker, the Society has received a Lesser Florican shot on 16th December 1912 between Mandwa and Alibag. The bird was a female.

The Lesser Florican is an uncommon cold weather visitor below ghats, and there are only some three or four records of its occurrence. Mr. Stuart Baker in his account of this species in the Journal, Vol. XXI, p. 728, mentions that "Mr. N. S. Symons reports two birds shot near Panwell in the S. Bombay Presidency." As will be seen from the original note in the Journal, Vol. XIX, p. 261, this is not quite correct as only one bird was shot at Panwell in January 1909, the other mentioned being obtained some twenty years earlier at Mahalaxmi. It might also be as well to point out that the gentleman who shot and recorded the birds was Mr. H. S. Symons and not his brother Mr. N. S. Symons.

Since writing the above I have heard from Mr. G. S. Hardy, I.C.S., that he put up a Florican on the 7th February, near Chiplun in the Ratnagiri district. Mr. J. W. Vidal during seven seasons in that district only saw and heard of three Florican.

N. B. KINNEAR.

BOMBAY, 10*th February* 1913.

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## No. XXVI.—OCCURRENCE OF THE BRONZE CAPPED TEAL *(EUNETTA FALCATA)* IN OUDH.

Records of the occurrence of the Bronze Capped Teal in Peninsular India are sufficiently uncommon to justify reporting further instances. Among the bag shot at Darziakna in the Gonda District on the 13th January I identified a fine male specimen, the first I have ever seen in India.

F. WALL, MAJOR, I.M.S., C.M.Z.S.

CAMP BAREILLY, 17*th January* 1913.

[We have received a specimen of this duck from Mr. H. W. Waite, who shot a young male on the Najatgarh jhil near Delhi on 26th January and another from Captain G. W. Burton, who obtained it and saw two others on Jogiwala jhil near Llaksar U. P., quite recently.—EDS.]

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## No. XXVII.—VORACITY OF A PYTHON *(PYTHON MOLURUS)*.

On the 10th November 1912, during the Dewali holidays, while shooting at Popatpura near Bavla, in the Ahmedabad District, I was walking after snipe, in company with Mr. J. H. E. Tupper, I.C.S., when one of the beaters called out that there was a big snake. We found that it was a large python,

lying torpid. We proceeded to shoot it, and as it was lying half coiled up, its body was naturally a good deal injured in the process. Seeing a feather sticking out of a wound, we told one of our men to extract the bird to which it belonged. He pulled a duck out of the wound, and took out five others one after the other, six duck in all. They were all quite, or recently fresh, their feathers being complete, and none far gone in digestion. They looked as if they had all been swallowed at about the same time. There were gadwall and spotbill among the duck, but we did not note the description of all the duck. All had been swallowed head foremost. The python, when stretched out and roughly measured was fully eight feet long. Is not this an unusually heavy meal for a python to make?

Shortly after, while wading in the water after a wounded duck, I saw a snake swimming near me. It made little attempt to avoid me, and I shot it through the head. It was a python about six feet in length.

P. R. CADELL, I.C.S.

BOMBAY,
11*th December* 1912.

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## No. XXVIII.—EFFECT OF A BITE FROM SCHNEIDER'S WATER SNAKE (*HYPSIRHINA ENHYDRIS*.)

The subject, a healthy man of about 36, while attempting to catch the snake, which had previously been irritated, was bitten on the back of the right hand between the thumb and forefinger. There were two distinct punctures and the parts got inflamed at once though scarcely two drops of blood were shed. Fifteen minutes later the hand began to throb and the throbbing lasted for about an hour, after which no ill effects were felt. The snake was a little over a foot in length, and the place of occurrence was Parbatipur, Bengal.

This snake was dealt with in the last journal, but as nothing seems to have been recorded of the effect of its bite, I thought this case might be of interest.

E. A. D'ABREU, F.Z.S.

CENTRAL MUSEUM, NAGPUR,
23*rd September* 1912.

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## No. XXIX.— RUPTURE OF THE EGG-SHELL IN THE GENUS *CALOTES*.

On page 1099, Vol. XXI, No. 3, of the Society's Journal referring to the method adopted by the young Calotes to rupture its egg-shell, Dr. Annandale expresses the opinion that the young lizard's claws are used for the purpose, a suggestion which is on the face of it so probable that it must be accepted in the absence of evidence to the contrary. My own note on the subject was certainly much too positive, and I am glad Dr. Annandale has drawn my attention to a careless piece of writing. It is obvious that no reliance can be placed on a hurried examination of a living specimen, and I ought to have stated expressly that no dissection was made and that I had no opportunity of extracting the "white point" which I took to be the fœtal tooth. I had intended to make a further examination of the spirit specimens, but on my transfer from Haka my specimens were lost.

The whole subject is one of absorbing interest closely connected with the evolution of the Reptilia. Perhaps one of our members can tell us what data are available or supply answers to the following questions: In what species or genera is a fœtal tooth known to exist? Major Wall has reported its existence in *Ophisaurus gracilis** and one would expect it to

* Vol. XVIII, p. 504, B. N. H. S. J.

occur in all the Reptilia, whose young are enveloped in a tough shell. Is the fœtal a relic of some tooth which in other Reptilia has ceased to be functional, and if so do any traces remain in any other representatives of the class, or is it possibly a vestige of two anterior præmaxillary teeth fused together and surviving for the present purpose? Major Wall has shown that in *Tropidonotus piscator* it is "bidentate"* which perhaps lends some slight support to the latter view.

On the other hand is it a lately evolved structure, and if so at what period in the evolution of the Reptilia and from what source has it been evolved?

There must be many among our members who, like myself, having been for years in the jungle away from any reference libraries would welcome a little enlightenment on the question and this must be my apology for referring to the subject again.

F. E. W. VENNING, Capt.

Pyawbwe, 27*th November* 1912.

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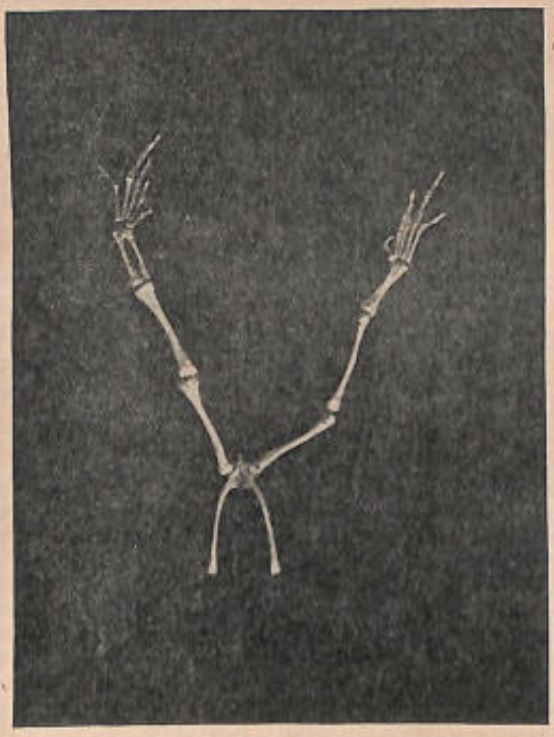

No. XXX.—CONGENITAL ABNORMALITY IN THE BONES O. THE BULL FROG *(RANA TIGRINA)*.

The bones reproduced in the above figure were obtained while preparing a skeleton of the frog last year for the students of the Agricultural

* Vol. XVIII, p. 504, B. N. H. S. J.

College. The Frog has in the hind limbs the ankle bones elongated to form an additional segment. These elongated bones are two and are called astragalus and calcaneüm. They are normally apart from each other so as to form a spindle-shaped aperture between them. In the specimen reproduced they were so in the right leg, but in the left the two were united together along their whole length, looking very much like the normal cannon bone of cows.

H. M. CHIBBER.

AGRICULTURAL COLLEGE, POONA, *October* 1912.

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## No. XXXI.—THE NEW WILD BIRDS AND ANIMALS ACT.

We give below the text of the New "Act to make better provision for the protection and preservation of certain Wild Birds and Animals" in case some of our Members may neither have seen it nor know of it. The Act received the assent of the Governor General on the 18th September 1912.—(EDS.)

*An Act to make better provision for the protection and preservation of certain wild birds and animals.*

WHEREAS it is expedient to make better provision for the protection and preservation of certain wild birds and animals, it is hereby enacted as follows:—

Short title and extent.

1. (*1*) This Act may be called the Wild Birds and Animals Protection Act, 1912; and

(*2*) It extends to the whole of British India, including British Baluchistan, the Sonthal Parganas and the Pargana of Spiti.

Application of Act.

2. (*1*) This Act applies, in the first instance, to the birds and animals specified in the Schedule, when in their wild state.

(*2*) The Local Government may, by notification in the local official *Gazette*, apply the provisions of this Act to any kind of wild bird or animal other than those specified in the Schedule, which, in its opinion, it is desirable to protect or preserve.

Close time.

3. The Local Government may, by a notification in the local official *Gazette*, declare the whole year or any part thereof to be a close time throughout the whole or any part of its territories for any kind of wild bird or animal to which this Act applies, or for female or immature wild birds or animals of such kind; and, subject to the provisions hereinafter contained, during such close time, and within the areas specified in such notification, it shall be unlawful—

(*a*) to capture any such bird or animal, or to kill any such bird or animal which has not been captured before the commencement of such close time;

(*b*) to sell or buy, or offer to sell or buy, or to possess, any such bird or animal which has not been captured or killed before the commencement of such close time, or the flesh thereof;

(*c*) if any plumage has been taken from any such bird captured or killed during such close time, to sell or buy, or to offer to sell or buy, or to possess, such plumage.

Penalties.

4. (*1*) Whoever does, or attempts to do, any act in contravention of section 3, shall be punishable with fine which may extend to fifty rupees.

(*2*) Whoever, having already been convicted of an offence under this section, is again convicted thereunder shall, on every subsequent conviction, be punishable with imprisonment for a term which may extend to one month, or with fine which may extend to one hundred rupees or with both.

Confiscation.

5. (*1*) When any person is convicted of an offence punishable under this Act, the convicting Magistrate may direct that any bird or animal in respect of which such offence has been committed, or the flesh or any other part of such bird or animal, shall be confiscated.

(*2*) Such confiscation may be in addition to the other punishment provided by section 4 for such offence.

Cognizance of offences.

6. No Court inferior to that of a Presidency Magistrate or a Magistrate of the second class shall try any offence against this Act.

Power to grant exemption.

7. Where the Local Government is of opinion that, in the interests of scientific research, such a course is desirable, it may grant to any person a license, subject to such restrictions and conditions as it may impose, entitling the holder thereof to do any act which is by section 3 declared to be unlawful.

Savings.

8. Nothing in this Act shall be deemed to apply to the capture or killing of a wild animal by any person in defence of himself or any other person, or to the capture or killing of any wild bird or animal in *bonâ fide* defence of property.

Repeal.
XX of 1887.

9. The Wild Birds Protection Act, 1887, is hereby repealed.

THE SCHEDULE.

(i) Bustards, ducks, floricans, jungle fowl, partridges, peafowl, pheasants, pigeons, quail, sand-grouse, painted snipe, spur-fowl, woodcock, herons, egrets, rollers, and king-fishers.

(ii) Antelopes, asses, bison, buffaloes, deer, gazelles, goats, hares, oxen, rhinoceroses and sheep.

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## No. XXXII—ON THE LEAF-FALL OF THE INDIAN WILLOW. (*SALIX TETRASPERMA*, Roxb.)

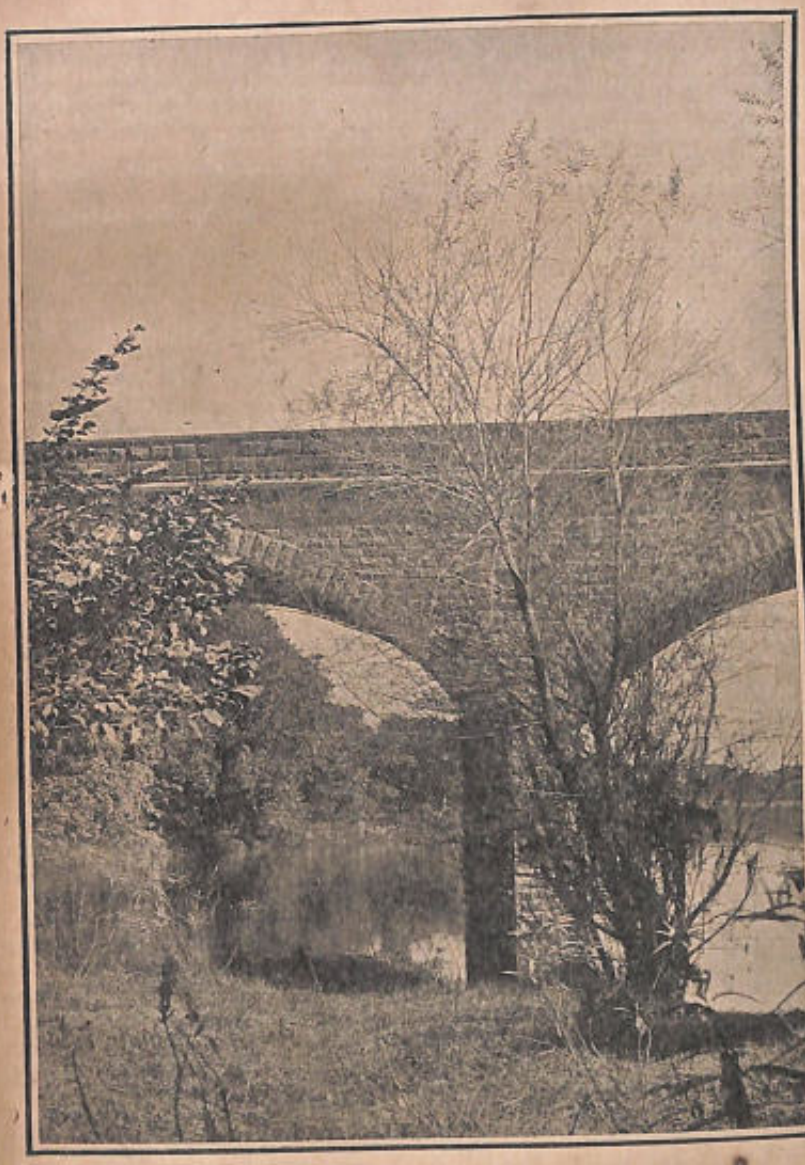
*Salix tetrasperma* is a much branched tree about 30 feet high with narrow acute leaves which are silky on the underside with silvery hairs. The tree occurs in this Presidency along the rivers. Several specimens of it can be seen at the Sangam river in Poona from the Wellesley Bridge.

During the rains, when every other tree on this side is clothed with green leaves, this tree presents its bare twiggy frame-work to passers-by.

Another point to be noticed in connection with leaf-fall is the way it takes place. In most trees the top or crown is first to lose the cover, the tree appearing stag-headed for such time as the leaf-fall takes to extend to the lower branches. With this tree it is just the reverse. The leaf-fall begins with the lower branches and gradually works upwards. The first appearance of new leaves in all cases begins with the crown.

With our present stock of knowledge on Field-biology, or Ecology as it is termed, it is difficult to give a definite explanation. However the following conditions under which the plant ordinarily occurs may have a bearing on the facts observed. The natural habitat is brinks of rivers. It is subject to innundations during the rains. The submersion of roots under several feet of water for several days together consequently takes place. This may have an inhibitive action on the activities of the roots. If the transpiration current is thus interfered with either leaf-fall should occur, unless the leaves have any mechanism to stop evaporation to any considerable extent, or the tree should wither up. The roots of this tree are of the aquatic type as they form a tangle of filiform growth. Similar masses of roots have been observed by me in *Ipomoea aquatica*, aquatic grasses, the water-chesnut and other similar plants.

The accompanying photogragh was taken on the 14th October 1912 by



Mr. K. R. Tilak, Artist to the Department of Agriculture, Poona. A part of the Wellesley Bridge, Poona, forms the background. The tree on the left hand with broad foliage is *Pongamia glabra (Karanj)* of which there is a whole clump. The small stray shrubs are those of *Asclepias curasavica*.

H. M. CHIBBER.

AGRICULTURAL COLLEGE,
POONA, *30th October* 1912.

## No. XXXIII.—ON VARIATIONS IN THE SIZE OF THE LEAVES OF *CALOTROPIS GIGANTIA*, R. Br.

Dr. Cooke in his *Bombay Flora* gives the leaves 4-8 by 1½-4 in., nearly sessile. The maximum limits set here were exceeded in the following two specimens found within the Presidency. One was collected by me at Jhund in Ahmedabad District in February 1909, which measured 11 by 8 inches. Another was recently collected at Dohad in Panch Mahals in July 1912, which measured 9½ by 7½ inches.

H. M. CHIBBER.

Agricultural College,
Poona, 29*th October* 1912.

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## No. XXXIV.—SOME FOSSILS IN THE SOCIETY'S COLLECTION.

It is just one year since we first started arranging our collection of Indian fossils, and in that time we have got together a good and very interesting number of specimens, mostly from the Jurassic formations of Cutch round about Bhuj, found and presented by Mr. J. H. Smith, who has been most untiring in his efforts to procure us a good selection of th most characteristic fossils from the Jurassic beds of Fakirwadi, Samatra, Keera Hill, Charwar Range, Hamandra and East and West Ler, and he has succeeded beyond doubt; for we can now show many very fine ammonites of the following species, *Oppelia*, *Phylloceras*, *Harpoceras*, *Perisphinctes*, *Stephanoceras*, *Macrocephalites*, *Peltoceras*, *Aspidoceras*, *Lytoceras*, *Amaltheus* and several *Nautilus*. Of *Belemnites* there are many kinds, though small, none however showing the phragmocones with the exception of one which is broken. We have hopes of more and better specimens of this family: Of other fossils from the same beds we have good *Terebratula*, *Rhynchonella*, *Cleriostreon*, *Trigonia*, *Alectryonia*, *Pholadomya*, one very fine *Ceromya inflata* which has been examined by the British Museum: several corals and parts of a Jurassic Crinoid. Mention also should be made of two specimens of *Aptychus*, the lid or operculum of the ammonite. Of other formations, we have a few *Productus* from the carboniferous limestone of India, but should be glad of a few other species (perfect, small specimens), if any member would send some; in fact, we also require specimens from all the older formations from Cretaceous downwards to Cambrian. From Perim Island, Gulf of Cambay, we have a few good fossil teeth and bones of extinct animals. From Raipur some fossil plant remains. Of the Tertiary formations we have fine specimens of Echinordea, Corals, Crustacea, Lamellibranchs, etc., etc. The whole collection, with the exception of a few large specimens, being now placed in a good dust-proof cabinet to be seen in our Museum.

A few words on fossils may not be out of place here; for it is extraordinary how few people know what a fossil is or anything about them, and when seen on the ground, or in the rock path, are only kicked out of the way, the culprit little knowing perhaps the great scientific interest that little bit of stone has. A fossil (from Latin *fossilia*, things dug up) is really the remains or traces of remains, of the once living animals and plants, which have become fossilised or petrified during the long ages they have been covered up in the rocks or earth. Each successive formation in the long history of the earth is characterized by fossils peculiar to itself: shells, fishes and other animals, are buried in the mud or silt of the lakes and estuaries, rivers carry down carcasses of land animals, the trunks of trees and other vegetable drift; and earthquakes submerge plains and islands, with all their vegetable and animal inhabitants. These remains

become enveloped in the layers of mud, sand or gravel formed by the waters, and in the process of time are petrified, that is, converted into a stony matter. By comparing fossil remains with existing races we are enabled to determine many of the past conditions of the world. Each period in the earth's history is marked by the existence of an animal and a vegetable creation peculiar to itself, and so characteristic of certain formations are certain fossils, that the Geologist can very often determine the exact age and place in the Geological sequence of a formation he may never have seen if a collection of that formation's fossils are placed before him.

Fossils enable us to investigate conditions of climate and of life of ancient times, even to the food the animal ate as in the case of specimens of the *Ichthyosaurus* found in the Lias clay, the intestines of which show half digested parts of other *Ichthyosaurus* it had eaten.

As to climate, if we find a deposit containing palms, bones of elephants or tigers we infer that that deposit was formed in tropical conditions, or again if a deposit has remains of the reindeer, musk-ox or lemming, it would be evidence of a cold climate.

But where shall we find fossils, this is the question so often asked. In the first place it is not much good looking in the vulcanic rocks such as the Deccan trap, basalt, &c. round Bombay, they are not there; we must hunt for stratified rocks, some of which are wholly made up of fossil shells, crinoids, &c., such as the carboniferous limestone, oolites, clays, etc. Where a stratified rock is found, look at the weathered surface of the rock, and owing to the fossil in most cases being harder than the rock it stands out; some clays have very perfect fossils and are easy to get out. Cutch is a very hot bed for fossils, Jurassic and Tertiary, and so are most parts that are not formed by volcanic action, they only want looking for.

As a pastime, fossil hunting is one of the best, it leads you into the wilds of the mountains and to the plains; the scenery, the fresh air, the change from whatever your business is, perhaps shut up in an office all day or overworked; it grows on you, and once taken up is never dropped again, for no matter whatever part of the world you go to, you will always have an interest in finding out what the rock before you contains. You may even one day find something, an animal, shell, fish or plant that has never been found before, there are still many such to be found, the rocks of the world are far from exhausted yet. In hunting for fossils keep the different fossils from each strata separate and label them at once with name (if you know it) and locality if possible. When using a chisel, never point the chisel towards the fossil but away from it. Don't try and trim off all the rock from the fossil if you think you may break it, one perfect fossil is better than a hundred broken ones, and besides we should like to see a bit of the rock too.

F. H. S. STONE.

BOMBAY, *9th February* 1913.

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## No. XXXV.—NOTES ON CUTCH AMMONITES.
### III—KEERA HILL.

Keera Hill stands on the North "Coast" of Cutch proper, overlooking the great flat Runn. Its exposures range from Katrol beds down to Macrocephalus, *i.e.*, from Kimmeridge to Lower Kelloway. The hill has, I believe, not been touched for 40 years: hence I was not surprised at picking up many good specimens of *Ammonites*—to say nothing of the great quantity of other molluscs, &c., which were to be had for nothing.

About 40 miles N.-W. of Bhuj there is the village of Charee: if you camp between that and the wattle huts of Phulre, an easy ride of 4 miles across a bay of the Runn brings you to the foot of a high conical hill, which is Keera, but not Keera of the *Ammonites*. This latter is the wide dome of hills lying to the south of the Cone, the Cone being merely trap. The dome is some two miles across. Mr. Wynne has described its petrological features; but I have found no description of its various Ammonite layers. Dr. Stoliczka must have written one from which Dr. Waagen was enabled to mention the beds in which his various specimens were found: but that description has not been published. So a few notes may be not out of place.

The Dome reproduces one great feature common to other hills (Habay and Javria) of the North Coast, and to the hills along the edge of the Cherwar Fault: its dip to the south is a good deal less steep than its dip on the north side. Originally it was probably like this:—

A

Denudation has worn away the softer and higher parts and left the various beds exposed thus:—

B

But between some of the south side strata, intensive trap sheets have forced their way and shoved the upper Ammonite strata further afield. Thus Dhose Oolite, the last on the left is separated from the last but one (*Anceps*) by Trap: and again beyond the Dhosa Oolite comes a great ridge of Trap which has pushed the Katrol beds still further out—at least one presumes it has: time failed me to reach the Katrol beds which Waagen says are found here. From the north point in the sketch, it is roughly 1,000 yards to the top of the Dome: and I should judge it to be more than 2,000 yards from the summit to the outer south ridge.

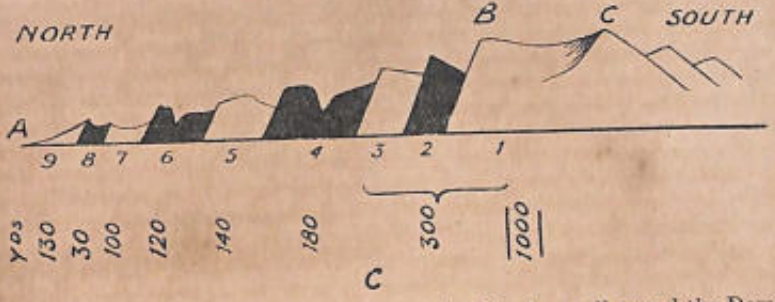
The ideal way of working these beds would be to take circle by circle, and collect the specimens of each. But the circles are wide in extent and numerous. Again one must allow for denudation having weathered many specimens from higher beds into lower ones. Thus on the top I found a neat little *Stephanoceras* with golden oolite particles stuck on it: now I could not see any golden oolite rocks *in situ* on the top: so this specimen most probably was left here when the upper layers of golden oolite got worn away. An expert in *facies* would probably have little difficulty in stating the bed to which each loose specimen owed its origin.

I have been warned by an eminent authority not to dream of having identified any specimen from books and illustrations: each specimen should, he says, be compared with its type. The warning is discouraging, but sound: and I hope that means may be found of getting these fossils

compared with their types in Calcutta. If I do wander into naming any finds, the name must be taken with this pinch of salt.

The following then is the result of my search:—

Starting from the brown rocks at the N.-E. foot of Keera Trap Hill and walking up to the highest point of the Dome visible from here, I find the following succession of ridges:—




The ridges are, of course, not persistent in this shape all round the Dome: one ridge will further to right or left vanish into flat ground or split into two or three ridges. On reaching B, you find that the highest point (C) is a bit to the S.-W., the whole top being a saddle of about 400 yards by 150. The distances given are only judged by eye.

No. 1 is of shale with thin flags of cold purple and yellow, the highest point, C, being of dark purple rock containing molluscs. I extricated one ball-shaped *Stephanoceras* from the rock, which may be taken as a native of the earliest bed here exposed. A gold speckled *Stephanoceras* was also found, probably a waif from later beds; a largish hair-ribbed *Phylloceras* in bad preservation was also found, and a great bulky specimen of 17" diameter, much weather-worn: its lobes being visible may help to its identity.

No. 2 is of hard light-yellow flags, very nasty for walking over. It is free from golden oolite: small molluscs are fairly frequent, but *Ammonites* appear to be few. A *Stephanoceras* and an apparent *Parisphinctes* were my only finds.

Nos. 3 and 4 are golden oolite, so called because of the glittering gold colour of its grains. This belt of golden oolite is rich in *Stephanoceras*. A flat *Oppelia* with median ridge also turned up; its lobes may identify it. There were a few *Harpoceras* and many *Belemnites*, *Trigonia* and other good molluscs. As to the *Belemnites*—plentiful enough in some beds—I found not one good specimen, they being either tight in rocks or else lying loose in small fragments.

No. 5. Loose flat slabs of yellow-brown stone—a compact mass of shells: good *Trigonia*, *Ostrea*, *Rhynconellæ*, &c., with some corals. Several *Stephanoceras*, I believe *Macrocephalus*, were found in this level and in the next one. This bed and in the next I suppose are the ones which constitute Mr. Wynne's 'Thick belt of shales,' and Waagen's "*Macrocephalus* Shales."

No. 6. Yellow-brown stone, rather softer than No. 5, and not nearly so full of molluscs. This bed proved to be the richest in *Ammonites*. On the S. E. side of the Dome it swells out into a broad belt with three separate ridges and interior slopes. What strikes one at once is the *great* number of fragments of an Ammonite extraordinarily like Waagen's Congener But Waagen attributes his Congener only to Putchum (Bath) beds. The broad-rimmed plates of this Ammonite can be picked up every five steps:

nor can I see in Waagen's work any other similar fossil. Several pretty little *Phylloceras* (*disputabile*, I believe) were found together with fragments of large specimens of the same. Not a few fragments of a *Lytoceras* are there, but unfortunately only very broken fragments, none with sutures visible, fell in my way. One fine big *Rehmanni* (?) had his top edge showing: a patient excavation brought it up to the surface, in 9 bits: but it makes a fine show now that it is patched together. Its 15 inches diameter have sutures to the end.

No. 7. The hard rock of this ridge is a mixture of brown, crimson and yellow, much like the facies of Dhosa oolite: but the beds lying outside No. 6 on the east and south sides are of soft dark crimson stuff. Some *Omphalodes* and fragments of others like those found in Fakirwadi *Anceps* beds join these lower beds on to the Charwar Series. On the south-east side, where the *Anceps* beds are worn down to a flat broad plain, you will find quite a good number of *Anceps*, several fairly complete and plenty of fragments. *Pseudorion* (?) I also found in the beds on the south. One specimen like an *Anceps* of some 3½" diam., has spines only on the inner whorls: none on the body chamber.

No. 8 seems to be of Dhosa oolite: its facies appears like that of the Charwar D. O.: and a few specimens of *Perisphinctes rota* (?) add to the probability, on its inner face [on the N. side of the hill.] Here is a thin belt of white stone, just as in places along Charwar: and a small fragment of an Athleta adds further evidence. But whereas the Charwar D. O. bears on its slab back numerous large circles of *Stephanoceras* and *Aspidoceras*, I saw none such in this broken belt of D. O.

No. 9 is a slight slope of softish crimson brown and yellow stuff, containing many molluscs. Seeing how closely the hard brown lower Katrol beds lie on the D. O. of Charwar, one would have expected this outer bit to be Katrol, but I saw no Katrol friends there: in fact the beds held an *Anceps*—probably a washdown. One very deeply umbilicated and globular *Stephanoceras*, which I cannot find in Waagen, also lay here, but this too was probably a washdown.

No. 10 would be Katrol beds, but they do not appear on this north side: and on the south side, they must *lie a good long way* out. The Keera Hill stands out on a peninsula stretching out into the Runn. A big 'bay' runs along its eastern base, and another one on its western. On its south-west side the succession of ridge behind ridge stretches out to the main line of hills of the coast: and here I expect will be found the whole succession of these upper *Jurassic beds.

As you ride eastwards from the hill to your Camp, you will note the occasional outcrop from the flat "bay" of ridges of rock, all dipping away from the dome and evidently once a part of it—one ridge is over a mile away from it. The sea which once covered the Runn has here eaten away all the softer strata and left only these hard ridges standing.

Another interesting point (geologically) is the question whether there has been another great fault all along the base of these north hills of Cutch. Mr. Wynne suggests it (Mem. J. S. I. ix, Art. i., p. 208). The Hubbye Jooria, Keera, Nurrha and Soorha hills are all folded into anticlines—much like the folds of the front hills of Charwar. Mr. Davies' letter on this subject in our last number helps to show that this is probable. Two areas of Tertiary beds let in on the north—one you cross on your ride to Charee—suggest some such event. If so, the Runn rests on the upturned

*One badly needs a better name. All the Cutch Jurassics are properly "Upper Jurassics" except the Putchum beds which are "Middle:" yet the Cutch series is obviously divisible into two great groups.

edges of all the succession of beds from Tertiary through Trap, Cutch, Upper and Lower Jurassics, down to the Bathonian, which emerge and form the high hills of Putchum Island, 25 miles north. If there is not a fault, the long line of the north anticlines are followed by a broad and gradual syncline, curving up to the north.

I have remarked above that the Keera exposures range from Kimmeridge to Lower Collovian, There is some doubt about the Kimmeridge belt being findable here. Dr. Waagen has in one place remarked that the Dhosa oolite is the highest bed of the Charee group: yet in locating the great *Lytoceras rex* found by Mr. Wynne on the south side of Keera, he assigns it to a Katrol bed (p. 216), in a third place remarking that its bed appears to be below Tithonian and above Oxfordian. No other fossils having been sent to him from this bed, it was not so easy to specify the horizon of the same. My reason for saying that Kimmeridge beds exist here is a deduction from the above, for the Sequanian beds of Kantkot (East Cutch) are not known to exist in this western half (p. 230). I didn't myself strike any Katrol (or Kimmeridge) beds, though it is not improbable that they do appear to the south of Keera. To make things clearer, it may not be out of place to give a list of the Cutch beds as far as at present subdivided (refer to Vredenburg's Summary of the Geology of India, 1910, p. 87, and to Waagen in Pal. Ind.)

| | | Ft. | |
|---|---|---|---|
| Umia .. .. .. | | 3,000 | Aptian. Barremian. Neocomian. Portlandian. |
| Katrol. | (Katrol Proper) .. | 1,000 | Kimmeridge. |
| | (Kantkot) .. | | Sequanian. |
| Charee. | (Dhosa oolite) .. .. | 50 | Oxfordian. |
| | (Athleta) .. .. | 25 | Callovian. |
| | (Anceps) | 1,000 | |
| | (Macrocephalus) | | |
| Patchum.. .. .. .. | | 1,000 | Bathonian. |

If an expert were to spend a few months here, he would probably be able to subdivide the thicker belts of the above into several sub-zones, which might be found to correspond with the latest-marked zones of European Jurassics, *e.g.*, there is the zone in which Waagen's *Harp. ignobile* and *crassefalcatum* were found a zone of yellowish marl. Waagen places this bed as *Anceps* or a little lower and yet not *Macrocephalus*. I believe a zone between *Anceps* and *Macrocephalus* has been recognized in Europe (*Koenigi*, I think). Investigation might show this Keera bed (No. 6) to correspond to this European bed. I found a *Harpoceras* very like to *ignobile* here. By the way the *Lytoceras* which I found in this same bed prove to have the sutures of *adeloides*.

J. H. SMITH.

BHUJ, CUTCH,
*3rd January* 1912.

# PROCEEDINGS.

## OF THE MEETING HELD ON 5TH DECEMBER 1912.

An "At Home" of the Members of the Bombay Natural History Society took place on Thursday, the 5th December 1912, Mr. Reginald Gilbert presiding.

### NEW MEMBERS.

The election of the following 52 members since the last meeting was announced:—

Mr. Hamid A. Ali, Sind; Mr. G. N. Bignell, Baluchistan; Capt. C. T. Daukes, Kashmir; Mr. B. R. Hutchinson, Shwegyin; the Honorary Secretary, Abu High School, Rajputana; Mr. W. G. Ponsonby, Purnea; Mr. E. A. Goll, Bombay; Mr. B. D. Barnes, Bombay; the Mess Secretary, 5th Ammunition Column R. F. A., Deesa; Lt.-Col. R. H. Elliot, I.M.S., Madras; Lt.-Col. Thos. Jackson, I.M.S., Ahmedabad; Major H. A. Forbes Knapton, I.M.S., Poona; Major G. E. Stewart, I.M.S., Mahableshwar; Major J. L. Marjoribanks, I.M.S., Nasik; Major C.S. Lowson, I.M.S., Poona; Mr. Ratan Tata, Bombay; Mr. E. Herbert Kealy, Rajputana; Mr A. B. Knowles, I.C.S., Amraoti; Major A.B. Dew, Baluchistan; Dr. D.B. Stewart, Rangoon; Mr. G. B. Winter, Bombay; Mr. A. D. Sanders, Ramandrug; the Director of Fisheries, Punjab; the Mess Secretary, 90th Punjabis, Nasirabad; Prof. D. Rosenstock, Germany; Mr. J. M. Mackenzie, Bihar; Mr. T. A. Whitehead, Madras; Mr. Frank L. Friedlander, Insein; Mr. H. G. Nash, Bulsar; Mr. C. Gimson, I.C.S., Assam; Major W. R. Walker, Cawnpore; Capt. C. A. Rocke, Montgomery; Mr. W. J. Greener, Burdwan; Mr. H. Dow, I.C.S., Sind; Capt. E. G. Longford, Jubbulpore; Major C. E. Davidson-Houston, Quetta; Mr. R. Lean, Madras; Mr. R. C. C. Yates, Madras; Major F. A. Greer, Quetta; Capt. W. H. Boalth, I.M.S. Baroda; Mr. A. Williamson, I.C.S., Shwegyin; Mr. F. P. Tomson, Shwegyin; Mr. A. J. Page, I.C.S., Nyaunglebin; Mr. J. G. Cattel, Karachi; the Principal, Thomason College, Roorkee; Mr. H. L. Cooper, Rangmati; Mr. Donald W. Chambers, Calcutta; R. H. Nisht, Siam; Mr. P. Wyndham, I.C.S., Mirzapur; Mr. G. W. Gilchrist, Bombay; Mr. G. F. Chalk, Bombay, and Mr. Julian Gut, Thana.

The Honorary Secretary, Mr. W. S. Millard, acknowledged the following contributions to the Museum since the last meeting:—

| Contribution. | Locality. | Donor. |
|---|---|---|
| 12 Panther (*Felis pardus*) Skulls .. | Berar, C. P. .. | Col. R. G. Burton. |
| Horns and Mask of Cheetal (*Axis axis*) in velvet. | Central Provinces .. | Mr. E. H. Blake, I.C.S. |
| 17 Bats, (*Otomops wroughtoni*) 1 Mungoose (*Mungos mungo*), 1 Palm Civet (*Paradoxurus niger.*) | Castle Rock .. | Mr. S. H. Prater. |
| Head and Mask of a female Oorial. (*Ovis vignei.*) | Garhwal .. .. | Capt. Bagnall. |
| Skin of Indian Marten (*Martes flavigula.*) | Abor Country .. | Major Sweet. |
| Skin of Marbled Cat (*Felis nebulosa*), Malayan Palm Civet (*Paradoxurus hermaphroditus*), and Slow Loris. | Taunggyi .. .. | Mr. S. St. Lightfoot. |

| Contribution. | Locality. | Donor. |
|---|---|---|
| 2 Tibetan Marmots (*Arctomys himalayanus* (Mounted.) | Chamba .. .. | The late Major G. S. Rodon. |
| 3 Kokla Green Pigeons (*Sphenocercus sphenurus*) (Mounted). | Do. .. .. | Do. |
| 47 Bird Skins.. .. .. .. | Chin Hills .. .. | Capt. W. R. Carey. |
| 37 Bird Skins.. .. .. .. | Taunggyi .. .. | Mr. S. St. Lightfoot. |
| 2 Florican (*Sypheotis aurita*) Eggs... | Satara .. .. | Assistant Surgeon W. E. Kirkpatrick, I.S.M.D. |
| 2 Rock Sparrows (*Carpospiza brachydactla.*) | Charbar .. .. | Mr. W. D. Cumming. |
| Indian Koel (*Eudynamis honorata.*) | Bombay .. .. | ,, A. D. Bingham. |
| 2 Great Indian Hornbill (*Dichoceros bicornis*) Eggs. | Kanara .. .. | ,, T. R. Bell. |
| Purple Heron (*Ardea manillensis*) Coot, (*Fulica atra*) Pheasant-tailed Jacana (*Hydrophasianus chirurgus.*) | Panvel .. .. | ,, R. Dos Remedios. |
| Several Birds' Nests and Skin of Blossom headed Paroquet (*Palaeornis cyanocephalus.*) | Dera Ismail Khan.. | ,, C. R. S. Pitman. |
| Macclelland's Coral Snake (*Callophis macclellandi.*) | Burma .. .. | Capt. S. Pershouse. |
| John's Earth Snake (*Eryx johni*). | Kirkee .. .. | Major W. B. Walker, R. A. |
| Indian Monitor (*Varanus bengalensis.*) | Matheran .. .. | Mr. S. A. Alli. |
| A number of Snakes, Frogs and Fishes. | Castle Rock .. | ,, S. H. Prater. |
| Cobra (*Nia trupudians*) .. .. | Chamba .. .. | Rajah of Chamba. |
| Rufus Cylinder Snake (*Cylindrophis rufous*), 13 Snakes. | Lower Chindwin, Taunggyi. | Mr. S. St. Lightfoot. |
| A number of Beetles.. .. .. | Bangalore .. .. | Capt. C. D. Gregson. |
| Do. .. .. .. | Kashmir .. .. | ,, H. F. Burke. |
| 22 Slides of radulæ of Bombay land and marine shells. | Bombay .. .. | Major A. J. Peile, R.A. |

## MINOR CONTRIBUTIONS.

Dr. Suter; Mr. H. B. Hand; Mrs. McBain; Mr. S. H. Prater; Mr. C. D. Baker; Mr. O. V. Donnell; Mr. T. H. Jhanim; Mr. E. C. Reid; Mr. W. S. Millard; Mr. R. Lowndes.

## PROGRESS OF THE MAMMAL SURVEY.

Mr. Crump is still collecting in Kathiawar, having camped at Junagadh on the outskirts of the Gir Forest, and is now at Rajkot. The Society is greatly indebted to Mr. L. Robertson, I.C.S., for his help in arranging the various camps, etc.

Mr. Shortridge went from East Mysore to Seringapatam and then to the Cauvery district in South Mysore. He is now commencing to collect in Coorg.

Money is still urgently required for the third collector for Burma. In addition to the Rs. 7,500 promised by the Government of India, Mr. Ratan Tata has given a further sum of Rs. 1,000 and H. H. the Rao Saheb of Cutch a second donation of Rs. 1,000 towards this object; but that still leaves some Rs. 10,500 to be obtained, as it is estimated that to bring out a third collector and employ him in Burma for 2 years will cost Rs. 20,000.

## EXHIBITS.

The Secretary exhibited the fruit of *Monstera deliciosa* (delicious fruited) grown in Bombay, a native of Mexico.

"Radulæ of Molluscs." Through the kindness of Major A. J. Peile, R. A., who was formerly stationed in Bombay, the Society has received a number of miscroscopic slides of the "teeth" or radulæ of some of the commoner marine, land and fresh water shells found in this neigbourhood.

These were exhibited at the meeting, miscroscopes being kindly lent by the Rev. J. Assmuth, S.J.

In a future number of the journal a paper by Major Peile will be published on "Snails' Teeth" illustrated by enlarged drawings made from the specimens presented to the Society.

Lt.-Col. K. R. Kirtikar, I.M.S. (Retd.), exhibited some beautiful specimens of algæ from the Coast of Australia, which were greatly admired, and which he explained to the members present.

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## MEETING HELD ON 30TH JANUARY 1913.

A meeting of the members of the Bombay Natural History Society took place on Thursday, the 30th January 1913, Mr. H. M. Phipson presiding.

The election of the following 27 members since the last meeting was announced:—Count Thurn, Bombay; Capt. J. C. G. Kunhardt, I.M.S. Bombay; Mr. H. R. Harris, Bombay; Mr. E. F. A. Hay, Pyinmana; H. E. the Right Hon'ble Lord Pentland, G.C.I.E., Madras; Mr. Nœl G. B. Kirwan, Chikmagalore; Mr. W. Lawton, Rangoon; Lt.-Col. J. Maxwell, R.F.A., Jubbulpore, C. P.; Mr. J. Wilson Johnston, I.C.S., Dera Ghazi Khan; Mr. J. Caldwell, Calcutta; Mr. W. E. Wait, Colombo; Mr. A. F. Slater, Aligarh, U. P.; Mr. C. F. C Beeson, Rawalpindi; Lieut. G. E. D. Learoyd, Rawalpindi; Lient. T. W. D. Evans, Rawalpindi; Mr. P. R. Wilson, Bombay; Mr. Thomas Parkin, M. A., F. L. S., F. Z. S., M. B. O. U., J. P, England; Mr. C. H. Atkins, I.C.S., Patiala; Mr. G. T. Boag, Palamcottah; Major H.J. Shipman, A.O.D., Bombay; Capt. B.G. Channer, Kohat; Mr. W. E. J. Dobbs, I. C. S., Bulandshahr; Mr. R. N. Gilbert, Dongri P. O., *via* Tumsar, B. N. Ry. Mr. E. M. VanIngen, Mysore; Mr. S. H. Cole, Bangkok; Mr. K. G. Gairdner, Bangkok; and Mr. T. M. Bostock, Mardan, N. W. F. P.

The Honorary Secretary, Mr. W. S. Millard, acknowledged the following specimens to the Society since the last meeting:—

| Contribution. | Locality. | Donor. |
|---|---|---|
| Cross between jungle cat (*Felis affinis*) and domestic cat. | Belgaum .. | Mr. T. J. Spooner. |
| 10 Mammal skins and 4 bird skins.. | Bhutan Duars .. | Mr. H. V. O'Donel. |
| Smaller Kashmir Flying Squirrel (*Sciuropterus fimbriatus*). | Malakhand .. | Major R. L. Kennion. |
| 5 Skulls of Wild Pigs (*Sus cristatus*). | Ahmedabad .. | Mr. F. B. P. Lory. |
| 4 Squirrel Skins and a number of Snakes, Lizards, Frogs and Ticks. | Abor Expedition,&c. | Indian Museum, Calcutta. |
| 27 Skulls of Tigers (*Felis tigris*) .. | Hyderabad, Deccan. | Col. R. G. Burton. |
| Desert Fox (*Vulpes leucopus*), Jungle Cat (*Felis affinis*) and several Lizards. | Thar and Parkar .. | Mr. P. O'Brien. |

| Contribution. | Locality. | Donor. |
|---|---|---|
| 3 Squirrels and one Tree Shrew (*Tupaia belangeri*). | Abor Expedition .. | Dr. J. M. Falkiner. |
| Palm Civet (*Paradoxurus niger*) .. | Bharatpur .. | Major J. W. Watson, I.M.S. |
| 2 Red-crested Pochards (*Netta rufina*). | Mandalay .. | Mr. E. N. Bell. |
| Shikra (*Astur badius poliopsis*), Hooded Racket-tailed Magpie (*Crypsirhina cucullata*), and three fishes. | Pyawbwe, Burma .. | Capt. F. E. W. Venning. |
| Green-billed Malakoa (*Rhopodytes tristis*). | Maymyo .. | Capt. S. Perehouse. |
| Coot (*Fulica atra*) .. .. .. | Chitral .. | Capt. R. Hill. |
| 10 Bird Skins.. .. .. .. | Taunggyi .. | Mr. S. St. Lightfoot. |
| Indian Tawny Eagle (*Aquila vindhiana*). | Motipur, C. P. .. | Mr. F. A. Simpson. |
| Common Snipe (*Gallinago cœlestis*), variety. | Thayetmyo .. | Mr. G. Clarke. |
| akes .. .. .. .. | Kollengode, S. I. .. | Mr. A. M. Kinloch. |
| nake (*Zamenis fasciolatus*) .. | Jalgaon .. | Mr. A. H. A. Simcox, I.C.S. |
| 14 Snakes, etc. .. .. .. | Jhelum .. | Capt. F. L. Hughes. |
| 15 Snakes and some land crabs .. | Coimbatore .. | Mr. C. E. C. Fischer. |
| 1 Common Krait (*Bungarus cœruleus*). | Malabar Hill .. | Rev. R. M. Gray. |
| 1 Iridescent Earth Snake (*Xenopeltis unicolor*). | Thayetmyo .. | Mr. A. Bayley de Castro. |
| Several butterflies and other insects. | Lahore .. | Capt. C. W. Watney. |
| A small collection of Termites .. | Various .. | Revd. J. Assmuth, S.J. |

Minor contributions from Messrs. C. H. Donald, L. H. Savile, Mr. F. H. S. Stone and H. Bulkley.

## PROGRESS OF THE MAMMAL SURVEY.

The Secretary said that members would be interested to hear that Mr. Shortridge, who has been collecting steadily in Coorg for the last two months, has obtained an excellent lot of specimens—thanks to the assistance given to him by Mr. F. Hannyngton, I.C.S., and Mr. J. Graham of Mercara, Coorg. After completing Coorg, Mr. Shortridge goes to Burma where doubtless members of the Society will assist him in the same way as they have done in other parts of India.

Mr. Crump is now at Dhrangadhra, where H. H. the Maharaja has rendered much help. Before this he collected at Rajkot, where Mr. J. Sladen, I.C.S., Major W. M. P. Wood and Major C. F. Harold all kindly assisted him.

The third collector, Major Mayor, will, it is expected, arrive from ngland next month and will at once proceed to Ceylon which it is con- ered necessary to work before Southern India is completed. More ey is still required to finance the survey, and it is hoped that members help by sending in further donations. So far only about Rs. 12,000 been received or promised towards the Rs. 20,000 required for the d collector, and more funds are, therefore, urgently needed.

## EXHIBITS.

Mr. N. B. Kinnear, the keeper of the Museum, exhibited a large number of skins of specimens returned from identification by the British Museum. Among some of the more interesting were the hares, of which three different

species were exhibited, *viz.*, the black naped hare of Southern India, the Sind hare of the dry regions west of Gujarat, and the Khandesh hare from Khandesh and parts of the C. P. Of the large red squirrels, two races were shown, the Bombay giant squirrel, a beautiful deep maroon coloured animal with a yellowish tip to its tail and the Central Provinces race, which is much darker in colour with blackish legs, feet and tail. When Mr. Crump was in Cutch he discovered a new rat of a greyish brown colour. On being examined at home, this rat was found to belong not only to a new species but also to a new genus. Since then Mr. Shortridge collecting near Bellary and in Mysore obtained specimens of the same rat and examples were on view from the different localities.

Two large trays containing a selection of the smaller rats and mice were shown. These, though common, are not often noticed and though differences are very marked are generally classed as "mice" by most people. Among them was the pretty little Deccan tree mouse which is of a reddish brown colour above and white beneath. The mole rats, which are responsible for the mounds of earth like mole hills seen everywhere in both cultivated ground and jungle, were represented by the southern mole rat which has been sent in from all the localities so far collected in except Cutch. Skins of the big Malabar bandicoot from Dharwar and the C. P., which is generally found about villages and not so much in the jungles as the previous rat. Mai specimens of the common Indian gerbil, one of the commonest rats in Indi and frequently appearing as small plagues, were on view from all the localities except Cutch, where the Indian desert gerbil takes its place.

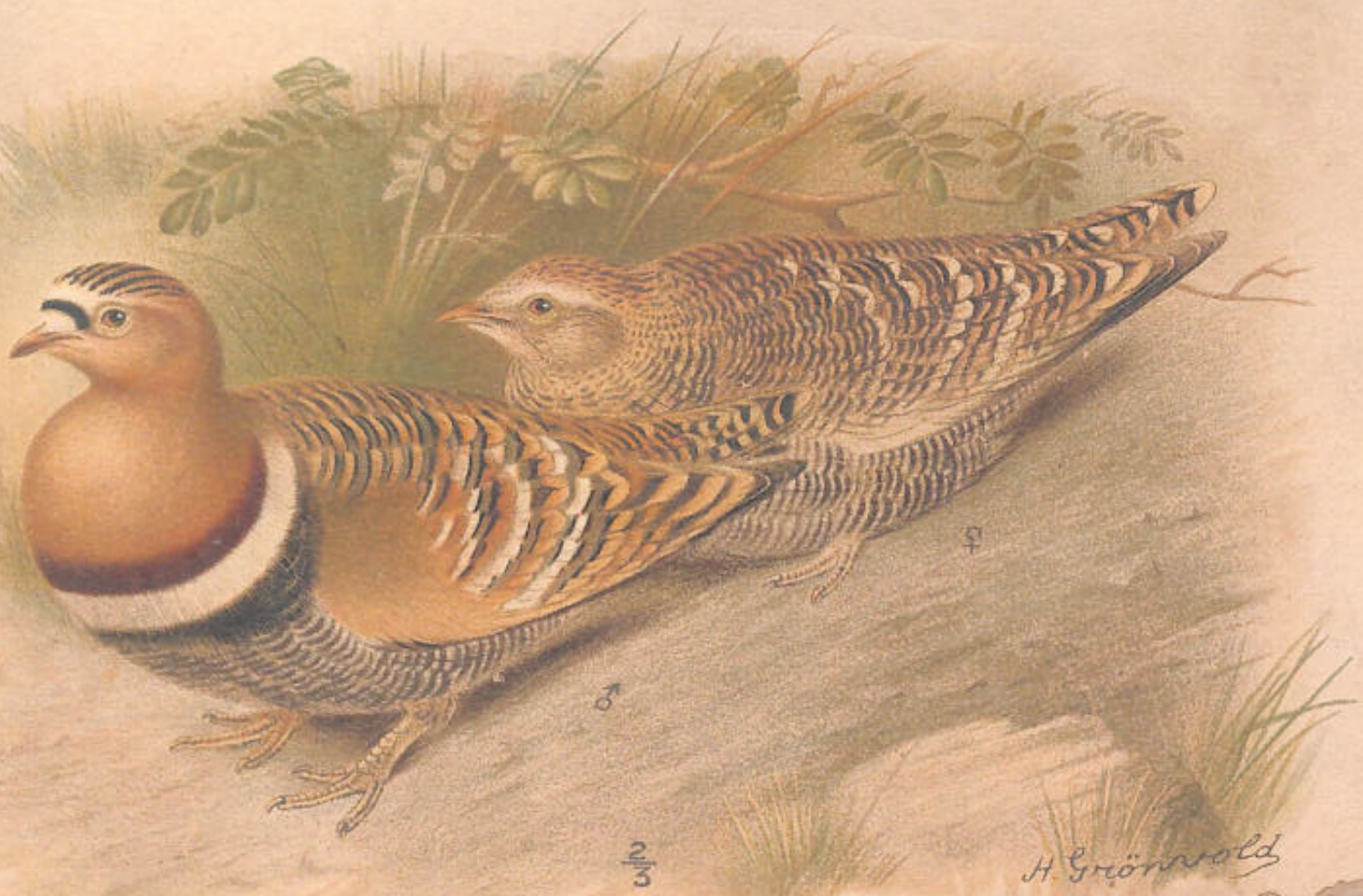
Among the carnivora, skins of the common Indian fox from Dharwar and the C. P., the desert fox from Cutch, the common mongoose and the ruddy mongoose from the C. P. were all on view. The last named mongoose is not so common as the former, which is darker with reddish brown feet and tail and larger in size. Cats were represented by a desert cat from Cutch, jungle cats from both the dry open and jungle districts and the beautiful little rusty spotted cat from Dharwar.

A large number of bats of many different kinds and sizes from the tiny southern dwarf pipistrelle to the flying fox were shown. These included several of the small fruit bats, vampires, leaf-nosed and pipistrelles. The beautiful painted bat, which was reproduced in colour in the last number of the Society's *Journal*, called for some attention, though unfortunately the brilliant colouring fades soon after death. This bat is not uncommon, and has been recorded from many parts of India. During the day it frequently rests under a plantain leaf. A series of skins showing the various colour phases of the Rufous horse-shoe bat and Sykes' leaf-nosed bat, which vary from bright golden bay to dusky brown, were of considerable interest, since at one time some were described as different species. The cave and temple aunting sheath-tailed bats were represented by several species, including the Cutch sheath-tailed bat which before the survey was started was supposed to be confined to Cutch, but since then has been obtained from the C. P., Hyderabad, Dharwar, and Mysore.

The Secretary showed a specimen of the pagoda tree (*Plumeria acuminata*) with 2 seed pods. This tree for some reason seldom produces seed pods and the malee caste allege that the seed pods are eaten from the tree by cobras. It is also said that the seeds are also sometimes boiled in milk and used as an antidote for snakebite.

## PAPER READ.

The Rev. J. Assmuth, S.J., read a paper on "The Wood-destroying Termites" and showed specimens of wood which had been attacked and destroyed by white ants or termites.




THE PAINTED SANDGRO[illegible] (Pt[illegible] fasciatus).

JOURNAL
OF THE
Bombay Natural History Society.

SEPT. 1913. VOL. XXII. No. 2.

# THE GAME BIRDS OF INDIA, BURMA AND CEYLON

BY
E. C. STUART BAKER, F.L.S., F.Z.S., M.B.O.U.

PART X.

*With Plate X.*

*(Continued from page 12 of Volume XXII.)*

## PTEROCLES FASCIATUS.

*The painted Sand-Grouse.*

*Indian Grouse.*—Latham, Gen. Syn. ii, p. 752 (1783).

*Tringa fasciata.*—Scop., Del. Flor et Faun., pt. ii, p. 92 (1786).

*Pterocles fasciatus.*—Gray, List B., iii, p. 49; Blyth, Cat. B. As. Soc. Mus., p. 249; Jerdon, B. of Ind., iii, p. 498; King, Jour. A. S. B., xxxvii, pt. ii, p. 216; Blanford, *ibid*, xxxviii, pt. ii, p. 188; Hume, *ibid*, xxxix, pt. ii, p. 139; McMaster, *ibid*., xl., pt. ii., p. 214; Stoliczka, *ibid*, xli, pt. ii, p. 249; Hume, Nest and Eggs, p. 511; Adam, Str. Feath., 1, p. 391; Ball, *ibid*, ii, p. 426; *id*, *ibid*, iii, p. 293; Butler, *ibid*, iv, p. 4; Fairbank, *ibid*, p. 262; Butler, *ibid*, v, p. 231; Davison and Wend., *ibid*, vii, p. 86; Hume, *ibid*, p. 162; Ball, *ibid*, p. 225; Hume and Marsh., Game Birds, 1, p. 59; Hume, Cat. No. 800; Butler, Cat. B. Sind, etc., p. 52; McInroy, Str. Feath., viii, p. 492; Tufnell, *ibid*, ix, p. 201; Heaviside, *ibid*, p. 202; Butler, *ibid*, p. 421; *id*., Cat. B. S. Bombay, p. 67; Davidson, Str. Feath., x, p. 316; Barnes, B. of Bombay, p. 295; *id*, Jour. B. N. H. Soc., v, p. 334; Laurie, *ibid*, vi, p. 94; Oates in Hume's Nests and Eggs, 2nd. Edit., iii, p. 364; Nurse, Jour. B. N. H. Soc., xiv, p. 172; Major F. J. N. Barton, *ibid*, p. 606; Ogilvie Grant, Cat. B. M., xxii, p. 27.; Oates, Game B. Ind., i, p. 45; LeMess, Land and Water B. of Ind., p. 56; Barnby Smith, Avicultural Mag. 1910, p 313.

*Pterocles fasciatus.*—Sharpe, Hand-l. i, p. 51; Oates, Cat. Eggs B. M. i, p. 79.

*Pterocles quadricinctus.*—Jerdon, Madr. Jour. L. S., xii, p. 4; *id*, iii. M. Orni, plo. 10 and 36.

*Vernacular names.*—Pahari Bhat-Titur, Bhat-ban, Dongar Rowrie (*Hin. N. W. P.*); Palki (*Belgaum*); Handeri (*Southern India*); Kal-Goujal Haki (*Can. Mysore*); Sonda Polanka (*Tamil*).

*Description—Adult male.*—Forehead white followed by a black band, then by another white one, each band being about 2" wide; remainder of crown reddish buff spotted with black or deep chocolate brown; hind neck olive-yellow or olive-buff; upper and lower back, upper tail coverts and rectrices a rather chestnut buff, barred with black, the black bars increasing in width and becoming V-shaped on the last, which with a few of their outer tail coverts are tipped yellow buff. Scapulars like the back but more boldly marked, many of the bars being somewhat grey and most of the feathers being broadly tipped with yellow-buff. Wing coverts buff, the innermost being tinted like the nape and gradually changing to an ochreous buff on the outer; a small patch next the scapulars marked in the same way as those feathers. Winglet, primary coverts and primaries dark brown, the last margined paler; inner secondaries like the scapulars, their coverts barred white and slate-colour with deep buff edges and with the margins of the slate bars black. Under aspect of wing a grey brown, inclining to buff near the shoulders. Chin, throat, side of head, fore neck and upper breast ochreous-buff, bordered by a broad, bright chocolate band, this is succeeded by a band of whitish buff and both these bands run right up under the shoulder of the wing to the back; rest of abdomen, flanks, thighs and vent banded deep brown, or chocolate-black and white; below the white breast band the bars are obsolete giving here the appearance in some birds of a definite deep brown or black band; under tail coverts banded buff and black.

"The colours of the soft parts vary somewhat. I have recorded the *feet* as dirty yellow, pale reddish olive, pale dingy brown, pale orange brown; the *irides* as brown, the skin round the eyes as yellowish green, and again bluish yellow; the bill as brown, reddish brown, reddish horny, dingy orange red, and dark orange red." (Hume.)

"Bill red; orbital skin lemon yellow; irides dark brown; feet dull yellow; claws reddish." (Jerdon.)

Wing 6·25" to 7·25" averaging 6·7"; bill at front ·49" to ·58," averaging ·52"; tarsus ·88" to 1·01" averaging ·95". As regards wing measurements it should be noted that only four birds out of over 100 measured had a wing exceeding 7" and only some half a dozen wing of under 6·5".

"The sexes differ but little in size. From a very large series of measurements taken in the flesh I find that—

"*Males.*—Measure: Length 10·5 to 11·25; expanse 19·75 to 22·5; wing 6·4 to 7·0; tail from vent 3·25 to 3·75; tarsus 0·88 to

1·0; bill from gape 0·58 to ·07. Weight 6 to 7·5 ozs." (Hume.)

Jerdon gives the weight of the male as from 7 ozs. to 8 ozs.

Variation in the colour of individual adult males consists principally in the depth and tone of the tinting of the upper surface. This in some birds is deeper and more reddish and in other birds paler and more buff. There is also considerable difference in the grey markings on the scapulars, etc., in some there being quite a french, or slate grey, in the centre of the bars, whereas in others the centre of the bar is almost concolourous with the margins.

*Adult female.*—Whole crown as in the male but the forehead without the black and white bars; nape more yellow buff and with the spots smaller than those on the head; whole remaining upper surface a reddish or chestnut buff, paling to ochreous buff on the rectrices and marked throughout with very deep brown or black bars, those on the tail being broadest; scapulars and innermost secondaries broadly tipped with pale yellow-buff, winglet, primaries, primary coverts and outer secondaries, as in the male, brown; inner secondaries like the back but with broader bars and often with a vinous tint on the outer webs; lores and sides of the head fawn with black striæ; chin and upper throat fawn-buff, immaculate in old birds, finely spotted in young ones; whole lower surface barred buff and deep brown, the buff bars becoming more or less white on the abdomen, where the brown bars deepen to black.

Females of this species vary almost more than the males and the difference in tint on the back is very great, varying from a rich, almost rufous bay, which, however, is very rare, to a pale sandy buff which is very common. The colours of the lower parts vary less, but birds are sometimes met with which have the breast bars almost white, the buff tint being quite faint and irregularly distributed.

The colours of the soft parts do not differ from corresponding parts in the male.

Wing 6·0" to 6·9" averaging 6·55"; bill at front ·47" to ·56" averaging ·51"; tarsus ·85" to ·98" with an average of about ·94".

Hume gives the measurements as follows:—" Length 10 to 10·5; expanse 19·5 to 20·5; tail from vent 3·25 to 3·75; tarsus 0·88 to 1·0; bill from gape 0·55 to 0·6; weight 6·38 to 6·75 ozs."

It will be seen, therefore, that Hume's measurements practically agree with mine and show that, age for age, males are a trifle bigger and heavier than females.

*Young male.*—The young bird acquires the plumage of the adult first on the wings and upper plumage, but this is much broken up with dark brown vermiculations; the tips of the quills and sometimes the inner portions of the inner webs are marked with pale buff vermiculations and the plumage of the upper back, hind neck and head are more like that of the female but these parts also are everywhere profusely vermiculated. On the under surface the

deep breast band is either obsolete or indefinite and much mixed with buff. From the breast downwards the lower surface of the body is banded black and white as in the adult bird, but the bars are narrower and not so perfect. The white forehead seems to be one of the last parts of the adult plumage to be acquired.

At a still earlier age, the whole of the back is vermiculated buff and black and the general colour varies through as wide a range of tints as in the adult. On the under parts the breast and abdomen are still more weakly barred than in the stage just described and the bars on the centre of the abdomen and about the vent often merge into a blurred patch of black or dark brown.

"Young females resemble young males, but the under parts are like those of the adult female." (Ogilvie Grant.)

The nestling is said to be covered with a uniform earth-brown down, the same colour as the soil on which the eggs are laid.

*Distribution*.—The habitat of this beautiful Sand-Grouse is given as follows by Blanford : "Peculiar to India and resident. Found in suitable places throughout the greater part of the Peninsular, but not on the Malabar or Bombay Coast, nor in the Forest Region North of the Godaveri and East of Raipor, Mandla, etc., nor in the low grounds of the Carnatic. This Sand-Grouse is fouund throughout the Deccan and the Central Provinces and as far South as Mysore, and is common in parts of Guzerat, Cutch, Rajputana, the N. W. Provinces and amongst the Siwalik Hills of the N. W. Punjab, but does not occur West of the Indus, nor on the Gangetic alluvium."

Its range has now to be carried considerably further East and also North-west across the Indus. In the Santhal Parganas I shot two birds out of a small flock, which for some days frequented some ravines close to the Birbhum Road between Nya Doomka and Suri. I have records of its appearance both in Ranchi and Hazaribagh and in Gya, further East than recorded by Hume, in the plains at the foot of the Ranga Hills. All these places are very dry and stony and are situated in amongst, or near hills, which are broken up with ravines and dry water-courses, but at the same time have a growth of jungle, scrub for the most part, but in others stunted tree and short coarse grass. None of the districts mentioned come within the area described by Hume as the "low, rich, unbroken alluvial plains in..... the whole of the Lower Bengal and Assam."

As regards the N.-W. Major F. J. K. Barton records in the Journal that *P. fasciatus* has been shot every year, almost since 1895, at Rustom, some 20 miles from Mardan in the Buner foot hills. He says: "Painted Sand-Grouse are found near Rustom in low stony hills with a fair quantity of jungle growing on them. They are generally put up in pairs or small flocks. The natives say they are always there, but that the numbers vary, some years there being more than others."

It has also been procured near the Orakzai, about half way between Bannu and Peshawar, and it is probable it will be found all along the foot of these hills. Mr. H. G. O. Bridgeman, in writing to me, says that they are comparatively common on the "Kala Chitta and neighbouring hills just South of Campbellpore during October and.....it is difficult to believe that they never cross the River Indus, as opposite to where the Kala Chitta Hills meet this river, exactly similar ground is almost within stone's throw."

The habits of the Painted Sand-Grouse are very different from those of the Common Sand-Grouse, our one other Indian resident which can compare with it in numbers. It is essential for this bird that it should have a certain amount of cover, and where this is absent, so will the bird be. Its favourite resorts are low rocky hills and the country immediately surrounding them, but the soil must be comparatively dry and the cover must be neither too dense nor too sparse. Tree and evergreen jungle it seldom enters and it prefers low scrub jungle, especially such as is rather sparse and scattered and which is broken up by numerous stoney ravines and dry, or nearly dry, water-courses.

They are seldom found in large flocks, more often in pairs than anything else, and, according to Hume, seldom in packs of over ten, which is the largest pack he has personally seen.

Mr. Bridgeman writes that he always found the birds in small parties of four or five, that is to say, in small family parties consisting of the parent birds and their last brood.

Occasionally, however, it does collect in much larger flocks and some of my correspondents mention packs of over one hundred. Mr. E. Phythian Adams says: "When marching through the Berars, at one of our halting places, we put up about 200 from a scrub covered hill. At other times I have only seen a few together."

So, also, Nurse in this Journal (*in loc cit*) records: "It is usually found only in small flocks, but this morning when shooting over some ravines covered with a little grass and a few bushes, I came across a large number, not less than two or three hundred. They were chiefly in flocks of from two to six, but there were several packs of ten or a dozen, and one flock of sixty or eighty birds. They were very wary and I seldom succeeded in getting within thirty yards of them. However, I managed to shoot twenty one, which is the largest number of this species I have ever killed in a day, chiefly by standing behind a bush and having them driven towards me. I could certainly have got more if I had cared to stay later, as they did not fly to any great distance and could generally be marked down."

Capt. A. H. Mosse sends me a very interesting account of this Sand-Grouse's habits, which shows well the many ways in which it differs from the majority of its relatives. Captain Mosse writes:

"It is common enough in all the less cultivated and more jungly parts of Guzerat, preferring more or less hilly country where the jungle is not too dense, and rarely, if ever, resorting to the open plains beloved of the Common Sand-Grouse. During the monsoon months, however, it does sometimes visit the more civilized parts, but only where there are trees, for instance, I have seen it at Baroda in the month of June.

" It does not ordinarily collect in large numbers like the Common Sand-Grouse and, as far as I can recollect, I have never seen more than seven or eight together, except when the flocks meet at a common drinking place. It differs, too, from the common species, and from the Imperial Sand-Grouse in its drinking habits. These two, as is well-known, drink in the morning after the sun has become hot and sometimes also, at least in the case of *P. exustus*, a couple of hours or so before sunset. *P. fasciatus*, on the contrary, always drinks at dusk, never in my experience before the sun is well below the horizon.

" It is a much more silent bird than *P. exustus* and, unlike the latter, it flies always within a few feet of the ground, so that it rarely shows up against the sky line and is not too easy a bird to shoot in the fading twilight. It does not, however, take as much killing as its notoriously tough relative, falling when hit, to smaller shot at greater distance.

" On one occasion, when I was sitting up for a panther near a pool in a river bed, in the North of the Mahi Kantha Agency, the Painted Sand-Grouse kept coming to drink in the gathering dusk in small parties until there were, at a rough estimate, about 150 birds collected at the water's edge in a patch of some thirty yards in length. This is the only time I have seen so large a number together, and quite a noise they made with their chattering, both as they arrived and on the ground before drinking. The single note, softer and lower than that of the Common Sand-Grouse, I have never heard except at dusk. When they alight on the ground they drop very suddenly and then squat like a nightjar.

" Although I have never personally seen this Grouse drink except at dusk, it is not impossible that, in the hot weather, it may also sometimes drink at dawn before the sun is up. I have more than once seen it on the wing at this time of the day."

Hume mentions the fact of their drinking in the morning and Blanford also says that they fly to water before sunrise and after sunset, but neither of these writers give any further details as to their watering in the early dawn.

Mr. Adams, as quoted by Hume, gives a rather similar account of the visit of these birds to a small pond in an Acacia grove, and in this says that his attention was first drawn to the birds by the " peculiar *cluck, cluck* which *fasciatus* makes when rising, " he also

adds that on alighting the birds "lay perfectly still for two or three seconds and then all of them commenced a rapid run down to the water."

Mr. Adams also states that "the Painted Sand-Grouse entirely leave the forests and jungle in the early part of the rainy season and then live in the open country, all through the rains, exactly as *P. exustus* does."

Although distributed over a very wide area and comparatively common in many parts of it, nowhere does this bird appear in the enormous numbers that *P. arenarius*, *P. exustus* and *P. alchata* do, consequently the huge bags which are sometimes made of these Sand-Grouse are never equalled by the bags made of *P. fasciatus*. Hume writes: "Where they are abundant they afford extremely pretty shooting, and 20 to 25 brace is by no means an out-of-the-way bag for two good guns. Even though at first flushed in parties of 7 to 10, they break up into pairs and singles after the first shot, and lie well. I have never seen them wild or rise at greater distances than 30 or at most 40 yards, and very often they whir up within a few feet. They rise with a chuckling chirp, fly low, and soon alight again, however, running a considerable distance after they have alighted. They run extremely well, compared with other Sand-Grouse, as I have repeatedly noticed when standing above whilst others were shooting below. For a moment I have often mistaken them for Grey Partridges.

"Although their flight is strong and tolerably fast, they offer an easy shot, and can be dropped with charges, and at distances that would afford little prospects of a kill in the case of *exustus*.

"Their plumage is very delicate, and half the feathers of the back and breast are often knocked out by the fall when they are shot. The aural orifices are very large, and being only partially covered with feathers of which the webs are very far apart, are conspicuous; but the birds do not appear to hear particularly well, or if they do, they are very tame or stupid, for they continually rise at one's feet, and if much disturbed lie so close that they are almost as hard to raise as Button Quail.

"Their crepuscular habits are undoubted, though I cannot say that I myself have often noticed them after dusk."

Nearly all sportsmen agree with Hume in considering that they are far less wild and smart than most Sand-Grouse and that they are also easier to kill. Col. Fenton remarks, *in epistolâ*, "When flushed they do not fly very far before pitching again. By marking them down and flushing them again one can go on shooting at them over and over again, until one or all the birds in a covey are bagged." Lieut. Pythian Adams says just the same and Jerdon, Thompson, Adams and other writers all give similar accounts.

Mr. Bridgeman points out that these Grouse when flying keep much closer together than the other species do, so that frequently

more than one bird gets knocked over by the same shot and that he himself has once dropped three birds out of four and several times two out of four and this without in any way being guilty of "browning."

The Painted Sand-Grouse appears to be almost exclusively a vegetarian and the crops of those examined by Hume and others have so far contained practically nothing but grain and seeds of various kinds. They seem, also, to keep very much to a hard diet and only one or two of my correspondents mention their indulging in green food, though they undoubtedly do eat such sometimes. They certainly eat White-ants—but squirrels even, as well as doves and similar vegetarian eaters will all tackle and swallow them with greediness—and one correspondent says that he found them feeding on ants. Probably they eat small insects fairly regularly as they come across them, though they may not go out of their way to hunt for them when grain is handy.

Captain Heaviside records a curious habit he observed in these birds in the Nerbudda Valley where he noticed them "in the evenings on the cart tracks, where they were probably dusting themselves as there is no grain traffic on these roads."

These Sand-Grouse suffer to a certain extent from snarers and bird catchers, but owing to their habits and to the fact of their not going about in large flocks, they do not fall victims to anything like the extent that *P. arenarius* and *P. exustus* do. Adams says that "Large numbers of the Painted Grouse are taken during the rainy season by bird catchers, who approaching under cover of a screen made of green leaves and twigs, drop a circular net, suspended to a hoop and held out horizontally at the end of a long bamboo, over the birds, which as a rule never seem to suspect that danger is at hand."

The most common means adopted to snare them is by nooses laid at the regular drinking places, in the same way that all the other Sand-Grouse are taken.

An excellent account of these birds in captivity is given by Mr. Barnby Smith in the Avicultural Magazine who writes: "The habits of the Painted Sand-Grouse were from the first strikingly different from those of the Pintail. When the latter were frightened their instinct was to fly, whereas the Painted Sand-Grouse crouched all together in a corner as though it was their nature to seek cover; although as a fact, there was no cover there.

"I accordingly provided them with another enclosure very similar to the first, except that nearly all the floor space was covered with tussocks of grass, small box bushes, dwarf juniper, etc., of course with sandy spaces at intervals. I found the birds always loved to lie in the sun near a tussock of grass, and would be seen to have moved their position several times a day so as to get full sunshine. This surprised me, as they are said to be crepuscular and nocturnal

in habit. Their large staring black eyes would quite give one this impression. Whatever they do by night their habits by day are most unexpected, and they justify their common name of "painted" in an extraordinary manner, for they might as well be merely painted birds as far as any movement can be observed in progress. One might go to look at them half a dozen times a day for weeks without seeing them making any movement. The seed put down vanishes, and the birds keep a good gloss on their feathers and appear to be in excellent health. Very occasionally one may be seen moving, but the same instant the bird will catch sight of you and draw in its head and remain squatting motionless, however long you remain to watch. If approached within a couple of feet, however, the bird will attempt to fly, with its wild alarm note of "Yek-yek-yek," and land behind another tuft of grass. After one attempt to fly, if again approached, it will permit itself to be handled. It is said that bird-catchers in India take these Sand-Grouse by approaching them under cover of leaves and dropping a net suspended at the end of a bamboo. Having seen the birds themselves I can readily imagine the possibility of such a method of capture.

"To make up for their uninteresting habits, it must be conceded, however, that the Indian Painted Sand-Grouse have most exquisitely marked plumage, the markings on the cock especially being most striking. Even in rough grass they are very difficult to see at short distance, but our English grass is too green to hide them perfectly. I should imagine that in their native haunts they will form a perfect example of obliterative coloration."

*Nidification.*

Wherever the Painted Sand-Grouse occurs it is a resident and breeds and young birds or eggs have been taken from all parts of the tract of country it frequents.

The principal breeding season is probably April to early June, but eggs have been taken at all times of the year, and it is difficult to say with any certainty that these are the favourite laying months. It is also probable that very few breed during the height of the rainy season, *i.e.*, from July to the early part of October. Amongst others who have reported the time eggs have been taken are the following:—

Pythian-Adam, Davidson.....January.
Butler, Col. R. Bingham.....February.
Mosse, Davidson, Wenden .....March.
Hume, Adam, Pythian-Adams, Bulkley...April.
Nunn, Hume, Davidson, Bulkley, C. T. Bingham .....May.
Barnes, Felton .....June.
Thompson, Davidson.....November.
Pythian-Adams .....December

As one would expect from its habits the Painted Sand-Grouse deposits its eggs, as a rule, in ravines, broken ground, etc., where there is certain amount of cover and, in the Central Provinces actually in forest land. As a rule it makes no nest at all, though a few odd pieces of grass may, perchance, collect in the hollow it scratches out in the earth before depositing its eggs. Sometimes, however, it does make some pretence of a nest, collecting a few bents and grasses and fashioning these, by pressure only, into a hollow cup, fitting the depression already made in the earth. Mr. R. Thompson also describes a nest which would appear to have been yet a further advance in architectural skill. "The nest contained three eggs, of which one unfortunately got broken. It was placed on the ground on a slight rise; neatly and well put together saucer like, made of dried grass, bits of dried leaves of bamboo and other plants. The soil was sandy, with a thin forest growing on it, and the nest was placed under the shade of a small tree. There was no cover in the immediate vicinity of the nest; in fact, for three or four yards all round there was nothing but short thin grass. I accidentally arrived at the spot, and whilst talking to a friend, the female bird got up close at our feet, and I saw the nest immediately." (Hume.)

Ordinarily, however, it makes no nest at all and nearly all observers write to this effect. Capt. Mosse gives me an interesting account of some young birds found by him. He writes: "I have only once come across a nest. This was on the 14th March 1904, in Kathiawar. I was at the time riding through a Bastard Teak jungle and dismounting to investigate the cause of a slight temporary lameness of my pony, caught sight of a pair of bright eyes fixed upon me a few feet away. The owner of the bright eyes being approached still nearer, rose and shewed herself to be a Painted Sand-Grouse. The nest which was merely a slight depression, unlined, contained two young ones a few days old. They were quaint little objects, which flattened themselves down as close to the ground as possible, and they had a peculiarly flattened out shape which enabled them the better to do so. Their covering was of a peculiar flaky character, neither down nor feathers, but something between the two, and their colour was a uniform brown, the exact shade of the surrounding earth."

The normal number of eggs in a clutch is undoubtedly three, though very often two only are laid and very rarely four may be found; such a clutch having been taken by Mr. R. M. Adam. They are in shape elliptical, both ends being equal, as is the case with the eggs of all Sand-Grouse, and they are much the same in size as those of the Common Sand-Grouse (*P. exustus*) but average a shade longer and a trifle less broad. Hume thus describes the large series which have passed through his hands. "As a body they are very

regular, obtuse-ended, cylindrical ellipsoids, the shell very smooth and glossy, the ground colour a delicate pale salmon pink, with a good many somewhat widely scattered specks and tiny streaks of brownish red, very generally much more numerous towards one or other end, and with a good many small pale inky purple spots and clouds almost exclusively confined to that end where the markings are most numerous.

"Specimens are occasionally met with in which the markings are very sparse, and I have one specimen in which they are absolutely and entirely wanting.

"Not unfrequently the markings form a pretty perfect zone towards one end, and here and there an egg is met with exhibiting six or eight large deep brownish-red blotches. Pale pinky white, and somewhat buffy stone-colour grounds are also met with.

"Dr. Jerdon remarks: 'I have had the eggs brought me, very cylindrical in form, of a dull earthy green with a few dusky spots; but these most assuredly were eggs of *P. exustus* and not of our present species *fasciatus*.'

"In length the eggs vary from 1·3 to 1·62, and in breadth from 0·93 to 1·05; but the average of forty eggs is 1·42 by 0·98."

These figures in millimetres are, roughly, 33 to 40, 23·5 to 27 and 36 by 25 mm.

In my own collection I have but a poor series of these eggs, but they all agree with Hume's eggs except one pair which have the ground colour a pale dull sea green with a few faded grey and brown blotches and spots sparsely but evenly distributed over the whole surface. These eggs were taken by a good sportsman who knew both the Painted and the Common Sand-Grouse well and I have no reason to doubt their identification, though I cannot guarantee it. Jerdon, notoriously, cared little for eggs and was constantly incorrect in this particular, so little reliance can be placed on the identification of his eggs referred to by Hume above. Nor do my eggs agree with Jerdon's, which seem to have been coloured much like those of *exustus*, whereas the eggs in my collection are very pale and weakly coloured, far more so than any I have seen of that bird.

The season during which the Painted Sand-Grouse should be protected might be taken as from the 1st April to 1st October, by which latter date the great majority of young would be well able to take care of themselves.

The descriptions of the adult male and female given in this paper were taken from the birds from which the artist painted the plates and they depict average well coloured adult birds, but, as I have already mentioned, there is a considerable range of colouration in this as in most Sand-Grouse, and this must always be born in mind by the sportsman and collector when identifying his birds.

# A STUDY OF EMOTIONAL EXPRESSION IN FELIS PARDUS.

BY

R. W. G. HINGSTON, I. M. S.

*(With Plates A and B.)*

As we ascend the animal scale from that stage at which the nervous system has become so concentrated and elaborated as to be capable of weaving the external bodily stimuli into an emotionary sensation, we find that the corporal changes by which that emotion is made manifest have become more differentiated and more complex. Although when the surroundings are unfavourable or possibly directly dangerous, the tiny amœba may check its creeping motion, the coelenterate may retract its tentacles, the mollusc may firmly close its shell or the crustacean hastily scramble away, yet such movements must be considered as of direct service to the creature, as endeavours on its part to shield the body from the source of danger and not as external evidence that any emotion, such as fear of the danger or anger towards the object producing the danger, has been experienced by those minute atoms of living tissue which go to compose its nervous system.

But when we consider those animals higher in the scale of Nature and which, from the greater development of their nervous apparatus, might be expected to possess mental faculties higher than those necessary to protect them from some immediate danger; we find that their internal emotions are expressed in such a manner as to make it difficult for us to determine what actual service those expressions may really be. Thus that inoffensive and harmless little snake the Buff-striped Keelback, when irritated, is described as erecting itself, flattening its forebody and distending itself until it brings into view its blue or vermilion colourations. The painted snipe, when slightly alarmed, is said to raise the wing furthest from the intruder; if pressed this wing is fully expanded, while in desperation the bird faces its adversary with both wings and tail spread so that their beautiful spotted markings are fully shown. Everyone has seen the domestic hen cackling with pride over the egg which it has laid or the domestic cock crowing with triumph over his defeated antagonist, yet few would attempt to explain why such sounds should have been evolved or what benefit they are to the creatures which make them or would prefer to give any more satisfactory explanation than that they are the outward manifestations of the internal emotions which at that moment excite the animal.

But in mammals the outward expression of emotional disturbances has reached a high pitch of differentiation. The horse forcibly

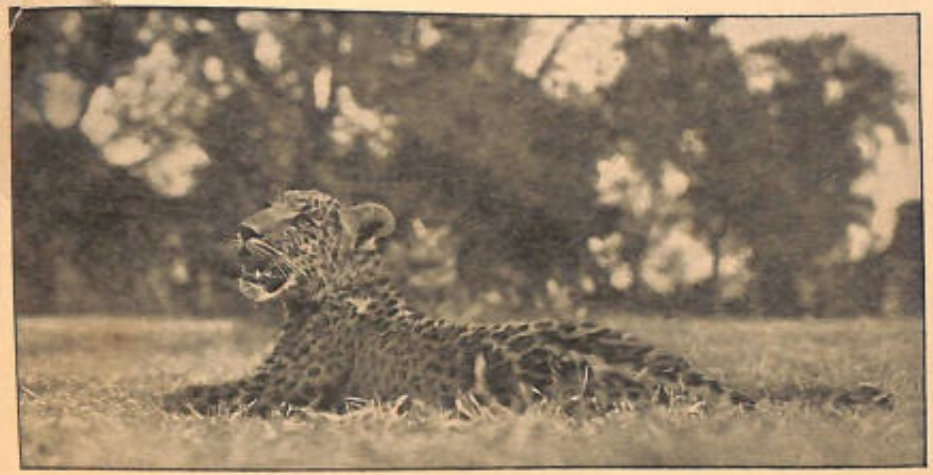


Fig. 1. Interested Contentment.

Fig. 4. Distress.

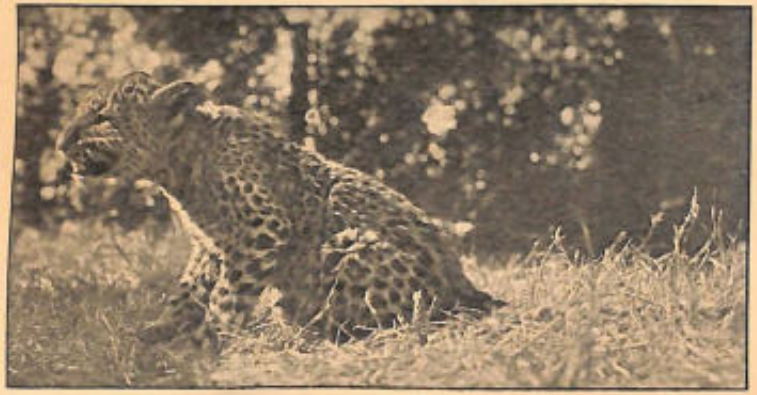


Fig. 2. Fear.

Fig. 3. Anger.

throws back his ears and presses them firmly against his head when he is alarmed. The dog wags its tail and throws its body into flexuous movements when it is affectionate. The cat raises its upper lip, exposes its canine teeth, retracts its ears, stiffens its body and forcibly spits and snarls when it is angry; and in man the emotions are so highly developed and expressed with such distinctiveness that his temper, cunning, his strength of will, his qualities of hatred and of love, his greed, sensuousness, vanity and many other emotions may be portrayed even on his apparently placid countenance.

We cannot expect to see those higher emotions such as shame, surprise, disgust, contempt delineated in the features or attitude of any wild mammal we attempt to study, though they can be discerned in some of the higher ones; and, undoubtedly, in a simple and elemental condition occur in all. But we can and should be able to detect internal evidence of those emotions; such as fear, anger, rage, attention, distress, eagerness and affection, which are so much more gross and simple in character and which play so prominent a part in every stage of the animal's life. From the point of view of emotional expression, the Felidæ form an interesting group, and I have endeavoured to obtain records of *Felis pardus* while experiencing those emotions which are outwardly most distinctive and most capable of recognition.

Contentment (Fig. 1. Plate *A.—Interested Contentment*).

In the contented and restful state when, after a satisfying meal, the animal lies partly curled upon the ground and the body and mind are calm and quiet or when the mental faculties are in complete abeyance during sleep; there is no rigidity of trunk and limbs, no twitching of muscles or changes in facial expression: the whole animal is limp and supple, its voluntary musculature is in a condition of physiological rest in complete unison with the calm and inactivity of its mind. Occasionally while coiled in this contended state the sight of some passing object may excite the interest of the animal. It raises its head, opens wide its eyes and looks steadfastly towards the object producing this mild excitement; the lower jaw drops and the mouth opens but not in anger; the whole countenance alters and the blank expressionless facies which characterised the animal in its state of pure contentment is changed instantaneously to one of interested intelligence.

Fear (Fig. 2. Plate *A.—Fear*).

Fear in a wild animal must be frequently associated with anger and perhaps preceded occasionally by astonishment, though the latter would be difficult, if not impossible, to detect. It does seem possible, however, to obtain the expression of fear distinct from that of anger, if the object causing the fear is so powerful as to overawe the animal to such a degree as to prevent it from displaying its anger.

*Felis pardus* when enduring the emotion of fear produced in such a manner, lowers itself into a crouching posture and throws its ears well back. Both these movements tend to lessen the apparent bulk of the animal and as many of the lower creatures in such conditions of danger, as would create the sensation of fear in the higher ones, do diminish markedly the volume of their bodies and by such diminution obtain definite protection; it is probable that these movements are instinctive tendencies inherited throughout a long ancestry, but which now display little, if any, serviceable manifestation.

The head during fear is often turned in the opposite direction to that from which the danger is expected to arrive. The eyes are partially closed, and tightly so if the fear amounts to terror. The nostrils are pinched so as to give the face a characteristic expression. It is a natural instinct in the higher animals to turn away the face if any special injury is directed towards it and to close the eyes either partially or completely and contract the nasal orifices in order to give protection to the delicate organs contained within, and this instinct seems to be so highly developed and so easily called into action as to occur in general states of fear, even when the danger is not specially directed to the sensitive organs of sight and smell. The limbs and tail are held stiff and the body loses its great muscular laxity. The corners of the mouth are raised, the upper lip elevated, the lower jaw depressed, the mouth is partially opened and the canine teeth displayed. The general facial expression is one of fierceness, and when a wild carnivorous animal is in fear or terror it must undoubtedly be fierce.

The domestic cat when terrified has been described as arching its back and erecting the hair over the whole body, especially on the tail, and as raising the basal portion of the tail upright and bending the terminal extremity to one side. I have never noticed this attitude in *Felis pardus*, nor by experiment have I been able to obtain anything resembling it; and it is possible that owing to the great strength of this animal it would not, in its native haunts, experience fear to any great extent, and would therefore not have the emotion so highly developed and exhibited in a manner exactly similar to that seen in the weaker and domesticated creatures of its kind.

ANGER, RAGE (Fig. 3. Plate *A.—Anger*).

Anger and rage, so frequently associated with fear, are expressed in a very similar manner. The body again crouches and, if the animal is savage, may be lowered completely to the ground. The trunk and limbs are rigid, the claws excerted and the tail usually stiff, though it may be curled from side to side. These are characteristics of an animal about to struggle for its prey. The crouching and rigidity maintain every muscle tense and ready instantaneously for the spring. The claws are projected for the fatal blow. Possibly

no cause excites the anger of a carnivorous animal so intensely and so frequently as the prospect of a coming battle and consequently those characteristics, which are of direct service to an enraged animal about to fight, have become so engrained into its nature as to be instinctively associated with its anger under all conditions, even when there is no suggestion of a fight. The rigidity of the tail is due to the muscles of that organ acting in harmonious contraction with those of the rest of the body, and the occasional curling motion may be an involuntary liberation of that great excess of muscular energy, which must be effervescing through its bodily system.

The angles of the mouth are elevated, the nostrils drawn together, but the whole face appears less contracted and pinched than when the animal is expressing true fear. The canine teeth are displayed in an open mouth and when the anger amounts to rage the whole row of teeth becomes clearly seen. The face is directed towards the object which excites the anger and the animal hisses or emits a deep gutteral snarl. These marked changes of facial expression and utterance of sound give to the animal a fierce and savage appearance, and are therefore of service to it by causing it to strike terror into the mind of the creature against which its anger is directed. I have never seen the hair erected during a state of rage, nor could I be certain that distinct hair movements ever occurred or were definitely associated with any emotion.

When the animal is enduring displeasure, but not amounting to anger, the above expressions are made manifest to a slight degree, but when the anger amounts to rage or savagery they are pronounced in a more exaggerated manner.

Although on analysis the emotions of fear and anger seem to be very similarly expressed, yet a comparison of the illustrations immediately shows that in the former the animal appears cowed into submission and ready to retreat from rather than advance towards its enemy, while in the latter he appears to be full of anger and spoiling for the fight.

Distress (Fig. 4. Plate *A.—Distress*).

Pain, though a most powerful sensation, can scarcely be considered as an emotion, its presence, however, gives rise to forcible emotionery outbursts so tangibly associated with those of fear and rage as to be incapable of separate recognition. An animal in pain must be in distress and this certainly is an emotion. It must also be terrified or enraged, and it is therefore not possible to describe any series of characteristics solely distinctive of a pained or distressed animal. A leopard in pain resembles almost identically a leopard in a state of anger, but the face displays a distressful appearance, and it is difficult to determine what individual muscles are brought into play in the production of it. The mouth is sometimes widely opened and the body may conform to almost any attitude.

EAGERNESS (Fig. 5. Plate *B.—Eagerness*).

When *Felis pardus* feels intensely eager as when it is stealthily creeping towards its prey or crouching low with the intention of springing on it, the attitude and expression again become characteristic. It is not reasonable to infer that under these conditions pure eagerness is alone manifest. It would be a matter of great difficulty to conclude that, when an animal is about to seize another for food and is probably anticipating a battle before that food is obtained, no other emotion, such as hatred of, or anger towards, the prey or subdued excitement at the prospect of an expected struggle or fear as to the consequences of that struggle is not at the same moment influencing the mind of the animal and converting what at first sight appears a simple emotion into one of extreme complexity. Intense eagerness, however, must be a very strong, if not the prevailing emotion under these conditions. If the other emotions of fear, anger, hatred or excitement were expressed in their unadulterated state, the sudden muscular movements and alterations in countenance associated with them would be in direct antagonism to the stealthy motion of the animal and fatal to the success of the object in view. We may conclude that if they are present, and no one can say that they are not present, they must be kept in a state of suppression or subdual by a higher and more powerful nervous control.

When intensely eager *Felis pardus* lowers its body completely to the ground. The hind limbs are flexed beneath the trunk ready to be instantaneously extended when the animal springs. The fore limbs are stretched forwards and the head which is lowered on to them is so fixed that the jaws rest on the dorsal surface of the feet and the chin is firmly pressed on the ground between them. By this depression of the head the apparent bulk of the animal is diminished and this gives him a greater opportunity of reaching his prey. The tail is curled, the ears are tilted forwards and the aural aperture enlarged to catch the slightest sound. The eyes are fixed and staring to note the gentlest movement. The mouth is tightly shut so that the teeth are completely covered. There is no twitching of the muscles or alterations in the countenance. The hair is occasionally erected but not often. No vocal sounds are emitted. The nostrils are slightly dilated and the whole body is absolutely motionless and in a state of rigid muscular tension, while the face expresses that earnest determination which at times must be so necessary for the successful accomplishment of the animal's desires.

Intense eagerness is also expressed when the animal is in motion as when it is endeavouring to discover the whereabouts of its food or is creeping with stealth towards another animal. The general attitude is precisely similar to that of an animal about to spring, but the head and body are lowered less completely to the ground and

Fig. 5. Eagerness.

Fig. 6. Attention.

Fig. 7. Playfulness.

EMOTIONAL EXPRESSION IN *FELIS PARDUS*.

the animal moves forward with extreme quietness. When the sense of smell is brought into action in association with this movement, the nostrils are dilated, the nose depressed to the ground and the animal sniffs with vigour as it moves silently and rapidly from place to place.

ATTENTION (Fig. 6. Plate *B.—Attention*).

When *Felis pardus* distinguishes in the distance an object, the nature of which it does not clearly recognise or hears a sound which it does not understand, the attitude which I have designated as "attention" is immediately assumed.

It may be considered with much truth that the two emotions of attention and curiosity so frequently associated and exercised in combination would not in the lower animals be sufficiently differentiated as to cause the gestures resulting from the influence of those emotions to be displayed in a different and individually characteristic manner. If the animal is lying in a calm and contented state and suddenly, on the hearing of an unusual sound, springs into the attentive posture, it is difficult to determine, with any degree of accuracy, whether the fixed position of body and the intent expression of the facies then assumed is due to a sense of curiosity manifested by a desire to discern the cause and nature of the sound or by a less complex sense of attention without any desire to make such an analysis.

In the attitude of attention the trunk is raised, so that the body is supported sometimes on the two front limbs and sometimes on all four. By this movement the animal's range of vision is greatly increased. The ears are directed forwards and the eyes widely opened. The mouth may be partially open or closed. The head is usually craned a little forwards and occasionally moved from side to side as though it was endeavouring to obtain in different directions a further explanation as to the cause of this excitement. There is no puckering of the features, no tightening of the angle of the mouth or exposure of the teeth. The hair over the shoulders may be slightly ruffled, but not markedly erected. The intent appearance of the countenance, produced mainly by the fixed and staring expression of the eyes, can scarcely be mistaken.

AFFECTION (Fig. 7. Plate *B.—Playfulness*).

The emotions of affection and love are diametrically opposed to those of anger and hatred, and are associated with external expressions equally distinct in their antithesis.

When *Felis pardus* is affectionate, the body is always limp and supple and the face calm and placid. There is no pricking of the ears or pinching of the nostrils. The teeth may be exposed by a uniform opening of the whole mouth, but never by a raising of its angle or by a wrinkling of the upper lip or associated with any muscular tension which might suggest a snarl. The eyes are

dilated and express docility. The claws are ensheathed. In this happy temperament *Felis pardus* resembles the domestic cat in its desire to lick or rub its head and trunk against the object towards which it is displaying its affection and to pat or pound it gently with the soft pads of its extended feet. This latter peculiar habit is most probably in origin the same as that pounding which young kittens may be seen to perform on the teats of their mother when they are suckling and at that time they are no doubt affectionate.

When we contrast the expression of the emotions of affection and anger it is clearly evident that they are in direct opposition to each other. Compare the supple trunk, the elevated ears, the dilated eyes, the ensheathed claws and the happy countenance of affection, with the rigid body, the depressed ears, the half closed eyes, the projecting claws and the fierce and pinched expression of anger. All these characteristics associated with anger are, to a greater or less extent, of some service to the animal if it be considered that its anger is directed towards some other animal which it is about to attack ; and in its native haunts there can be no other cause which so frequently and acutely excites its anger.

But on the other hand it does not seem possible to detect any serviceable asset in the opposed expressions associated with affection. They can only be explained on the Principle of Antithesis which states that any action or series of actions which have for long periods of time been directly associated with any sensation or emotion will be immediately suppressed under emotions of a directly opposing nature and that an antagonistic set of muscles will be brought into play so as to produce an opposite action or series of actions, though they may be of no use.

During play the animal may assume almost any posture. It may roll on its back on the ground and wave its paws in the air and with its claws completely ensheathed endeavour to grasp the object with which it is playing. It may spring towards its playmate and leap upon him. It may seize him between its teeth, but will never injure him or express in its attitude or countenance any desire to do so.

Just as man has his hates and loves, so have the lower animals their hates and loves also. Wonderful is the mind of man and great is the gulf which divides it from that of the very highest of the brutes, yet every impulse of its will, every sensation it receives, every emotion it excites is, in a fundamental manner, experienced in the minds of those very brutes whose ignorance we so despise.

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# NOTES ON A COLLECTING TOUR AT RAMTEK, C. P.

BY

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*General.*—The following note is the result of a collecting tour made in the first week of September last year. The object with which the tour was undertaken was that of comparing the flora of the transition formations with that of the Deccan trap. So far as the comparison is concerned, the tour was a failure, for with few exceptions both formations showed a more or less common flora. As however no list of Central Provinces plants has been published, I propose to give the list of plants collected at Ramtek. From a botanical point of view the Central Provinces form a particularly interesting area as they furnished the meeting place of the Bombay or Western flora and the Bengal or Eastern flora. Nagpur may practically be taken as the Eastern limit of the Deccan trap and with it of the Deccan flora. Eastwards through Bhandara and Chatisgarh the Bengal flora commences.

*Situation.*—The town of Ramtek, the headquarters of the tahsil bearing the name, is situated in 21°-24′ N. and 79°-20′ E., 28 miles north-east of Nagpur by road. A mile and a half east of the town is the hill of Ramtek. Crowned with its white temples it forms a conspicuous object rising abruptly 600 feet above the almost level Wainganga plain. The hill itself is about 1,400 feet above sea level.

*Topography.*—The hill is a detached hog-backed spur forming almost the last link in the chain of hills known as Amnagar Range of Bhandara. On the east the range is continued by the low-lying hillocks of Mansar and Kandri with their famous manganese deposits. Four miles east the Sur river has broken through the range in a narrow gorge. In 1909 this gorge was closed to form the Ramtek Reservoir, giving a spread of water, when full, of nine square miles to the north of the hill. The hill terminates on the west in the form of a horse shoe or V, the inner sides enclosing the Ambala tank near which is a fair sized village. On the south and west sides the hill ends abruptly in lofty natural scarps. No springs were found on the hill sides.

*Geology.*—The Ramtek Range consists of quartzites often slightly micaceous. The strata are inclined at 50°-55° dipping towards the south. The freshly fractured stone appears red in sunlight doubtless giving rise to the old name for the hill Sindu-ragiri, "the vermillion mount." The high elevation of the strata accounts for the absence of any springs.

*Climate.*—Figures for temperature are only available for Nagpur. The maximum recorded during the hot season of March to June is 117·8° F. though as a rule the maximum temperature lies between 110° F.-115° F. During the cold weather months of December and January, the temperature in the day varies between 80° F.-90° F. dropping at night to 52° F. and occasionally in January to 48° F. Ramtek being higher than Nagpur is probably slightly colder.

The average rainfall recorded over the past forty years at Ramtek is 50·29 inches, mostly received from the middle of June to the end of September.

*General characters of flora.*—The heavy rainfall confined in a short period furnishes the climate essentially suited for woodland. The forest belongs to the monsoon type of the tropics and is leafless during the dry months. Thus *Sterculia urens* is leafless from November to June, *Boswellia serrata* leafless from January or December to June. *Chloroxylon Swietenia* from February, *Wrightia tomentosa* from March to May. *Tectona grandis* is leafless from December to June. The leaf fall is preceded by a severe attack of *Uncihula tectonæ* (Teak mildew) and this probably accounts in part for the early leaf fall. Many trees show xerophyllous adaptations in addition to the periodic leaf fall, *e.g.*, the thick almost fleshy leaves of *Gymnosporia montana*, a plant common throughout the area. The trees are without exception low growing with thick stems and relatively small leaves. In some, *e.g.*, *Zizyphus jujuba*, an umbrella shape is well developed while pinnately or bipinnately compound leaves are extremely common. A noticeable feature is the red colouration in the young leaves of many trees and shrubs especially in *Woodfordia floribunda* and *Combretum valifolium*. A further point of interest is the light position occupied by the young leaves. Practically all hang vertically downwards, exposing only their basal edge to the rays of the mid-day sun. Only when the leaf tissues have matured do the leaves take up a fixed light position.

*Special features.*—The most notable absentee from the trees on Ramtek were *Acacia arabica*, *Acacia leucophlœa*, *Phœnix sylvestris* and *Mangifera indica*.

The occurrence of the same herbaceous plants in both situations is accounted for by the fact that these plants are more dependent on climate (rainfall) than edaphic (soil) conditions. The most striking group of plants on the hill was perhaps the flame coloured *Cæsalpinia pulcherrima* to the N. E. of the temple and the undergrowth of *Nyctanthes* about three-quarters of the distance to the gorge of the Sur river. The undergrowth was confined to the ridge extending only a short distance on the slopes.

The influence of man is seen on the slopes round the villa where the ground is carpeted with *Cassia occidentalis*. Its fet leaves are avoided by the village cattle. Bamboos (*Dendrocalamus*

*strictus*) occur only on the northern slopes. Their survival is probably due to their distance from human habitation, and their disappearance from the inner slopes is very typical of the way in which excessive demand has abolished this species over large areas of Central Provinces forests. The presence of a large number of thorny bushes and small trees is no doubt in part a response to the ecological conditions but must not wholly be attributed to this cause. The villagers in their search for firewood naturally chose the most easily procurable material and avoid those armed with thorns. The seedlings also of these plants escape grazing on account of their thorns.

The absence of grasses in the list is due to the time at which the collection was made and to the late arrival of the rains last year. Only the earliest grasses were in flower and on inner slopes of the hill they were grazed level with the ground.

nonaceæ.
*Anona squamosa*, Linn.

Menispermaceæ.
*Cocculus villosus*, D. C.
*Cissampelos Pareira*, Linn.

Capparideæ.
*Cleome monophylla*, Linn.
*Cleome viscosa*, Linn.

Violaceæ.
*Ionidium suffruticosum*, Ging.

Bixineæ.
*Cochlospermum Gossypium*, D. C.

Polygaleæ.
*Polygala erioptera*, D. C.

Caryophylleæ.
*Polycarpæa corymbosa*, Lamk.

Portulaceæ.
*Portulaca oleracea*, Linn.

Malvaceæ.
*Sida humilis*, Willd.
*Sida mysorensis*, W. & A.
*Sida carpinifolia*, Linn.
*Sida cordifolia*, Linn.
*Urena sinuata*, Linn.
*Hibiscus Solandra*, L'Herit.
*Thespesia lampas*, Dalz. & Gibs.
*Bombax malabaricum*, D. C.

Sterculiaceæ.
*Sterculia urens*, Roxb.
*Helicteres Isora*, Linn.
*Melochia corchorifolia*, Linn.
*Waltheria indica*, Linn.

Tiliaceæ.
*Grewia lævigata*, Vahl.
*Grewia salvifolia*, Heyne.
*Triumfetta rhomboidea*, Jacq.
*Triumfetta rotundifolia*, Lamk.
*Corchorus trilocularis*, Linn.

Malpighiaceæ.
*Aspidopterys cordata*, A. Juss.

Geraniaceæ.
*Biophytum sensitivum*, D. C.
*Impatiens Balsamina*, Linn.

Rutaceæ.
*Ægle marmelos*, Corv.

Burseraceæ.
*Boswellia serrata*, Roxb.

Meliaceæ.
*Chloroxylon Swietenia*, D. C.

Olacineæ.
*Olax scandens*, Roxb.

Celastrineæ.
*Elæodendron glaucum*, Pers.
*Gymnosporia montania*, Laws.

Rhamneæ.
*Ventilago calyculata*, Tulasne.
*Zizyphus jujuba*, Lamk.
*Zizyphus œnoplia*, Mill.
*Zizyphus xylopyrus*, Willd.

Ampelideæ.
*Vitis latofolia*, Roxb.
*Vitis setosa*, Wall.

Sapindaceæ.
*Cardiospermum Halicacabum*, Linn.
*Schleichera trijuga*, Willd.

Anacardiaceæ.
*Odina Wodier*, Roxb.

Leguminosæ.
*Crotalaria hirsuta*, Willd.

*Indigofera enneaphylla*, Linn.
*Indigofera hirsuta*, Linn.
*Indigofera pulchella*, Roxb.
*Tephrosia tenuis*, Wall.
*Tephrosia Purpurea*, var. *pumila*, Baker.
*Tephrosia villosa*, Pers.
*Zornia diphylla*, Pers.
*Smithia gemniflora*, Roth.
*Æschynomene indica*, Linn.
*Alysicarpus rugosus*, var. *styracifolius*, Baker.
*Desmodium gangeticum*, D. C.
*Desmodium latifolium*, D. C.
*Desmodium rotundifolium*, Baker.
*Abrus precatorius*, Linn.
*Erythrina suberosa*, Roxb.
*Galactia tenuiflora*, W. & A.
*Butea frondosa*, Roxb.
*Phaseolus trinervius*, Heyne.
*Atylosia scarabæoides*, Benth.
*Dalbergia latifolia*, Roxb.
*Dalbergia paniculata*, Roxb.
*Pterocarpus Marsupium*, Roxb.
*Cæsalpinia pulcherima*, Sw.
*Cassia Fistula*, Linn.
*Cassia occidentalis*, Linn.
*Cassia Tora*, Linn.
*Cassia absus*, Linn.
*Cassia pumila*, Lamk.
*Cassia mimosoides*, Linn.
*Bauhinia purpurea*, Linn.
*Mimosa hamata*, Willd.
*Acacia Catechu*, Willd.
*Acacia pennata*, Willd.
*Albizzia procera*, Benth.

Combretaceæ.
*Terminalia belerica*, Roxb.
*Anogeissus latifolia*, Wall.
*Combretum ovalifolium*, Roxb.

Lythraceæ.
*Woodfordia floribunda*, Salisb.
*Lagerstræmia parviflora*, Roxb.

Onagraceæ.
*Ludwigia parviflora*, Roxb.

Cucurbitaceæ.
*Trichosanthes cucumerina*, Linn.
*Luffa acutangula*, Var. *amara*, Roxb.
*Momordica Cymbalaria*, Fenzt.
*Citrullus Colocynthes*, Schard.
*Mukia scabrella*, Arn.
*Zehneria umbellata*, Thwaites.

Ficoideæ.
*Trianthema monogyna*, Linn.
*Mollugo Spergula*, Linn.
*Mollugo stricta*, Linn.

Cornaceæ.
*Alangium Lamarckii*, Thwaites.

Rubiaceæ.
*Stephegyne parvifolia*, Korth.
*Oldenlandia aspera*, D.C.
*Oldenlandia nudicaulis*, Roth.
*Gardenia latifolia*, Ait.
*Hamiltonia suaveolens*, Roxb.
*Spermacoce stricta*, Linn.
*Spermacoce hispida*, Linn.

Compositæ.
*Elephantopus Scaber*, Linn.
*Pulicaria angustifolia*, D. C.
*Eclipta alba*, Hassk.
*Blainvillea latifolia*, D. C.
*Bidens pilosa*, Linn.
*Chrysanthellum indicum*, D. C.
*Tridax procumbens*, Linn.
*Emelia sonchifolia*, D. C.

Companulaceæ.
*Lobelia trigona*, Roxb.

Ebenaceæ.
*Diospyros montana*, Roxb.
*Diospyros tomentosa*, Roxb.

Oleaceæ.
*Jasminum angustifolium*, Vahl.
*Nyctanthes Arbor-tristis*, Linn.

Apocynaceæ.
*Vinca pusilla*, Murr.
*Holarrhena antidysenterica*, Wall.
*Wrightia tomentosa*, Roem and Schultes.

Asclepiadeæ.
*Hemidesmus indicus*, Br.

Gentianaceæ.
*Hoppea dichotoma*, Willd.
*Canscora decurrens*, Dalz.

Boragineæ.
*Trichodesma amplexicaule*, Roth.

Convolvulaceæ.
*Argyreia sericea*, Dalz. and Gibs.
*Ipomœa hederacea*, Jacq.
*Ipomœa pes-tigridis*, Linn.
*Ipomœa eriocarpa*, Br.
*Evolvulus alsinoides*, Linn.
*Cuscuta reflexa*, Roxb.
*Cuscuta chinensis*, Lamk.

Scrophularineæ.
*Linaria ramosissima*, Wall.
*Limnophilla gratioloides*, Br.
*Vandellia crustacea*, Benth.

*Bonnaya brachiata*, Link. and Otto.
*Striga euphrasioides*, Benth.
*Sopubia delphinifolia*, G. Don.

Lentibularieæ.
*Utricularia stellaris*, Linn.

Bignoniaceæ.
*Stereospermum chelonoides*, D. C.

Pedalineæ.
*Sesamum indicum*, D. C.

Acanthaceæ.
*Elytraria crenata*, Vahl.
*Ruellia prostrata*, Lamk.
*Ruellia Beddomi*, Clarke.
*Hemigraphis latebrosa*, Nees.
*Blepharis boerhaaviæfolia*, Pers.
*Barleria Prionitis*, Linn.
*Andrographis paniculata*, Nees.
*Andrographis echioides*, Nees.
*Haplanthus verticillaris*, Nees.
*Justicia diffusa*, Willd.

Verbenaceæ.
*Lippia nodiflora*, Rich.
*Tectona grandis*, Linn.

Labiatæ.
*Ocimum canum*, Sims.
*Plectranthus incanus*, Link.
*Anisochilus carnosus*, Wall.
*Anisomeles ovata*, Br.
*Leucas stricta*, Benth.
*Leucas aspera*, Spreng.

Amarantaceæ.
*Celosia argentea*, Linn.
*Allmania nodiflora*, Br.
*Pupalia lappacea*, Moq.
*Aerua Monsonia*, Mart.
*Achyranthes aspera*, Linn.
*Alternanthera sessilis*, Br.

Polygonaceæ.
*Polygonum plebejum*, Br.

Aristolochiaceæ.
*Aristolochia indica*, Linn.

Euphorbiaceæ.
*Euphorbia hypericifolia*, Linn.
*Euphorbia pilulifera*, Linn.
*Bridelia retusa*, Spreng.
*Phyllanthus reticulatus*, Poir.
*Phyllanthus Emblica*, Linn.
*Phyllanthus simplex*, Retz.
*Phyllanthus Niruri*, Linn.
*Flueggea microcarpa*, Bl.
*Acalypha indica*, Linn.
*Acalypha malabarica*, Muell.
*Sebastiana Chamælea*, Muell.

Urticaceæ.
*Ficus bengalensis*, Linn.
*Ficus religiosa*, Linn.
*Streblus asper*, Lour.

Orchideæ.
*Habenaria digitata*, Lindl.
*Habenaria platyphylla*, Spreng.

Scitamineæ.
*Curcuma montana*, Rosc.

Amaryllideæ.
*Curculigo orchioides*, Gærtn.

Dioscoreaceæ.
*Dioscorea dæmona*, Roxb.

Liliaceæ.
*Scilla indica*, Bak.
*Gloriosa superba*, Linn.

Commelinaceæ.
*Commelina bengalensis*, Linn.
*Commelina attenuata*, Koenig.
*Commelina obliqua*, Ham.
*Aneilema nudiflorum*, Br.
*Cyanotis fasciculata*, Schultes.
*Cyanotis cristata*, Schult.

Aroideæ.
*Theriophonum crenatum*, Bl.
*Amorphophallus bulbifera*, Bl.

Gramineæ.
*Paspalum sanguinale*, Lamk.
*Chamæraphis spinescens*, Poir.
*Axonopus cimicinus*, Beauv.
*Setaria glauca*, Beauv.
*Apluda varia*, Hack.
*Andropogon monticola*, Schult.
*Aristida Adscensionis*, Linn.
*Sporobolus diander*, Beauv.
*Microchloa setacea*, Br.
*Gracilea Royleana*, Hook.
*Eleusine indica*, Gaertn.
*Eragrostis tenella*, Roem & Sch.
*Eragrostis amabilis*, W. & A.
*Eragrostis pilosa*, Beauv.
*Dendrocalamus strictus*, Nees.

Polypodiaceæ.
*Adiantum lunulatum*, Burm.
*Adiantum caudatum*, Linn.
*Cheilanthus tenuifolia*, Swartz.
*Cheilanthes farinosa*, Kaulf.
*Actinopteris dichotoma*, Bedd.
*Marsilea quadrifoliata*, Linn.

Lycopodiaceæ.
*Selaginella proniflora*, Bak.

# SCIENTIFIC RESULTS FROM THE MAMMAL SURVEY.

BY

O. THOMAS, F.R.S., AND KATHLEEN V. RYLEY.

## IV.

## A NEW SPECIES OF LEGGADA FROM MYSORE.

LEGGADA SIVA, sp. n.

A *Leggada* most nearly resembling *cinderella*, but differing from that species in having a longer muzzle and more rufescent coat.

Size medium. Fur soft and mixed with spines. General colour of fur above drab grey with rufescent tips, base of hair ashy grey. Head, face and ears the same colour as back. Feet as usual white. Tail of average length, about equalling the body without the head, dark above and white below. Under surface white, the hairs grey to their bases; line of demarcation on flanks sharply defined. Skull rather longer than in *cinderella*, the muzzle, as indicated by the lengths of the nasals and diastema, distinctly longer.

Palatal foramina shorter and not extending so far backwards, their end opposite the middle cusp of the first laminæ of $m^1$.

*Dimensions of the type.* (recorded by the Collector). Those of *L. cinderella* placed in brackets.—Head and body 81 (85); tail 56 (65); hindfoot 16 (16); ear 14 (13).

*Skull.*—Condylo-incisive length 22·6 (21·8); zygomatic breadth 12 (12); nasals 10 (9·1); breadth of braincase 11·0.

*Habitat.*—Sivasamudram, S. Mysore. Altitude 2,500 feet.

*Type.*—Old female. B. M. No. 13. 2. 16. 1. Original number 2070. Collected Nov. 20th, 1912, by Mr. G. C. Shortridge. Presented to the National Collection by the Bombay Natural History Society. One specimen only.

"No. 2070 was trapped among rocks, all of the other kinds of *Leggada* being obtained among patches of scrub jungle." G.C.S.

1

2

all nat. size.

3.

P. Gerhardt de

J. Green, Chromo.

THE COMMON INDIAN SNAKES. (Wall.)

Naia tripudians, *poisonou*... 2. *var.* cæca 3. *var* fasciata.

# A POPULAR TREATISE ON THE COMMON INDIAN SNAKES.

ILLUSTRATED BY COLOURED PLATES AND DIAGRAMS.

BY

MAJOR F. WALL, I.M.S., C.M.Z.S.

*Part XX with Plate XX.*

*(Continued from page 28 of this Volume.)*

Proteroglyphous colubrines or snakes with canaliculate fangs in the front of the maxillæ, are divided into two sub-families, *viz.*, *Hydrophiinæ* the sea snakes, and *Elapinæ*, the poisonous land colubrines. The latter included 29 genera when Mr. Boulenger's catalogue appeared in 1896, one of which—*Naia*—contains the subject of this paper. As classified by Mr. Boulenger the genus *Naia* comprises ten species, seven African, one peculiar to the Philippines, and two *viz.*, *tripudians* and *bungarus* denizens of Malayasia.

## NAIA TRIPUDIANS (MERREM).

### THE COBRA.

### (PART I.)

*History.*—As one would expect the cobra is one of the very earliest snakes to receive mention in scientific literature. Long before the inauguration of scientific nomenclature it was referred to. Seba in 1734 appears to have been the first to describe, and figure it. Later in 1754 Linné figured it, and from him it received its scientific baptism under the name *Colober naja*. Laurenti was the next to refer to it under the name *Naja lutescens* in 1768, and then Russell described and figured it in both his volumes which appeared in 1796 and 1801. In addition this authority wrote much on the effects of its poison, and reported many cases of cobra bitten subjects. In the 19th century it is referred to under a host of names by every herpetologist who has written on the Indian snakes.

*Nomenclature*—(*a*) *Scientific.*—The generic name introduced by Laurenti, was borrowed from the specific title bestowed upon it by his predecessor Linné.

"Nag," the Sanscrit word for snake, is most probably the origin of Linné's "Naja," but why the "j" has been substituted for the "g" it is difficult to understand. It is still more difficult to understand why the word once latinised as "Naja," and accepted by every herpetologist as such for over a century, should appear as a

"Naia" in Mr. Boulenger's works.* I notice Professor Stejneger in his more recent work† adheres to the original rendering of the word, and I also prefer to accept this.

The specific title "tripudians" bestowed by Merrem is from the Latin meaning literally "dancing on the toe." This is obviously in allusion to the cobra's characteristic attitude when excited.

(*b*) *English.*—To Europeans generally the snake is known as "the cobra" a word however applied in Portuguese to any snake. The Portuguese always referred to it as the "cobra de capello" or "hooded snake," and for many years subsequent to their occupation of India the qualifying adjective, now obsolete, was retained to distinguish it from the "cobra monil" or "necklace snake" (Russell's viper), the "cobra de aqua, or "water snake," etc., etc.

(*c*) *Vernacular.*—In most parts of India the cobra is known to the natives as "nag," "nag samp," or some variation of "nag." The varieties that natives pretend to recognise, and to which they apply special names are endless. Every juggler has a dozen qualifying terms, at his command, and no two jugglers will agree in the name they apply to a given individual. One hears of "arege nagoo," "coodum (wheat) nagoo, "jonna nagoo," based on colours resembling that of various cereals, "chinta" or "scinta (tamarind) nagoo," "malle (jasmine) nagoo" and "mogla nagoo" based on the names of plants, "cowri nagoo" and "sankoo nagoo" based on the names of shells, "kala nag," "sata nag," and a host of other "nags." Such names mostly emanate from professional snake men, and are of little or no interest, but there are many other local names that deserve mention. "Naya" is the name applied to the cobra by the Singhalese in Ceylon, but in this Island where so much Tamil labour is employed, South Indian names are frequently heard, such as "nalla pambu" (good snake), and "naga pambu." On the West Coast I heard "murukan" literally "cruel," and "sairpoom," both Malayalam words applied to it. In Mysore the Canarese call it "nagara hava." In Bengal where the two forms, *viz.*, the binocellate and the monocellate are associated, the former is known as "naga gokurra," and the latter as "keauthia", according to Fayrer, Ewart, Nicholson and others with "kala" or other qualifying prefixes "Gorhmon" is another name used in Bengal for pale varieties according to Simson.‡ Mr. D'Abreu tells me that in Behar "goh-manna" and "nag" are in use. In the North-West about Rawal Pindi "chajli" or "chajliwalla" is the common name for the cobra. "Chaj," I understand, is the Pushtu for a winnowing fan, which its dilated hood is somewhat fancifully held to resemble. Another Pushtu name in allusion to the hood is, I am told, common

* Faun. Brit. Ind. Reptilia and Batrachia and Cat. Snakes, British Museum.
† Herp. of Japan.
‡ Letters on Sport in Eastern Bengal, p. 239.

about Peshawar, *viz.*, "chamcha-mar" (spoonsnake). The comparison to a flattened spoon is quite a good one, and has been noticed by natives in other parts. "mywe howk," the usual name for the cobra in Burma implies "hissing snake." In the Chin Hills, Venning* tells us, the vernacular name is "tlua-kan." Flower† writing of Siamese snakes says, the cobra in Siam is called "ngu how." The same authority mentions "toodong sta" as the name for it among the Malays at Kedah. Cantor, however, gives the Malay name for it as "ular mata -ari" (sun snake), and Annandale and Robinson‡ "ular tedong sendok kunyit" meaning "turmeric ladle hood snake."

*Varieties.*—I think it wisest in this paper to adhere to the arrangement of the varieties contained in Mr. Boulenger's catalogue (Vol. III, p. 380). Though my notes are voluminous and I have examined many hundreds of cobras I do not consider the material I have worked upon adequate to justify the introduction of another system yet. I have appealed through this journal to our readers to assist our Society in procuring specimens from every part of India, and this may be possible hereafter¶.

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* Bomb. N. H. Jourl., Vol., XX, p. 335.

† P. Z. S. 1899, p. 690.

‡ Fasci., Malay, 1903, p. 168.

¶ From the available literature at my disposal, and the much larger materia contained in my note-books I realise that the classification of the cobra (*N. tripudians*) is a very complicated matter. Stejneger (Herp., Japan, p. 394) suggests that a method based on lepidosis, *i.e.*, scale rows, ventrals and subcaudals is more scientific, and might be productive of a better grouping of the varieties than the scheme laid down by Boulenger which gives primary attention to colour, and hood markings. My own views accord completely with those of Stejneger, and I think that most herpetologists would unhesitatingly allow that lepidosis is of far greater importance than coloration. A scheme based primarily on lepidosis however does not pan out as satisfactorily as Stejneger anticipated, still complicated though it remains it is less so than Boulenger's scheme, and it groups the specimens much more satisfactorily in accordance with geographical areas.

I find that in many localities the variations in colour and hood marks are very numerous, whereas there is a very close agreement in scale characters. According to Boulenger's method a specimen from South India (where the scale rows in midbody are invariably 23 to 25) which has no mark on the hood, is grouped with a specimen from the Punjab without a hood mark, though in the Punjab all the cobras have but 21 scales in midbody!. Into the same group falls the *oxiana* of Eichwald, a variety with a range of ventrals and subcaudals distinct from the cobras of the East of Asia, and with a distinct geographical distribution restricted to the North-Western part of our Indian Empire, and beyond. An anocellate cobra from Burma, Java, or even the Philippines falls into the same group, *viz.*, variety *B. cæca*.

It seems to me this method is as unscientific as it is unsatisfactory. The fact is the colour and hood marks of individuals in many localities are too varied to permit of their being grouped satisfactorily on these characters. As an example, take the cobra referred to usually as the black *cæca*. A typical specimen is black, and bears a hood mark. In Fyzabad, U. P., a uniform black or blackish cobra was the commonest form. Many of these had a perfect "spectacle" mark on the hood, many had a modified or disintegrated "spectacle," some had one or more spots which however were placed in the situation usually occupied by the "spectacle" and some rare individuals had no indication of even a spot. The marks in many of these black specimens are obscure, often so much so

that they escape notice unless specially looked for, and even then are often but obscurely visible or suggested. In Almora again the prevalent cobra is a black one. Just as in the Fyzabad specimens I find some with perfect spectacles, some with disintegrated spectacles, and some with no trace of a mark. Mr. Mackinnon some years ago told me all the cobras in the Dun were black, and without spectacles, but while I was in Mussoorie he sent me one from the Dun on which I found a very perfect and distinct spectacle. Colonel Bannerman sent me specimen of a black cobra with no hood marks from the Central Provinces All his first specimens, I discovered, showed obscure but unmistakable indications of a disintegrated spectacle, and he had some trouble to eventually find a specimen without any mark at all on the hood. Major O. A. Smith told me the common cobra in Multan is a black one with no hood marks. One that he sent me however had a very perfect "spectacle." From this it appears to me conclusive that the form "*cæca*" does not deserve recognition as a variety apart from "*typica*," and only a few deserve the name "*cæca*" as hitherto understood, many being typically spectacled, and a host of intermediate forms cannot be placed in either category, (*i.e.*, *cæca* or *typica* as previously defined).

The only form I saw in Chitral where it was common was the *oxiana* of Eichwald. One specimen however was uniformly blackish instead of being an olivaceous-brown with darker cross bars anteriorly, breaking up later into an irregular variegation. This specimen however accorded well with the ranges of ventrals and subcaudals found peculiar to variety *oxiana*, and not with those characteristic of the black Indian form called *cæca*, which it so closely resembled. Similarly a specimen from Duki, N. Baluchistan without any trace of dark cross bars anteriorly showed a range of ventrals and subcaudals typical of *oxiana*, and not of the Indian forms, and this should thus, I hold, be classed as an aberrant colour variety of *oxiana*.

Mr. Boulenger arranges the varieties as follows :—

"A.—Forma TYPICA (*C. naja*, *L.* ; *N. lutescens*, *fasciata*, *brasiliensis*, *siamensis*, Laur.; *C. rufus*, Gmel.).—Yellowish to dark brown above, with black-and-white spectacle-mark on the hood and a black-and-white spot on each side of the lower surface of the hood. 25 to 35 scales across the neck, 23 to 25 across the middle of the body.

(*a*) One or two dark brown cross-bands on the belly behind the hood.

(*b*) Body variegated with darker, and lighter; belly with several dark cross-bands which may extend across the back.

B.—Var. CÆCA (*N. non-naja*, Laur.; *C. cæcus*, Gmel.; *T. oxiana*, Eichw.).—Uniform pale brown or grey to blackish; no marking on the hood; one or more dark cross-bands on the anterior part of the belly; young sometimes with dark rings. 25-31 scales across the back, 21-25 across the middle of the body.

C.—Var. FASCIATA, Gray (*N. kaouthia*, Less.; *N. larvata*, Cant.; var. *scopinucha*, Cope).—Brown, olive, or blackish above, often with more or less distinct light, black-edged cross-bars; hood with a whitish, black edged ring or U, or with a mask-shaped figure; a black spot on each side under the hood. 25-31 scales across the neck, 19 to 21 across the middle of the body.

(*a*) Body dark brown behind, with light variegations; two to four blackish cross-bars under the anterior part of the body.

(*b*) Olive to blackish above, the skin between the scales black;

lower surface of neck white, with a black cross-bar, rest of lower part dark brown or blackish.

D.—Var. SPUTATRIX (*N. sputatrix*, Boie; var. *nigra*, Gray; *N. atra*, Cantor).—Black or dark brown above and beneath, with some yellow or orange on the sides of the head, and neck; young with a pale U or O-shaped marking on the hood, and the chin and throat whitish. 25 scales across the neck, 19-21 across the middle of the body.

E.—Var. LEUCODIRA.—Brown or blackish; no marking on the hood; lower surface of neck yellowish white, followed by a black cross-band, and usually with an azygos black spot anteriorly and one or two on each side. 21-25 scales across the neck, 17 to 19 across the middle of the body.

F.—Var. MIOLEPIS.—Dark brown or black; sides of head and throat yellowish, whitish in the young; no marking on the hood; young with whitish rings completely encircling the body and tail, and with the white of the sides of the neck extending backwards towards its fellow to form an angular band behind the hood. 21-23 scales across the neck, 17 to 19 across the middle of the body."

To these varieties I can add the following which I cannot place in the above scheme.

In Shillong (Khasi Hills, Assam) I was told by three people independently of a bright green cobra that was in the possession of a juggler shortly before my visit. Unfortunately the man had evidently left the station as I could not trace him. Curiously enough talking to Mr. W. Tottenham, Commissioner of Forests in Dibrugarh, a few days before this he mentioned a bright green cobra that he had encountered in North Siam, at a place called Nan on the Mekong River, but which for want of spirit he could not preserve. On my publishing this information in this Journal * I heard from Mr. H. Hampton from the Ruby Mines, Burma, that the natives there report the existence of a green cobra, but though he has tried for years he has failed to procure a specimen. The Burmans call this snake "indaing-mwe-howk." Further two Europeans told him they had seen this snake, but described it as a bright blue. Shan visitors to the menagerie confirm these statements, and report the snake as rare. Variety *viridis* would be a suitable name for it.

I have examined a curious variety of the cobra from the Andamans submitted to me by Dr. Annandale from the Indian Museum. It differs in colouration from anything I had previously seen, and does not conform to anything I have read of. It is fawn coloured and has well defined, broad, black, chevrons running

* Vol. XVIII, p. 331.

down the back, the apices directed forwards, and the arms ending low in the flanks. The intervals are about one-third to one-fourth the width of the chevrons. Also in the flanks between each chevron is a small black triangular spot. The hood bears a light monocellus. The ventrals and subcaudals are 175 and 65, the scales in midbody 21, and the lepidosis as in a normal cobra except that the præocular shield fails to touch the internasal. If not already christened I suggest for this the name *sagittifera*.

*Dimensions.*—The cobra when adult measures usually from four and a half to five and a half feet. Larger specimens are rare, and six-footers extremely rare. Dr. Nicholson*, who for some time distributed the rewards for poisonous snakes on behalf of the Mysore Government, says that out of 1,200 specimens that passed through his hands at Bangalore only 4 exceeded 5 feet 6 inches, and the largest of these measured 5 feet 8 inches. I have probably examined 500 cobras from various parts of Asia between Baluchistan and Chitral to South China. I have only once seen a six footer and this was sent to me by Mr. P. W. Mackinnon and was killed in the Dun. It taped 6 feet 4 inches. Mr. H. Hampton writing to me from Mogok, Ruby Mines, Burma, early last year, told me he had obtained a specimen of a precisely similar length, which he had sent to the British Museum. He further stated that Mr. Boulenger in acknowledging the specimen told him it was the largest received in that Institution where there are upwards of 70 examples. Mr. Millard has told me of two specimens he has seen, one 6 foot from Khandalla, and another 6 feet 5½ inches, locality not specified. Mr. C. Bateman wrote to me in 1909 that he had killed one of the monocellate variety in the Jalpaiguri District that measured 6 feet 5½ inches unstretched. Writing to Mr. Millard in 1906, Mr. S. H. Pearless said that the four largest examples he had killed at Badulla, Ceylon, measured respectively 5'-11", 6'-0½", 6'-6", and 6'-10½", and he believed specimens running to 7 feet were on record. *The Pioneer* of the 12th February 1908 contained an account of a 7 foot cobra, quoted from the *Times of Ceylon*. It appears that on the 31st January 1908, Mr. Webster whilst motoring Sir Thomas Lipton in Colombo saw a crowd of natives collected on the road. These proved to be watching a hole in which a snake was partly visible. Mr. Webster by means of a noose of rope managed to extract the snake, and kill it, and it was found to be a cobra of unusual length which when taped measured 7 feet. The account further stated that a local taxidermist set up the specimen. On writing to Sir Thomas Lipton he repeated this story to me, and gave me permission to see the specimen in his

* Indian Snakes, pp. 106 and 173.

residence at Osidge. It is set up in the erect posture with open mouth, showing the fangs. I measured it, and found it taped 6 feet 7½ inches. * Our Society has recently acquired a specimen, from Shamshirnagar, 6 feet 7 inches unskinned. Lyddeker † says one has been recorded 7 feet 3 inches in length, but gives no details of the locality where it was found nor the authority who measured it.

*General characters.*—The head is depressed, the snout rather short, with no canthus, and broadly rounded as seen from above. The nostril is rather large, and occupies the full depth of the suture between the nasal shields. The eye is moderate in size, and the round shape of the pupil can usually be well seen in life. In some specimens however the usually distinct arc of gold at the pupillary edge may be so faint that the pupil does not show up against the iris. There is a more or less obvious swelling in the temporal region over the underlying poison glands. The tongue is blackish at the tips.

The shields on the head are highly polished. A neck is scarcely if at all evident. Just behind the neck the hood commences, and is discussed later. The body is depressed, and there is a more or less distinct narrow groove down the spine. The scales over the back like those on the head are highly polished. The body maintains a fairly uniform girth throughout. The tail is short, and accounts for from one-fifth to one-ninth the total length.

It is very interesting how much the relative length of the cobra's tail differs in various localities, and I wish in my earlier days I had been more careful to record this, for it may, I think, assist in the difficult question of the classification of the varieties. I find that in Cannanore the tail in ♂ ♂ was one-eighth the total length, and in ♀ ♀ about one-ninth. In Fyzabad and Almora the tail is about one-sixth in both sexes. In Chitral it was also about one-sixth, and often in males only two-elevenths. In the Punjab it was as much as one-fifth in some males, and from one-fifth to one-sixth in females. In Burmah it was usually one-sixth in males, and varied from one-fifth to one-seventh in females.

*Identification.*—This is easy if attention is paid to the lepidosis. The presence of the little "cuneate" scale between the 4th and 5th infralabials (see ‡ Diagram Cun.) will declare the snake a cobra among all *land* snakes. It is found in many of the sea snakes however. Rarely two such scales exist in the cobra, but it is very rarely absent on both sides. Another important relationship is that of the præocular with the internasal shield. (*Vide* figure Pra. and Int.) This is only seen in the snail snake, *Amblyo-*

* Jour. Bom. Nat. Hist. Soc., Vol. XXI, p. 718.
† Royal Nat. Hist. Reptilia and Fishes, p. 223.
‡ Will be published in the second part.

*cephalus monticola* peculiar to the Eastern Himalayas, the Assam Hills, and Nicobar Islands, and as an abnormality in the little *Xylophis perroteti* known from the hills of Southern India. In neither of these does the 3rd supralabial shield touch the eye as it does always in the cobra.

If a typical hood mark is present either of the monocellate, or binocellate type the diagnosis is also easy, but in many specimens there is no hood mark at all, and in death rigor mortis stiffens the joints so that the hood is not easily demonstrable. It is for this reason that attention to shield characters is recommended. If the hood is seen dilated in life there should not be any doubt about the snake, but it must be remembered, that the hamadryad (*N. bungarus*) has a well developed hood and that other snakes flatten the neck to a more limited degree. The cobra has been confused by Europeans and natives with the *Pseudoxenodon macrops* in the Eastern Himalayas, and Assam, and Burmese Hills, and with the *Zamenis fasciolatus* a snake common in the Western Ghats, but also known from the Eastern Ghats, and the Ganges Valley.

*Disposition.*—The cobra is usually not an aggressive snake. When flushed in its native haunts it nearly always tries to escape, and usually succeeds in doing so, but is often shot before it gets to a place of safety. I have encountered many, and find that at close quarters if suddenly disturbed, or it may be if stepped upon, it quickly erects itself, hisses loudly, sways backwards and forwards and awaits its opportunity to strike. If one keeps still, the menace is quickly over, and the snake drops its head, and slinks off. An incautious movement however causes it to turn, erect itself once more, and challenge the intruder again. Many good observers have remarked on its timid nature. Mr. Phipson even went so far as to describe it as an exceedingly timid snake. Elliot* says : "Of one thing I feel certain, the cobra is a timid snake, that it is not at all inclined to bite, and unless assailed, and so infuriated will not bite, even if trodden on by accident so long as the snake is not hurt." He cites two cases known to him where a cobra was actually stepped on, but in neither case did it inflict a bite. Wall (A. J.) remarks that a full grown cobra can be handled with perfect safety, and Flower mentions one that was picked up in his garden by a servant, and brought to him alive not having attempted to bite him.

In Chitral one day an adult passed right through my pony's legs, whilst I was walking along the road with another mounted officer. The snake did not even erect itself though in danger of being trodden upon, but glided through the pony's feet, and then when three or four yards distant turned, half erected itself for a second, and then

* Gold, Sport, and Coffee Planting in Mysore, p. 164.

glided off down a bank. I could quote many more incidents and opinions illustrating the unaggressive temper of this snake, but on the other hand I have certainly witnessed many incidents of a completely contrary character. The cobra is sometimes very fierce, and when disturbed may be a very dangerous snake to encounter. Whatever spirit and aggressiveness may be natural to it in the early days of captivity, I think all will agree that it is very easily tamed. This is evident to anyone who has seen jugglers, and professional snake-men with their captive specimens. If a specimen has been on show for long, it will often require a good slap on its back to provoke it to erect itself and hiss. The cobra that will do so without such treatment one may depend upon it has been but recently deprived of its liberty.

Young cobras are much more dangerous than adults as a rule. They seem more on the alert, more easily excited, and strike repeatedly and with much malice. Wall (A. J.) speaks in similar terms when he says: "When the young cobra is hatched, it is very small, very irritable and exceedingly dangerous. A full grown cobra can be handled with perfect safety, but a young one, ten or eleven inches long, is so active, and its body is so small, that it can be scarcely touched with impunity." It is certainly significant that one never sees a young cobra in the hands of jugglers.

The cobra's effective striking range is a very limited one. I believe the erection of its forebody and the expansion of its hood are invariable preliminaries, and the height to which it can erect itself forms the radius of its stroke. This radius when the snake is erect is very deceptive, appearing much greater than it proves to be when measured along the ground on the completion of its stroke. Jugglers from long practice estimate this range wonderfully, and contrive to evade their captive's menace, with remarkable precision, withdrawing their hands often only a few inches from the spot where the stroke is delivered.

The bite is often a mere snap of the jaws, and the bitten part immediately released, but sometimes the snake will fasten itself tenaciously, necessitating a forcible opening of the jaws to effect release. Mr. Donaghy told me of an incident witnessed by him where a young sampwalla was bitten, and the snake hung on to him so that it had to be removed by forcibly prizing open the jaws. Sometimes after a bite a drop or more of venom may be seen on the skin of the bitten subject which may be wiped off without gaining access to the punctures inflicted. More rarely poison is shaken off in the form of a spray or jet by the forcible thrust forward of the snake, which may fail to reach the object of its attack.

I have on more than one occasion witnessed this with jugglers who unconcernedly wiped away the poison emitted. In our

Journal* Mr. Goring Jones reported a cobra at Mandalay striking at Lieut. Gibson who was bending down near the snake. He was not actually struck, but had poison ejected into his eye, much swelling and pain following. A Hospital Assistant of mine, whilst trying to dislodge a cobra that had taken refuge in the wall of his garden, had a jet of poison ejected into his face. Mr. Kinnear tells me that in our Society's rooms it is a matter of common observation that cobras "spit" at spectators and leave a spray on the glass. One may presume that some such incident caused Boie to christen one variety of our Indian cobra *sputatrix* (spitter). The habit is well known among certain African cobras, notably *N. flava*, *N. nigricollis*, and perhaps *N. melanolenca* † I believe the venom ejected is shaken off the fangs, and carried forward by the vehemence of the thrust. In some instances, however, where a shower of spray is reported it is more probably caused by the explosive expiratory blasts from the glottis which occur while the snake is hissing, and to which I refer again later.

*Haunts.*—The Cobra may be found almost anywhere. I have encountered it in heavy jungle, and in open country far removed from forest growth. The ryot disturbs it in his crops, the mali in Cantonment gardens, and the sportsman when quail, partridge or hare shooting. It is a common snake in almost every populated area, and I have had it sent to me frequently from within Cantonment limits, from the regimental and other bazaars, from Artillery and other lines, the suburbs and actually in the gardens of our largest towns, from inside jails, the godowns of the Supply and Transport Corps, and the Telegraph and such like departments, from the warehouses of various mills, and such like situations. No amount of bustle or disturbance seems to deter it from taking up its abode in man's immediate vicinity. It was sent in to me several times in Rangoon from timber yards, where hundreds of men were working daily, elephants pounding up and down moving timber, engines vibrating and throbbing and circular saws screeching through boles of teak. Even in such scenes of turmoil it will establish itself beneath a stack of wood, or convenient drain, and escape dislodgment for long periods.

Old masonry invariably harbours cobras among other snakes. In Delhi the old walls of the Fort were always a safe draw for the snakeman whom I saw every week bring in his bag—some half dozen or more—to be robbed of their poison, which was being collected for the Government of India. Similarly old cemeteries, and ruined habitations, mosques, etc., furnish ideal quarters for

* Vol. xiii., p. 376.

† The spitting snake of S. Africa is usually admitted to be *Sepedon hæmachates* the "ringhals" of the Dutch.

this snake. Another favourite haunt is the loose brick work of old wells. The basements of many houses in Cantonments and bazaars can boast a cobra tenant, and it is not surprising therefore that this snake is so frequently encountered inside bath-rooms, and dwelling rooms, besides stables and servant's habitations. Further afield an ant's nest is often a specially favoured resort, or it may be any hole in the ground, or at the basement of a tree among its roots. It is frequently found near water, and often actually in that element, in which it swims with facility and strength.

A few cases of cobras climbing trees are reported, the object usually being the plunder of some bird's nest.

It has been occasionally reported in the sea, perhaps carried thence by rivers in flood time, but sometimes no river being in the vicinity it must have taken to the sea of its own free will. In one instance a four footer is said to have managed to board a man-of-war, *viz.*, the Wellington, lying off the Coast of Ceylon at Aripo.* Another account of the incident † however, says that the sailors saw the snake in the sea swimming vigorously towards the ship, and assailed it so successfully with billets of wood and other missiles that it returned to land. Bassett Smith in this Journal‡ mentions one fourteen inches long trying to board the flagship at Trincomalee when lying out about half a mile from land.

*Food.*—The cobra feeds principally on rats, frogs, toads, and less frequently on birds and it seems to show no special preference for any of these creatures. Its choice in batrachians is largely determined by their size, the most bulky individuals being apparently those most sought after. Thus among frogs it is the bull frog, *Rana tigrina*, which is most usually victimised, and among toads *Bufo melanostictus*, and *B. andersoni* receive special attention, and internal accommodation. Rats and mice are very frequently taken, and I think there can be no doubt the numbers of these vermine are materially checked by this snake. I was astonished in Bangalore some years back to see with what avidity the captive cobra belonging to a juggler, accepted dead mice which he withdrew from his pocket. The man offered them as one would a morsel to a dog and one of his cobras nosed its snout into his hand, and took three mice, swallowing them one after another in a couple of minutes or so. Other creatures are taken as circumstances dictate. The Rev. C. Leigh, S.J., writing from Trichinopoly of his captive specimens told me that after eating two small frogs, and then three middle sized ones, one cobra finally disposed of two squirrels (*Sciurus palmarum*). Sometimes birds are attacked, and

* "Ceylon" by an Officer late of the Ceylon Rifles, Vol. II, p. 89.
† Tennants' "Ceylon," Vol. I, page 193-4.
‡ Vol. XI, p. 547.

killed, especially poultry. In Fyzabad one got under a hen coop one night in a native hut, and killed the hen and six chicks. The snake met its death the next night, swallowing a frog bated on a hook. On another occasion one got into a quailery in Fyzabad, and accounted for 13 birds in the night. One only of these had been swallowed, and it seems to me likely that some or all the rest may have died from fright. Only recently in Almora an officer whilst quail shooting flushed a cobra which he shot in attempting to escape down a hole. The snake was cut in half by the shot and a freshly swallowed quail fell out of the stomach. Ferguson* mentions one in this Journal, that was brought in to him at Trivandrum enormously distended. It measured four feet, and contained a monitor lizard (*Varanus bengalensis*) two feet long. Phipson mentions lizards being taken by the young in our Society's rooms. Occasionally the cobra exhibits ophiophagous tastes. Mr. Millard tells me that one in our Society's rooms ate another with which it was caged, both snakes having seized the same frog, and commenced eating from opposite ends. On another occasion one was observed to eat a wolf-snake (*Lycodon aulicus*). Mr. Frere recently sent me a young example measuring 14½ inches, that was eating a *Lycodon aulicus* measuring 13½ inches. I saw one once in a well in Trichinopoly in the act of devouring a gamma snake (*Dipsadomorphus trigonatus*). Colonel G. H. Evans found one in Burma eating a young snake of the genus *Simotes*. Mr. Kinlock wrote to me of one he encountered at Kil Kotageri. It measured 5 feet 7 inches, and was engulfing a dhaman (*Zamenis mucosus*) 6 feet long. Flower† again mentions one in Siam swallowing a snake (*Macropisthodon rhodomelas*.) Here I may mention that the cobra itself sometimes falls a victim to its larger and more confirmed ophiophagous relative the King cobra (*Naja bungarus*).

Some interesting accounts have appeared in this Journal of cobras eating the eggs of poultry. Mr. C. P. George recovered the egg of a guinea fowl from a cobra's interior, which he set, and in due course hatched out. Miss Hopley in her book on snakes (p. 60) records an exactly parallel incident.

In this case however the egg was a hen's. It was marked after extraction and placed under a guinea fowl, and successfully incubated. Mr. Brook Fox records a cobra that had got into a guinea fowl's nest, and had eaten 6 of the 15 eggs. It was photographed in this state. The eggs were subsequently removed, and set and 3 eventually hatched out. After the publishing of these events Colonel Bannerman experimented on cobras in the Parel Laboratory, to ascertain how long it took for the egg shell

* Vol. X, p. 75.
† P. Z. S., 1896, p. 894, Vol. XVI, pp. 174, 363, 369 and 395.

to dissolve under the influence of the gastric pieces, and he found that it required about 48 hours. Inspection of the subsequent excrements showed in one case that a few pieces of egg shell were discharged 16 days after the experiment.

In captivity many specimens feed eagerly, and thrive well. Mr. Phipson wrote that those in the Society's rooms "fed freely on rats, birds, and toads." Similarly Ferguson said those at Trivandrum took large frogs "with avidity." The Rev. C. Leigh wrote to me that one of his captive specimens ate "rats with relish," and two others "took frogs with avidity." On the other hand Dr. Nicholson speaking of cobras in captivity says "I have never seen a cobra feed and I think that unless fed by force he will starve himself to death." This statement coming from such an authority is remarkable, but it would appear from the methods of some professional snake-men that they too find some of their specimens difficult to tempt with food, for many carry with them a small natural funnel which appears to be part of the shaft of the tibia of a goat, which they insert into some cobras' throats, and into which they break a fowl's egg, or pour milk.

*Habits.*—The most notable habit in the cobra is the very remarkable pose it adopts when alarmed and which has gained for it world-wide renown. Not only does it erect the forebody to a remarkable degree, but it flattens its neck in a very remarkable, and characteristic way to form the so called "hood." The height to which a cobra can erect itself is usually very much overestimated by the casual observer. I have taken careful measurements on several occasions, marking off the height on a stick when the snake's attention was engaged by a juggler. The measurement of the whole snake in life is not easy, and the lengths given must not be taken as very exact. I found the degree of erection commensurate with the degree of excitement or provocation. One snake measuring 5 feet 2½ inches poised vertically to a height of 13 inches, another 5 feet 4 inches long sat up 15½ inches, a third 6 feet and ½ an inch raised itself 14 inches, and a fourth 5 feet 1 inch, only 7½ inches. On the 20th August 1904 in Bangalore I found a 5 footer just sat up 15 inches, but on the next day in the presence of a mongoose that was causing him much agitation the same snake erected itself 21 inches. Another cobra 1½ inches less in length raised itself just 21 inches under similar provocation. It may be taken then that the maximum limit of erection is about one-third the length of the snake.

The so called "hood" is formed by the action of muscles operating upon the ribs in the region behind the neck. I have examined a skeleton in the museum of the Royal College of Surgeons, London, which is well set up in the erect position, and with the ribs fixed as they would be in the expanded hood in life. The

atlas (1st vertebra), axis (2nd vertebra), and the 3rd vertebra have no ribs, but the 3rd has an elongate rib-like transverse process. The succeeding 27 vertebræ have ribs attached to them that are involved in the production of the hood. These ribs are much less bowed than those in the rest of the body, and enjoy a range of movement greatly in excess of the other corporeal ribs. The 9th is the longest on the left side, and measures 41 mm., and the 10th measuring 42 mm. is the longest on the right side. The preceding and succeeding ribs progressively diminish so that an oval outline is given to the hood. The ribs are set obliquely forming an angle of 40° to 45° with the long axis of the spine. In the prone state they are directed backwards, outwards, and downwards, and give a contour to the body almost like that in other parts. In the erect pose the corresponding direction of the ribs would be downwards, outwards, and forwards, but any forward tendency is entirely obliterated by the action of a set of dorsal muscles that not only draw the ribs back till they are completely transverse, but also fully straightens them. During full expansion judging from freshly dissected hood, I think the ribs are also slightly elevated, and the angle made with the spine thereby rather increased. As the overlying skin is but loosely attached it does not in any way hamper the movements of the ribs within, which by their backward extension and elevation enormously stretch it in a lateral direction, at the expense of the ventro-vertebral diametre. The oval shape of the hood, and the flattening produced has been well compared to a shallow spoon, or skimmer. The hood originates high up in the nape, and the head bent strongly at the atlas joint is carried at right angles to it when spread. The arching of the forebody and general pose and movement of the cobra when erect remind one very forcibly of the carriage of a swan's neck. The dorsal skin is very much stretched when the hood is expanded, so that the scale rows are widely separated (see our plate) and as the hood marks are almost entirely confined to the skin, they become very conspicuous. The curious poise adopted can be sustained for a considerable time, certainly many minutes if sufficient stimulus is offered, and continued. Whilst poised with expanded hood the snake sways restlessly forwards and backwards and can be made to bend backwards to an extraordinary degree before losing its equilibrium. It hisses in a fierce explosive manner whilst erect and I have carefully observed caged specimens at this time. I noticed that hissing occurs both during inspiration, and expiration. The inspiratory is the shorter act, and its note higher pitched than the expiratory. It is quavering in quality, reminding one of a knife on a grindstone. The expiratory effort is the longer, louder and lower pitched and intermittently explosive in character. The tongue is emitted during both inspiration and expiration. The

throat is very distinctly pouched during both acts, but is far more marked during expiration. The inflation extends as far forwards as the chin shields. Whilst erect the snake inflates its body independently of its hood action, and the inflation affects nearly the whole body length, declining posteriorly till finally lost a few inches before the vent in an adult.

One of the most interesting matters in connection with the cobra affects that ever fruitful subject of discussion "charming." It is clear that many very competent authorities disbelieve in the practice. Mr. Phipson says "it is the constant movement of the musical instrument in front of the snake that keeps it erect and not the noise produced," and this is precisely what many other good observers state. I certainly take this view myself, and came to this conclusion very early in my Indian career. One thing puzzled me at first and aroused my suspicion, *viz.*, why is it that in all the stories one reads of "charming," it is invariably the cobra that withdraws from its snug retreat, whilst other snakes apparently are not susceptible to the captivating (?) sounds of the juggler's pipe? I know of no anatomical difference in the auditory apparatus of cobras from other snakes. I experimented frequently in Delhi in my verandah with cobras. I cut narrow strips of sticking plaster, sufficiently broad to cover the eyes completely. These strips had a double purpose. Not only did they blindfold the subjects of experiment, but being carried right round the head they locked the snake's jaws, and so prevented any chance of my being bitten. This done the snake was released, and in a very short time it relaxed its hood, and assumed a completely recumbent attitude. The verandah in which the first of these experiments was carried out was a crazy wooden structure, and if one moved a chair, or even if a servant walked along the room inside, the snake immediately erected itself as if conscious of danger. On the cement verandah downstairs, it was also noticed that the snakes immediately got up when any one walked along in the near neighbourhood. I had a kerosine oil tin at hand, and when the snakes were recumbent I beat this with a stick close to their heads without their taking any notice whatever. Similarly I blew a bugle close beside them, and if an amateur's attempt at bugling failed to rouse them they must indeed be deaf. The greatest care is necessary in conducting such experiments, to eliminate all other possible means of rousing the snake. For instance if a rusty tin is beaten over the snake, particles will fall on it, and rouse it to attention. Similarly if the blast of air emitted from the bugle, impinges ever so little on the snake, it is roused to action, and erects itself.

Many people suppose that a snake is deaf, but this is not the case. Snakes hear well though they have no external ears. Many

people are not aware that there are two ways in which the essential auditory apparatus may be stimulated, and sounds heard. If one strikes a tuning fork, and places the stem on any part of the skull, or even the spine to its lowest part, the vibrations can be heard distinctly. If the head is in contact with a table, and the tuning fork struck, the sound is audible when the stem is placed on the table at some distance though inaudible when not touching the table. This is due to the conduction of vibrations through solids and such vibrations are better heard, and for a longer time than those conducted by waves of air which strike upon a membrane "the drum," situated at varying depths (according to the particular animal) in a canal in the skull (the external auditory meatus). The drum set vibrating acts through a chain of tiny bones in the middle ear, so as to affect fluid contained in semicircular canals in the internal ear, the fluid in its turn communicating the vibrations to highly specialised sense organs at the termination of the filaments of the auditory nerves. These nerves carry the impulses received to the brain centres where they are interpreted as sounds. This latter method of conduction, *viz.*, by means of the air is the predominating one in mammals, birds, and many reptiles, but is entirely wanting in all snakes, there being no external orifice, and no drum to receive impressions. Conduction by solids is however good in snakes, perhaps for all we know more highly sensitive than in man.

Now it is obvious that if snakes have no ear openings and no drums they cannot hear sounds conducted by air, such as those emitted by musical and other instruments. This accounts for the cobras taking no notice of the noises I made at close quarters, though they were keenly alive to sounds such as footsteps communicated through the ground. If one is to believe the wonderful stories, told in good faith I have no doubt, about "charming," one must explain it by assuming that snake charmers are possessed of some occult force not apparent to the spectators, for it cannot be explained through the agency of sound conducted by air. As a matter of fact a snake charmer in Bangalore with whom I had become very familiar admitted to me that snake-men knew that snakes were deaf, and that the whole of their "charming" was a hoax. It is most certainly the incessant movement of the man's arms while piping, or the restless movements of his knees while squatting that affords the necessary stimulus, and keeps the cobra excited, and erect.

It is very curious how all absorbing movement is to the cobra. Mr. Phipson says "you have only to attract its attention with one hand, while you seize it in the middle of the body with the other and the snake is yours. It strikes in every direction *especially at any moving object*, but it never seems to occur to it to turn, and bite

the hand that is holding it as almost all other snakes would do at once." I fully agree with all Mr. Phipson says on this subject, and consider this strange trait argues a very great lack of intelligence.

The cobra seems to show a decided tendency to a social life. Many writers have remarked upon its habit of living in couples, and this is specially true during the breeding season. It appears however to seek society apart from sexual impulses for on one occasion in Rangoon two were brought to me found coiled together beneath a stack of wood, and both proved to be females. On another occasion, also in Rangoon, a Burman dug out a hole where he had seen a snake make good its escape. The result was the discovery of three cobras. Two of these were males, and one a female which showed ovarian follicles obviously fertilised and enlarged. This leads one to ask the question does the cobra on occasion practice polyandry? Mr. Fitzgerald once told me that he saw three large snakes go into a hole in his compound within a few minutes. He had possessed himself of his gun as speedily as possible, and shot the third snake before it had quite disappeared, and this proved to be a cobra. He assumed the others to have been of the same species but unfortunately did not verify his suspicions.

The cobra is frequently abroad during the day. I have several times met one when bird nesting, shooting or out after butterflies. Many of these were obviously not roused from a siesta, but were roaming about I suppose in search of food or drink. In populated areas it is perhaps more frequently encountered at night. Mr. Hampton tells me his captive specimens did not usually show themselves until mid-day, or the early afternoon, and remained out till about 10 p.m.

Like other snakes it suffers from thirst, specially in the hot weather, and I daresay that many of its intrusions into bath-rooms and its lodgment in catch-pits and wells may be accounted for in this manner. I saw one in the possession of a snakeman in Cannanore that dipped its head into a tin of water presented to it, and drank greedily, each gulp being plainly visible in the throat.

(*To be continued.*)

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# A LIST OF KALAW BIRDS, WITH BIRD-NESTING NOTES.

BY

J. P. Cook.

My collection and observations were made during the month of April 1912. The area covered was in the immediate vicinity of Kalaw, with exception of two days' collecting at Wetpyuye, about eight miles to the west, with an elevation of 3,200 feet.

Kalaw is situated about 60 miles to the south-east of Thazi, a railway town of the Meiktila District, Upper Burmah. It is a small village of the Southern Shan States, but will shortly become a rather important station on the Southern Shan States Railway, and also probably a popular Hill Station.

The country round Kalaw, with exception of one or two abrupt ridges, is undulating, and is wooded for the most part with pines. There is a certain amount of scrub and secondary jungle between the plots of cultivation, consisting chiefly of longish grass, wild raspberry bushes, and a sprinkling of secondary bamboo. The ridges are rather rocky, the vegetation consisting mostly of long grass and oak trees.

Colonel Rippon contributed a list of the birds he and Mr. E. W. Oates collected at Kalaw to "The Ibis" for July 1896 and January 1897, which he has very kindly given me permission to quote. I have decided therefore to include all the birds he records in the following list in addition to those which I myself collected. Colonel Rippon's list numbered 109 species. The following list contains 129, or 20 additions.

I should like to take this opportunity of thanking Colonel Rippon for the help and encouragement he gave me in my collecting, and for forwarding to the Natural History Museum specimens of a species, the identification of which we were doubtful. This has now been identified as *Chrysomitris ammbiguus*, The Yunnan Siskin.

I think it probable that the following list of Kalaw birds is far from complete, and that there is still plenty room for additional discoveries. There are many birds recorded by Col. Rippon from the Southern Shan States as being found at elevations corresponding with that of Kalaw, but which neither I, nor does Col. Rippon appear to have, found at Kalaw itself.

For example, Col. Rippon records the following Laughing Thrushes from Southern Shan States in "Ibis," Vol. I, page 529, October 1901 :—

*Garrulax pectoralis* (72)—"Reaches up to 4,500 feet."

*Trochalopterum melanostigma* (86)—"Fairly common above 3,500 feet."

*Trochalopterum ripponi*.—"This is the commonest of all the Laughing Thrushes found in the Southern Shan States at elevations from 4,000 to 6,000 feet."—Rippon, "Ibis," page 529, Vol. I.

(Note—Numbers in brackets correspond to numbers in Fauna, B. I. (Birds).

## List of Kalaw Birds.

1. *Corvus macrorhynchus* (4)—The Jungle Crow.
2. *Corvus insolens* (8)—Burmese House Crow.

*Note*—I include this as doubtful. I did not actually shoot bird.

The former of the above pests is much the commoner at Kalaw. I found a nest placed at the very top of a high pine tree, close by the house I was occupying. According to Oates, it is unusual for this crow to nest close to human habitation. But *Corvus marcorhynchus* is a very bold bird at Kalaw usurping the place of its congener *Corvus insolens*.

3. *Pica serica* (10a).—Chinese Magpie.

I did not observe this bird myself, although Col. Rippon records "*Pica rustica*," but probably referred to above species, as *Pica serica* at the time he drew up his list had not been distinguished as a sub-species.

I found what I took to be at the time *Pica rustica* (now *Pica serica*) very common east of Taungyi some years ago, and I think the occurrence of *Pica serica* as far west as Kalaw is rare.

4. *Urocissa occipitalis* (12)—Red-billed Blue Magpie.

Extremely common birds at Kalaw, and, if a poacher, must be responsible for the destruction of many nests. They are, however, I found, very fussy where their own family arrangements are concerned, the present bird of a nest, containing apparently young, being very pugnacious and fainting attacks at a party, of whom I was one, and at the dog accompanying us, when the nest was approached.

5. *Garrulus leucotis* (25)—Burmese Jay.

I met with this bird several times in the Oak country. I was fortunate in finding a nest with a nice clutch of 5 eggs on the 21st of April, on an isolated hill, about 5,000 feet elevation, sparsely wooded with oak. The nest was situated about 10 feet from the ground and built on the fork of a lateral branch, close to its extremity. The parent bird sat very tight, and had to be driven from the nest. The eggs were slightly incubated. In colour they corresponded with the uniform pale green type, with a dark zone round the larger end, and with very fine black streaks, as described by Major H. H Harington (J. B. N. S Vol. xx., page 1004). The nest, although rather bulky and outwardly roughly constructed, was not very conspicuous, owing to the twigs of which it was built harmonizing very closely with its surroundings. I found another Jay's nest on the 28th of April, situated in a very similar site, and of the same construction, containing two young birds and an egg.

6. *Parus commixtus* (32c).—Chinese Grey Tit.

Col. Rippon recorded *Parus minor* from Kalaw, but as the sub-species was described since he compiled his list, I fancy the bird he refers to is identical with abovenamed sub-species.

I found this bird very common at Kalaw in the pine woods, but I failed to find any nests until just a day or two before the end of my stay. This nest was, however, deserted after one egg had been laid. It was composed of a pad of moss and a few feathers, and situated in a deep crevice of a partially rotten and much charred pine stump, about a foot from the ground.

7. *Ægithaliscus pulchellus* (36a).—Rippon's Tit.

Recorded by Col. Rippon from Kalaw, but I failed to find any birds.

8. *Machlolophus spilonotus* (41)—Black-spotted Yellow Tit.

Recorded by Col. Rippon, but I myself did not observe it.

9. *Dryonastes sannio* (67)—White-browed Laughing-Thrush.

An extremely common bird. I found many nests, all situated in thick bushes. April seems to be the chief breeding month, as all the nests I found contained fresh eggs, and with one exception the clutch was three eggs. The exception contained four eggs. All eggs were very pale blue in colour, the average measurements being 1·1″ × 3·8″. The dates on which I took clutches were April 8th, 12th, 15th, 18th, 22nd and 27th. The nests were very compactly built, being composed externally of rough grass and bracken. The inside cup-shaped, roughly formed of leaves, and neatly finished off with fine grass.

10. *Pomatorhinus nuchalis* (117)—Tweedale Scimitar Babbler?

I record this bird from Col. Rippon's lists. I shot several birds which took to be *P. nuchalis*, but decided, on examining them, that they were

*P. olivaceus*. On comparing my skins with series in the Natural History Museum, however, I found they differed from the series of skins labelled "*P. olivaceus*" in museum, but exactly corresponded with series labelled "*Pomatorhinus olivaceus ripponi*," and I think it is just possible that the bird Col. Rippon records may belong to this species.

11. *Pomatorhinus ripponi* (118a)—(Bull, B. O.C., Vol. XXXII, page (9).

Common on the grass lands. I found two nests—the first on the 7th of April containing three eggs on the point of hatching; the second nest, with also three eggs, but quite fresh, I found on the 23rd. Both nests were globular in shape, and composed of coarse grass loosely woven. The former was placed on sloping ground between the stems of a clump of tall grass; the other nest was placed on flat ground, but amongst thin grass. The nest was so moulded into a little depression that the top of the nest was little above the surrounding ground level. The eggs were pure white and elliptic in shape, and measured—one egg 1" × ·70", two eggs, ·99 × ·69.

12. *Pomatorhinus imberbis* (129a).

Fairly common, but not so common as last species, although being found in much the same sort of country.

Curiously enough, I found this bird's nest within a few feet of the nest of *P. ripponi*, although on a different date. Both were found on a small patch of thin grass and a little scrub-jungle, one of the few of such like that had not been burnt. Cattle were regularly grazed over it, and much of the grass had been trampled down. It is a marvel the nests had not been destroyed before I had the good fortune to find them.

The nest of *P. imberbis* was constructed very much like that of *P. ripponi*, but larger and rather more clumsily built of coarse broad grass stems and lined with fine grass. When first found, the nest contained only one egg, which I left in the hopes of obtaining a full clutch; but, although I waited until the solitary egg was almost incubated, no more were added, much to my disappointment. The egg was in shape similar to eggs of *P. ripponi*, and pure white, measuring 1·05 × ·80. Date, 13th April.

The parent bird was very cunning in its attempts to elude detection on leaving its nest. The first occasion on which I approached the nest I saw something brown scuttle away from the spot through the grass, which I mistook for a squirrel, but this, after it had gone some distance, I discovered was the bird, its tail trailing on the ground. I made a second attempt to shoot the bird off its nest, but it eluded me, and I eventually had to wait and shoot it as it stealthily and cautiously returned.

On the 28th of April I shot a nestling, which was at the time in company with its parents, and just able to flutter from tree to tree. As the plumage of the immature bird does not appear to have been hitherto recorded, I append a description of it.

*Upper Plumage* similar to that of adults. Also colour of soft parts.

*Lower Plumage* differs from adult in the extreme point of chin only being white, a few adult white feathers appearing on the throat. The remainder of plumage bright rusty, paling to whitish on the abdomen.

Measurements of immature *P. imberbis* compared with adult bird :—

| | Adult. | Immature. |
|---|---|---|
| Bill .. .. | 1·4" .. .. | 1" |
| Wing .. .. | 3·5" .. .. | 3·2" |
| Tarsus .. .. | 1·4" .. .. | 1·2" |
| Length .. .. | 8·8" .. .. | 6·8" |
| Tail .. .. | 3·5" .. .. | 8·2" |

13. *Pyctorhis sinensis* (139).—Yellow-eyed Babbler.

Recorded by Col. Rippon.

14. *Pellorneum minus* (143).—Sharpe's Spotted Babbler.

I had some doubts as to the identification of the parent bird of a nest I found. The bird differed from *P. subochacheum*, in having pronounced cream edges to the feathers of the side of the neck, almost forming a complete necklace, and on comparing the skin with series of skins in South Kensington Museum of both *P. minus* and *subochacheum*, I found my specimen corresponded with *P. minus*.

The nest was placed on the edge of a path across a slope, where dried leaves had accumulated. The roof of the nest was covered with leaves, and as it was almost flush with the leaf-strewn ground, was very difficult to see; indeed had not the bird flown out of the nest at my feet I probably should never have found it. The nest was domed in shape, constructed of coarse grass, and lined with fine grass. The eggs, three in number, were quite fresh. Colour white, densely marked with purplish and reddish-brown spots. Date—25th April.

15. *Stachyrhidopsis rufifrons* (173).—Hume's Babbler.

Not observed at Kalaw, but shot at Wetpyuye, 8 miles to the West, in low bamboo jungle. Elevation 3,200 feet.

16. *Mixornis rubricapillus* (176).—Yellow-breasted Babbler.

Not found at Kalaw. Fairly common on the Ghaut, 1,200 feet, where I found two nests on May 1st containing hard set and fresh eggs respectively.

17. *Myiphoneus eugenii* (188).—Burmese Whistling Thrush.

Only one seen at Kalaw along a small wooded stream, one of the two in the neighbourhood. This bird is very common on the road up the Ghaut, where it runs along a fairly large stream.

18. *Lioptila melanoleuca* (206).—Tickell's Sibia.

Col. Rippon records having once obtained this bird at Kalaw. I did not observe it.

19. *Lioptila castanoptera* (207).—Fea's Sibia.

Very common in the scrub jungle, and although from examination of specimens I shot they appeared to be breeding, I failed to find a nest.

20. *Actinodura ramsayi* (212).—Ramsay's Bar-wing.

Occasionally met with in the thickets. Breeding in April, but did not find nest.

21. *Zosterops aureiventris* (227).—Hume's White-eye.

22. *Zosterops simplex* (228).—Swinhoe's White-eye.

Col. Rippon records both of above species from Kalaw. I obtained birds, the parent birds of nests, which I at the time took to be, of each above-named species respectively. Col. Rippon remarks ("Ibis," Vol. I, page 534) that the former "appears to me to grade into the next species." This is exactly what I found. Certainly the amount of yellow on the abdomen of one of my specimens was rather conspicuous, and this I named *aureiventris*, but on comparing the skins with the series of skins named "*Z. aureiventris*" in the South Kensington Museum, I found my bird had not the very decided band down the abdomen of the Museum series, also the colour of the back much more resembled *simplex*, being of olive instead of yellowish green, the tail also being longer. I therefore came to the conclusion that my specimens were *Z. simplex*.

23. *Pteruthius æralatus* (238).—Tickell's Shrike Tit.

Recorded by Col. Rippon.

24. *Ægithina tiphia* (243).—Common Iora.

The only bird of this species I met with was carrying nesting materials.

25. *Chloropsis hardwickii* (249).—Orange-billed Chloropsis.

I obtained this bird at Wetpyuye, 3,200 feet, eight miles from Kalaw.

26. *Psaroglossa spiloptera* (261).—Spotted-wing.
Recorded by Col. Rippon.

27. *Hypsipetes concolor* (270).—Burmese Black Bulbul.
Fairly common. While at Kalaw I tried to find a nest of this bird, but only succeeded on the last day of my stay—the 30th of April. The parent birds gave the nest away. I was attracted by their excited behaviour, as they kept flying to and fro, erecting the feathers of their head and calling the while. After watching for some time, I saw one of the birds hop along the branch of a huge pine tree and suddenly squat, and I then realized she was on her nest, which I had not till then been able to see. It was a great height up, some 50 or 60 feet, and situated towards the extremity of a branch, just on a small fork. It appeared to be very shallow and covered with cobweb, which harmonized with the colour of the branch. In order that the nest might be examined, it was necessary to erect a scaffolding up to it, as the branch at the site of the nest would not have borne a man's weight. Fortunately some carpenters were close by building a house, and from them I borrowed some bamboos, ropes, etc., and my Burman pluckily managed to reach the nest, to find it contained alas! young birds. The finding of the *H. concolor's* nest had often defeated me previously, as I never imagined they nested at such a height from the ground.

28. *Hemixus tickelli* (276).—Tickell's Bulbul.
Recorded by Col. Rippon.

29. *Alcurus striatus* (277).—Striated Green Bulbul.
Recorded by Col. Rippon.

30. *Molpastes nigripileus* (280).—Tenasserim Red-vented Bulbul.
Seems to take the place at Kalaw of *M. burmanicus*, but not so common, as *burmanicus* is on the plains. I found two nests, both in wild raspberry bushes—one with 2 eggs dated 13-4, the other with 3, dated 24-4. The eggs in the latter nest were almost identical to *M. burmanicus*, but the eggs of the former clutch were pinkish, thickly mottled with red, and with no purple markings.

31. *Xanthixus flavescens* (287).—Blyth's Bulbul.
Recorded by Col. Rippon.

32. *Otocompsa emeria* (288).—Bengali Red-whiskered Bulbul.
Not common in the immediate vicinity of Kalaw, its place being taken by *Pycnonotus xanthorrhous*, but fairly common close to the stream and marshy land about two miles out.

33. *Otocompsa flavicentris* (290).—Black-crested Yellow Bulbul.
Very common at Wetpyuye and up to about four miles West of Kalaw. Elevation about 3,800 feet, but not noticed at Kalaw. I found a nest, a rather untidy structure, in a raspberry bush at Wetpyuye on the 2nd April, containing two fresh eggs.

34. *Pycnonotus xanthorrhous* (298a).—Anderson's Bulbul.
Very common in the scrub jungle round Kalaw. I found several nests. These were cup-shaped and very neatly built of grass and bracken, and lined with fine grass. The usual site chosen for the nest was a raspberry bush, but I found several nests built in thick clumps of grass close to the ground.

The eggs are of two types, one being richly and thickly marked with purple and dark red-brown; the other pinkish, thickly marked with pinkish red. The date of the first nest found was April 3rd and of last nest April 28th, containing fresh eggs. *P. xanthorrhous* suffered terribly from some nests-robber, human or otherwise. Nor was it the only bird. *D. sannio* was also in a like plight. Over and over again eggs were removed from nests I had been watching. I tried hard to find some signs

as to how the depredations had been committed, such as egg-shells lying about, but failed to do so. I strongly suspect the magpies, of which there were so many at Kalaw. The little Shan boys might also have been responsible, but I doubt it. At any rate, in no locality in which I have been bird-nesting, have I noticed such a mysterious disappearance of eggs as occurred at Kalaw.

35. *Sitta neglecta* (317).—Burmese Nuthatch.

Col. Rippon records this bird, but I did not meet with any, although finding the next bird (*Sitta nagaensis*) very common, which Col. Rippon does not record.

36. *Sitta naganeis* (318).—Austen's Nuthatch.

Found three nests, but all with young. Dates—April 12th, 15th, and 16th. Two of the nests were in holes made on the upper side of large branches, and could only be found by seeing the parent bird going in. The entrance to nest hole was in every case plastered up with mud.

37. *Sitta magna* (319).—Giant Nuthatch.

Only seen twice. One male specimen procured.

38. *Sitta frontalis* (325).—Velvet-fronted Blue Nuthatch.

Recorded by Col. Rippon, but not observed by myself.

39. *Dicurus cineraceus* (333).—Grey Drongo.

Common among the pine trees. Found five nests, three situated towards the extremity of pine boughs, one of which was quite inaccessible. I was most unfortunate over the eggs. The only full clutch I obtained on April 30th was quite hard set. Another nest was destroyed after two eggs had been laid. The other two nests were disturbed owing to the difficulty in reaching the nests, which were found to contain incomplete clutches of one and two eggs respectively. Dates—15th and 27th April.

40. *Bhringa remifer* (339).—Lesser Racket-tailed Drongo.

Saw a bird and its nest on my way up the Ghaut, April 1st, elevation 3,000 feet. On my return the young birds could be seen moving about, over the top of the nest, which was at the extremity of a branch of a huge tree and quite inaccessible.

41. *Orthotomus sutorius* (374).—Indian Tailor Bird.

One specimen only obtained—a young bird.

42. *Megalurus palustris* (389).—Striated Marsh Warbler.

Seen about a swamp about two miles to East of Kalaw.

43. *Herbivocula schwarzi* (404).—Radde's Bush Warbler.

Fairly common in the scrub and grass land. I mistook the specimens for *Phylloscopus fuscatus* until I compared them with skins in South Kensington Natural History Museum.

44. *Phylloscopus affinis* (405).—Tickell's Willow Warbler.

One specimen obtained.

45. *P. superciliosus* (417).—Recorded by Col. Rippon.

46 *Acanthopneuste davisoni* (430).—Tenasserim White-tailed Willow Warbler.

Occasionally seen on the grassy hills. Found a nest built into a bank, containing young, date 8th April.

47. *Cryptolopha tephrocephala* (432).—Anderson's Flycatcher Warbler.

Recorded by Col. Rippon.

48. *Suya crinigera* (458).

I found this bird common, and obtained nest with four eggs, date 24th April.

49. *Suya superciliaris* (461).—Anderson's Hill Warbler.

I did not shoot any for identification, but Col. Rippon records them, although curiously omits the former bird, *S. crinigera*, which I found common.

50. *Lanius collurioides* (474).—Burmese Shrike.
Common. Found three nests. Two were built in the fork of saplings, one in the fork of a branch of an oak tree. Two nests contained clutches of five eggs, one nest of four. Dates—April 12th, 17th, 27th.
51. *Lanius nigriceps* (475).—Black-headed Shrike.
Only once seen, the parent bird of a nest built in a wild raspberry bush on the edge of a paddy field. Clutch four eggs fresh. Date—14th April.
52. *Lanius tephronotus* (477).—Grey-backed Shrike.
Recorded by Col. Rippon.
53. *Tephrodornis pelvicus* (486).—Nepalese Wood Shrike.
Recorded by Col. Rippon.
54. *Pericrocotus speciosus* (490).—Indian Scarlet Minivet.
Recorded by Col. Rippon.
55. *Pericrocotus fraterculus* (491).—Burmese Scarlet Minivet.
Recorded by Col. Rippon.
56. *Pericrocotus brevirostris* (495).—Short-billed Minivet.
Recorded by Col. Rippon.
57. *Pericrocotus solaris* (498).—White-throated Minivet.
Two specimens obtained.
58. *Pericrocotus peregrinus* (500).—Small Minivet.
Observed, but not collected.
59. *Campophaga melanoptera* (506).—Pale-grey Cuckoo-Shrike.
Several times seen.
60. *Artamus fuscus* (512).—Ashy Swallow-Shrike.
Recorded by Col. Rippon.
61. *Oriolus indicus* (514).—Black-naped Oriole.
Recorded by Col. Rippon.
62. *Oriolus tenuirostris* (515).—Burmese Black-naped Oriole.
Common, but I was unsuccessful in finding nests. Capt. Venning, who was at Kalaw at the time, found two or three towards end of April. They appear to have just begun nesting at the latter end of the month.
63. *Oriolus trailii* (522).—Maroon Oriole.
Fairly common, but not so much so as the last species. I only collected one of the Mynas (*Graculipica nigricollis*), but Col. Rippon records the following :—
64. *Graculipica nigricollis* (546).—Black-necked Myna.
65. *Graculipica burmanica* (547).—Jerdon's Myna.
66. *Acridotheres tristes* (549).—Common Myna.
67. *Æthiopsar grandis* (553).—Siamese Myna.
68. *Æthiopsar albicinctus* (554).—Collared Myna.
69. *Cyornis melanoleucus* (569).—Little Pied Flycatcher.
Recorded by Col. Rippon.
70. *Cyornis unicolor* (574).—Pale Blue Flycatcher.
One specimen obtained. Only once seen.
71. *Cyornis rubeculoides* (575).—Blue-throated Flycatcher.
Common.
72. *Cyornis tickelli* (576).—Tickell's Blue Flycatcher.
Recorded by Col. Rippon.
73. *Stoparola melanops* (579).—Verditer Flycatcher.
One specimen obtained—a breeding male.
74. *Culcicapa ceylonensis* (592).—Grey-headed Flycatcher.
Very common.
75. *Rhipidura albicollis* (605).—White-throated Flycatcher.
Common. One nest found with three fresh eggs. Date—25th April. Nest a beautiful little cone-shaped structure, composed of soft grass, and

well plastered over with cobwebs, built in a cluster of forks of a thin dried overhanging bamboo.

76. *Pratincola caprata* (608).—Common Pied Bush-Chat.

Very common. Found several nests. One had young birds at the beginning of April. Two nests contained cockoo's eggs. *Cuculus canorus* or *Cuculus canorus bakeri* (Hartert Vogel der palaarktischen, Vol. 2, page 948).

77. *Oreicola ferrea* (615).—Dark-grey Bush-Chat.

Only saw one, the parent bird of a nest. This was situated under a tuft of short grass on the upper edge of a small path along a grassy slope. The nest contained four fresh eggs, very pale green in colour, sparingly marked at the larger and with rusty brown. Date—21st April.

78. *Copsychus saularis*, (663)—Magpie Robin.

Very common. Nests found April.

79. *Merula protomomelæna* (679).—Black-busted Ouzel.

Met with several times. Appeared to be breeding from dissection of specimens obtained.

80. *Uroloncha topela* (735a).—Chinese Munia.

Fairly common. Found two unfinished nests, end of April.

81. *Chrysomitris ambiguus* (Oustalet) (773a).—The Yunnan Siskin.

I do not think this bird has been recorded previously from Burmah. I found it fairly common among the pine trees, especially so close to the house I was occupying. They were usually seen in small parties, and were conspicuous by their yellow and black plumage as they flew from tree to tree. They appeared to be feeding on the young shoots of the pine trees.

I was especially fortunate in finding the nest on the day that I first became acquainted with the bird. I had shot one in the morning and on returning home, close to the house, I was attracted by a similar bird flying from a pine sapling. On investigation I found the nest. It was well concealed, being built into the pines that clustered at the head of the sapling, which was about six feet high. The nest was composed of dry pine needles, mixed with a little moss roughly bent into a cup shape and lined sparingly with wool and feathers, the whole rather loosely put together, and it came almost to bits on my removing it from its site. The eggs, four in number and quite fresh, were very pale greenish-blue, sparingly spotted with black, chiefly at the larger end, with one or two hair-like streaks. Measurements—·70 × ·53, there eggs; ·73 × ·55, one egg.

82. *Passer domesticus* (776).—House Sparrow.

Common round the village.

83. *Passer cinnamomeus* (780).—Cinnamon House Sparrow.

Recorded by Col. Rippon.

84. *Emberiza pusilla* (791).—Dwarf Bunting.

Seen up to about middle of April amongst the wild raspberries. Later on they seemed to have migrated

85. *Emberiza aureola* (797).—Yellow-breasted Bunting.

One specimen obtained on the Ghaut, 12 miles West of Kalaw, elevation about 3,000 feet.

86. *Melophus melanicterus* (803).—Crested Bunting.

Very common on the open grass land two miles East of Kalaw.

87. *Hirundo smithii* (818).—Wire-tailed Swallow.

Recorded by Col. Rippon.

88. *Hirundo striolata* (820).—Japanese Striated Swallow.

Recorded by Col. Rippon.

89. *Motacilla ocularis* (828).—Streak-eyed Wagtail.

Recorded by Col. Rippon.

90. *Anthus maculatus* (841).—Indian Tree Pipit
Very common up to nearly end of April.
91. *Anthus striolatus* (846).—Blyth's Pipit.
One specimen obtained.
92. *Alauda gulgula* (861).—Indian Skylark.
Recorded by Col. Rippon.
93. *Æthopyga sanguinipectus* (891).—Walden's Yellow-backed Sunbird.
Recorded by Col. Rippon.
94. *Arachnecthra asiatica* (895).—Purple sunbird.
Seen on several occasions.
95. *Dicæum ignipectus* (915).—Fire-breasted Flower-pecker.
Recorded by Col. Rippon.
96. *Psarisomus dalhousiæ* (944).—Long-tailed Broadbill.
I saw this beautifully plumaged bird occasionally, generally in thickly-wooded ravines. Obtained one specimen.
97. *Gecinus occipitallis* (950).—Black-naped Green Woodpecker.
Shot one specimen, the parent bird of a nest containing four fresh eggs. Date—18th April. The nest hole was in a stump and in height about three feet from the ground.
98. *Hypopicus hyperthrus* (960).—Rufous-bellied Pied woodpecker.
This was one of the commonest woodpeckers at Kalaw I found three nests, but was very unfortunate with the eggs. The first nest hole I found, 16th April, contained one egg. Next day when I visited the spot the parent bird flew off nest. On the 19th I went to take eggs, but found all the chips scattered on the ground and their place taken by some dried pine needles shaped in the form of a nest. Of eggs I could find no trace. Was a Magpie Robin the culprit? The nest-hole was in a rotten pine stump about three inches in diameter, and was situated about two feet from the ground.

The second nest-hole was in a high rotten pine stump about fifteen feet from the ground. On cutting into it, I found only one egg. This was curiously shaped, quite unlike the other eggs obtained, being very elongated. At the bottom of the tree was a broken egg, perhaps dropped while the bird was in flight.

The next day, April 27th, I found another nest in a very rotten pine stump, about two feet from the ground. On approaching it, the parent bird flew out, but when I cut into the nest I found four eggs, of which two were slightly damaged and two broken. This had obviously occurred some time previously, as the yolk was all caked, and yet parent bird had been sitting on four broken eggs! Measurements—·94 × ·64. Abnormal egg measured 1″ × ·60.
99. *Dendrocopus cabanisi* (962).—Chinese Pied Woodpecker.
Found nest-hole on the 2nd April and in a rotten pine stump about ten feet from the ground, and could hear young birds crying within. On the 5th found another nest-hole containing three fresh eggs. In this case a decayed branch of an oak tree had been utilized for nesting purposes. A natural hole from decay led to the egg chamber, but notwithstanding this the woodpecker had excavated another hole for its entrance, just of sufficient size to allow of its passing in. Measurements of three eggs—1·1″ × ·74.
100. *Dendrocopus atratus* (968).—Stripe-breasted Pied Woodpecker.
Recorded by Col. Rippon.
101. *Iyngipicus canicapillus* (975).—Burmese Pigmy Woodpecker.
Found nest-hole in the hole of a fairly large green tree. The aperture was nearly as large as the nest-hole of *H. hyperthrus* just allowing of one's four fingers to fit in. There was a hollow in the interior of the tree

and into this the hole led. I found a single egg on the floor of the hollow chamber. It was quite fresh, and though I could not wait to see the parent bird as it was on the last day of my stay—from its size I am pretty confident it belonged to above species. The egg was of the regular woodpecker type and measured ·72 × ·52.

102. *Chrysocolaptes guttacristatus* (992).—Tickell's Golden-backed Woodpecker.

Only one pair seen.

103. *Megalæma virens* (1007).—Great Chinese Barbet.

Only one seen and obtained.

104. *Coracias affinis* (1023).—Burmese Roller.

Very common and in April were making much noise over their nesting operations. Three eggs taken April, 25th.

105. *Merops viridis* (1026).—Common Indian Bee-Eater.

Recorded by Col. Rippon. I found them up to 2,000 feet only, on the Ghaut, West of Kalaw.

106. *Ceryle varia* (1033).—Indian Pied Kingfisher.

Recorded by Col. Rippon.

107. *Upupa indica* (1067).—Indian Hoopoe.

Common.

108. *Caprimulgus macrurus* (1093).—Horsfield's Nightjar.

This appeared to be the common Nightjar of Kalaw I found no other. A specimen I obtained contained an unformed egg.

109. *Cuculus canorus bakeri* (1104a) (Hartert, Vol. P.F.Vol. 2, page 945.)—Hartert has subdivided *C. canorus* into sub-species, *telephonus* and *bakeri*; *bakeri* being the non-migratory bird and presumably the bird found breeding at Kalaw. I have therefore adopted Hartert's nomenclature.

110. *Cuculus micropterus* (1107).—Indian Cuckoo.

Recorded by Col. Rippon.

111. *Hierococcyx sparverioides* (1108).—Large Hawk-Cuckoo.

Common and noisy in April.

112. *Hierococcyx nisicolor* (1110).—Hodgson's Hawk-Cuckoo.

One specimen obtained.

113. *Cacomantis merulinus* (1113).—Rufous-bellied Cuckoo.

One specimen obtained.

114. *Eudynamis honorata* (1120).—Indian Koel.

Fairly common.

115. *Rhopodytes tristis* (1123).—Large Green-billed Malkoha.

Recorded by Col. Rippon.

116. *Palæornis torquatus* (1138)—Rose-ringed Paroquet.

Recorded by Col. Rippon.

117. *Palæornis finschi* (1142).—Burmese Slaty-headed Paroquet.

Fairly common and seen close to the houses in the settlement.

118. *Otogyps calvus* (1191).—Black Vulture.

Seen on several occasions.

119. *Milvus govinda* (1229).—Common Pariah Kite.

Found close to the village.

120. *Columba intermedia* (1292).—Indian Blue-Rock Pigeon.

Recorded by Col. Rippon.

121. *Turtur orientalis* (1304).—Rufous Turtle-Dove.

Very common. Found several nests. One with young. One of the nests found was built on the hole of a fallen tree amongst rather tall grass.

122. *Turtur tigrinus* (1308).—Malayan Spotted Dove.

Common and nests found.

123. *Œnopopelia tranquebarica* (1311).—Red Turtle-Dove.

Only met with once.

124. *Phasianus humiæ* (1331).—Mrs. Hume's Pheasant.
Recorded by Col. Rippon. I saw this beautiful bird or it may have been *P. burinanicus*, 1331a, several times, and generally in the open jungle on rocky grass hills. On one occasion I put up five birds singly at intervals of about a minute or two. At one time I thought I had found a nest, as a hen bird rose at my feet, but I hunted everywhere without success. These Pheasants do not seem to be quite so gregarious as *G. lineatus*, nor so partial to the proximity of water. I should have liked to have shot one or two, but when I saw them I always had my little ·410 with me only, which would not have been sufficient to have brought them down. One one occasion I put up a Pheasant out of some wild raspberry bushes amongst long grass, the fruit of which it was perhaps feeding on.

125. *Francolinus chinensis* (1374).—Chinese Francolin.
Common

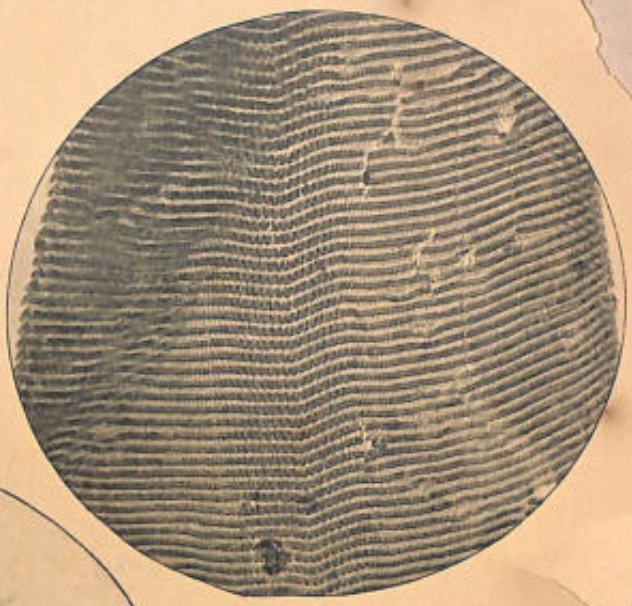
126. *Turnix pugnax* (1382).—Bustard-Quail.
Saw a few on the open grass land, two miles East of Kalw.

127. *Grus antigone* (1409).—Sarus.
Recorded by Col. Rippon.

128. *Sarcogrammus atrinuchalis* (1432).—Burmese Red-wattled Lapwing.
Common.

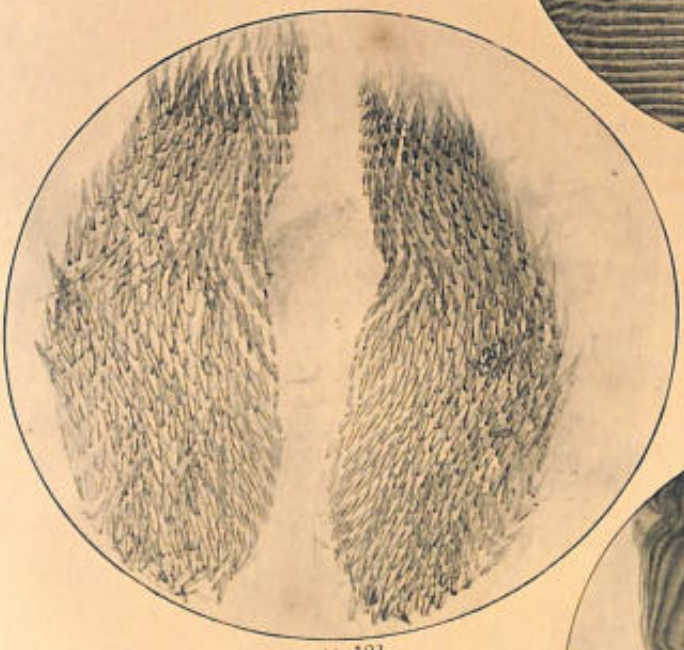
129. *Gallinago stenura* (1485).—Pintail Snipe.
I believe there is good snipe shooting close to Kalaw in the cold weather.

Fig. 1.



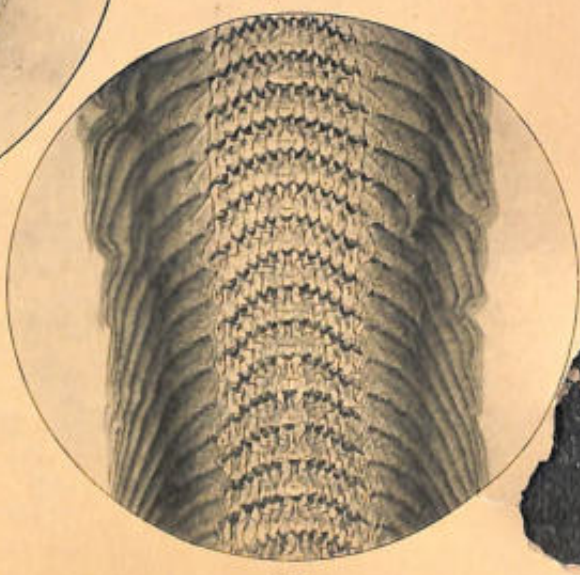
× 29.

Fig. 2.



× 12½

Fig. 3.



× 29.

1. ARIOPHANTA LÆVIPES—Müller. Part of Radula × 29.
2. IANTHINA FRAGILIS—Lamarck. Radula × 12½.
3. POLYDONTA RADIATA—Gmelin. Part of Radula × 29.

# THE TEETH OF SNAILS.

BY

MAJOR A. J. PEILE, R. A.

*(With one Plate.)*

Almost all the mollusca, except the bivalves (*Pelecypoda*) possess in the mouth and throat an organ which is sometimes referred to as the palate or the tongue, but which is better called the "radula" or "odontophore." Only a few genera do not possess this apparatus and these are mostly parasitic in their habits and obtain their food by suction of the juices of their hosts.

The radula consists of a band of chitin studded with rows of teeth, each row generally bilaterally symmetrical on either side of a centre tooth. The band lies on the floor of the mouth and is flat in the forward part, but further back often forms almost a tube. The shape, number and arrangement of the teeth differ enormously in different families and even in different genera, so that a study of these beautiful objects is of great interest as affording an insight into the natural affinities of the group.

An excellent account of the organs in question is to be found in the Cambridge Natural History, Volume "Mollusca." These few notes, which are based on the arrangement given in that volume, are explanatory of some of the types which have been mounted for the Society's collection. These were obtained, with one exception, from spirit specimens furnished by the kindness of some of the members. The illustrations are from photographs and drawings of the actual specimens.

A. SCAPHOPODA.

The collection does not as yet possess a radula of this class. Some of the *Dentaiida* (tusk shells) are found at Bombay, notably the small *Cadueus gadus*, Sowerby, common as dead shells in shell sand. The living animals burrow in sand and mud.

B. GASTEROPODA.

1. Order *Pulmonata*.—This order contains the inoperculate land and freshwater snails. These possess a radula consisting of numerous rows of minute teeth each on its own basal plate, so that the whole structure resembles the surface of a rasp. Example: *Ariophanta lævipes*, Müller, the common striped snail of Bombay with a sinistral shell. Plate, fig. 1, shows a portion of the radula; at the edge on the left side, where the membrane has been doubled on itself, the hooked form of the teeth may be discerned. Text, fig. 1, shows the form of the central tooth of each row and the adjoining laterals; fig. 2 shows the change in form of the teeth as the edge of the radula is approached, the lateral passing into so-called marginals.

Fig. 1.

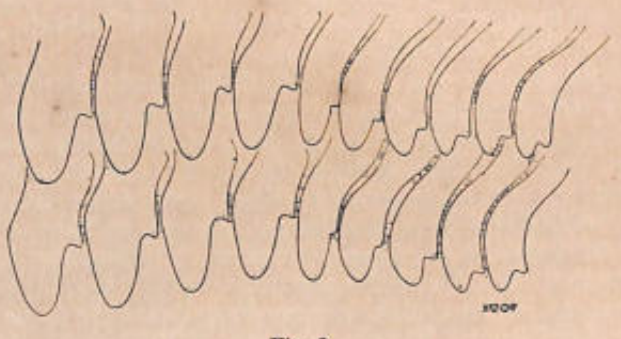


Fig. 2.

Another species in the collection is *Macrochlamys pedina*, Benson also a common Bombay snail, belonging, with *Ariophanta*, to the family *Limacidæ*.

Other well-known families of the order, as yet unrepresented, are *Helicidæ*, *Stenogyridæ* and *Pupidæ* (land), *Limnæidæ* (freshwater) and *Auriculidæ* (brackish).

While most of the radulæ of the pulmonates have a general resemblance one with another, an infinite variety of detail will be found on comparing the different genera. Some of the carnivorous genera possess sickle-shaped teeth, somewhat resembling those of the marine genus *Ianthina* (*see* fig. 10).

The non-carnivorous genera possess, in addition to the radula, a curved mandible placed behind the upper lip of the mouth; this is used for biting their food, while the radula would appear to be used for grating up the particles as they are swallowed.

2. Order *Opisthobranchiata*.—This order which includes amongst others the nudibranchs, the limpet-like *Siphonaria* and the *Bulloidea* is not represented in the collection.

3. Order *Prosobranchiata*.—The families in this order, to which most of the better known marine molluscs and the land and freshwater operculates belong, may be conveniently classified by their radulæ as follows :—

(*a*) *Toxoglossa* (τόξον = arrow)

Our example is *Conus achatinus*, Chemnitz, which possesses from 50 to 60 long slightly curved shafts, each having a poison gland at the base. Each tooth is wonderfully barbed, *see* fig. 3.

Fig. 3.

The barbs in our species are more remarkable than those of many of the other species of the *Conidæ*. On the other hand some of them (*e. g.*, *Conus textile*) have a serrated edge to the shaft.

(*b*) *Rachiglossa* (ῥάχις = ridge).

Our examples are *Eburna spirata*, Lamarck (fig. 4), belonging to the

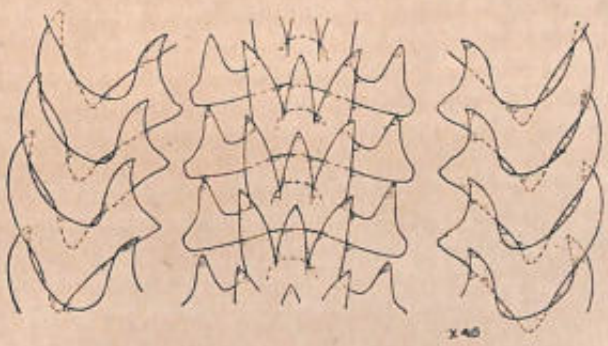


Fig. 4.

same family as the British "whelk" (*Buccinidæ*), *Nassa ornata*, Kiener (fig. 5), *Columbella terpsichore*, Leathes (fig. 6), and *Purpura blanfordi*, Melvill (fig. 7). A few complete rows are illustrated in each figure.

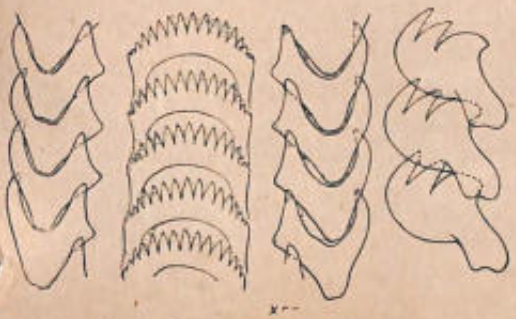


Fig. 5.

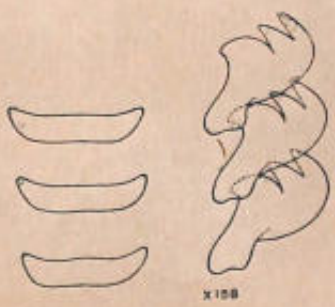


Fig. 6.

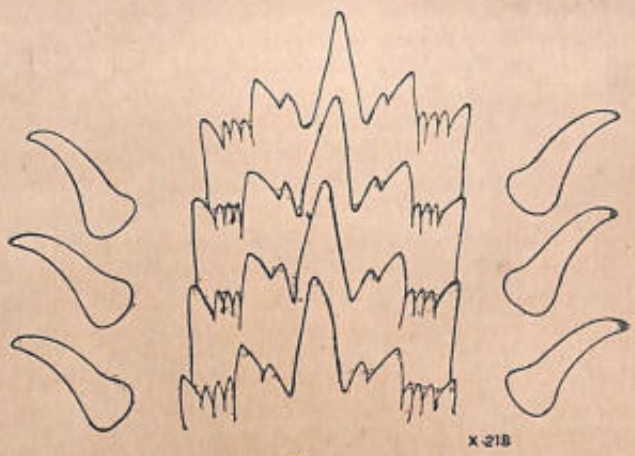


Fig. 7.

These radulæ may all be given the dental formula 1. 1. 1., the figures denoting one central with one lateral on each side. It is interesting to notice the difference in shape of the centrals.

*Eburna* has about 40 rows, *Nassa* about 65 and *Purpura* about 200. These species are all carnivorous. *Purpura* preys upon other molluscs, boring holes in their shells in order to get at the contents.

Other species in the collection are *Sistrum tuberculatum*, de Blain, and *Purpura tissoti*, Petit; both belong to the family *Muricidæ*.

(*c*) *Tænioglossa* (ταινία=ribbon).

Examples: *Planaxis sulcatus*, Born (fig. 8), marine, and *Ampularia nux*, Reeve (fig. 9), freshwater, from streams in the ghâts.

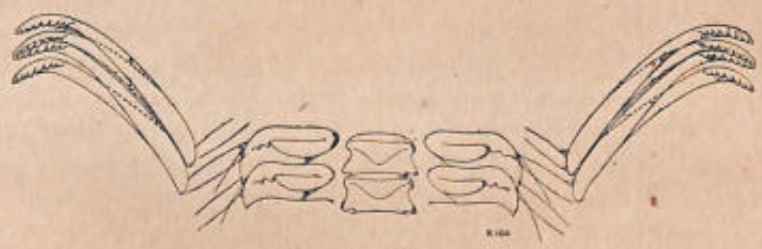


Fig. 8.

Fig. 9.

These species have two marginals in each row as well as the central and laterals and may be given the formula 2. 1. 1. 1. 2. *Planaxis* has many rows and *Ampullaria* about 40. Another species in the collection is *Paludomus obesus*, Phil. (freshwater) belonging to the *Melaniidæ*, and the *Cyclophoridæ* (land operculates) are represented by *Leptopoma halophilum*, Benson, a small species from Ceylon. Belonging to the *Tænioglossa* are many other well-known families as yet unrepresented, notably *Cypræidæ* (the "cowries"), *Littorinidæ* (the "winkles") and *Naticidæ*. Of all these families Bombay has several species, those of the last named inhabiting the sandy bays. The *Littorinidæ* are remarkable for the extraordinary length of their radulæ, usually many times longer than the animal, the part not in use being coiled up like a watch spring.

Fig. 10.

Many of the *Tænioglossa* are provided with two lateral jaws, sculptured with elaborate patterns and file-like projections.

(*d*) *Ptenoglossa* (πτηνός = winged).

Example: *Ianthina fragilis*, Lamarck, Plate, fig. 2, shows the whole radula which is formed in two divisions with a gap in the middle. Text, fig. 10, shows a few teeth more highly magnified.

Formula $\infty \cdot 0 \cdot \infty$

The *Ianthinidæ* float on the surface of the ocean and are reputed to feed on jelly fish.

One other family, the *Scalariidæ*, is placed doubtfully with the *Ptenoglossa*; in habits and appearance it is very unlike *Ianthina*. Bombay has a few small and rather rare species, not yet represented in the collection by their radulæ.

(*e*) Two families (*Eulimidæ* and *Pyramidellidæ*), in which the radula and jaw are absent, are classed as *Gymnoglossa* (γυμνός = bare).

(*f*) *Rhipidoglossa* (ῥιπίς = fan).

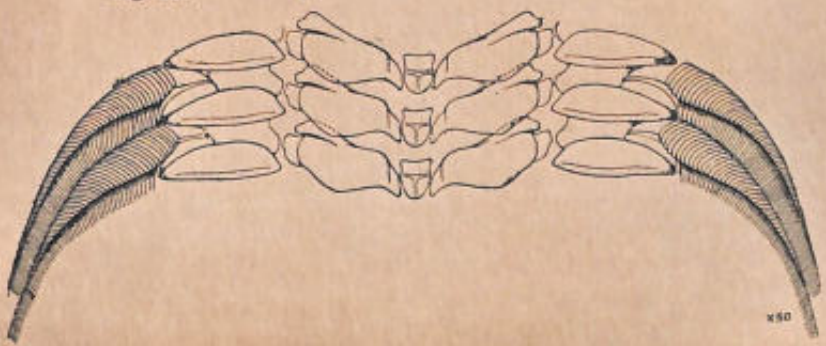



Fig. 11

Examples: *Nerita oryzarum*, Récluz. (fig. 11); *Astralium stellatum*, Gmelin, belonging to the *Turbinidæ* (fig. 12) and *Polydonta radiata*, Gmelin, belonging to the *Trochidæ* (Plate, fig. 3, and Text, fig. 13).

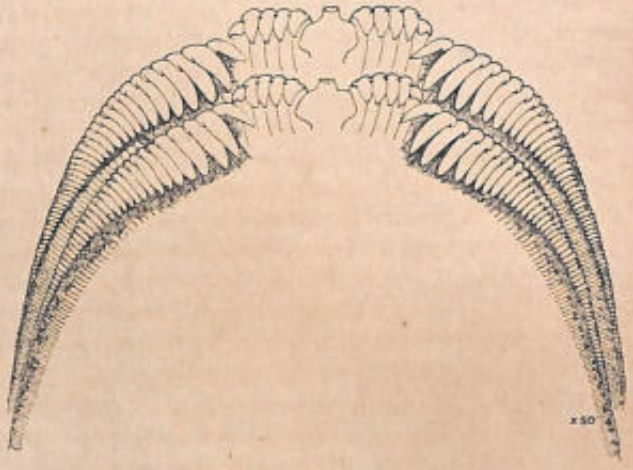


Fig. 12.

Fig. 13.

The formula for *Nerita* may be stated as $\infty \cdot 3 \cdot 1 \cdot 3 \cdot \infty$ if the large capituliform tooth next the marginals be regarded as a lateral. That for *Astralium* and *Polydonta* is in each case $\infty \cdot 5 \cdot 1 \cdot 5 \cdot \infty$ All these radulæ consist of a large number of rows, only a couple of rows are illustrated in the figures.

Other species in the collection are *Turbo elegans*, Phil., *Clanculus scabrosus*, Phil., and *Euchelus indicus*, A. Adams. The two latter belong to the *Trochidæ*.

Fig. 14.

All our species are vegetable feeders and are common on rocks, between tide marks, on the Bombay beaches.

Some of the *Rhipidoglossa* possess jaws.

(*g*) *Docoglossa* (δοκός=beam).

Example: *Melcioniscus aster*, Reeve, family *Patellidæ* (the "limpets"). The radulæ of the limpets are of great length, that of *Melcioniscus*, when stretched out straight, is much longer than the body of the animal. A few rows are shown in fig. 14. The formula may perhaps be written as 3. 1. (1. 0. 1.) 1. 3. where the outer figures denote some obscure plates not shown in the drawing and the inner figures denote a pair of identical centrals.

4. Order *Amphineura*.

Example: *Chiton burmanus*, Carpenter (fig. 15). The *Chitonidæ* are creatures, with the habits of limpets, protected by a compound shell of eight overlapping plates connected by a leathery margin. When detached from the rock they have the power of rolling themselves up like a woodlouse. The radula is very large and massive compared with the size of the animal and is very complicated in structure compared with the types we have already examined. Formula for this species may be written 4. 4. 1. 4. 4.

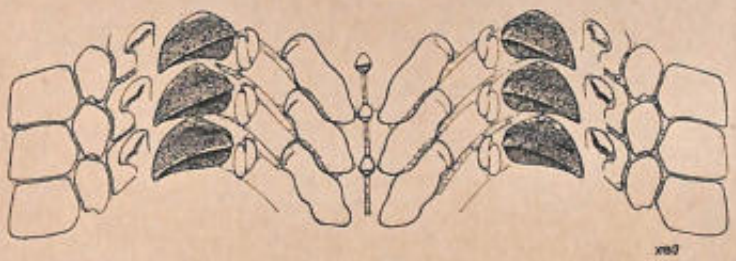


Fig. 15.

The drawing does not show the first lateral on each side which is rather like the central; owing to the manner in which the laterals overlap it is very difficult to distinguish them under the microscope and depict them in a drawing.

C. Cephalopoda.

The members of this class, *Octopus*, *Nautilus*, &c., are distinguished by the possession of powerful jaws as well as a small radula. There are no examples in the Society's collection.

In order to mount the radula as an object for the microscope it may be obtained from a large species by dissection and then cleaned by boiling in a not too strong solution of caustic potash. A word of warning is necessary, however, that the largest species do not always possess the largest radulæ.

With small species the proboscis or buccal mass, or even the whole animal, may be boiled until nothing is left but the clean radula. The radula can then be washed and mounted, the best medium for the purpose being glycerine jelly, which should be run in under the cover-glass after the latter has been clipped over the specimen. Air bubbles can be removed by a momentary boiling and the specimen should then be left for some weeks after which the superfluous jelly may be cleaned away and the slide finished by ringing, first with microscope cement and then with gold size.

The author would be glad to furnish further notes on preparing and mounting specimens to anyone who should be interested in the subject or to prepare examples for the Society from any fresh material that may come to hand. The material cannot be too common or apparently insignificant, for instance, *Planaxis sulcatus*, which is very common and has a most unattractive shell, furnishes us with one of the most beautiful radulæ.

It should be noted that many of the radulæ are particularly beautiful objects when viewed with the polariscope.

# NOTES ON INDIAN BUTTERFLIES.

By

Captain W. H. Evans.

In the following notes, which will appear in the Journal from time to time it is proposed to give brief notices of any information published regarding Indian butterflies, also the results of my own observations and those communicated to me by other Collectors.

1. Occurrence of **Una usta, Dist.** in Burma. Mr. E.V. Ellis obtained three males of this insect in November 1912 at Maymyo. *Una usta* was described from Malacca, *vide* De Nicéville's Butterflies of India, Vol. III, footnote, page 51. Col. Tytler has recorded it from the Naga Hills.

2. **Azanus ubaldus, Cr.** and **uranus. But.** Bingham thought that these two butterflies would prove to be seasonal forms of the same species. Major H. F. Thuillier at Ahmednagar in November 1912 and Major H. D. Peile at Peshawar in December 1912 found the two forms flying together commonly. There is, I think, no doubt that the two forms are perfectly distinct.

3. **Parhestina jermyni. Druce.** Trans, Ent. Soc. 1911, page 187. This new butterfly is described from two examples caught by Col. T. Jermyn during June 1906 in the Tons Valley near Mussoorie at 4,000 and 7,000 feet elevation. The butterfly is a striking mimic of *Aporia agathon phryxe*, Bdv. It is greenish white with black veins; the black colouring over the veins increases in width towards the termen amalgamating to a row of elongate subterminal spots between veins 4 to 7 on the forewing. The hindwing is angled at vein 4 and cut square to the dorsum. The butterfly is probably a form of *mena*, Moore, if it is not the same insect: the habitat of *mena* is unknown. The Chinese *viridis*, Leech is no doubt conspecific with *mena*, but certainly represents a distinct race. *Nicevillei*, Moore is also conspecific with *mena* and differs chiefly in the far greater extent of the black colouring on the hindwing; it has only been recorded from Dalhousie. It seems probable that we have to deal with a very variable insect, wherein it resembles its prototype *agathon*, and that the Indian forms will eventually stand under the name *mena* with two races, *viridis* and *nigrivena*, Leech from China.

4. A revision of the genus **Lycœnopsis** (late *Cyaniris*), based on an examination of the male genitalia. Dr. T.A. Chapman, P.Z.S., 1909, Vol. I, page 419. As the type of *Cyaniris* is *Lycæna semiargus*, Rott. the name must be abandoned and Felder's *Lycœnopsis*, type *haraldus*, Fab., adopted. Moore gives the type of *Cyaniris* as *argiolus*; it seems a pity to abandon the well established name of *Cyaniris* on the grounds given. It is remarked that though the facies above of the various species affords no reliable indication of identity, yet the spotting below, when not obsolete, differs constantly in the various species. Attention is drawn to the remarkable mimetic variation in *limbata* and *argiolus*.

Three Indian species are separated from *Lycœnopsis* under the name *Notarthrinus*, type *vardhana*, M. as the male organs possess the movable hook present in most *Lycænidæ* but absent in *Lycœnopsis*. Besides *vardhana* this new genus comprises *musina*, Snell and *binghami*, Chap. The Indian form of the Javan *musina* has been separated by Swinhoe as *musinoides*; it has been found commonly by Col. Tytler at Manipur. *Binghami* has been described from Assam; it closely resembles the wet season form of *jynteana*, but the dark border at the apex of the forewing is about as wide as in *puspa* and continues at the same width throughout the outer margin of both wings. Col. Tytler obtained a specimen, of what I identify as *binghami*, in the Naga Hills.

*Chennellii*, DeN. is placed in the new genus *Bothrinia*, first called *Bothria*, but the name was found to be pre-occupied. In *Bothrinia* the clasp is as in *Everes*, the neuration as in *Zizera* and the facies as in *Lycænopsis*.

The Indian species of *Lycænopsis* are given as: (1) *transpecta*, M. (2) *oreas*, Leech, (3) *puspa*, Hors. (= *cyanescescens*, DeN.), (4) *argiolus*, L.(= *huegeli*, M. *coelestina*, Koll., *victoria*, Swinh. and *sikkima*, M. (5) *albidisca*, M. (6) *marginata*, DeN., (7) *limbata*, M. (= *placida*, DeN. and *jynteana*, DeN.), (8) *dilecta*, M. (9) *lanka*, M. (10) *akasa*, Hors. (11) *melaena*, Doh., (12) *singalensis*, Fd.. (13) *albocærulea*, M. *Lilacea*, Hamp. is not mentioned.

*Oreas* is a Chinese insect and the Indian form, of which there are a few specimens from the Khasi Hills in the British Museum, has been separated by Swinhoe as *oreana*. It is equal in size to *huegeli* and *singalensis* and may be recognized by the four discal spots on the underside of the hind-wing being in a regular line, large, prominent and well separated from the others.

*Huegeli*, *cœlestina* and *sikkima* are said to be paralleled by *limbata*, *placida* and *jynteana*: *limbata* forms can always be separated by the third spot on the underside of the forewing being slightly oblique. The following *argiolus* forms are described; *puspargiolus* from Assam mimicking *puspa*; *bothrinoides* flying with and mimicking *chennellii*; *albocæruleoides*, locality not given, mimicking *albocærulea*. These all appear to be dry season forms; the last named agrees with the dry seoson form from the Naga Hills. In my list of Indian butterflies, J. B. N. H. S. XXI, 982, I have pointed out that *jynteana*, De Nicèville's and Moore's types, are forms of *argiolus* and not of *limbata*.

*Singalensis* is said to only occur in Ceylon, Java and Sumatra.

The paper is illustrated with excellent photographs of the genitalia of the various species dealt with.

I have generally followed Dr. Chapman's arrangement in my list, but have retained the name *Cyaniris* and have placed his new genera as sub-genera.

5. Revision of the **Zizeeriidæ** based on an examination of the male genitalia. Dr. T. A. Chapman, Trans. Ent. Soc. 1910, 479. Moore in describing *Zizera* gave as his type *alsus* though intending the genus for *karsandra*, *gaika* and *indica*. Dr. Chapman states that *alsus* is very different to these three forms and, as the name *Zizera* must therefore be abandoned, proposes to replace it by *Zizeeria*, type *karsandra*, M. In Seitz's Palæarctic Lepidoptera, *minima*, Fuess (=*alsus*, W. V.) still figures under *Zizera* and so Dr. Chapman's reasons for abandoning the name are not altogether clear.

The group included heretofore under *Zizera* are called the *Zizeeriidæ* and are split up as follows:

(1). *Zizeeria*, type *karsandra*, M.; other species *lysimon*, Hub., *maha* Koll, *ossa*, Swin. Clasps soldered together for some distance basally extremities broad and furnished with bold teeth.

(2). *Zizina*, type *labradus*; other species *sangra*, M. and *indica*. Mur. Clasps only slightly soldered together, terminal teeth minute, a solitary hair, thick and clubbed arising close to the base.

(3). *Zizula*, type and only known species *gaika*, Fab. Forewing vein 11, joining vein 12 and not again separating from it, *i.e.*, it forms merely a bar from the cell to vein 12. Clasps as *Zizina*.

*Lysimon* is the European and African form: *karsandra* the Asiatic form. On the forewing below the discal row of spots in *lysimon* are small, even and slightly curved; in *karsandra* these spots are large, of varying size and in a much bent row.

*Maha=diluta*, Fd., *chandla*, M. *squalida*, But., *opalina*, Pouj, *marginata*,

Pouj., *albocæruleus*, Rob. *argia*, Men, *japonica*, Mur., *alope*, Fenton. Perhaps some of these may=*ossa* and even be prior to it. The distribution of *maha* and *ossa* is not given: according to Swinhoe *ossa* is the form from Southern India and Ceylon, while *maha* is the form from the remainder of the region inhabited by the species. The genitalia are very similar, but in *maha* the clasps are longer and more slender.

*Sangra* is a form of *labradus* from South Polynesia and Australia. The identification of *otis*, Fab., is doubtful and it may equal *indica* or *sangra*. *Sangra* is the form from North India, Burma the Andamans and Nicobars; *indica* from Ceylon and India South of Lucknow. The spots on the forewing below are small and uniform, while in *indica* they are large and irregular. On the hindwing below in *sangra* the second spot from the costa is so placed that a line joining the first and second spot would, if continued, pass close to the discal line and strike the sixth spot; in *indica* these spots are less basal and this line would meet the fourth spot.

It is worthy of note that, as regards the markings below, *indica* differs from *sangra* in exactly the same way as *ossa* does from *maha* and *lysimon* from *karsandra*.

I had not seen this paper when compiling my list of Indian butterflies. I consider that the name *Zizera* should be retained and possibly *Zizina* and *Zizula* adopted as subgenera; the Indian form of *lysimon* should be regarded as *lysimon karsandra*: there seems no reason why, at any rate, until Fabricius's type is discovered, the name *otis* should be discarded in favour of *sangra*.

6. A note on certain butterflies in the collection of Mr. Ollenbach of Dehra Dun.

Mr. Ollenbach has very kindly sent me an oil painted plate from which the following notes are taken. Amongst them are three species new to India. It is, of course, dangerous to attempt to identify insects from figures only, but in this instance there is no room for doubt as to the particular species represented, though whether they happen to be local races of the first named form is another matter.

(*a*) **Papilio alexanor, Esp.** A male and female obtained in April 1905 at a height of 4,300 feet on the road between Quetta and Nushki in Baluchistan, flying in company with *Hypermnestra helios*. The specimens do not appear to differ from typical *alexanor*, which flies in Southern Europe and is certainly nearer to it than to the Persian race, *orientalis*, Rom. The butterfly belongs to the same sub-genus as *machaon* and resembles it as regards the yellow ground colour; the wings are crossed by broad black bands, *viz.*, a sub-basal band across both wings, beyond which are two subcostal bands on the forewing and one at the end of the cell on the hindwing, followed by a submarginal and narrow marginal band; the base of the forewing and the dorsal margin of the hindwing for two-thirds of its length are narrowly black.

(*b*) **Papilio neptunus, Guer.** caught at Tavoy, Burma, in June 1912. The butterfly was described from Malacca and inhabits also Borneo, Sumatra and Nias. It is a member of the *coon* group, possessing the spatulate, slender shafted, tail characteristic of the group, of which the Indian *doubledayi* and *rhodifer* are members. It is black above with paler patches between the veins of the forewing as in the forms of coon; the hindwing bears a discal series of somewhat elongate red spots in interspaces 1 to 4. The breast is red at the sides and the abdomen greyish yellow from the middle.

(*c*) **Hypolimnas antilope anomala, Wall** a female caught in the Nicobars in June 1912. *Antilope*, Cr., was described from the Moluccas, but the butterfly occurs in a number of forms from Sumatra to the Fiji Islands. The

Westerly race is *anomala* and to this form belongs the female in Mr. Ollenbach's collection. The butterfly resembles the dry season female form of *bolina*, but is somewhat smaller; the ground colour is black with, on both wings, a subterminal row of small white spots in each interspace followed by a terminal row of two minute white spots in each space; there are also three obscure long white dashes between the cell on the forewing. The female is shot with brilliant blue all over the forewing. This is one of the few species in which the female is more brilliantly coloured than the male.

(*d*) The following records of butterflies caught in Chinese Turkestan may prove of interest:

**Mesapia peloria, Hew,** a rather pale form and **Coenonympha sinica, Alph.** Suchow, 9,500 feet, August 1907.

**Parnassius actius caesar, Stg.,** near ab **actinobolus, Stg.,** and **szechenyi, Friv.** Uch Turfan, 9,000 feet, July 1907.

**Colias cocandica, Ersch,** a rather dark specimen, Hindutash Darwan 14,500 feet, July 1907.

(*e*) A specimen of **Papilio memnon agenor, L.,** female form **agenor** with all the white markings much developed; the whole of the hindwing and the lower portion of the forewing are entirely white. It resembles the form *venusia* described by Dr. Jordan from Borneo. The specimen was caught in the Khasi Hills in September 1906.

(*f*) A specimen belonging to the genus *Euthalia* (*Dophla*), probably a female. The forewing resembles exactly the forewing of *sahadeva* female while the hindwing is an exact copy of the hindwing of *duda* female. Were this the only specimen known, one would take it for a hybrid, but Colonel Tytler has obtained, in the Naga Hills, several males and females similarly marked and so it may be taken to represent a new species intermediate between *duda* and *sahadeva*. Colonel Tytler has informed me that he intends to describe his specimens. Mr. Ollenbach's specimen was taken in the Khasi Hills in October 1906.

(*g*) Two aberrations or possibly extreme dry season forms of **Pareronia hippia, Fab.,** males taken near Dehra Dun in October 1909. The marginal band on the fore wing is very reduced and there are no spots on the ground colour enclosed. Mr. Ollenbach informs me that the head, thorax and abdomen are covered with white down and the veins and marginal markings are pale brown.

7. Occurrence of **Ypthima philomela, Joh.** in lower Burma. Mr. E. V. Ellis has just sent me a long series of the dry season form of this species caught at Yetho near Tharrawaddy during February 1913. In size the specimens resemble the South Indian form; above the bi-pupilled ocellus on the forewing and the two ocelli on the hindwing are bright and clearly defined as in race *indecora* from the Western Himalayas. Below they resemble the dry season form of *inica*, but, when visible, the ocelli are arranged as in *philomela*; there are traces of a discal band on the forewing and of a discal and sub-basal band on the hindwing.

# BOMBAY NATURAL HISTORY SOCIETY'S MAMMAL SURVEY OF INDIA.

BY

KATHLEEN V. RYLEY.

With Field Notes by the Collector, G. C. SHORTRIDGE.

| | |
|---|---|
| COLLECTION ... ... ... | No. 9. |
| LOCALITY ... ... ... | MYSORE. |
| DATE ... ... ... | SEPTEMBER-NOVEMBER 1912. |
| COLLECTED BY ... ... | MR. G. C. SHORTRIDGE. |
| EARLIER REPORTS .. .. | No. 1, E. Khandesh, Vol. XXI, p. 392, 1912; No. 2, Berars, Vol. XXI, p. 820, 1912; No. 3, Cutch, Vol. XXI, p. 826, 1912; No. 4, Nimar, Vol. XXI, p. 844, 1912; No. 5, Dharwar, Vol. XXI, p. 826, 1912; No. 6, Kanara, Vol. XXI, p. 29, 1913; No. 7, Central Provinces, Vol. XXII, p. 45, 1913; No. 8, Bellary, Vol. XXII, p. 58, 1913. |

The State of Mysore lies between 11°-38′ and 15°-2′ N. lat. and 74°-42′ and 78°-36′ E. long. This collection however was principally made in the South and East of the State as a camp had been made before in the North at Shimoga, the result of which was included in the Kanara collection and therefore this collection may practically be said to have been made South of about 13°-20′ N. lat.

Mysore can be divided in two natural areas, the "Mulnad" or hill country on the west, bordering and on the Western Ghats, and the "Maidan" or open country which is roughly that area lying to the East of a line from Shikarpur to Periyapatna. The "Mulnad" consists of hills covered with forest, principally evergreen, which gives place higher up to open downs and scattered trees topped frequently by bare craggs. On the hill sides much clearing has been done for Coffee plantations and in the valleys, rice, &c., is cultivated, The "Maidan" country is more varied and is heavily cultivated in the valleys, where the black alluvial soil is found. On the higher parts the red soil takes the place of the black and various grain crops are grown there, but much of it is under grass and on the dryer parts a considerable area is covered with scrub jungle.

The following descriptions are sent by Mr. Shortridge:—

"*Bangalore.*—Altitude 3,113 feet; average rainfall 36 inches; mean temperature 76°·2. Flat, red, sandy country, entirely under cultivation. The city itself covers an area of 20 square miles, the residential part being composed largely of detached bungalows surrounded by well timbered grounds. The present collection was obtained in the compound of the Deccan Horse Mess.

*Kolar Town.*—About 11 miles to the North of Bowringpet Station, near the Kolar Gold Fields, in the district of the same name. Altitude 2,786 feet with rocky granite hills rising up behind the

town to an altitude of 4,026 feet, with the exception of these hills, which form quite an isolated patch, the country is quite flat, with red sandy soil. The district is naturally almost treeless, but trees have been planted very extensively in the district, and besides fringing the roads, there are a considerable number of 'casuarina' and other plantations. The rainfall is less than around Bangalore.

*Malur.*—About fifteen miles West of Kolar Town, Kolar District.

*Nundydroog.*—About 35 miles North-West of Kolar Town.

*Coromandel.*—About 10 miles South-East of Kolar Town. Kolar Gold Fields.

*Seringapatam.*—About 10 miles from Mysore City. Altitude 2,338 feet, situated on an island between two branches of the Cauvery river. The island is almost flat and entirely under cultivation, which consists chiefly of rice, well wooded with cocoanut palms, wild fig, mango trees, etc.

"*French Rocks.*"—A group of bare rocky hills about two miles to the North of Seringapatam.

*Sivasamudram* (Cauvery Falls).—About 40 miles to the East of Mysore City, on the North bank of the Cauvery river, which here forms the boundary between Mysore State and Coimbatore. Altitude about 2,500 feet. Country very hilly and rocky in places, and except where there are patches of cultivation, very evenly covered with thick scrub jungle. On the Coimbatore side of the river the scrub is higher, while there are also patches of big forest and bamboo jungle.

Among the larger mammals occurring in the district are Sambar, Chital, Four-horn Antelope, Bear, Panther, Tiger (rare) and Pig. *Simia sinica* was fairly plentiful, and a 'Langur' said to exist on the Coimbatore side of the river, is very probably '*Presbytis priamus*;' otters occur in the river but are said to be rare and seldom seen.

While in Mysore State, I received much assistance from the local officials, while H.H. the Maharaja was kind enough to grant me a free license as well as permission to shoot in State forests."—G. C. S.

The Collection includes 458 specimens, belonging to 37 species in 27 genera.

A large and representative series of the Mysore Slender Loris was taken, also a great number of Bats representing 16 species. Six Domestic Cats were obtained and it will be interesting to compare the specimens from different villages in various parts of the country. The Rodents include a large series of *Funambulus palmarum* and a number of *Cremnomys cutchicus*, which appears to be very common in Mysore State. There was also one *Leggada* which does not seem to agree with any of the previously described forms; it resembles *L. cinderella* in some respects, but has rather a longer nose and redder fur, and as *cinderella* was collected in Cutch, this one is probably a different form.

SIMIA SINICA, L.

*The Bonnet Monkey.*

(Synonymy in No. 5.)

♂ 1898. Kolar, E. Mysore.

(*See* also Reports Nos. 5, 6 and 8.)

"Very plentiful at Kolar. Here, as in many other places, owing to the protection afforded them by the Hindoo villagers, they have practically lost all fear of men, hardly making way for people when in the streets. Large numbers of them live in the towns and villages, where they often do a lot of damage to houses by pulling off the tiles, for which reason the roofs are frequently covered with thorny branches to keep them off; while they constantly raid shops where food is kept, but apart from this they do not, in a free state, seem to develope the same inquisitive and vicious habits, that caged specimens so often do. It is noticeable that in forest country both this Monkey and the Langur are comparatively much shyer animals. No species of Langur occurs in Eastern Mysore so that I may have crossed the South-Eastern limit of *Presbytis hypoleucus*."—G. C. S.

LORIS LYDEKKERIANUS, Cabr.

*The Mysore Slender Loris.*

1888. *Loris gracilis* Blanford. Mammalia No. 27. (Partim)
1904. *Loris gracilis* (typ. var.), Lydekker, P.Z.S.; p. 345.
1908. *Loris lori lydekkerianus*, Cabrera. Bol. R. S. Espan; Hist. Nat. p. 211.

♂ 1899. ♀ 1900, 1901, 1902. Kolar, East Mysore.
♂ 1911, 1913, 1914, 1915, 1916, 1917, 1918, 1923.
♀ 1912, 1919, 1920, 1921, 1922, Malur.
♂ 1974, 1975, 1978, 1979, 1980. ♀ 1976, 1977, Nundydroog.

Vernacular names:—KADA-PAPA, ADAVI-PAPA (Kanarese); WANUR-MANUSHYA (Marathi); ARAWE-PAPA (Telegu); KATTU-PAPA, KATTU-PULLAYE (Tamil); SHERMINDA (Dekhani and Hindustani).

"*Loris tardigradus* is not the *Nycticebus tardigradus* of the "Mammalia" No. 26, which is the slow Loris of Malaysia, Mr. Thomas has shown in the A.M.N.H. for 1908 (p. 468) and again in the P.Z.S. for 1911 (p. 129) that the name *tardigradus* was undoubtedly given by Linnæus to the Ceylon Lemuroid.

Blanford, in common with most systematists of the 19th Century, is in error in following Geoffroy, who in 1796 (Mag. Encycl., Vol. I., p. 48.) transferred the name, without authority, from the long-armed Slender Loris, to the short-armed Slow Loris, and established the name *gracilis* for the former. The name *gracilis*, as well as *lori*, *ceylonicus*, *zeylanicus*, all having been given to the Ceylon animal, must rank as synonyms of *tardigradus*.

The earliest name for the Slow Loris, as shown by Stone and Rehn (Proc. Acad. Nat. Sci. Philadelphia, 1902, p. 141) is *coucang*, Boddaert, (Elench. Anim., p. 67, 1783) with the type locality 'Bengal.' In the same paper they propose to adopt also Boddaert's name *Tardigradus* for *Loris*, but Palmer has pointed out (Ind. Gen. Mamm. 1904) that that name is preoccupied by Brisson for an Edentate. The name *Nycticebus coucang*, Bodd, must therefore be used for the animal dealt with under No. 26 in the 'Mammalia.'

In 1904, Lydekker (l.c.) separated the Ceylon and Mainland forms, on colour differences, and four years later Cabrera (l.c.) gave the name *lydekkerianus* to the Madras form. The mounted specimen, mentioned by Lydekker, is the only one from Ceylon available to us for examination, so that unless, and until, a series from Ceylon is obtained to show that the colour differences, relied on by Lydekker are not constant, the name we have here used must stand for the Madras Slender Loris, and all the names mentioned above except those in the synonymy, must be relegated to the synonymy of the Ceylon Slender Loris."—R. C. W.

"Pupils vertical and almost perpendicular. The upper points inclining slightly inwards, in a strong light they contract, to a very small size. At night when the pupils are fully expanded they shine with a very bright golden-copper light. Irides bright chestnut; bare skin on snout deep reddish flesh colour; insides of ears bright yellow. All of these specimens were kept alive for various lengths of time; in some respects they showed very little intelligence and if irritated one would generally make for and bite its nearest neighbour; some that were kept in a small room if teased would even walk across to the other side in order to attack another that might be in an other corner; while an angry female would even vent its rage on its own young, which would chatter and bite back but never let go its hold. Even when first caught they do not appear much frightened, and if carefully handled, would seldom attempt to bite unless their faces were touched. When in a cage, dogs would occasionally come up and bark at them, when they would get up close to the wires of the cage and growl back apparently without any fear whatever. If watched closely they would generally crawl away, or, if in a tree, attempt to conceal themselves among the leaves, or if that were impossible, they would occasionally hide their faces between their forepaws, which was their usual position when asleep; on account of this habit, it has got its Hindustani name *Sherminda* (shy animal).

When in a tree, especially among foliage, they bear a striking resemblance to the spotted owlet (*Athene brama*), which was very plentiful in the district, and they have the owl-like habit of swaying their heads from side to side, besides the noise they make, especially when fighting, is almost identical to the screech of this owl, except that it is perhaps not quite so loud. The only other sounds I have heard them make is a faint chattering noise rather like that of a monkey, and a kind of low growl that is uttered when irritated. The young, even when three parts grown, would cling by day to the female so tightly that she would often appear half suffocated. The pale, silky appearance of the fur on the hind parts of the females is probably due to the constant clinging on of the young; at other times it is probably similar in appearance to that of the males. Several females were found carrying two young, so that two at a birth are probably quite usual. If placed on a branch, three, or four feet from the ground, they would occasionally drop to the ground, but were quite incapable of jumping even the shortest distance from one branch to another. They have a very strong power of grip, and when caught would grab at anything within reach. Although their movements were as a rule slow and deliberate, they were much less so, than those of *Nycticebus*, and at night when on the ground they could run about at qute a respectable pace, displaying a considerable amount of cunning in trylin to escape or hide away when they were not being watched; their movements on the ground being exactly like those of a monkey when walking slowly. They must frequently travel considerable distances on the ground, as they must have done to have existed around Kolar, where most of the trees have been planted, while there are large stretches of quite

Mysore Slender Loris (*Loris lydekkerianus*).

open country between that town and any real forest country. From its evident abundance in the Kolar district it would seem to be an animal that is not confined at any rate to heavy forests. They appear quite unable to swim and when placed in water would strike out alternately with each leg in a helpless way without making any headway. They are extremely pugnacious, and when several were kept together, would fight and keep up a continual squeaking throughout the day and night, while every day one or more would get killed, probably more from exhaustion than anything else. Their method of fighting was very peculiar; it consisted of gripping each other by the fur of the head, in order to keep the other's head away, and then biting each other on the feet and hands, drawing blood freely. If kept alive for any length of time they would have to be kept separately, or in a very large enclosure. They fed freely on cooked rice and bananas, and were especially fond of grasshoppers, which they would hold in one hand and take bites from. They are said also to feed largely on small lizards and other insects."—G. C. S.

These Lorises and those received later from Coorg indicate that, besides the grey form described as *Loris tardigradus lydekkerianus* to which these belong, there is also in S. India a representative of the form *L. tardigradus*. The two forms differ not only in colour, as hitherto supposed, but also by the size of their skulls; and I, therefore, think they should be recognised as distinct species, a conclusion in which Mr. Thomas agrees with me.

The following are the dimensions of good examples of *Loris lydekkerianus* (No. 1922) and of *Loris tardigradus* from Coorg (No. 2586), the latter is perhaps rather less aged than the former.

*Dimensions.*—Head and body 245 (216); hind foot 52 (45); ear 31 (25).

*Skull.*—Greatest length 55 (48), Condyle to front of canine 45·5 (40·3); back of $m^3$ to front of canine 18 (15·5); combined inter-orbital breadth 33·4 (32·4); breadth across $m^2$ (from the outside) 17 (15·5); mastoid breadth 33·8 (29·4).

Dimensions of Coorg specimens in brackets.

PTEROPUS GIGANTEUS, Bruenn.

*The Common Flying Fox.*

(Synonymy in No. 2.)

♂ 1769, 1770, 1772, 1773, 1775, 1776, 1777, 1778, 1868.
♀ 1768, 1771, 1774, in al ♀ 1794 (head only). Kolar, E. Mysore.
♂ 2000, 2081. Seringapatam, S. Mysore.

(*See* also Reports Nos. 2, 3, 4, 5, 7 and 8.)

CYNOPTERUS SPHINX, Vahl.

*The Southern Short-nosed Fruit Bat.*

(Synonymy in No. 6.)

♀ 2043. Seringapatam, S. Mysore.

(*See* also Report No. 6.)

"Not very plentiful at Seringapatam. This species, unlike the large 'Flying Fox' seldom clings to the trees while feeding; nearly always biting at a fruit while in flight, and devouring it on the wing. Its presence in a district is not always easy to detect as it appears late in the evenings and its flight, which is comparatively swift, is not unlike that of the larger insectivorous bats."—G. C. S.]

LYRODERMA LYRA, Geoff.

*The Indian Vampire Bat.*

(Synonymy in No. 1.)

♂ 1854, 1885. ♀ 1851, 1852, 1853, 1855, 1883, 1884, 1886, 1887, 1888, 1889, 1890. Kolar, E. Mysore.
♂ 1930, 1932, 1933. ♀ 1931, Seringapatam, S. Mysore.

(*See* also Reports Nos. 1, 4, 5, 6, 7 and 8.)

The Kanarese name 'KANKAPATA' or 'KAPATA' means 'deceit' or "something that appears to be what it is not."

"I have been given the following Kanarese legend about the temple dwelling bats—from Kolar. According to the legend, bats were once birds, but becoming dissatisfied they began coming to temples in order to pray that they might be made like men; and one day they actually did change, but only partly so, becoming nondescript animals, still partly like birds, but with the teeth and faces of men. Being then ashamed to meet other birds, they only went about by night, but still they come to the temples by day, although now to pray that they may once more be changed into birds again."—G. C. S.

RHINOLOPHUS ROUXI, Temm.

*The Rufous Horse Shoe-Bat.*

(Synonymy in No. 5.)

♂ 1924, 1942. ♀ 1934, 1935, 1936, 1937, 1938, 1939, 1940, 1941, 1943, 1944, 1945, 1946, 1947, 1948, 1949, 1950, 1951, 1952, 1953, 1954, 1955, 1956, 1957, 1958, 1959, 1960, 1961, 1962, 1963 1964, in al. 1965, 1966, 1967, 1968, 1969, 1970. Seringapatam, S. Mysore.

(*See* also Reports Nos. 5 and 6.)

"In the 'Report' on the Dharwar collection, it was suggested that the colour 'phases' of some bats might be analogous to the white and dark bellied forms of "*Epimys rufescens.*" The present series, however, shows pretty clearly that the bright rufus colouring of the fur of this species at least is not peculiar to individuals, but a temporary coat which is in all probability seasonal. (I doubt if it has anything to do with the breeding season.) In a large number of this series, the red fur is evidently being 'moulted.'

I think that there is very little doubt that the red and grey bats represent the hot and cold season moults; in the present series the grey coat, that is being assumed, would seem to belong to the coming 'hot season.' I suggest, however, that the cold season moult, although normally of a varying shade of rufus is not invariably assumed, which would account for rufus or grey individuals of either sex occurring at all seasons."—G. C. S.

HIPPOSIDEROS LANKADIVA, Kel.

*The large Indian Leaf-nosed Bat.*

(Synonymy in No. 6.)

♂ 1747, 1875, 1903, Kolar, E. Mysore.

(*See* also Reports Nos. 6, 7 and 8.)

HIPPOSIDEROS DUKHUNENSIS, Sykes.

*Sykes' Leaf-nosed Bat.*

(Synonymy in No. 5.)

♂ 1862, 1863, 1865, 1866, 1871, 1872, 1873, 1879, 1880.
♀ 1783, 1784, 1864, Kolar, E. Mysore.
♂ 2014, 2015, 2016, 2118, 2019, 2022. ♀ 2017, 2020, 2121, 2123. Seringapatam, S. Mysore.
♂ 2069, 2145, 2186, 2139. Sivasamudram, S. Mysore.

(*See* also Reports Nos. 5, 6 and 8.)

"Plentiful around Seringapatam and Sivasamudram. A low but not a particularly late flier."—G. C. S.

HIPPOSIDEROS FULVUS, Gray.

*The Bicoloured Leaf-nosed Bat.*

(Synonymy in No. 3.)

♂ 1909. Coromandal, E. Mysore.
(*See* also Reports Nos. 3, 5, 6, 7 and 8.)

PIPISTRELLUS CEYLONICUS, Kel.

*Kelaart's Bat.*

(Synonymy in No. 1.)

♂ 1729. ♀ 1698, 1709, 1728, 1731. Bangalore, E. Mysore.
♂ 2034. Seringapatam.
♂ 2075, 2076, 2080, 2081, 2087, 2089, 2091, 2139.
♀ 2074, 2077, 2078, 2079, 2099, 2100, 2101, 2105 2106, in al, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2107, 2108. Sivasamudram, S. Mysore.

(*See* also Reports Nos. 1, 2, 3, 5, 6 and 8.)

PIPISTRELLUS MIMUS, Wrought.

*The Southern Dwarf Pipistrelle.*

(Synonymy in No. 1.)

♂ 1696, 1727. Bangalore, E. Mysore.

(*See* also Reports Nos. 1, 2, 3, 5, 6, 7 and 8.)

PIPISTRELLUS COROMANDRA, Gray.

*The Coromandel Pipistrelle.*

(Synonymy in No. 5.)

♂ 1697. Bangalore, E. Mysore.
♂ 2131. ♀ 2129, 2130, imm. Sivasamudram, S. Mysore.

(*See* also Report No. 5.)

KERIVOULA PICTA, Pall.

*The Painted Bat.*

(Synonymy in No. 5.)

2051 in al. Sivasamudram, S. Mysore.

(*See* also Report No. 1.)

"Without doubt a late flier. In an immature specimen from Java, the interfemoral membrane, as well as the wings, was mottled with black.

The Southern Indian specimens differ considerably from the Javanese in colour, the bright orange red of the wings being in Java of a deep yellow with hardly a trace of orange."—G. C. S.

SCOTOPHILUS KUHLI, Leach.

*The Common Yellow Bat.*

(Synonymy in No. 1.)

♀ 1717, 1725, 1726. Bangalore, E. Mysore.
♂ 1882. ♀ 1881. Kolar, E. Mysore.

(*See* also Reports Nos. 1, 3, 5, 6 and 7.)

SCOTOPHILUS WROUGHTONI, Thos.

*Wroughton's Bat.*

(Synonymy in No. 1.)

♂ 1858. Kolar, E. Mysore.
♀ 1999. Seringapatam, S. Mysore.

(*See* also Reports Nos. 1, 5, 6 and 7.)

"Fairly plentiful around Seringapatam. An early and a very swift flier."—G. C. S.

TAPHOZOUS KACHHENSIS, Dobs.

*The Cutch Sheath-tailed Bat.*

(Synonymy in No. 1.)

♂ 2053. ♀ 2052, 2054. Sivasamudram, S. Mysore.

(*See* also Reports Nos. 1, 3 and 8.)

"A small colony of this species was discovered in the roof of the Electric power station at Sivasamudram."—G C. S.

TAPHOZOUS LONGIMANUS, Hardw.

*The Long-armed Sheath-tailed Bat.*

(Synonymy in No. 6.)

♂ 1817, 1849, 1850, 1859, 1860, 1895. Kolar, E. Mysore.

(*See* also Reports Nos. 6, 7 and 8.)

NYCTINOMUS TRAGATUS, Dobs.

*Dobson's Wrinkle-lipped Bat.*

(Synonymy in No. 3.)

♂ 1812, 1840. Kolar, E. Mysore.

(*See* also Reports Nos. 3 and 5.)

PACHYURA, sp.

*Shrews.*

♂ 1700. ♀ 1699, 1701. Bangalore, E. Mysore.

(*See* also Reports Nos. 1, 3, 4, 5, 6 and 7.)

FELIS PARDUS, L.

*The Panther.*

(Synonymy in No. 5.)

1815, 1904. Kolar, E. Mysore.

(*See* also Reports Nos. 5 and 6.)

"No. 1815 must have been an exceedingly large panther, and, although apparently not much stretched, its head and body alone measures 5 ft. 9 ins., its entire length is 8 ft. 6 ins., but at least a foot of its tail has been broken off. It is considered remarkably large here, and it would have been interesting to have known its measurements in the flesh.

No. 1904 is said, by the natives who caught it, to have been adult, and an example of the small, so called dog-panther, but it appears to me to be without doubt an immature specimen."—G. C. S.

FELIS (domestic).

♂ 1816, 1838, 1869, 1891, 1893. ♀ 1892. Kolar, E. Mysore.

"These specimens are the typical domestic village cat of the Dekhan. There seems to be very little variation in their markings, except as to the extent of white on their limbs and underparts."—G. C. S.

CANIS INDICUS, Hodgs.

*The Common Indian Jackal.*

(Synonymy in No. 1.)

♀ 2112, 2136. Sivasamudram, S. Mysore.

(*See* also Reports Nos. 1, 3, 4, 5, 6 and 7.)

MUNGOS MUNGO, Gmel.

*The Common Indian Mongoose.*

(Synonymy in No. 1.)

♂ 1973, 1998. ♀ 1972, 1997. Seringapatam, S. Mysore.

(*See* also Reports Nos. 1, 2, 3, 4, 5, 7 and 8.)

"The common mongoose around Seringapatam; this species was also identified at Sivasamudram."—G. C. S.

FUNAMBULUS PALMARUM, L.

*The Palm Squirrel.*

(Synonymy in No. 2.)

♀ 1708. Bangalore, E. Mysore.
♂ 1861. ♀ 1785, 1896, 1897. Kolar, E. Mysore.
♂ 1906, 1907. ♀ 1907, 1908. Kolar Town, E. Mysore.
♂ 1982, 1984, 1985, 1986, 1987, 1988, 1990, 1991, 1993, 2003, 2004, 2005, 2007, 2012, 2013. ♀ 1983, 1989, 1992, 2002, 2006. Seringapatam, S. Mysore.
♂ 2145. Sivasamudram, S. Mysore.

(*See* also Reports Nos. 2, 4, 5, 7 and 8.)

"Not very plentiful around Bangalore, but it is said to have died off in large numbers during the last Bubonic plague epidemic, although it is curious that it does not appear to die off in all plague striken localities. Very plentiful around Kolar."

Existing in what appeared to be abnormal numbers around Seringapatam."—G. C. S.

TATERA INDICA, Hardw.

*The Indian Gerbil.*

(Synonymy in No. 1.)

♂ 1797, 1799. ♀ 1798, 1800, 1830, 1831. Kolar, E. Mysore.
♂ 1994, 2011. ♀ 1995, 1996, 2008, 2009, 2010, 2024. Seringapatam, S. Mysore.
♀ 2124, 2138. Sivasamudram, S. Mysore.

(*See* also Reports Nos. 1, 2, 4, 5, 6, 7 and 8.)

Kanarese (of Kolar) Kardilli.

CREMNOMYS CUTCHICUS, Wrought.

*The Cutch Rock Rat.*

(Synonymy in No. 3.)

♂ 1757, 1759, 1761, 1763, 1764, 1765, 1876. ♀ 1758, 1760, 1762, 1877, 1878, 1894. Kolar, E. Mysore.
♂ 2025, 2026, 2027, 2028, 2033, 2037, 2039. ♀ 2029, 2035, 2036, 2038, 2040, 2041, 2042. French Rocks, Near Seringapatam.
♂ 2046, 2072, 2082, 2083, 2095, 2116, 2125, 2135. ♀ 2044, 2045, 2047, 2048, 2049, 2071, 2084, 2123 in al. ♂ 2096. ♀ 2050. Sivasamudram, S. Mysore.

(*See* also Reports Nos. 3 and 8.)

"Very plentiful among the rocky hills near Kolar, and from the number of bones found in their pellets, this species must be preyed upon by owls. The granite hills, on which this species was obtained, cover a considerable area to the West of Kolar Town, and are quite isolated, although there are several similar but smaller patches visible to the North and North-East.

They are quite similar to the rocky hills around Vijayanagar. I think this may be the South-Eastern limit of *Cremnomys*, as to the South, the grass and jungle covered slopes of the hills, that culminate in the Jawadi hills and Shevaroys, are visible, the country between being quite flat, but it may occur a little further South, in a Western direction."—G. C. S.

"Plentiful at 'French Rocks'—the hills are bare and rocky, very similar to those around Kolar. Occurring on Chamandi hill close to Mysore City. I was very much surprised to find *Cremnomys* in large numbers at Sivasamudram, as although the hills are rocky, the country (including the hills themselves) is everywhere covered with dense scrub jungle, quite unlike the dry open localities where I had previously obtained this species, while here it was by no means confined to rocky localities. It is astonishing that such a plentiful and widely distributed species as this should have remained so long undiscovered."—G. C. S.

EPIMYS BLANFORDI, Thos.

*The White-tailed Rat.*

(Synonymy in No. 2.)

♂ 2141. ♀ 2134, 2140, 2143, 2144. Sivasamudram, S. Mysore.

(*See* also Reports Nos. 2, 6 and 7.)

"I was surprised to find, what in South India is such a typically forest species as this, existing in scrub jungle, side by side with '*Cremnomys*.' In North Kanara, I found this rat building nests in hollow trees, often at some distance from the ground. At Sivasamudrum, where the jungle is almost entirely composed of large bushes, its habits are without doubt different."—G. C. S.

EPIMYS RUFESCENS, Gray.

*The Common Indian Rat.*

(Synonymy in No. 1.)

♂ 1692, 1694, 1695, 1706, 1713, 1716, 1720, 1721, 1736. ♀ 1689, 1702, 1707, 1730, 1733. Bangalore, E. Mysore.
♂ 1786, 1833, 1837. ♀ 1793, 1819, 1836. Kolar, E. Mysore.
♂ 1910. Coromandel.
♂ 1929, 1971. ♀ 1925, 1926, 1927, 1928. Seringapatam, S. Mysore.
♂ 2098, 2114. ♀ 2073, 2097. Sivasamudram, S. Mysore.

VARIETY with white underparts.

♂ 1693, 1704, 1705, 1724, 1734, 1735. ♀ 1712, 1715, 1723. Bangalore, E. Mysore.
♂ 1779, 1780, 1781, 1814, 1818, 1835, 1846, 1856. ♀ 1766, 1782, 1834. Kolar, E. Mysore.
♂ 2056, 2057, 2058, 2113. Sivasamudram, S. Mysore.

(*See* also all previous Reports.)

"I consider the grey and white bellied varieties, obtained around these and other camps near towns and villages, are undoubtedly one species—the Indian domestic form (at one time imported). The frequent appearance of white below makes it probable that the original white bellied jungle form (of which specimens obtained in Kardibetta Forest, Shimoga, are typical) crosses freely with the grey bellied when they meet, and that the pure white bellied form has quite disappeared in the populated districts, those with white bellies merely retaining a persistent character derived from crossings probably of many generations back."—G. C. S.]

"Numbers 2113 and 2114, large specimens with extremely long tails, were trapped in jungle, one specimen has white underparts, and the other dark."—G. C. S.

MUS BOODUGA, Grey.

*The Southern Field-Mouse.*

(Synonymy in No. 1.)

♂ 1718. Bangalore, E. Mysore.
♀ 2127. Sivasamudram, S. Mysore.

(*See* also Reports Nos. 1, 2, 4, 5, 6, 7 and 8.)

MUS MANEI, Kel.

*The Common Indian House-Mouse.*

(Synonymy in No. 5.)

♂ 1745, 1746. ♀ 1739, 1740, 1742, 1743, 1744. Bangalore, E. Mysore.
♂ 1750, 1751, 1752, 1791, 1804, 1805, ♀ 1748, 1749, 1753, 1787, 1788, 1789, 1790, 1801, 1802, 1803, 1806, in al. ♂ 1807. ♀ 1808. Kolar.
♀ 2109, 2110, 2111, 2115, 2137. Juv. 2118, 2120, 2121, 2122. Sivasamudram, S. Mysore.

(*See* also Reports Nos. 5, 6 and 8.)

A peculiar thing about *Mus manei* is that it is distinctly local, and although plentiful, and occasionally swarming in most towns and villages, it is sometimes unaccountably rare or even entirely absent."—G. C. S.

LEGGADA PLATYTHRIX, Benn.

*The Dekhan Spiny Mouse.*

(Synonymy in No. 1.)

♂ 1842. ♀ 1841. 1843 juv. Kolar, E. Mysore.
♂ 2132, 2137. ♀ 2128, 2142. Sivasamudram, S. Mysore.

(*See* also Reports Nos. 1, 2, 4, 5 and 7.)

"The several species of *Leggada* trapped at Sivasamudram may have been plentiful enough, but I found it impossible to get a satisfactory series of any of them, as the enormous numbers of *Cremnomys*, in the district invariably got into the traps to the exclusion of everything else." —G. C. S.

LEGGADA SIVA, Ryl.

*The Mysore Leggada.*

1913. *Leggada siva*, Ryley. Journ., B. N. H. S. Vol. xxii, p. 241.
♀ 2070. Sivasamudram, S. Mysore.

GUNOMYS KOK, Gray.

*The Southern Mole-Rat.*

(Synonymy in No. 1.)

♂ 1820, 1822, 1827, 1829. ♀ 1796, 1821, 1824, 1825, 1826, 1827, 1828, 1847, 1848. in al. ♀ 1844, 1845. Kolar, E. Mysore.

(*See* also Reports Nos. 1, 4, 5, 7 and 8.)

BANDICOTA MALABARICA, Shaw.

*The Malabar Bandicoot.*

(Synonymy in No. 5.)

♂ 1688, 1690, 1691, 1738 juv. ♀ 1703, 1710, 1711, 1714, 1719, 1722, 1732, 1737 juv. 1741 (skull only). Bangalore, E. Mysore.
♂ 1767, 1792, 1813, 1867, 1870. ♀ 1754, 1755, 1756, 1809, 1810, 1811, 1832, 1839, 1857 in al. 1795, 1874. ♀ Kolar E. Mysore.
♀ 2055. Sivasamudram, S. Mysore.

(*See* also Reports Nos. 5, 6 and 7.)

"More plentiful in Kolar town than in any place I have yet visited, also numerous in Bangalore. A number of the specimens obtained at Bangalore, had the hair on the back curiously worn away. I think it is due to those particular specimens having made their tunnels between bricks and hard masonry which they had been unable to enlarge sufficiently. The reddish hairs on the backs of many bandicoots are probably due to insufficient colouring matter in hairs that are continually being worn away."—G. C. S.

HYSTRIX LEUCURA, Sykes.

*The Indian Porcupine.*

(Synonymy in No. 1.)

♂ 2133. Sivasamudram, S. Mysore.

(*See* also Reports Nos. 1, 2 and 5.)

Not plentiful, chiefly among rocky hills."—G. C. S.

LEPUS NIGRICOLLIS, Cuv.

*The Black-naped Hare.*

(Synonymy in No. 5.)

♀ 1823 juv. Kolar, E. Mysore.
juv. 2030, 2031, 2032. Seringapatam, S. Mysore.
♂ 2119. Sivasamudram, S. Mysore.

(*See* also Reports Nos. 5, 6 and 8.)

MANIS CRASSICAUDATA, G. St. Hil.

*The Indian Pangolin.*

(Synonymy in No. 3.)

♂ 2126. Sivasamudram, S. Mysore.

(*See* also Reports Nos. 3, 6 and 8.)

# THE SEROWS, GORALS AND TAKINS OF BRITISH INDIA AND THE STRAITS SETTLEMENTS.

By

R. I. Pocock, F.R.S.,

Superintendent of the Zoological Society's Gardens, London.

Pt. II. On the Serows (*Capricornis*) and Gorals (*Næmorhedus*).

*With 3 coloured and 4 uncoloured Plates.*

In the February issue of the Journal of this Society for 1910, pp. 807-812, I explained briefly that the Serows, Gorals and Takins, which are confined to Asia, constitute with the Chamois of Europe and the so-called Rocky-Mountain Goat of North America a special but not easily defined group of ruminant ungulates known as the Rupicaprinæ. I also pointed out in greater detail the principal characters, both external and cranial, by which the Gorals, Serows and Takins may be distinguished from each other. It may, however, be useful and save a back reference to my former paper if I recapitulate the chief features by which Gorals (*Næmorhedus*) and Serows (*Capricornis*) may be separated from one another.

It is a remarkable thing that although Gorals and Serows are very much alike superficially, so much so indeed that they have often been referred to the same genus even by experienced zoologists, they differ nevertheless profoundly in the structure of the skull. The skulls of Gorals approximate those of Takins in several particulars, and suggest a kinship between these two animals which no one would suspect from an examination of living specimens. The skulls of Serows, on the contrary, are very distinct from those of the other genera. Since, however, I am not now concerned with Takins, I will confine my remarks to the main differences between Gorals and Serows. By their cranial characters they may be briefly distinguished as follows:—

(*a*) Maxillæ in contact with the nasals for a long distance in front of the lacrymal bone; lacrymals with a large pit like depression; nasals forming a transverse or slightly arched suture with the frontals; upper rim of orbits not at all prominent..... *Capricornis.*

(*b*) Maxillæ separated from nasals by a narrow fissure and only a very short area of the lacrymal touching the nasals;

JAMRACH'S SEROW (*Car* *ensis jamrachi*).

lacrymals without any deep pit; nasals forming an angular union with the frontals; upper rim of orbits prominent. *Næmorhedus.*

Although the above mentioned cranial differences are very marked, and do not suggest close relationship between Gorals and Serows, they are nevertheless to a certain extent bridged over in the skull of the small thick coated Japanese Serow formerly called *Capricornis crispus*, but more recently separated as a distinct genus *Capricornulus*. Further evidence that *Capricornulus crispus* is related to the Gorals is furnished by the structure of the foot glands, which resemble those of Gorals, as I have shown in a paper on the cutaneous glands of Ruminants (Proc. Zool. Soc. 1910, pp. 853-855).

Another point of interest about these glands is their close resemblance to those found in the feet of sheep, both wild and domesticated. These glands open by a small orifice in the front of the pastern, above the hoof, and each consists of a short narrow duct and a more voluminous glandular sac which is bent upon itself. For want of material, I have not been able to ascertain whether exactly similar glands are present in Serows or not. To settle this, fresh or unskinned feet are necessary for examination. A living Serow from Darjeeling, now living in the Zoological Gardens, appears to have such glands, judging from the size of their orifices in the forelegs, but I could not find them on the skin of the feet of a specimen of a Chinese species (*Capricornis sumatraensis argyrochætes*), and according to Bosc an example of the typical Sumatran Serow had no foot glands. In the present state of our knowledge, therefore, it is impossible to affirm anything definite about the foot glands of Serows. Serows, nevertheless, have a well developed facial gland opening in front of the eyes by a small orifice, which is not closed by a flap of skin as in sheep and gazelles. In the Serow in the Zoological Gardens, London, referred to above, the secretion of this gland is a clear fluid which soon dries to a substance of the consistency and smell of gum arabic, and the animal itself has a strong smell something like human perspiration, but this, like the smell of goats and sheep, appears to come from the surface of the skin and not from any specially localised glands. It is the presence of this face gland in the Serows that constitutes one of the main external differences between these animals and Gorals, which have no face gland; and this gland in the Serows is lodged in the hollow of the lacrymal bone mentioned above in the brief description of the skull. Apart from this character Serows are much larger than Gorals and have much longer legs. The tail, however, is very much shorter.

The main external differences then between the two animals may be briefly epitomised as follows:—

(*a*) A distinct gland on the face in front of the eye; tail very short; height at withers about three feet..... *Capricornis.*

(*b*) No gland in front of the eye; tail longish or long; height a little over two feet at the withers ..... *Nœmorhedus.*

In the first portion of this paper (Journal Bo. Nat. Hist. Soc. XIX, No. 4, pp. 810-811). I gave briefly the reasons which compel me to adopt the name *Capricornis* for the Serows and *Nœmorhedus* for the Gorals; and it is needless, I think, to repeat them here.

Genus *Capricornis* (Serows).

*Nœmorhedus.*—H. Smith, Griffith's Animal Kingdom V, p. 352, 1827 (in part).

*Capricornis.*—Ogilby, P. Z. S., 1836, p. 138 (type *bubalinus-thar*) Gray, List Mamm. Brit. Mus., XXVI. 166, 1843; and subsequent works; Heude, Hist. Nat. Chinois II, pp. 222-234, 1894; Pocock Ann. Mag. Nat. Hist. (8) 1, pp. 183-188, 1908; *id.* Proc. Zool. Soc. 1908, pp. 174-175.

*Nemorhœdus.*—Blanford, Fauna of British India, Mammalia p. 512, 1891; Lydekker, Great and Small Game of India, p. 128, 1900, and subsequent works.

It would serve no useful purpose in a paper of this kind to follow in detail the progress of our knowledge of the Serows of British India and the Straits Settlements. It will be sufficient to say that until about three or four years ago zoologists, naturalists and sportsmen who wrote about these animals adopted the nomenclature and identifications set forth by Dr. Blanford in his classical work on the Mammalia of the Fauna of British India, pp. 512-515, 1891. This author referred the Serows of these areas to two species, the distinguishing characters of which he epitomised as follows:—

Legs white or grey near the feet..... *bubalinus.*

Legs rufous ..... *sumatrensis.*

The range of the first was said to be from Kashmr to the Mishmi Hills; of the second from the Eastern Himalayas, Yunnan and Moupin to Sumatra, through Assam, Burma and the Malay Peninsula.

Without entering upon further criticisms of Dr. Blanford's results, it is necessary to point out here that he deliberately refrained from adopting the oldest available and therefore correct name for the species he named *bubalinus* and that from not consulting the older natural histories he fell into the error of believing that the Sumatran Serow has the legs red below the knees and hocks. If he had known, as he might very easily have known from literature and from a specimen in the British Museum

FIG. 1.

FIG. 2.

FIG. 3.

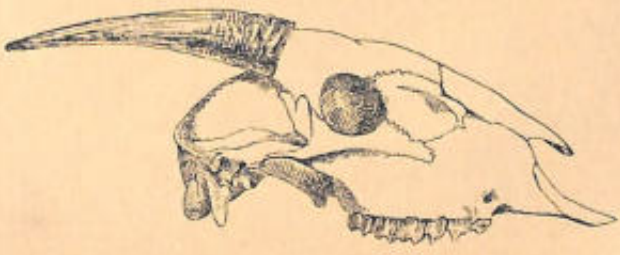


FIG. 4.

SKULLS OF SEROWS.
(Copied with modifications from P.Z.S., 1908.)

FIG. 1.—SKULL OF NEPAL SEROW (*Capricornis sumatraensis thar*).
FIG. 2.—SKULL OF RODON'S SEROW (*Capricornis sumatraensis rodoni*).
FIG. 3.—SKULL OF HUME'S SEROW (*Capricornis sumatraensis humei*) from Pir Punjal.
FIG. 4.—SKULL OF ROBINSON'S SEROW (*Capricornis sumatraensis robinsoni*) from Selangor.

that the limbs of the Sumatran animal are black to the fetlocks, he would have seen that Burmese specimens could not carry the name *sumatrensis* in a restricted sense.

There is no reason to think that Dr. Blanford included more than one race of Serow under the name *bubalinus*. But, setting aside the true *sumatrensis* which he evidently did not know, the synonymy he quoted under that specific named embraced two kinds of Burmese Serows, namely, the red form named *rubidus* by Blyth, and a blackish form with red legs named *milne-edwardsii* by David. If he had known the typical *sumatrensis* and had excluded it as doubtless he would have done, from the British Indian fauna, he would have been compelled to adopt the title *rubidus* for the Burmese Serows. He was quite evidently, however, full of doubt as to the true status of the Serows he discussed, for he wrote: "I am far from satisfied that this goat-antelope (*sumatrensis* so-called) and *bubalinus* are really distinct, or, if they are, whether the Arakan *rubidus* belongs to this form. I follow Blyth in uniting *rubidus* and *sumatrensis*."

The doubts expressed by Blanford on this head were taken up by Mr. Lydekker nine years afterwards [1] and practically expressed by the relegation of the British Indian forms to one species for which the name *sumatrensis* was adopted. A further modification of Blanford's classification was the recognition of *rubidus* as a race, so that three races of *sumatrensis* were admitted in British India, namely, *bubalinus* and *sumatrensis, sensu stricto*, and *rubidus*. The only criticism of this classification that need be offered concerns the acceptance and propagation of Blanford's mistake regarding the colours of the legs in the typical *sumatrensis*. This was repeated in the second edition of Great and Small Game of India, etc., issued in 1907.

Dr. Blanford also put Mr. A. L. Butler quite off the scent as to the true affinities of the Serow from the Larut Hills, Perak, which he described as *Nemorhedus swettenhami*, regarding it as a new and quite distinct species mainly on account of its having the legs below the knees and hocks black. If Mr. Butler had known the characters of the Sumatran Serow, he would have seen at once that his Malaccan animal was closely allied to it (Proc. Zool. Soc. 1900, 675), the two differing, not in the colour of the legs, but in the colouring of the mane.

The above given summary will show the accepted views of the characters and names of the Serows of British India and the Straits Settlements down to 1907. In that year the necessity for identifying some examples that had been acquired by the Zoological Society of London forced me to take up the question of these

[1] Great and Small Game of India, pp. 128—135, 1900.

interesting animals. Some of the results arrived at were set forth in a paper published by the Society in 1908 (Proc. Zool. Soc. 1908, pp.173—190). The rest are embodied in the following pages.

The first fact that speedily came to light was the characters of the typical Sumatran animal and the discovery that no such race exists, so far as is known, in British India. From the available material, moreover, consisting of skulls and skins mostly preserved in the British Museum, I found reason for thinking that there were no fewer than four races of Serows inhabiting the Himalayas north of Hindostan, namely, one in Kashmir, one in Chamba, one in Nepal and one in Darjiling; that there were two in the Straits Settlements, one coming from Selangor, the other from Perak. To these have now to be added two from different localities in Burma.

Apart from the two from Malacca which are very possibly based on dimorphic phases of one and the same race, the races above mentioned seem to be valid and distinguishable forms in the sense that they appear to be determinable both by cranial and integumental characters. Nevertheless I do not think their distinctive features are sufficiently rigid and invariable to justify us in giving these forms full specific rank, for I have a strong suspicion that when Serows are better known, that is to say, when more material has been collected in the localities whence the types were obtained and in localities from which skins have not yet come to hand, gradations will be traced from one to another and thus justify the view I now hold that all the Serows ranging from Kashmir to Burma belong to one locally variable species.

Although in my previous paper, as in the present one, the known Serows of the Straits Settlements have been also referred to the same species as the Himalayan and Burmese forms, I am not sure that future discoveries will not show that they should rank together with the Sumatran animal, as specifically distinct. This suspicion rests more upon the characters of the skull than upon the colour of the coat, for the skull of the animal from Selangor can be at once singled out from those of the Himalayan animals by its general characters and dimensions, the profile of the nose and forehead being markedly convex, the horns inclining much more strongly backwards, and the cranial region sloping more abruptly backwards and downwards, but in another and younger skull of apparently the same animal, these characters are much less marked. Until, therefore, a good deal more material in the way of properly localised skulls, accompanied by entire skins, has been examined, it seems to me that no final settlement of the exact status to be accorded to the different described forms of Serows can be reached.

Sportsmen who shoot these animals not unnaturally think that

there is nothing fresh to be found out about them and are contented with the frontlet or the entire skull and at most the skin on the head. But through the medium of the pages of this Journal I should like to be permitted to appeal for entire skins and skulls accompanied by full particulars as to dates, locality and altitudes. By this means alone can we hope to learn more than we know at present about the variations exhibited by Serows in different localities and the changes, if any, they may show in connection with sex, age and season in the same district. Our existing knowledge on these important points amounts to very little.

The characters of the races of Serows that have been described from different localities within the areas to which this paper is restricted may be briefly tabulated as follows:—

| | |
|---|---|
| *a*. Legs below knees and hocks mostly black; horns inclined backwards in the plane of the forehead. | |
| $a^1$. Mane composed of black and white hairs.. | *robinsoni*. |
| $b^1$. Mane with a considerable amount of red in it ..... | *swettenhami*. |
| *b*. Legs below knees and hocks rusty red or white; horns more uptilted. | |
| $a^2$. Body, head and limbs all red ..... | *rubidus*. |
| $b^2$. Body, head and limbs not all red. | |
| $a^3$. Head and body brownish-black or black. | |
| $a^4$. Legs with a considerable amount of rusty red or yellow below knees and hocks. | |
| $a^5$. Legs below knees and hocks all rusty; body brownish black..... | *milne-edwardsii*. |
| $b^5$. Legs below knees and hocks rusty fawn; knees and fetlocks white; body jet black ..... | *jamrachi*. |
| $b^4$. Legs white or dirty white below knees and hocks. | |
| $a^6$. Belly only a little paler than the sides, their colours blending; much less white on the jaw and throat and breast ..... | *thar*. |
| $b^6$. Belly white and sharply contrasted with the rufous-brown of the sides; much white on chest and along lower jaw ..... | *rodoni*. |
| $b^3$ Head pale chocolate-brown, body probably that colour also and legs probably white below ..... | *humei*. |

*Capricornis sumatraensis.*

Typical sub-species *sumatraensis*, Bechst.

The Cambing Outan, Marsden, Sumatra, ed. 1, p. 93, ed. 3, II, p.115, pl. XIV, 1811.

The Sumatran Antelope Pennant, Quadrupeds, ed. 3, II, p. 321, 1793.

*Antilope sumatraensis*, Bechstein; Uebersicht-vierfuss. Thiere I, p. 98, 1799 (based on Marsden's Cambing Outan).

*Antilope sumatrensis*, Shaw, Gen. Zool. II, pt. 2, p. 354, 1801; F. Cuvier, Hist. Nat. Mamm. IV, No. 377, (fig.) 1821; Raffles, Tr. Linn. Soc. XIII, p. 266, 1821.

*Nemorhaedus sumatrensis*, H. Smith in Griffith's An. Kingdom IV, p. 277, (fig.) 1827; Jardine Nat. Libr. Mamm. IV, p. 97, pl. 2, 1836.

*Capricornis sumatraensis*, Pocock, Proc. Zool. Soc., 1908, p. 176.

Prevailing colour black, with a thick grey mane on the neck and withers. Areas of the legs below the knees and hocks black turning brown only on the fetlocks.

*Distribution.*—Sumatra.

Although this race of Serows occurs geographically outside the localities indicated by the title of this paper, I have thought it wise to include a brief description of it, with full synonomy, on account of the erroneous conception of its characters conveyed by most of the literature dealing with Indian and Burmese Serows.

There is very little material available for description; but judging from the skin of a young specimen ticketed Sumatra in the British Museum (*Raffles*), the animal has a considerable quantity of brown on the face between the eyes and nose; but the forehead and cheeks are black. The upper lip is whitish, there is a whitish area extending from the lower lip along the edge of the jaw on each side and a dirty grey patch on the throat. Ears brown at the back, noticeably paler than the black of the neck. The occipital crest is almost all black, but the mane becomes progressively greyer posteriorly and forms a large greyish crest on the withers. The general colour of the body is black intermixed with brown and there is no white or dirty white in the chest, belly or inside of the legs. The legs are blackish brown, the fetlocks being rather browner than the upper parts, but there is no abrupt change of colours at the knees and hocks.

Subspecies *robinsoni*, Pocock.

*Capricornis sumatraensis robinsoni*, Pocock, Proc. Zool. Soc., 1908, p. 185, text fig. 35, (living animal), 36 (skull).

Closely related to the typical Sumatran race, but differing apparently in that the mane is crest-like instead of mat-like and composed of a mixture of black and white hairs.

*Distribution.*—Selangor and ? Perak in the Malay Peninsula.

This race of Serows was based upon the skin and skull of an example presented to the Zoological Society by the Government

J. Green del et Chromo lith.

SEROWS FROM BURMA AND MALACCA.

1. Capricornis sumatraensis rubidus. 2. Capricornis sumatraensis robinsoni.

of Selangor. The animal was actually captured near Batu on the Coast of Selangor; but according to Mr. H. C. Robinson, it must have wandered thither either from the range of hills between Selangor and Negri Sembilan to the south of it, or possibly from the main range of the Malay Peninsula.

In 1908 a second specimen was forwarded to the Society by Mr. Robinson's Assistant, Mr. Boden Kloss. This resembled in colour the first example from Selangor. It was said, nevertheless, to have been captured in Perak. It was to this specimen that belonged the skull, mentioned above, as differing in certain particulars from the skull of the type of *robinsoni*.

Subspecies: *swettenhami*, Butler.

*? Nemorhædus sumatrensis*, Cantor, Journ. As. Soc., Bengal XV., pp. 272-278, 1846.

*Nemorhædus swettenhami*, Butler, Proc. Zool. Soc. 1900, p. 675.

*Nemorhædus sumatrensis swettenhami*, Lydekker. The Game Animals of India, Burma, Malay and Tibet, 1907, p. 147.

*Capricornis sumatraensis swettenhami*, Pocock. Proc. Zool. Soc. 1908, pp. 186-187.

General colour black. The back strongly, the sides slightly grizzled with grey, the bases of the hairs being white. Mane black, mixed with whitish hairs on the forepart of the neck and with reddish hairs towards the withers. Inside of thighs rusty red. Neck, chest, belly, legs and tail black. Head black, but the lips whitish grey, with some red on the upper lip, posteriorly a patch of red on the lower jaw beneath. A rusty red patch on the throat. Skull unknown. Horns from 6 to 8½ inches long.

*Distribution.*—The Larut Hills in Perak; Biserat in the Malay Peninsula.

There are two specimens of this animal in the Perak Museum, an adult and young, which, according to Mr. Butler, are alike in colouration, except that the kid had a narrow rufous band above the hoof. A third specimen also resembling them, has been seen by that gentleman; and there is a skin from Biserat in the British Museum which seems to be of exactly the same type.

The evidence supplied by these skins of the apparent constancy of the colouration of the Larut examples justified the view that the Selangor example above described as *robinsoni* represented a distinct race intermediate between *swettenhami* and typical *sumatraensis*. But this evidence was weakened by the arrival of the *robinsoni* form from Perak. I have, moreover, seen a skin in the British Museum from the Siamese frontier of Malacca which seems to me to be indistinguishable from typical *sumatraensis*. From these facts I now incline very strongly to the opinion that the Serows from South Malacca, named *swettenhami* and *robinsoni* are

probably racially identical with typical *sumatraensis* as Hamilton Smith long ago thought. It would, however, be premature, I think, to unite them before craniological proof of their identity is forthcoming. Whether the Serows from Tenasserim mentioned by Dr. Cantor belong to this black-legged race or to *rubidus* or *milne-edwardsii* or are different from all three, remains to be ascertained.

Subspecies : *rubidus*, Blyth.

*Capricornis rubida*, Blyth, Cat. Mamm. Asiatic Soc., p. 174, 1863 (foot-note).

*Capricornis sumatrensis*, Blyth, Cat. Mamm. Burma, p. 46, 1875.

*Nemorhædus sumatrensis*, Blanford, Fauna of British India : Mammalia, pp. 514-515, 1891 (in part).

*Nemorhædus rubidus*, A. L. Butler, Proc. Zool. Soc., 1900, p. 675.

*Nemorhædus sumatrensis rubidus*, Lydekker, Game Animals of India, p. 143, 1907.

Prevailing colour red all over, paler beneath, a blackish spinal stripe extending to the tip of the tail ; white on the chin, lower jaw and upper end of the throat ; whitish on the fetlocks and sometimes also on the knees.

*Distribution*.—Assam (Shillong), Chittagong, Arakan, Salween.

I am indebted to Dr. N. Annandale, the Director of the Indian Museum, Calcutta, for the following information about the type and other examples of this race of Serows preserved in the Museum under his charge. "The type of *C. rubida* appears to have been destroyed, judging from an old annotated copy of the Asiatic Society's Catalogue, over 30 years ago, before the Society's collection was transferred to the Indian Museum." There are two other examples, however, in the collection, one from Shillong, the other, a young one, from Chittagong. Dr. Annandale's temporary Assistant Mr. T. Bentham, kindly supplied the following particulars about these in answer to some inquiries I made with regard to points Blyth had omitted to mention. "The individual hairs are white at the base and red distally and have no black in them ; the knees and fetlocks are white and the white of the chin extends along the lower jaw to join the white patch on the throat. The underside is not white but dirty greyish fawn which extends only on the extreme underside of the body and reaches the knee joints on the inside of the legs ; the whorls of hair at the base of the forelegs in front, are not white but light golden brown with white bases to the hair." Blyth's original specimens, namely, a mounted head and two flat skins, it may be added, came from Arakan.

Of this race I have only seen two skins. One is in the British Museum but unfortunately has no locality. It is that of an adult

animal and belonged to Hume's collection. The other skin is that of a young animal from Arakan, shot by the late Mr. C. E. Mumford. For the opportunity to examine this I am indebted to Mrs. Mumford. These differ in some interesting particulars from each other and also to a certain extent from the Shillong and Chittagong specimens in the Calcutta Museum.

In Mr. Hume's specimen the upper lip, rim of the muzzle, chin, interramal area of jaws and the throat patch are white. The head, neck and body are covered with fiery-red hairs, the head and neck being much redder than the body, the grey basal portion of the hairs of the body showing to a great extent and imparting a hoary aspect to this region. The hind quarters are darker than the body. There is a distinct but narrow black spinal stripe and the tail has a black tip. The hairs of the mane are red distally, black basally. The legs are reddish brown throughout, showing no decided change of colour at the knees and hocks, but are patched with white on the fetlocks. The lower surface of the body and the insides of the limbs at the base are greyish-red, not white.

The skin of the young specimen shot by Mr. E. G. Mumford on Kyauk-pin-daung mountain in the hill tracts of northern Arakan resembles the last described specimen in a general way. The sides of the neck are a uniform rusty yellow, the hairs being white basally but having no black in them. The shoulders and the rest of the body are darker owing to a noticeable quantity of black in the middle of each hair, the base being white and the distal end red. The hairs of the mane show the same three colours, but along the spine the encroachment of the black over the red in the hairs forms the dark spinal stripe. The upper portions of the limbs are rather darker than the body (the lower portions, like the head, have been cut away), but at the base of the forelegs on the inner side, the whorl of hairs, present in all Serows and Gorals, is quite white, and this colour extends for a short distance up the throat in front and backwards on to the inner side of the legs. There is also a white patch on the inner side of the thigh in front.

In the presence of the white upon the chest this specimen differs markedly from Mr. Hume's specimen and also from the two in the Calcutta Museum. It is also considerably darker than the former owing to a greater amount of black in the hairs of the body. The Calcutta specimens from Shillong and Chittagong it may be noted again, have no black in the hairs. Finally in Hume's specimen the hairs of the mane are black at the base and red distally, whereas in Mr. Mumford's example the extreme bases of the hairs of the mane are white. I suspect, however, that these differences in Mr. Mumford's specimen are attributable to immaturity.

It may be added that the presence of black in the hairs of some

of the red Serows serves to connect these animals with Serows of the ordinary type in which the black prevails.

In response to my inquiry concerning the habitat of these goat-antelopes, Mrs. Mumford kindly furnished me with some particular which I venture to quote verbatim from her letter:—

"Both species of goat (Red Serow and Grey Goral) were shot during Xmas-week, 1900, upon a mountain in the Arakan hill tracts called Kyauk-pin-daung. The mountain is of very curious formation for it rises abruptly out of the hills to a great height, being in the form of a horse-shoe. It is sheer both on the convex and concave sides of the horse-shoe. The top is a tableland at its widest (say) a mile across, sloping up gradually to the highest point and overgrown with a fine variety of coarse garss which sparsely covers the slabs of rock and boulder of which the mountain is formed. The convex side of the mountain presents a stern and weather-worn aspect; and there is only scrub vegetation consisting of bushes and coarse grass with some few deciduous trees on its face. Here the goats live. On the concave side there is little or no bamboo on the rock, but all up its face there are plenty of small deciduous trees. The undergrowth here is so thick that it is impossible to see anything except at close quarters, whereas the convex side of the mountain is comparatively bare. The sloping surface of the mountain leading on each side from its extremity up to the shoulder where the tableland begins is covered like all the hill tracts, with a maze and jungle of fine bamboo, which, however, ends abruptly at the edge of the tableland, which in addition to the coarse grass already mentioned bears the common English bracken. Both bison, tzaing (the Burmese wild cattle) the black Honey Bear and a species of deer range this tableland, also tiger and elephant; but they do not live there as it is only after the rains that the grass springs up and attracts the elephant, bison and tzaing up to feed. There are no monkeys so high up, though from the highest point late at night or early in the morning their chattering may be heard hundreds of feet below.

I well remember the day the red goat (Serow) was shot. My husband and a friend and I were out after brown goats (Goral) and while peering with glasses over the precipice we saw far below a large reddish goat lying up. She was lying sunning herself under a bare tree, the trees being leafless at that time of the year, and did not seem to hear us. I fired at her, but whether I hit her or not we never knew, for she jumped up and plunged away; but my husband fired immediately after I did and one of us must have hit her young one which was lying between her and the tree and which we had not seen. Hearing it cry she came back again, calling to it, but a third shot frightened her, and she plunged down the cliff helter skelter followed by a shower of stones and shale.

The little one was recovered by the coolies who went after it by being let down the face of the cliffs by ropes. These red goats were very shy indeed. It was difficult to get within shot at all and though we were on the ground some days we never saw them in groups but singly or a female with her young one almost invariably."

For the record of the red Serow from Salween we are indebted to Mr. G. W. Bird, who says it is common in the limestone hills of the Salween Valley (*Field*, Jan. 9th, 1909, p. 62).

Sub-species : *milne-edwardsii*, David.

*Capricornis milne-edwardsii*, David, Nouv. Arch. Mus. V, p. 10, 1869.

*Antilope* (*Nemorhædus*) *edwardsii*, M. Edwards, Rech. Mamm., p. 364, pls. LXXII-LXXIII.

*Nemorhædus edwardsii*, Anderson, An. Zool. Res., p. 335.

*Nemorhædus sumatrensis*, Blanford, Fauna of British India: Mammalia, pp. 514-515, 1891 (in part).

Colour brownish-black or blackish with some reddish hairs intermixed on the outer side of the thighs, the legs below the knees and hocks rusty-red throughout both externally and internally.

*Distribution.*—Moupin in Eastern Tibet; Yunnan; Burma, Moulmein and Pegu.

Evidence for, but not proof of, the existence of this race in British Burma is supplied by Beavan who described a specimen from Zwagaben, a limestone hill near Moulmein, and declared he had seen Serows like it at Thayet-mayo in Pegu. The prevailing colour was black with a tinge of hoary, the belly and tibiæ [*sic*] being rufous; the throat was rufous and white tipped, the buttocks rufous and white; the inside of the ears white with black tips and edges. It may be inferred that by "tibiæ" the writer meant the area of the legs below the knees and hocks, and presumably the expression "white-tipped" as applied to the throat referred to the ends of the hairs. The upper lip, lower lip and chin, a narrow band behind the muzzle and the whole of the inferior edge of the lower jaw as far back as the throat whitish.

The description of these animals (Proc. Zool. Soc. 1866, p. 4) is not sufficiently detailed to make their identification absolutely certain; but so far as it is possible to judge, they seem to resemble the Moupin and Yunnan form more nearly than any other. At all events the evidence that a blackish Serow with red legs inhabits the southern portions of British Burma is complete and its coloration serves to affiliate it with the Moupin race rather than with those inhabiting the Straits Settlements and Sumatra.

A closely allied form apparently resembling typical *milne-*

*edwardsii* in colour except that the fronts of the cannon bones appear to be black has been recorded by Mr. H. Shaw Dunn from Kyonklongyi and other localities in the North Shan States of Upper Burma where it lives mostly in evergreen forests at altitudes of from 4,500 to 6,000 feet. (*Field*, Jan. 9th, 1909.)

Sub-species: *jamrachi*, Pocock.

*Capricornis sumatraensis jamrachi*, Pocock, Proc. Zool. Soc. 1908, p. 183, text fig. 34 (living animal).

Prevailing colour coal black with the hairs basally white, upper lip, chin and a stripe from the latter running backwards along the lower jaw beneath white. Underside of body dirty greyish-brown. Hairs of the foreleg above the knee and of the outer side of the thigh down to the hock mixed with brown and black; area of legs below knees and hocks rufous yellow externally, with the fetlocks and knees white and the inner side whitish. The coat is shortish at all seasons of the year and has little or no underfur.

*Distribution.*—Kalimpong near Darjiling.

Two specimens of this sub-species, both imported by Mr. Jamrach from the above mentioned locality, have been seen by me. One is a mounted example in the British Museum, the other is living in the Zoological Society's Gardens. Col. Kinloch, however, shot a Serow near Darjiling, which according to Blanford was intermediate between the species Blanford named *bubalinus* and *sumatraensis*. Since these two are the same as those here named *thar* and *milne-edwardsii*, between which *jamrachi* occupies a middle place, it is practically certain that Kinloch's specimen belonged to the race now under discussion.

The skull characters of this race are unknown.

A special point of interest connected with this Serow is that an example purchased when about six months old by the Zoological Society of London in August 1906 has not changed appreciably in colour or other characters down to the present time (Dec. 1912), when she is nearly seven years old. From this it may be inferred that there is to all intents and purposes no seasonal colour change in this race and that the young is like the adult.

Sub-species: *thar*, Hodgson.

The Bubaline Antelope, Hodgson, Gleanings in Science III, p. 122, 1831.

*Antilope thar*, Hodgson, Gleanings, etc., III, p. 324, Oct. 1831, *id.* Proc. Zool. Soc. 1833, p. 105.

*Antilope bubalina*, Hodgson, Proc. Zool. Soc., 1832, p. 12.

*Antilope (Nemorhædus) thar*, Hodgson, Proc. Zool. Soc., 1834, p. 86.

J. Green del. et Chromo lith.

SEROWS FROM THE HIMALAYAS.

1. Capricornis sumatraensis jamrachi. 2. Capricornis sumatraensis rodoni.

*Capricornis thar*, Ogilby, Proc. Zool. Soc., 1836, p. 138.

*Nemorhædus proclivus and thar*, Hodgson, Journ. As. Soc. Bengal, X, p. 913, 1841.

*Nemorhædus* or *Capricornis bubalinus*, Adams, Blyth, Jerdon, Blanford and others.

*Nemorhædus bubalinus typicus* and *N. sumatraensis bubalinus*, Lydekker.

*Capricornis sumatraensis thar*, Pocock, Proc. Zool. Soc., 1908, p. 176, fig. 30, id. Journ. Bombay Nat. Hist. Soc., XIX, No 4, p. 823, 1910.

Closely allied to the last described race, but with the legs whitish or greyish-white below the knees and hocks and without the very decided rusty fawn tint on the outer side of the cannon bones. The lower surface is at most dirty greyish-brown and not clear white as in the Chamba race which follows.

*Distribution.*—Nepal, Sikhim, Chumbi.

There are a few old and mounted skins of this animal in the British Museum procured by Hodgson in Nepal and one from Sikhim presented by Blanford. Capt. Bailey recently shot a specimen in Chumbi, as recorded in this Journal Vol. XIX, p. 823, 1910.

Skulls of this Serow sent by Hodgson from Nepal are less convex in the frontal and nasal region than are the skulls of the two Himalayan races described below.

The synonymy of this animal has been quoted somewhat fully to show that *thar* and not *bubalinus* is the earliest name given to it, and therefore the one that must be adopted irrespective of frequency of use and the quite unimportant predilections of individual authors.

Sub-species : *rodoni*, Pocock.

*Capricornis sumatraensis rodoni*, Pocock, Proc. Zool. Soc., 1908, p. 180, text figs. 32 (skin) and 33 (skull).

General colour brownish-black, the black portion of the hairs tinged with red. Upper lip, lower lip and chin white, the white from the chin running along the lower jaw and joining a conspicuous patch at the upper end of throat. Sides of body, shoulders and thighs browner than the back. Chest, belly, inside of thighs and of upper portion of forelegs and the whole of the outer side of the legs from above the knees and hocks white, the white of the belly and chest sharply defined from the brown of the flanks and neck.

*Distribution.*—Chamba in the Punjab.

This race of Serows is at present known from a skin and skull sent to me by the late Major G. S. Roden, F. Z. S. It may be

distinguished from the Nepalese race (*thar*) by the characters set forth in the table (p. 303). In addition to the characters there enumerated, it may be added that the coat is long and shaggy, and has a plentiful supply of underfur, whereas in *C. s. thar* the coat is more scanty and has little or no underfur so far as is known. This indicates that the Chumba Serows live at a higher altitude than those of Nepal. There are also differences of the skull, the nasal bones of *C. s. rodoni* being extremely short, much shorter in fact than in *C. s. thar* and the following race *C. s. humei*.

Sub-species: *humei*, Pocock.

*Capricornis sumatraensis humei*, Pocock, Proc. Zool. Soc., 1908. p. 178, text fig. 31 (skull.)

Distinguishable from the previously described races of Serows by the uniform pale chocolate brown colour of the head.

*Distribution.*—Kashmir.

This race is represented in the British Museum by a mounted head belonging to Mr. Hume's collection. Apart from this nothing is known of the pelage, but since the head is approximately the same colour as the neck and body in all Serows hitherto described it may be inferred that this Kashmir race is pale brown all over. Moreover, if the law of the progressive change in the colour of the legs from nearly black in specimens from Southern Malacca to white in examples from Chamba holds good to the west of the last named district, the Kashmir animal will also prove to have white legs. To sportsmen in Kashmir we must look for the settlement of these questions. If it may be urged as a criticism of basing a race of Serows on a single mounted head that the hairs may have faded from black or dark brown to pale brown, it must be replied that one of Hodgson's Nepalese specimens has been exhibited for at least the same length of time without turning to the pale shade seen in Hume's example.

Further evidence for the distinctness of Kashmir Serows from those further east is also supplied by a skull in the British Museum from Pir Punjal, formerly belonging to Mr. Lydekker. It is, of course, not certainly known that this skull resembles that of Hume's specimen, but until there is evidence to the contrary, this may be assumed to be the case. This skull differs from that of the Chamba race (*rodoni*) in having much longer nasal bones and much shorter frontal bones, the suture between the two being near the middle of the upper edge of the lacrymal bone. The length of the nasal bones far exceeds the length of the frontals measured from the naso-frontal suture to the posterior rim of the orbit. In the skull of the type of *rodoni* the nasal bones when so measured fall short of the posterior rim of the orbit.

Genus: NEMORHÆDUS (Gorals).

*Nemorhædus*, H. Smith, Griffith's Animal Kingdom, V, p. 352, 1827, (in part); Gray, List Mamm., Brit. Mus., p. XXVI, 1843, *id.* Ann. Mag. Nat., Hist. XIII, p. 232, 1846, and later works (type, *goral*); Pocock, Ann. Mag. Nat. Hist. (8) I, pp. 183-188, 1908; *id.* Proc. Zool. Soc., 1908, p. 190.

*Kemas*, Ogilby, Proc. Zool. Soc., 1836, p. 138 (type, *goral*); Blanford, Mamm. Brit. India, pp. 513-516, 1891 (nec *Cemas*, Oken, Lehrb. Zool. II, p. 727, 1816).

*Caprina*, Radde, Reisen in Süd. Ost. Sibirien I, pp. 262-270, 1862-1863 (type, *raddeanus*).

*Urotragus*, Grey Ann. Mag. Nat. Hist. (4) VIII, p. 371, 1871, (type, *caudatus*); Lydekker, Zoologist, 1905, p. 83; *id.* Great and Small Game of India, 1900, p. 136 and subsequent works.

The essential characters of this genus are enumerated above (cf.p. 300).

*Distribution.*—Himalayas from Kashmir to Sikhim and Bhotan Assam, Arakan in Burma, and northwards through China to Corea.

The synonymy of this Genus which was long ago settled by Gray has been quite needlessly confused by authors who followed him. Hamilton Smith included both Gorals and Serows under *Nemorhædus* and this name must stand either for the one genus or the other. Neglecting this law Ogilby ignored *Nemorhædus* and called the Serows *Capricornis* and the Gorals *Kemas*. Gray, who followed him, put the matter right by reserving *Capricornis* for the Serows and keeping *Nemorhædus* for the Gorals. He dropped *Kemas*, very wisely, because Oken had previously employed the name, spelt with a 'C' instead of a 'K,' in a totally different sense, that is to say, for a number of Antelopes in which the Goral was not included. *Kemas* was, however, resuscitated for the Gorals and *Nemorhædus* transferred to the Serows by Blanford, who either did not know of Gray's settlement of the question or thought he could set it on one side. Then came Mr. Lydekker who, seeing quite rightly the inadmissibility of *Kemas* and not being aware presumably of what Gray had done, followed Blanford in using *Nemorhædus* for the Serows and introduced for the Gorals the name *Urotragus* which had been given by Gray in 1871 to a long-tailed species inhabiting north China, namely, *caudatus* of Milne-Edwards. But Radde in 1863 had cited another north Chinese species as *Antilope* (*Caprina*) *crispa* [1]; so that even if Blanford and Lydekker were right in calling the Serows *Nemorhædus* the claims of *Caprina* would have to be considered before *Urotragus* was adopted for the Gorals. But as I have said, Gray had straightened the

[1] This species being wrongly identified as *crispa* of Temminck, was correctly renamed *raddeanus* by Heude.

matter strictly in accordance with the rules of nomenclature long before all these difficulties, initiated by Blanford, arose and I can see no excusable pretext for ignoring his decision unless each author has the right to choose the name he pleases for an animal irrespective of the work of his predecessors.

The three species of Gorals now recognised from British India and Burma may be distinguished as follows :—

*a* Tail shorter, about three inches long exclusive of the hair : black stripe on foreleg passing over the knee down the middle of the cannon bone to the fetlock (Himalayas).

*b* Grey or fawn-grey, more or less suffused with black ; spinal stripe absent or not passing beyond withers ; no stripe down middle of tail and none up back of thigh ... *goral.*

*b'* Brown suffused with black ; spinal stripe reaching at least to croup ; a black stripe down tail ; blackish up back of thigh ... *hodgsoni.*

*a'* Tail longer, about 5 inches without hair ; black stripe on foreleg not passing over knee but turning and running down outer side of cannon bone (China to Arakan) ... ... *griseus.*

The Himalayan Gorals.

In Blanford's Mammals of British India, pp. 516-517, the Gorals of the Himalayas were assigned to a single species to which the name *Cemas goral* was given. But in 1905 Mr. Lydekker pointed out that there are two types of this animal in that mountain range, namely, a ' grey ' type and a ' brown ' type. To the grey one he gave the new name *bedfordi* and restricted the old name *goral* to the ' brown ' one. That these two kinds of Goral exist is undeniable, but Mr. Lydekker's selection of the technical names was most unfortunate, because Hardwicke, the original describer of *Antilope goral*, expressly stated that the animal to which he gave the name, a specimen living in the Barrackpore menagerie whither it had been sent from Katmandu, was of a ' grey mouse-colour," the Latin diagnosis running ' *corpore supra colore murino canescente* ! Since it is quite impossible to believe that Hardwicke could have applied those epithets to an animal which was independently described by Hodgson as ' rusty and brown ', by Blanford as ' brown, more or less rufous ' and by Mr. Lydekker as ' rufous brown', there is no logical escape from the conclusion that Mr. Lydekker's ' grey ' goral is the same as Hardwicke's goral and must take the technical term *goral*, with *bedfordi* as its synonym.

Clearly, therefore, it was the ' brown ' Himalayan Goral that required a new name and not the ' grey ' one. This name I

THE GREY HIMALAYAN GORAL (*Næmorhedus goral*).

supplied in 1908, when I dedicated the species to Brian Hodgson who was the first to discover and misname it.

The available evidence shows that the grey goral which ranges at least from Chamba to Nepal, is a more westerly form than the 'brown' one which extends from Nepal to Sikhim. They may prove to be merely local races of one species; but since we have no actual proof that they intergrade even in Nepal where both types occur, it is better perhaps to regard them as distinct species. At the same time it cannot be claimed that the differences between them have the same value as the differences which distinguished the Burmese Goral from both of them.

*Nœmorhedus goral*, Hardwicke.

*Antilope goral*, Hardwicke, Tr. Linn. Soc. Zool. XIV, p. 518., pl. XIV, 1825; H. Smith, Griffith's An. Kingdom IV, p. 279, 1827; Jardine, Nat. Library, Mammalia IV, p. 98, 1836.

*Urotragus bedfordi*, Lydekker, Zoologist 1905, p. 83, *id.* Game Animals of India p. 151, 1907, *id.* in Rowland Ward's Records of Big Game p. 343, fig. 1907.

*Nœmorhedus goral*, Pocock, Proc. Zool. Soc. 1908, p. 192, fig. 37.

Nec *Nemorhœdus goral*, Hodgson; *Cemas goral*, Blanford; *Urotragus goral*, Lydekker.

Colour yellowish-grey suffused with black, varying considerably in tint individually but the pale area of the hairs never rufous or brown; forehead and sides of nose suffused with rusty yellow; chin, upper lip, underside of jaws and throat patch white, the latter sometimes yellowish and dark edged. Occasionally a darker spinal Stripe on the nape and withers, but usually none, although this area often appears darker owing to the dark basal portion of the hairs showing when they are erect. Tip of tail black. No blackish stripe running up back of thigh from the hock to the root of the tail. Legs below knees and hocks varying from grey to rich fawn; the foreleg usually but not always black down the middle over and below the knee, the hindleg usually darker, often blackish, behind from the hock to the fetlock. Ventral surface and inside of thighs whitish.

*Distribution.*—Chamba, Dharmsala; Nepal, ? Kashmir.

On general grounds it seems probable that Kashmir Gorals are specifically the same as those that occur at Chamba; but I am not acquainted with any description of Gorals from Kashmir, nor have I seen any skins. Of Gorals from Chamba, I have examined eight examples shot by H. H. the Rajah and kindly sent to me through the late Major Rodon. The type of *N. bedfordi*, an example that lived at Woburn, came probably, as I learnt from Mr. Jamrach, the importer, from Dharmsala. Evidence for the extension of

this grey goral into Nepal is furnished by a skin shot by Maharajah Dhuleep Singh and now preserved in the British Museum. This skin has an important bearing on Hardwicke's statement that the grey goral he described as *Antilope goral* came from Nepal.

I may add that Major Rodon was strongly of opinion that both the 'grey' and 'brown' Gorals occur at Chamba and to convince me of this he forwarded to me the series of specimens above mentioned, which were shot by the Rajah. Clearly, however, these all belong to the 'grey' type.

A living male example of this species was presented as a young animal to the London Zoological Society in 1904 by Major G. S. Rodon and is still living. It is important to record that this specimen has not changed appreciably in colour during its eight years' sojourn is England. It has shown no tendency whatever to assume the brown coloration of the species next described.

*Næmorhedus hodgsoni*, Pocock.

*Nemorhædus* (*Antilope*) *goral*, Hodgson, Proc. Zool. Soc. 1834, p. 85.

*Cemas goral*, Blanford, Fauna of British India; Mammalia p. 516, 1891 (in part).

*Urotragus goral*, Lydekker, Zoologist, 1905, p. 83; *id.* Game Animals of India, etc., 1967 p. 151.

*Nemorhædus hodgsoni*, Pocock, Proc. Zool. Soc. 1908, p. 195.

Nec. *Antilope goral*, Hardwicke, H. Smith, Jardine, Pocock.

Colour varying in tint but always golden or rufous brown speckled with black; forehead and nose darker, cheeks paler; chin, lower side of jaws and throat patch generally yellower than in *N. goral*. A black spinal stripe extending from the head to the root of the tail but tapering away and almost evanescent on the croup. Tail black above. A dark, often ill defined stripe running up the back of the thigh from the hock. Legs below knees and hocks golden brown, generally with a median black stripe. Belly and inside of thigh greyish yellow.

*Distribution.*—Nepal and Sikhim.

Of this Goral there are in the British Museum complete skins obtained by Hodgson in Nepal and one, the type, shot by Blanford in Sikhim.

The Burmese Goral.

*Næmorhedus griseus*, Milne-edwards.

*Antilope* (*Næmorhedus*) *griseus* A. M. Edwards, Nouv. Arch. Mus. VII, Bull, p. 93.; *id.* Rech. Mamm. I, p. 361, pl. 71, fig. 2-2a, pl. 71a, fig. 1, 1874.

? *Antilope* (*Nemorhædus*) *cinerea*, A. M. Edwards, Rech. Mamm. p. 362, pl. 70, pl. 71, fig. 1, pl. 72, fig. 2, 1874.

J. Green del. et Chromo lith.

GORALS FROM INDIA AND BURMA.

1. Nemorhaedus cinereus. 2. Nemorhaedus hodgsoni. 3. Nemorhaedus goral.

*Kemas henryanus*, Henry, Proc. Zool. Soc. 1890, p. 93.

*Urotragus evansi*, Lydekker, Zoologist (4), IX, p. 83, 1905; *id.* The Game Animals of India, etc., p. 153, 1907; Evans, Proc. Zool. Soc. 1905, p. 311.

*Nemorhædus griseus*, Pocock, Proc. Zool. Soc. 1908, pp. 199-202.

Distinguishable from the two Himalayan forms above described by two main characters; the skin of the tail is about five inches long in the adult and the black stripe on the foreleg instead of passing over the knee and running down the middle line of the cannon bone to the fetlock, turns aside at the knee and usually passes down the outer side of the cannon bone to the false hoof and spreads thence on to the back of the fetlock and pastern.

The colour varies considerably individually from a dirty yellow or greyish-brown to a rich dark brown and a black spinal stripe may be distinctly defined or scarcely traceable. The hairs of the tail are black above and below and the entire tail with its long fringing hairs may reach a length of ten inches. The pale patch on the throat is tinged with yellow, especially marginally. The lower portion of the foreleg is blackish externally and behind, the knee and the inner side of this part of the limb being pale. The corresponding area of the hind leg is brownish behind and fawn or greyish fawn in front. The fetlocks and pasterns themselves vary in colour from ferruginous to fawn or white irrespective of season and sex.

*Distribution.*—Eastern Tibet (Moupin) Szechuen and Ichang in Southern China to Arakan in Burma. ? Assam.

*Nemorhædus griseus* was based upon a specimen from Moupin in Eastern Tibet. Subsequently Milne-Edwards described under the name *cinereus*, another species from the same locality, regarding the two as distinct because of certain differences in the skull and teeth. But since the example of *griseus* was a comparatively young animal with the teeth unworn and the last molar not entirely erupted, while that of *cinereus* was quite old with the teeth much worn, it is in the highest degree probable, in my opinion, that the differences relied upon were due to age.

In the British Museum there are several specimens of Gorals from Southern China which seem to be inseparable from *N. griseus*. Some of these are from Szechuen and others from Ichang. These exhibit very instructive individual variation in colour. One male example shot in Ichang on September 9th has a poor coat of a dirty yellow brown colour, with a very distinct black spinal stripe and the feet rusty yellow. Another, also a male, shot on the same day, has the coat mixed brown and grey, no distinct spinal stripe and the feet white. A third, also a male, shot in December, has the coat richer brown with the spinal stripe less distinct than in the first specimen, the feet fawn, that is to say,

paler than in the first and darker than in the second, and the throat patch yellower than in either. Again in one of two examples from Szechuen the feet are fawn, in the other they are nearly white. They were shot in January and the colour of the coat is like that of the example shot in December in Ichang. Since the type of *N. henryanus* came from Ichang, there is very little doubt that it was identical with the above mentioned examples from that locality in the British Museum.

Now as to the form from Arakan described by Mr. Lydekker as *Urotragus evansi*. In the summer of 1903 Mrs. Mumford sent me for identification the incomplete skins of some Gorals shot by the late Mr. G. E. Mumford at Kyauk-pin-daung in the Arakan Hills. (see *supra* p. 307). These I was unable to distinguish specifically from the above mentioned skins in the British Museum from Szechuen and Ichang and I consequently identified the Arakan Goral as *Nemorhedus griseus*. The late Col. Bingham to whom I showed them told me he had long been aware of the existence of Goral in Burma, but supposed them to be identical with the Himalayan animal.

Two years later Major Evans brought the skins and skulls of two young specimens from Mt. Victoria in the Pokokku district of Arakan. These fell into the hands of Mr. Lydekker, who noting certain differences between them and Nepalese Goral and overlooking the likelihood of their resembling Goral from Southern China, described them as a new species which was dedicated to Major Evans. I cannot distinguish these skins specially from those from Ichang and Szechuen and even if the latter are wrongly referred to *N. griseus*, the name *henryanus* must be adopted for them in preference to *evansi*.

The existence of a Goral in the Naga Hills, Upper Assam, was recorded by Capt. Butler (Journ., As. Soc., Bengal, XLIV, pl. 1, p. 332). The characters of this Goral are unknown to me; but since the Naga Hills are separated from the Himalayas by the Valley of the Brahmaputra, it is probable that this Goral will prove to be identical with *N. griseus*.

According to Major Evans who has given an interesting account of the distribution and habits of Gorals in Arakan and the neighbouring districts, the animal occurs at an elevation of 3,500 feet in the Chin-Luchai Hills and extends, he believes, on to the Siamese side of the Thaungyin River and about the hills at the headquarters of the Me-Ping. Their habits appear to be exactly the same as those of the Himalayan species. They live in small flocks numbering from four to about a dozen and frequent steep precipitous ground, which combined with their keenness of vision, makes them exceedingly difficult to approach except expert cragsmen. They feed in the early morning and evening

FIG. 1

FIG. 2.

SKULLS OF GORAL AND TAKIN.
(Copied from Milne Edward's Rech. Mamm.)

FIG. 1.—SKULL OF THE BURMESE GORAL (*Næmorhedus griseus*).
FIG. 2.—SKULL OF TAKIN FROM EASTERN TIBET (*Budorcas taxicolor tibetanus*).

on grassy patches near their favourite haunts and spend the day resting on inaccessible ledges of rock on the precipitous hill-sides. Their note of alarm is a short sharp hissing or sneezing noise which is immediately taken up by others of the party near by. Their flesh is not bad eating; and the best season to shoot them is from December to May. According to this same observer they stand from 25 to 27 inches at the shoulder; the average length of the horns, which are only slightly longer and thicker in the male than in the female, being about 4 inches or rather over.

## Supplementary note on the Takin (*Budorcas*).

In the Journal of the Bombay Natural History Society, Vol. XIX, pp. 812—821, 1910, I gave an account of the described forms of Takins from North India and China. Since then Mr. Oldfield Thomas has described as representing a new species some specimens procured at Tai-pei-San in Shen-si, a province of northern China, naming it *Budorcas bedfordi*, in honour of the Duke of Bedford.

It may be remembered that the prevailing colour of the Assamese and Bhotan Takin (*B. taxicolor*) is blackish brown with the whole of the upper side of the body, apart from the dark spinal stripe, suffused with greyish yellow. At least in the case of old animals it seems that there is considerable variation in colour, possibly of a seasonal nature. The new coat, when it first appears, is brown, and the old coat, when it is ready to be shed, nearly grey. The Bhotan Takin was regarded by Mr. Lydekker as a geographical race distinct from the typical form from the Mishmi Hills, but whether this view prove to be well founded or not, the Takins hitherto discovered in the two districts in question are to all intents and purposes identical.

North of the Eastern Himalayas, in Moupin and Sze-chuen, the Takin just mentioned is replaced by a lighter form (*B. tibetanus*) which is mostly yellow or grey in colour, but retains a blackish patch on the muzzle, black ears and tail, a short dark spinal stripe, and blackish or iron-grey legs. Thus the main characters in which this Southern Chinese animal differs from the Assamese one in the extension of the pale coloration over the greater part of the head, and its intensification everywhere.

In the Shen-si form (*B. bedfordi*) the obliteration of the pigment is carried a stage further. The dark coloration has disappeared from the spinal area and from the tail; but on the muzzle, ears and legs, a varying amount of black persists, at least in some skins as tell-tale marks of affinity between the Shen-si and Sze-chuen

types. Where the pigment is least apparent the Shen-si Takin is a beautiful golden yellow colour almost throughout.

It cannot be doubted that the evanescence of the pigment is a derivative and not a primitive character and this view receives the strongest support from the uniformly brown colour of the young both of the Assamese and Sze-chuen animals, the pale colour being added later in life. This being so we may conclude that the comparatively dark North Indian Takin is the least specialised and the Shen-si Takin the most specialised representative of the genus *Budorcas* hitherto discovered.

From what has been said it will be clear that although the Shen-si Takin was described as a new species, it does not differ from previously described Takins in characters of any great moment: and that gradual evanescence of pigment can be traced from the southern to the northern forms.

Speaking of *B. taxicolor* and *B. tibetanus* in my paper quoted above, I said (p. 817): "The two forms indeed are not nearly so distinct from one another as Mr. Lydekker's descriptions would lead one to suppose, and it is quite possible that Milne-Edwards was after all quite right in regarding them merely as local races of one and the same species."

This suspicion arose from the fact that several of the characters relied upon by Mr. Lydekker were shown by the literature of the subject to have no existence in reality and from the impossibility of laying hold of any convincing and definable differences in the skull and horns; the differences of colour, in fact, are practically the only differences to rely upon in distinguishing the animals. And in the *Field*, May 6th, 1911, p. 866, I suggested that there were no logical grounds for regarding the Shen-si and Sze-chuen Takins other than as local races. Quite recently Mr. Lydekker adopted this suggestion (*Field*, October 26th, 1912, p. 860) when writing of some Takins obtained by Mr. Fenwick Owen in Kansu, he said these "Specimens suggest that all the Chinese Takins are local forms of a single specific type." He also said of this Kansu Takin that it "appears to be a whole coloured animal very similar to the Golden Takin (*B. bedfordi*) from Shen-si, but darker in colour." But we know from the typical *B. taxicolor* that the exact shade of colour has no systematic value. Hence it probably has none in the case of the Chinese forms. A further point to be noticed is this. A Takin from Kansu was described by Mr. Lydekker (in Rowland Ward's Records, p. 350, 1907) as *Budaras sinensis*, as I have already pointed out in this Journal (Vol XIX, p. 820). But this animal was subsequently regarded by its describer as identical with the Sze-chuen form *B. tibetanus*.

The position then appears to be this. Two kinds of Takins are alleged to exist in Kansu, namely, *tibetanus* which ranges southwards

to Sze-chuen and *bedfordi* which ranges eastwards to Shen-si. The possibility of this must be admitted : but, however strong a suspicion one may have that *sinensis* and *bedfordi* will prove to be indistinguishable the available material does not warrant their systematic fusion; but the inference that they are merely racially separable is quite justifiable.

If then we regard all the described Takins as belonging to one species, *Budorcas taxicolor*, the races may be tabulated as follows :

Sub-species *taxicolor*, Hodgson, 1850, Mishmi Hills.
" *whitei*, Lydekker, 1907, Bhotan.
" *tibetanus*, M. Edwards, 1874, Sze-chuen.
" *sinensis*, Lydekker, 1907, Kansu.
" *bedfordi*, Thomas, 1911, Shen-si.

## EXPLANATION OF COLOURED PLATES.

*N. B.*—The illustrations on the coloured plates representing Serows and Gorals have all been traced from photographs. The shapes and attitudes of the animals are therefore correct. The coloration is not however in all cases quite accurate.

### Serows from Burma and Malacca.

Fig. 1.—The red Burmese Serow (*Capricornis sumatraensis rubidus*). In this figure the white on the throat is overdone and the area above the nostrils should have been black.

Fig. 2.—Robinson's Malayan Serow (*Capricornis sumatraensis robinsoni*). The colour of the eye is doubtful and there should have been more black above the nostrils.

### Serows from the Himalayas.

Fig. 1.—Jamrach's Serow (*Capricornis sumatraensis jamrachi*) from Darjeeling.

Fig. 2.—Rodon's Serow (*Capricornis sumatraensis rodoni*) from Chamba.

The Nepal Serow (*Capricornis sumatraensis thar*) is intermediate between these two in colour.

### Gorals from India and Burma.

Fig. 1.—The Burmese Goral (*Næmorhedus griseus* not) *N. cinereus* as labelled on plate.

Fig. 2.—The Brown Himalayan Goral (*Næmorhedus hodgsoni*) from Nepal and Sikkim.

Fig. 3.—The Grey Himalayan Goral (*Næmorhedus goral*) from Chamba.

# THE COMMON BUTTERFLIES OF THE PLAINS OF INDIA.

## (INCLUDING THOSE MET WITH IN THE HILL STATIONS OF THE BOMBAY PRESIDENCY).

BY

T. R. BELL, I.F.S.

## PART XIV.

[*Continued from page 100 of Volume XXII.*]

**98. Ixias pyrene.**—(Pl. J, figs. 65♂, 65*a*♀)—*Dry season brood.*—Male *upperside*: deep sulphur-yellow. Fore wing: base and basal half of costa thickly irrorated with black scales; apical half of the wing black, with an enclosed, large, irregularly triangular, orange-coloured patch, the apex of which is more or less broadly rounded and blunt; the orange colour extends into the apex of the cell but is interrupted there by a black, discocellular spot that spreads diffusely inwards and joins the black, oblique bar which forms the base of the orange patch; veins that traverse this latter, black. Hind wing: uniform with a little black scaling at extreme base; termen with a dusky-black, somewhat narrow border (sometimes entirely absent) which decreases in width posteriorly. *Underside*: a darker yellow, sparsely irrorated with fusco-ferruginous short strigæ and minute spots. Fore wing: base and posterior area broadly similarly irrorated, with a whitish pale virescent tint; the strigæ and minute spots most numerous towards the apex and along the termen; interspaces 4, 5, 6 and 8 with a curved, subapical series of small, rounded dull-ferruginous spots and a similar spot on the discocellulars. Hind wing also with a ferruginous spot on the discocellulars, followed by a postdiscal series of similar spots in interspaces 3 to 8, all or most of them, centred with white; the spots in interspaces 5, 6 and 8 the largest, those in 5 and 6 often coalescent. Antennæ and thorax anteriorly dull-ferruginous; thorax posteriorly and abdomen above, fuscous black; head, thorax and abdomen beneath: yellow. Female *upperside*: white, faintly tinged with yellow. Fore wing: apical half black, with an enclosed, irregular, broad, oblique patch of the ground colour that extends into the upper apex of the cell; on the innerside of this the black is reduced to a short, oblique bar broadened at the lower apex of the cell, from whence it is continued as a somewhat slender, diffuse, oblique streak to the tornus, where it broadens again abruptly and meets the black on the termen; the outer margin of the oblique, white patch is irregularly crenulate, sometimes triannulate; the black colour on the apex often forms a right angle on vein 4; on the white patch posteriorly there is a black spot in interspace 2 and another in interspace 3. Hind wing: uniform, a few subobsolete, slender, fuscous, transverse strigæ posteriorly; the terminal margin sometimes with (more often without) a narrow, dusky-black edging, broadened anteriorly at the apices of the veins. *Underside*: similar to that in the male, with similar markings, the ground-colour a dark, dull ochraceous, the fusco-ferruginous strigæ more numerous. Antennæ, head, thorax and abdomen as in the male.

*Wet-season brood.*—Male and female *upperside*: differs in the broader, more pronounced, black, terminal edging to the hindwing which is often

remarkably broad; and in the female by the ground colour which is pale yellow. *Underside*: the fusco-ferruginous strigæ and spots often sub-obsolete, occasionally entirely absent in the male. Expanse 43-62 mm.

Col. Bingham says that the species was described originally from a dry-season male, probably from China. He states that the insect is most variable in size and colour locally and seasonally; and that the characters peculiar to the dry and wet-season forms are most unstable. It is not uncommon to find specimens with the wet-season character of the broad, black border to the hind wing on the upperside and on the underside with the prominent, fusco-ferruginous, transverse strigæ and spots usually associated with the dry-season forms. Again in the male, the width of the orange patch of the fore wing is very variable. Broadly speaking, however, he says, the males of *I. pyrene* can be divided into two groups mentioned here at the end of "Habits."

*Egg*.—An egg was laid at about 1 p.m. on the 14th September 1912, on a partly eaten leaf of *Capparis sepiaria* at Pachchapur in the Belgaum District of the Bombay Presidency; it was pearl-white in colour and shiny; it turned pale cream-colour the second day; pale pink blotches and spots appeared all over it on the 16th, but these were not very dense. The little larva emerged about 7 o'clock on the morning of the 18th. The egg is more or less bottle-shaped as in

the margin has 12 longitudinal ridges or ribs from top to bottom, of which the 1st and 4th sometimes, or the 1st and 3rd sometimes, anastomose before the top, finishing then, thus joined, in a little free tooth: the teeth forming a narrow ring or crown to the egg: the intervening ridges, when two, run into each other or into one of the ones that reach the top. Always 6, or half the number, seemingly, reach the top as teeth. The ridges are thin, round-edged, and the intervals between, double the breadth of the ridges, are concave and finely, transversely striated with some 30 or more parallel, fine, low cross-ridges. The points or teeth are fairly long, the intervals between them rounded. L: 1·5 mm.; B: 0·6 mm.

*Larva*—The little larva emerged about 7 a.m. on the 18th of September and finished the egg-shell by about 10 a.m. as its first meal. Then it began to wander about the leaf. The 2nd stage was 2 mm. in length by 0·5 mm. in breadth and of a translucent ochreous tint, the spines from the subdorsal, dorsolateral, and supraspiracular, large, conical, slightly opaquely white tubercles nearly as long as the larva is broad; those on segment 2, indeed, slightly longer and curved forwards; those on the anal segments somewhat shorter but longer than the majority; all these with little globules of liquid on their ends; other hairs there are also in the subspiracular region but not as stout as those from the above main tubercles. The head more or less round in shape, of the same colour as the body, with dark eyes and jaws and a slight red apical blotch; surface shiny, smooth except for some long, slightly curved (as long as or very little shorter than the majority of the body hairs) hairs in the usual positions. There is a more or less distinct neck, the long tubercle hairs of segment 2 making a very prominent collar behind it. The colour is, as said above, a translucent ochreous-yellow before feeding on the leaf substance, with a red subdorsal shade on segment 9 and on head-vertex; all tubercles slightly opaque-white, the hairs all light except those on the

head which are nearly black and one, subspiracular, on segment 2 also black.

*3rd stage.*—The little larva finished moulting on the night of the 23rd of the month. It had become green before it moulted from eating vegetable matter. It was still green when it finished moulting though slightly less opaquely so. On the 25th morning it was 11 mm. long by something over 1 mm. in breadth; it was shiny green in colour, the head being tinged with yellow; on segments 2, 3, 4, 5, 6, 11 and 12 there were spiracular, dark, chocolate-brown marks, just little spots on the first 3 segments, a good deal larger on segments 5, 6, still larger and nearly coalescing at margins on the last two, including the spiracle on the last four. The tail-points well accentuated, short, diverging, separated narrowly at bases, conical, covered with little erect hairs like the body though slightly longer, proceeding from the somewhat flattened cremastral segment out backwards and in the same plane with it. The head is round, though of course truncated across jaws and that, indeed, somewhat broadly; the clypeus is large, triangular and somewhat depressed; the surface shiny, bearing many, little, brown, erect hairs or bristles all over its surface as well as some few (the usual subdorsal, dorsolateral and lower ones) longer hairs from, each, a light-coloured, conical tubercle; the jaws and eyes dark in colour, the labrum and ligula perhaps lighter than the rest. The surface of body transversely lined as usual, covered somewhat profusely with short, erect, brown hairs which do not, however, hide the surface in the least when viewed from above, these hairs being disposed without order on the intervals between the depressed lines; there are also the prominent white, conical subdorsal, dorsolateral and supraspiracular tubercles of this type of larva, each bearing a longer, erect dark hair with the usual drop of liquid at its tip, though this drop may be wanting occasionally (its presence seems to depend upon the state of health for it is mostly wanting in such larvæ as are stinted in their food); some fine hairs subspiraculary which are light in colour and as long as the main-tubercle ones; there are two less conical, yellowish tubercles below the spiracles; there is a distinct "flange" running the whole length of larva below the spiracles and these are situated upon it. Spiracles oval, of ordinary size, flush, whitish in colour; those of segments 11, 12 larger than rest; those of segment 2 also, of course, larger. The colour of the larva is light grass-green, the ventrum and legs and claspers somewhat lighter still, all shiny; the chocolate spiracular markings very conspicuous, seemingly prominent-convex, shiny.

*4th stage.*—This was successfully accomplished in the night of the 25th September; the larva was eating the cast skin on the morning of the 26th. On the 28th mid-day it was full grown and then measured 17 mm. by 2 mm. The head semi-elliptical, the lobes fairly well marked, the vertices of lobes rounded; the surface minutely shagreened, covered with short, semi-erect, sharply and slimly conical, brown hairs, all of the same length, distant one from the other about their own length (no longer vertical or facial ones except a few, very slightly longer, about base); clypeus large, triangular, same colour as rest; labrum same colour also; ligula whitish; jaws tipped dark brown; eyes glassy, sometimes partially suffused brown; antennal basal joint green; 2nd joint colourless translucent. Surface of body as in last stage, the main tubercles rather less prominent comparatively with rather (also comparatively to the minute hairs) shorter brown hair to each; the whole surface similarly transversely lined and covered with similar, dark brown, short hairs; the anal segment with the points rather more widely separated by an even rounded sinus in continuation with the inner, lateral outline of each, the points shortly haired with white and brown hairs, the subspiracular region shortly light-haired. The spiracles light, thinly bordered with black, surrounded by body-colour

somewhat broadly in the chocolate spiracular blotches; the spiracular chocolate line more or less along the whole larva, turning white along segments 13, 14; spiracles of segments 2 and 11, 12 very slightly larger than rest; all oval, flush. Colour of body grass-green, the tops of transverse ridges dotted alternately white and brown not affecting the depressed lines; the main tubercles white; true legs watery-green; prolegs light green, marked slightly with brown; the subdorsal, tubercles of segments 6—11 suffused brown for some distance round bases, forming spots. The above is the end of the stage; the larva has just settled down to begin preparing for the moult which will bring it into the 5th stage; it is 2 o'clock p.m. of the 28th.

*5th stage.*—The larva cast its skin on the morning of the 29th at 8 o'clock. On the 1st of September it was as follows:—24 mm. long by 3 mm. broad. Head round, the lobes less distinctly indicated; surface similarly shagreened, covered with minute, shiny, deep-brown, slightly raised points, each bearing a short pointed bristle a little longer than itself, all pointing downwards towards the jaws; clypeus large, triangular, pointed bearing a few brown points with bristles like the rest in its upper half; eyes very prominent; colour of head rather dark grass-green; the labrum green, longitudinally crinkled; the ligula shiny, smooth, light green, antennal basal joint green, 2nd suffused-brownish; jaws dark-tipped; eyes suffused brown; a beginning of a white band through eyes, bordered above and below brown-red representing a continuation of the spiracular band of the body. Surface of body as in the last stage, the main tubercles white, comparatively smaller, with the surmounting hair comparatively even more minute; the rest of body bearing similar, still more minute hairs than in last stage; the tail-points comparatively rather shorter, more widely separated, perhaps blunter; the anal segment well overhanging the anal claspers. The spiracles oval, flush, yellowish-white, thinly dark-bordered, those of segments 2 and 12 much larger than the rest, that of segment 11 slightly larger. Colour of body dark grass-green covered with little dull-red dots; a more or less interrupted, spiracular, white, narrow band, bordered above and below by brownish-red, this brownish-red subsisting, where the white is wanting (on some segments in this particular larva) as an interrupted line broadening and darkening in colour on segments 5, 6, 7; the white band very distinct on segments 10 to end of 14 and along its hinder margin; belly, true legs and prolegs somewhat purer green, the true legs slightly suffused with pink, the prolegs more liberally as regards the extremity of their cylindrical portion, the feet lobed and nearly colourless. The length was 27 mm. by 4·5 mm. just before pupation when the larva became semi-translucent looking. When full grown it sits with the front segments 3, 4, somewhat hunched and the belly resting flat on the surface and then reminds one of the larvæ of *Hebomoia glaucippe*.

Foot of Larva.

*Pupa.*—The pupa is very like that of *Ixias marianne*; the general shape as to the wide bulge of the ventral wing-outline and snout to head is the same; the inclination of the portion composed of segments 1-4 is generally at an angle of 45° to the rest, sometimes at a much greater angle, up to 75°. The head is mostly composed, as far as visible from above, by the widened base of the "snout," the cylindrical end-half of which, sometimes straight, sometimes turned up, is as long as the widened basal half; the transversely convex segment is not quite as long as this half and both front and hinder margins curve towards each other in dorsal line of pupa, each reaching the dorsal line in an angle, not a curve and this dorsal line is in the

same plane as vertex of head, that is, slightly ascending from the longitudinal axis towards thorax ; the thorax itself is rather prominently humped, the front slope rather less (though much more than segment 2) inclined away from longitudinal axis than hinder slope is towards it, the curve of the two slopes being wide and even : about an angle of 125° if it might be expressed as an angle; the hinder margin of thorax is a considerable curve meeting the wing-lines on each side in a rather deep, rounded angle of not far off 90° (say 80°) ; the dorsal line of abdomen is very slightly convexly curved thence to cremaster ; the lateral outline of head and segment 2 is a semi-ellipse (apex produced into the snout) placed on the thoracic portion of pupa which is somewhat suddenly broader, sloping shortly to the shoulder bosses where the short, lateral wing-edge ridge takes its origin ; the lateral outline of pupa then curves, gently and evenly, slightly inwards (the breadth of pupa decreasing) to about segment 4, then out again as evenly to segment 7, whence the pupa narrows gradually to the cremaster ; the ventral outline is slightly convex at head, then very slightly concave (nearly quite straight) up to where it curves largely and widely over the apex of wing-bulge back again to abdomen at segment 8, after which the ventral line of abdomen is a straight line to cremaster ; if the line from cremaster to shoulder-point is considered to be the longitudinal axis of pupa, the straight front slope of the wing-bulge curve is at 45° to it; the cremaster is a rather small, square piece with the extreme end a wide rounded sinus leaving a blunt point at either angle, the sinus perhaps about the depth of ¼ or ⅓ of the square piece ; this square piece is slightly concave down the middle and is continued along sides of segment 14 (and pupa) in a broad, well-defined, prominent, round-ended extensor-ridge ; the ventral surface of cremaster is concave, the whole piece thin dorso-ventrally and there are also two slight ventral, extensor ridges on the undersurface of segment 14, curved towards each other and ending in a little free, blunt point or knob. Spiracles of segment 2 are linear, pointed at ends, flush, rather long, lighter in colour than the pupa ; the rest are greyish white, with lighter, narrow, central, raised line and with a fine, raised, green border-line ; they are not large, that of segment 11, however, is much larger than the rest, that of 12 is blind. Surface of pupa is very finely punctate on abdomen, imperceptibly corrugate-rough elsewhere, the intervals between the lower parts flat and very little raised; the snout transversly, deeply lined, often seemingly composed of two pieces, one narrower than the other, end to end. Colour light green mottled darker in round dots and spots ; the snout, lateral cremastral extensor ridges, dorsal line of thorax (generally carinated slightly), shoulder points, a lateral dot or spot at front margin of each segment (most prominent, sometimes a little patch) on segments 4 and 9, a more or less obsolescent, dorsal, spiracular and central, ventral line, some ventral, abdominal dots, a fascia along inside edge of apical orange wing-patch orange (the area occupied by the orange patch, in the imago that is), a discocellular spot, some powdering on wing-surface : all these some shade of brown, some nearly black others quite light. As often as not the pupa is bone-coloured with the markings black or dusky when the change takes place where the green of the leaves does not affect it. The antennæ only reach to just before apex of wing-bulge curve. L : 20 mm.; B : 5 mm. at middle ; H : about 9 mm. at apex of wing bulge, 5 mm. at thorax-apex ; L. of snout : 1 mm.

*Habits.*—The egg is laid single on a leaf, dead stick or withered part of the plant in any position and the laying is done rapidly ; most generally a shaded place is chosen low down on the plant and often right inside amongst the stems and branches, for the plant

grows in thickets and very often amongst prickly-pear and *Lantana*. The little larva always eats the egg-shell as its first meal and emerges through the side and generally near the top. It then wanders away and takes up its position on a leaf, either above or below, making a bed of silk to rest on; it is never found on young leaves and always eats fully mature ones, often, indeed, those that are partially withered. At first it eats the surface in little round holes which do not penetrate the whole substance; later on it starts at the side, always lying along the edge of the eaten part. This position is well chosen for the larva is then very difficult to see; and it has the habit of falling off when violently disturbed, keeping, however, an anchor in the shape of a single silk thread by which it climbs back when the danger is over. Although, where the butterfly occurs, it is always plentiful, the larvæ are not easy to find; and when found, they are generally ichneumoned and die like most of those of this type; or, indeed, like most of the larvæ of the typically plain-country butterflies. The pupation takes place in a secluded place, well hidden from outside and the chrysalis is attached very strongly by the tail and hangs in a loop just long enough to allow the ventral surface of the abdomen to move without touching the branches or object wherefrom it is suspended. The larva is somewhat sluggish, always moving slowly and haltingly; the pupa wriggles slowly from side to side in a jerking manner when disturbed. The butterfly is a fairly fast flier and delights in the sun; it goes readily to flowers and rests on leaves of bushes and trees at rather long intervals. In the evenings or in dull weather it retires to places low down among the leaves in the thickets which characterise its haunts; it then sits with the wings closed over the back and the front ones drawn into the hinder ones. The flight is generally hurried, more or less straight and varies little from an even, strong fluttering motion of the wings. The butterfly is, as a rule, found in the open country and about the bases of hills in scrub-jungle where there is much tangled vegetation; it seems to be particularly partial to places where prickly-pear (*Opuntia dillenii*) abounds. It is not found in the Bombay Presidency in Kanara on the coast; but is common in Bandra near the city of Bombay close to the sea and is plentiful throughout the Dharwar, Sholapur and Bijapur Districts, and in Belgaum east and north. The foodplant of the larva is *Capparis sepiaria*, L., and it will not readily eat any other Caper. The distribution of the butterfly is given by Colonel Bingham as "nearly throughout our limits, but not in desert parts; extends to China and the Malayan Subregion." By "our limits" is meant British India. Colonel Bingham says that the insect is so variable that it can be divided into two groups as follows:—

(1) *Pyrene* group.—Forewing with the orange patch on the upperside broad, extended right across the apex of the cell, but in

typical *pyrene* interrupted there by a black discocellular spot. To this group belong *evippe*, Drury, *rhexia*, Fabr., *sesia*, Fabr., and *latifasciata*, Butl.

(2) *Pirenassa* group.—Fore wing : with the orange patch on the upperside narrower, extending only into the upper apex of the cell. To this group belong *kausala*, Moore, *satadra*, Moore, *moulmeinensis*, Moore, *frequens*, Butl., *dharmsalæ*, Butl., *watti*, Butl., *cingalensis*, Moore, *jhoda*, Swinh., *alana*, Swinh.

**99. Ixias marianne.**—(Pl. I, fig. 62)—*Wet-season brood.*—Male, *upperside*: chalk-white ; apical half of fore and terminal margin of hindwing broadly black, the black on the latter broadest anteriorly. Fore wing : a broad, rich-orange patch obliquely across the black area extended to the upper apex of the cell, narrowed posteriorly and spread above the tornus into interspace 1 ; opposite the apex of the cell this orange patch is very broad and leaves only the apex of the wing and a comparatively narrow band along the termen and costa black ; base of the wing irrorated with black scales. *Underside* : rich sulphur-yellow as in most of the forms of the genus, irrorated with fusco-ferruginous, short, transverse strigæ and minute dots. Fore wing : the orange patch of the upperside plainly seen by transparency on the disc ; a broadly triangular area below the cell white ; discocellular spot large and prominent, centered with white. Both fore and hind-wings with a discal, transverse series of reddish brown spots, in other forms characteristic of the dry-season broods, present and more or less conspicuous, the spots always centred with white ; on the fore wing the patch above the tornus prominent and in some specimens very large. Antennæ reddish-brown, head and thorax anteriorly with reddish-brown hairs, thorax above with white hairs, abdomen black ; beneath : head, thorax and abdomen white.—Female *upperside*: similar. Fore wing : the orange patch on the black apical area narrower, posteriorly truncate, not extended below interspace 2 ; an outer transverse series of four black spots on the orange patch in interspaces 2 to 5. *Underside* as in the male, the markings slightly larger. Antennæ, head, thorax and abdomen similar.

*Dry-season brood.*—In both sexes this differs less from the wet-season form than it does in *I. pyrene*. The characteristic dry-season markings on the underside are more pronounced, sometimes remarkably so. Expanse : 54-56 mm.

*Egg.*—Is of the usual shape, that is, shaped like a bottle, with a very short neck ; rather slight, with 11 longitudinal, fine ridges, the intervals between them concave ; some 6 of these ridges, reaching the somewhat thickened ring round the narrow top as little white teeth ; the neck of the bottle affecting ¼ of the height ; surface finely, tranversely striated parallelly, shiny. Colour light yellow when laid, turning flesh-coloured. H : 1·5 mm. ; B : nearly 0·5 mm.

*Larva.—First stage.*—1·5 mm. in length when born, ochreous in colour the head black or yellow, round, with black tubercles and short black hairs. Body cylindrical, anal segment bifurcated ; surface more or less sparsely covered with erect bristles, each with a drop of liquid at its extremity. Colour yellowish with sign of a dark-purplish, spiracular band.

*2nd stage.*—Head shiny, bristled, green, speckled with brown; body with rows of little bristles transversely across each segment, mottled with brown, otherwise green; tail points well developed.

*3rd stage.*—Head same as in last stage; body covered densely with small bristles of a brown colour; reddish-brown spiracular band, darker round the spiracles which are placed on it; otherwise the colour of larva is green.

*4th stage.*—The head is round, somewhat rugose as to surface, covered with short bristles which are brown on upper part, longer and white around base. The body is broadest immediately behind the head: about segments 3 and 4, narrowing to the narrow anal segment which ends in two contiguous, short, triangular teeth thickened at ends and set with small, brown bristles; these teeth transparent at ends and red-brown at base. The surface of body is covered with very minute, brown bristles nearly all of one size. The colour is grass-green with a spiracular, yellow, narrow band bordered narrowly by red-brown below and more faintly above, stretching from end to end of larva; abdomen bluish green.

*5th stage.*—The same as above; head and body covered with very minute, brown bristles amongst which the main-tubercle bristles are hardly perceptible by their slightly greater length; anal segment trapeze-shaped, the cremaster itself or the part that becomes the cremaster in the pupa being nearly square, the tail-points short but very evident. Spiracles small, nearly flush (perhaps sunk a little), oval, light in colour. L: 28mm.; B: nearly 5mm.

The larva is somewhat broadened out in segments 3, 4 and sits with the ventrum closely applied to the resting surface at times in the manner of that of *Hebomoia glaucippe*.

*Pupa.*—Is of the same shape as that of *I. pyrene* described above having the same large parabolic wing-bulge; the head process slightly curved back (sometimes straight), rather long, cylindrical with conical base. Segment 2 straight as to front margin, the hinder margin concave towards the head; the piece composed of head and segment 2 is trapeze-shaped from above and triangular from side view; the front part of pupa, composed of segments 1-3, is thrown back at an angle of about 75° to the plane of the abdominal axis, so that the hinder dorsal slope of the humped thorax is inclined to segment 4, 5 at an angle of, say, 110°; the front slope of thorax less steep, the apex broadly rounded; sides of thorax (lateral outline of pupa there) very slightly convex; wings slightly expanded behind shoulders where the pupa is broadest; dorsal line of abdomen slightly convex, ventral line slightly concave. The cremaster is square, bifid, the depth of sinus separating the two points being ⅓ the length of it; each point is bluntly rounded; the ventral extensor-ridges are parallel and end each in a small free point. The antennæ reach to just before the apex of wing-bulge. Surface of pupa like that of *I. pyrenne*; the shoulders with a slight tubercle. Spiracles of segment 2 indicated by a flat, narrow, light coloured surface let in between the margins of segments 2, 3; the others nearly flush with a medial, raised, narrowly oval, lighter centre which has got a depressed line down its longer diameter but posterior to the middle of it; spiracle of segment 11 not larger than rest; that of segment 12 blind. Colour of pupa livid bone-colour, speckled, dotted and slightly blotched with ochreous brown; the lateral line from shoulders to end of cremaster (sub-spiracular to hinder margin of segment 5, thence supraspiracular to end) is very much darker, especially along segments 3-5 and 10-14; the snout

also, and apex of thorax, dark; a darkish, dorsal line; a black speck in front of each spiracle and another, lateral, near front margin of each segment; cell-spot on wings deep brown; the broad, square-ended strong, lateral extensor-ridges of cremaster as well as snout pinkish, dotted with black. The colour may be green marked with dark reddish-brown. L: 19 mm.; B: 5 mm.; H. at wingbulge: 9 mm.; L. of ventral line from tip of snout to apex of wing-bulge: 14 mm.; from apex of wing-bulge to end at segment 9: 6mm.

*Habits.*—The egg is laid on the wood or on a thorn, or on a leaf, either on the upper or under surface; and always singly. The larva lives generally on the upperside of a leaf in the normal manner but feeds lying along the side or along the part previously eaten, like *I. pyrene* and the *Pareronia* larvæ. In the last two stages, it wanders about a good deal and rests on stalks and branches; it feeds on tender leaves; it is sluggish in its movements. The pupa is formed under a leaf or from a leaf and stalk, the tail attached to the stalk, the body-band to the underside of the leaf; the attachments are strong, the body-loop rather lax. The position chosen for pupation is generally fairly open, not amongst thick foliage and branches as preferred by *I. pyrene*. The butterfly is on the whole much more of an open-space insect than *I. pyrene* and may be seen right away from jungle in the open country flying along the "bands" (boundary-ridges) between the fields in the black-soil plains, though it is also found with the other species in scrub-jungle areas. It is never as plentiful as the other species where they are found together but is plentiful where it occurs. It is a better flier than the other on the whole and is fond of the sun, often goes to flowers and is easy to catch when so engaged. The female is never nearly so plentiful as the male; out of every dozen caught perhaps one will be of that sex. The flight is the same as that of *I. pyrene* though, as said before, perhaps stronger and faster; the butterfly rests in the same way. The foodplants are all Capers: *Capparis sepiaria, Capparis divaricate, C. aphylla, C. grandis* are plants it has been bred upon. Its distribution is N. W. Himalayas as far east as Kumaon; Punjab; Bengal; Central, Western and Southern India; Ceylon.

**100. Ixias nola.**—Very closely resembles *I. marianne* in both sexes, but the few specimens Colonel Bingham has seen, he states, are constant in colouration, and differ from *marianne* as follows: Male *upperside*, for wing: orange patch on black apical half narrow, not extended to the discoidal cell at all, the black that borders it on the inner side subobsolete below vein 4. Hind wing: the black, terminal border is much restricted and occupies in some specimens only the anterior third of the terminal margin, in no specimen is there more than a mere indication of it on the posterior portion of the termen. *Underside*: similar to the underside of *I. marianne*. Female *upperside*, fore wing: the orange patch on black apical half still narrower; the black that borders it on the inner side completely interrupted between veins 3 and 4; the outer series of black spots on the orange so conspicuous in *marianne* reduced to one in interspace 3 and another in interspace 4. Hind wing: as in the male.

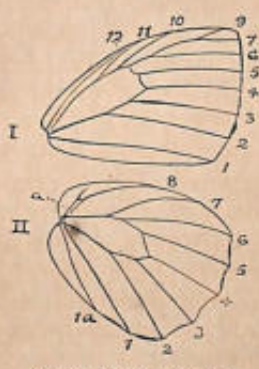
*Underside*: similar to that in *I. marianne* female. Antennæ, head, thorax and abdomen as in that form.

Expanse 50-55 mm.

The insect has not been bred and it is very doubtful whether it is really a good species; or whether it is not a mere variety of *Ixias marianne*. It has only been recorded from Mahableshwar, a high peak of 3,500′ to 4,500′ of the Western Ghats in the Satara District of the Bombay Presidency. As Colonel Bingham remarks a local observer is wanted who will devote his attention to the breeding of this form, and to that of *I. marianne*, which probably occurs with it.

## Genus Appias.

As already once remarked, this genus is in a state of considerable confusion and no two authors are quite agreed even as to the number of species that really exist within the limits of British India.



*Appias hippo, venation.*

The group *Appias* has been divided into several sub-groups or sub-genera known as *Tachyris*, *Appias*, *Catophaga*, *Hyposcritia* and *Lade*, based upon general facies or appearance, colouration, &c., and each type is very easily recognizable at sight or by the relative length of the discocellular veinlets. In British India *Lade* contains a single species (*lalassis*) from Burma, Malay, &c., differing from all other members of the group by the falcate apex to the fore wing. *Tachyris* is sufficiently distinguished by being coloured from vermillion to deep crimson-red in both sexes, the only species is *nero* which is found in Sikhim and Assam and eastwards through Burma to the Philippines. The typical *Appias* (consisting of the two species, *hippo* and *libythea* and their local races and varieties) are characterized by the black outer margin not being produced inwardly in interspace 3 on the upperside of the fore wing. These three groups present no difficulty even though the amount and intensity of the black marking may vary greatly according to season: the general pattern of a species always remains the same. The *Hyposcritia* species *indra* and *lalage* with their races or varieties (*indra* with *shiva*, *statilia* and *varendra* and *lalage* with *durvasa*, *argyridina* and *lagela*) can seemingly be separated from all others by the relative lengths of the discocellular veinlets and by the fact that they have either a minute black dot on the discocellular veinlets of the fore wing on the upperside (*indra*) or a large black spot in the lower apex of the cell on the same wing (*lalage*). These last two species are rather like the *Catophaga* lot to look at and it is this *Catophaga* group or sub-genus in which the confusion exists. Colonel Bingham, in the Fauna of British India, gives five species of *Catophaga*: *paulina*, *galathea*,

*albina*, *leis* and *wardi*. Captain W. H. Evans has just published a "List of Indian Butterflies" in this Journal (March 31st and July 30th, 1912), in which he reduces these to two: *albina* and *melania* (= *leis*), lumping *paulina*, *wardi* and *galathea* under the latter. He may be correct in keeping *albina* (= *darada*, *neumbo*) as a good species. *Leis* and *wardi* are probably the same insect, for the bred series of Kanarese *Catophaga* as also a considerable number of caught males and females are distinctly all referable to one or other of these two forms as described in Colonel Bingham's book, though the Kanarese form does not always agree in every detail with either. *Galathea* and *paulina*, the one from the Andamans and Nicobars, the other from Ceylon, may well be local races of the same *melania-leis*. There is one somewhat suspicious fact connected with the name of *venusta* which is one of the recognized races or varieties of *albina*: where did the name come from? Why was it given? When it is noted that the foodplant of the larva of *leis-wardi* is *H. venusta* it would seem that the butterfly *venusta* must have been named after the plant, although there is nothing on record to show that this is the case; therefore also, it is probable that either this form or its larva was found at the tree or feeding on it. That is the probabilities would be that the larvæ of *wardi-leis* and of *albina* feed upon the same plant, and might therefore possibly be one species or, at least, the forms might be much more nearly related than hitherto has been supposed. It is a pity that only a few species of the genus *Appias* have been bred or are known to have been bred; these are, two belonging to the subgenus *Appias* and one belonging to *Catophaga*; the former from larvæ feeding upon *Capparideæ*, the latter upon *Hemicyclia venusta*, a euphorbiaceous tree. If, for example, *Catophaga albina* larva were to be found feeding upon a Caper it would go far towards fixing its status as a good species. As regards the distribution of the different insects and the inferences to be drawn therefrom, it might be taken for granted that forms widely separated and characteristic of the regions they are found in should be entitled to the status of distinct species; or, at least, distinct races. But the localities given for several of the forms in Colonel Bingham's work are, nearly certainly, not correct and are due to mistakes having been made originally in the determination of particular insects. For example, the locality "Kanara" for *Appias albina* is certainly a mistake; it is based upon de Niceville's faulty determination of a specimen of *leis-wardi* as *neumbo* (one of the recognised *albina* forms); in all probability "Poona" and "Guzarat" for the same species are based upon a similar mistake. It is only natural, when the different insects have been so confused in the past by even the best known authorities, that localities mentioned should also be looked upon with suspicion; and the writer refuses altogether to

rely upon "Poona" as given by Captain Evans (probably upon the authority of Colonel Swinhœ) as a possible habitat of *A. indra* (form *shiva*, Swinhoe). On the whole evidence seems to point to the fact that the Group *Catophaga* consists of four Indian species *paulina*, *galathea*, *albina* and Colonel Bingham's *leis-wardi*. We shall only be able to get at definite truth by breeding the different forms.

This has been a somewhat long digression from the strict limits of the subject insects of this paper, but the matter seemed worth considering even though no definite result is reached; every little helps.

**101. Appias libythea.**—*Wet-season brood.*—Male, *upperside*: pure white. Forewing: costa, apex and termen anteriorly very narrowly shaded with dusky black scales, the black colour produced very finely along the veins for a short distance; the rest of the veins white. *Underside*: pure white, the black colour merely indicated along the costa and at apex. Female, *upperside*: white. Forewing: costa, the apex and termen very widely and the discoidal cell dusky black, the black in the cell produced in a broad streak to the black on the termen so as to leave only a short, oval, oblique bar of the ground-colour beyond the cell; the black on the terminal portion of the wing narrows posteriorly and has its inner margin irregular; on the posterior, inner portion of the wing also there is a somewhat diffuse, dusky black streak from base, narrowed outwardly and not extended to the black on the terminal margin. Hindwing, terminal margin more or less broadly black; a shading of dusky black scales that forms a diffuse, sub-costal streak from base and another, more diffuse, obscure streak across the disc that leaves between it and the dark, terminal margin, a series of, posteriorly, very ill-defined markings of the white ground-colour which decrease in size up to interspace 6. *Underside*: white with similar markings that are, however, more diffuse. Forewing with the black along the terminal margin interrupted by a series of streaks of the white gound-colour in the interspaces. Hindwing with the black scaling along the terminal margin very faint, the dusky shading on the basal and discal areas of the wing as on the *upperside*, but more or less obsolescent; a faint tinge of yellow on the humeral angle. Antennæ in both sexes dusky-black, obscurely spotted with white; head, thorax and abdomen above bluish white; beneath white.

*Dry-season brood.*—Male: similar, but the narrow, black markings on the forewing still more restricted. Female also similar, but the black markings on the *upperside* on the forewing restricted to the upper part of the cell, and the markings on the costa, the apex of the wing and the termen altogether much narrower than in the wet-season form. On the hindwing the markings are restricted to a narrow, macular band along the termen with mere indications of a dusky, detached streak in the middle of the disc. *Underside*: white in both sexes; apex of the forewing and the whole of the hindwing with an ochraceous tint. In the female the black markings of the upperside show through by transparency. Antennæ, head, thorax and abdomen as in the wet-season form. Expanse 54-66 mm.

*Egg.*—Is of the usual pierid type, like a short-necked bottle. The longitudinal ribs are 10 in number, thin and distant from each other about ½ the width of the somewhat concave intervals between them: every two anastomose just at their upper ends and reach the top of the egg as a minute single point or tooth, there being thus a narrow ring of five teeth as a

crown; the surface between the ribs is finely transversely striated. The colour is pearl-white when first laid, and shiny, becoming later on a fine orange.

*Larva.*—The body is sub-cylindrical, thickest in middle, fining down somewhat to both ends, though very little forwards; the anal end is produced beyond the anal claspers, shortly bifid, the points thus formed being set with colourless, translucent, conical tubercles, each bearing a fine hair. Head is round from the front view, slightly narrower than segment 2 when the larva is full grown, rather thick, covered with small, green, shortly cylindrical tubercles, each bearing a fine hair; yellowish green in colour. The surface of body is, as usual, lined transversely by fine, impressed, parallel lines, about 7 to each segment; it is covered all over with minute, short, erect, hairs; the main tubercles represented by small, white spots each bearing a slightly longer, fine hair; some longer, fine, whitish, sometimes slightly curved hairs along the dorsoventral line beneath spiracles. Spiracles situated above the longitudinal sub-spiracular white line or narrow band, not small for the larva, oval, flush, light in colour. Colour of the body is a rather light yellowish-green, blotched all over closely with light purplish spots with the exception of the head and belly. L: 30 mm; B: 4 mm.

*Pupa.* Is of the angulated type of *Huphina*. The head is tucked under segment 2 and has a moderately long snout which is generally only slightly curved. It is very similar to that of *A. hippo* described below. The snout is not so long nor so much curved as in *hippo*; the largest lateral teeth, those of segment 7, being broader and equilaterally triangular while those in *hippo* are narrowed at points, conical, that is, ; segment 2 is not produced backwards into a lateral tongue on each side as in that species, but has instead a small lateral rounded knob. The spiracles of segment 2, hidden by the tongue in *hippo*, are linear, light and inconspicuous; other spiracles are large, oval, flush, of the same colour as the body. Colour is light green, often with a brownish shade, there is a lateral, abdominal row of black spots and a subdorsal row of yellow ones, one spot on each side to each segment; otherwise the pupa is marked as in *hippo*. L: 18 mm; B: 6 mm at shoulders; at apex of thorax: 6 mm.

*Habits.*—The butterfly always lays its eggs singly and nearly always on a young shoot or the upper surface of a leaf. The larva eats the shell on emerging, as usual and takes up its quarters immediately afterwards along the midrib on a bed of silk spun by itself. It continues this habit all through its life though later on it of course chooses larger leaves. It is sluggish but will wriggle and fall when disturbed, keeping, however, a silk anchored to the place whence it has fallen. The larvæ are much subject to parasitism, principally from small hymenopterous insects. They eat much and continuously and grow fast. The pupation takes plant after a short wandering and generally somewhere on the foodplate on a leaf or branch, either on the upperside or underside; the body-string is short and tight, the tail-fixing strong. Like the larva of *hippo*, this larva also often rests with its true legs bunched and the fore part of the body held in the air. It is, however, often found high up on trees while *hippo* seems to choose much smaller plants whereon to oviposit. The growth is rapid, as said, and from the laying of the egg to the emergence of the imago is

sometimes not more than twenty days. The imago is a strong flier and quick, likes the sun, comes sparingly to flowers compared to other *Pieridæ* and generally rest on a leaf some distance from the ground. It keeps its wings closed over the back and, when really at rest, the front ones drawn somewhat into the hinder ones. The flight is the normal, pierid flight: fairly straight; rather busy and always rapid. The males sometimes come to wet places in nallas in numbers, the females hardly ever; indeed, like it is with many butterflies, the females are not seemingly, at first sight, nearly as plentiful as the male; though, on the whole, when a number of insects are bred from caterpillars, the former generally outnumber the latter. *Appias libythea* is typically an insect of the Plains, though it is by no means confined to the open country; it is often, locally, very plentiful from the sea-level upwards in the most jungly parts of hilly forest country on the west coast in the Bombay Presidency where the rainfall amounts often to as much as 200", perhaps more. The females are very much affected by season and vary from white with little black marking on the upperside in the dry weather to nearly black—a dusky black, never intense—in the seasons when the foodplants offer much juicy nourishment, that is when the leaves are budding and very tender. The hot weather is the season when the duskiest females are commonest. The butterflies like the sun and open spaces and are generally found, in forest country, in the beds of rivers and along their banks where one of the commonest foodplants of their larvæ, *Crataeva religiosa*, is most plentiful. This small tree seeds copiously and, where it exists, is always abundant in individuals; it is often planted round Mahomedan grave-yards and is considered holy by the followers of the Prophet. It belongs to the Capparidæ. The larva also feeds upon members of the genus *Capparis* as, for example, upon *C. sepiaria*; but has not been actually bred upon others. Colonel Bingham gives the distribution as Panjab; Mussoorie; Delhi; Plains of Bengal; Orissa; Western and Southern India; Ceylon. It also exists in Sind.

**102. Appias zelmira.**—Male and female differ from *Appias libythea* as follows:—*Wet-season brood.*—Male, *upperside*, fore wing: base with an obscure bluish tint, costa more broadly black; apex and termen with a series of short black streaks along the veins that are dilated along at their inner apices and thus form a more or less, incomplete, transverse, postdiscal, excurved band that is not extended below vein 3. Hindwing with a terminal series of triangular spots at the apices of the veins. *Underside*: pure white. Forewing: markings as on the upperside. Hindwing: all the veins except the basal portion of the median and of veins 5 and 6, conspicuously bordered with black; this gives the appearance of a series of three transverse, black lines that cross the wing, from the posterior one of which other black lines radiate to the termen; humeral angle tinged with yellow:—Female, *upperside*: much as in *libythea*, but the black markings broader, more clearly defined. Forewing: an anterior, subterminal, transverse, series of three or four elongate spots of the white ground

colour is conspicuously apparent on the black margin of the wing. Hindwing: the white ground-colour much restricted and appears merely as a comparatively large, upper-discal patch and four or five postdiscal spots. *Underside*: white; the black markings of the upperside show well through by transparency; the areas covered by them are more or less densely irrorated on the hind wing with yellow scales, which are also less densely scattered over the apex of the forewing.

*Dry-season brood.*—Male, *upperside*: differs from the wet-season form chiefly in the black streaks at the apex and along the anterior portion of the termen on the fore wing which do not extend so far inwards, although the streaks are themselves broader. Hind wing: the series of connected triangular, black spots along the termen reduced to incomplete series of terminal spots, or altogether absent. *Underside*: white with an obscure yellowish tinge on the apex of fore wing and the whole of the hindwing. Forewing with an irroration of black scales along the base of the costa which spread into the cell. Hind wing with a short, diffuse cross-bar of like scales on the disc.—Female, *upperside*: as in the wet-season form but the black markings are more restricted and allow more of the white ground-colour to appear. *Underside*: similar to the underside in the day-season form of the male, but the irroration of black scales on the forewing fills the cell, extends in a narrow streak in interspace 4 and meets an oblique, postdiscal, lunular band of like scales; on the hindwing the discal cross-bar of black scaling broader. Antennæ, head, thorax and abdomen in both sexes and in both seasonal forms as in *libythea*. Expanse 54-68mm.

*Habits.*—No information as to the breeding of this species is available; but the foodplant of the larva is sure to be a Caper of some sort. The species (Colonel Bingham treats it as a race of *libythea*) is easily distinguished from *libythea* by the border of conspicuous black vein-streaks all round both wings on the upperside in the male. The two species meet in Bengal in the plains. This is broadly speaking, the eastern representative of the western and southern *libythea*. It's distribution, is Sikhim at low elevations; the plains of Bengal; Assam; Burma; Tenasserim; extending into Siam.

**103. Appias hippo.**—*Wet-season brood*:—Male, *upperside*: white; along the costal margin of the forewing and the terminal margin of the hindwing somewhat broadly bluish, due to the black colour of the underside that shows plainly through; costal margin of forewing irrorated densely on basal half, more sparingly on apical half, with black scales; terminal margins of both fore and hindwings edged with black, this colour produced triangularly inwards along the veins for a short distance; veins of both wings white, subcostal vein and veins above vein 6 on forewing black. *Underside*, forewing: white; extreme base of costa irrorated with black scales, sometimes condensed into a broad edging along the costal margin which is widened at the apex and continued along the terminal margin in a gradually narrowing border to the tornus, the terminal edging inwardly produced along the veins as on the upperside; a large yellow or white oval spot superposed on the black area at apex in interspace 6. Hindwing: sulphur-yellow; veins concolorous; terminal margin with a black edging as on the upperside but much broader though not so prominently produced inwards along the veins. Antennæ black, sparingly dotted with minute, white dots; head, thorax and abdomen white with a bluish tinge. Female, *upperside*: dusky blackish-brown, variegated more or less with white on the forewing in

short, somewhat broad streaks in interspaces 1, 2, 4 and 5; these streaks very variable in width and length. Hindwing on the basal, half and along the dorsum broadly white; the extent of the white is very variable and very ill-defined shading imperceptibly into the dusky-brown. *Underside*, fore wing: similar, the white streaks much broader and longer; an additional dusky-white, longitudinal streak along the middle of the cell; base of wing dusted with yellow scales; apex with a large, diffuse, purplish patch. Hindwing: basal two-thirds pale sulphur-yellow; apical third dusky brownish black, the margins of the two colours fairly sharply defined; veins crossing the disc black. Antennæ as in the male; head, thorax and abdomen above with greenish pubescence; beneath: white.

*Dry-season Brood.*—Male and female: similar to the wet-season form but smaller; in the male, the black edging to the wings both on the upper and undersides is narrower, often markedly so. In the female the differences are more conspicuous in the extreme forms. Specimens captured in the height of the hot weather in specially dry localities resemble the male of the wet-season form except that the irroration of black scales along the costal margin in the latter is replaced by a broad, continuous streak, widened at the apex and continued in a similar manner as in the male along the terminal margin to the tornus, the inward prolongations of the black colour along the veins more marked. On the underside the dry-season female very closely resembles the wet-season male, the only marked difference is the absence of the elongate, oval spot in interspace 6 of the forewing. This form is the *Appias hippoides*; var. *epicœna*, Swinhoe. Between it and the dark wet-season form of the female many intermediate individual specimens can be found in almost every large collection. Expanse 54-82mm.

Race **taprobana**, Moore.—*Wet-season brood* (*latifasciata*, Moore).—Male closely resembles the wet-season form of typical *hippo*, but the colours are brighter; the black, terminal bordering to the wings on both upper and undersides broader, especially on the underside of the hindwing; the yellow also on this wing is of a deeper, more vivid tint. It can, moreover, be discriminated from *hippo* male at once by the subcostal vein and veins 6, 7 and 8 where they cross the yellow ground-colour, which are not concolorous but conspicuously edged with black scales, these latter often form a broad streak along the basal half of vein 7. Female does not differ materially from the wet-season form of the female of *hippo*; but the dusky brown-purplish on the terminal half of hindwing on the underside is always broader than in females of typical *hippo*.

*Dry-season brood.*—Male can be separated from the typical form as follows:—*Upperside* forewing: vein 6 more or less broadly edged or defined with black. *Underside* hindwing: terminal, black border much broader; subcostal vein and veins 7 and 8 black, not concolorous with the yellow ground-colour. Female differs from the female of *hippo* only by the greater width of the purplish-black, terminal margin of the hindwing on the underside. Antennæ, head, thorax and abdomen in both sexes as in typical *hippo*. Expanse 64-76mm.

The distribution of *hippo* is given as Sikhim, Lower Bengal, Orissa, Assam, Burma, Tenasserim, extending into Siam and China to the east and southwards to the Malay Peninsula and Sumatra. *Taprobana* is chronicled as from Southern India, Malabar, Travancore, Ceylon.

Another race is recognised, inhabiting the Nicobars (also known from the Philippines), which is characterized in Colonel Bingham's key to the species as "male, underside hindwing: pale yellow, veins concolorous with wings at all seasons". This is known as *andrea*, Esscholtz. He says,

however, that it is "a slightly differentiated form scarcely established, even as a local race, as yet."

The insect existing in North Kanara District of the Bombay Presidency is not *taprobana*, but *hippo*; many hundreds of specimens have been bred, the majority of them approaching very close to *taprobana*, but not quite agreeing with the description. Specimens bred from larvæ fed on fairly old leaves have the veins on underside of hindwing concolorous with the ground-colour. The males can always be distinguished from the females by the sharp apex to forewing.

*Egg.*—Cylindrical from base to three-quarters the way up, whence it narrows gradually to the truncated end, 11 or 12 longitudinal ribs which are finely transversely striated; half the number reaching the top where they appear as small teeth, forming a crown; the interspaces between the ribs are also striated transversely and very finely. The colour of the egg is very light green when laid but quickly changes to orange. L: 1·2mm; B: 0·6mm.

*Larva.*—(Pl. 1, fig. 18).—The body is subcylindrical, narrowing more to anal end than to head; the anal end overhangs the anal claspers and is narrowly and shortly bifid, the points thus formed being conical and covered with conical, colourless, translucent tubercles. Head round, rather thick, somewhat narrower than segment 2 when the larva is fully grown; studded with shiny, black, pointed, conical, tubercles, each surmounted by a short seta or hair, these setæ, or some of them, often carrying a single globule of transparent liquid at the point; some fine, white, longer hairs at base round jaws; colour yellow-green. Surface of body thinly impressed-lined transversely, 7 parallel lines to each segment, the interspaces between each two being occupied by a single row of shiny black tubercles, each row reaching down each side as far as the subspiracular yellow line or narrow band; the tubercles on head, segments 2, 3, 4 being larger than the rest; the body is, besides, covered somewhat profusely with minute, erect, fine hairs, longest in subspiracular region where they are less numerous and lighter in colour. Spiracles rather large, oval, white, situated on the upper margin of the subspiracular yellow band. Colour is dark yellowish-green; there is a yellow, dorsal line and subspiracular, yellow, narrow band; ventrum light watery green. L: 30 mm.; B: 4 mm.

*Pupa.* (Pl. 1, fig. 18*a*.)—Of the type of *Huphina*; head tucked under segment 2, that is, nearly quite hidden under it from above; with a long, laterally compressed snout, which is much turned up and attenuated at tip. Segment 2 is triangular seen from above, convex and carinated in the dorsal line; the dorsal line produced into two short points anteriorly, these points close together and produced over the base of the snout; the lateral posterior corners of the segment produced into, each, a tonguelike process of circular transverse section which embraces the shoulder and lies along it: this is very characteristic. Thorax high, convex, humped, carinated in middle along dorsal line, the side view thus being triangular, and this apex is situated just behind a line joining the shoulder-points; this carination extends to segment 4, but not beyond it; the shoulders are slightly angled and the pupa is broadest at them; segment 5 dorsally somewhat convex, segment 6 dorsally flat and this flat part is produced out laterally into a narrow ledge overhanging the wing-surfaces and embracing segment 5 slightly with its lateral corners, segment 7 is similar, the ledge being produced out at front margin into a triangular, slightly up-curved tooth of which the base extends, broadened, to the middle of the segment, the end of the tooth being narrowed and conical. The ledge of segments 7 and 8 looses itself in addomen at hinder margin of segment 8.

Segment 6 is somewhat broader in front than behind (because of the lateral ledge). The front lateral corners of segment 8 are also slightly pointed. Segments 7 and 8 are dorsally very slightly convex. The abdomen finishes off posteriorly rather narrowly, the dorsal half-segments are triangular in transverse section because of a abdominal dorsal carination; the ventral half segments are semi-circular in section and meet the dorsal halves in a slight angle or carination; the cremaster is short, triangular, truncated, not or hardly bifid. Surface nearly smooth except for the usual fine, very shallow, irregularly disposed aciculations. Spiracles of segment 2 hidden by the tongue-like process; other spiracles longly oval, white slits. Colour of pupa light green or brownish, with a lateral row of black dots; top of carina of thorax yellow; top of snout black; a black dorsal mark near front margin of segments 9 to 12; underside whitish. L: 18 mm.; B. at shoulders: 6 mm.; H. at apex of thorax: 6·3 mm.

*Habits.*—The eggs are laid in batches of from 4 to a dozen and more on young shoots or the upper sides of leaves; the larvæ are gregarious until they reach full size when they gradually separate, each one, then, lying in the centre of a leaf along the midrib in the usual style. They eat voraciously, and grow fast in consequence; from the egg to the imago takes only a matter of three weeks. The pupæ are formed in the same way and in similar localities or situations as those of A. *libythea* described above. The larvæ are parasitized in the same way. The butterfly is not quite so much an insect of the plains as *libythea*; it is not quite so common, though, where it is found, it is quite as numerous in individuals as the other. It inhabits similar localities in the jungle countries and hills of Bombay that *libythea* does; but is not nearly so common in the plains, indeed is there rather scarce. It is probable that it is really confined to coast districts throughout its habitat and to beds of rivers, generally preferring wooded localities, eschewing the immediate sea-side, but occurring up to 2,000 or 3,000 feet. The eggs are generally laid upon very low bushes or young plants, on the tender shoots; the butterflies keep low down mostly, near the surface of the ground, often resting on it; but are strong fliers all the same, perhaps even stronger than *libythea*. They do of course rise occasionally above the usual level of flight, but not often, for the female's sphere lies near the ground and males are generally engaged in seeking these. They are not often seen at flowers, but collect at wet spots on the sand or mud in nalla beds in the hot weather and sometimes in such numbers as to nearly obscure the landscape when put up suddenly in a narrow stream; there are always a few *libythea* *Catopsilia* and an odd *Papilio* or two among these drinking parties. As a rule the flight is straight ahead, barring the frequent circling round trees and in amongst the branches in search of females; and is of the usual, jerky, undulating type usual with nearly all the members of the pierid family. The resting position is the same as for *libythea*: wings closed over the back and the forewings drawn

into the hind ones, leaving only the yellow under surfaces of the latter and apices of the former exposed. The only plant the larvæ have been bred upon is *Crataeva religiosa* belonging to the botanical family *Capparidæ*. The distribution of the butterfly has been given above both for *hippo* and the form *taprobana*.

**104. *Appias indra.**—*Wet-season brood.*—Male, *upperside*: white. Forewing: base and basal half of costa thickly irrorated with black scales; a minute, black spot on the discocellulars; the apical half of the costa, and the termen above vein 2, broadly black; the inner margin of the black colour broadly produced inwards in interspace 3; three obliquely-placed spots of the ground-colour on the apical area. Hindwing: uniform white with a minute black speck on the discocellulars. *Underside*, forewing: white; costa at base pea-green; beyond with a broad black stripe that curves round and crosses the wing postdiscally to the terminal margin above vein 2; this black band produced prominently inwards in interspace 3; apex of wing beyond the black band yellowish, obscurely dusted with black scales. Hindwing pale yellow, with very obscure postdiscal patches of white; the whole wing irrorated somewhat sparsely with minute black scales; discocellular, 1st black spot more or less conspicuous.—Female *upperside*: white. Forewing: basal area up to nearly the apex of the cell densely irrorated with blackish scales: remainder of the wing black except lower apex of cell, basal two-thirds of interspace 2 and basal third of interspace 3, which are white: apex of wing with two (not three as in male) obliquely-placed, white spots. Hindwing: dusky black, fading inwardly on basal half of wing to diffuse, dusky grey; two or more upper subterminal, white spots. *Underside*: similar to that of the male. Forewing: the yellowish green colour at base more extended; the curved black band that crosses the wing very much broader and produced inwards along the dorsum for a short distance; apical area greenish yellow, with an obscure series of pearly-white patches between it and the black band, a similar short streak on the tornus. Hindwing differs from that of the male in the deeper yellow of the ground-colour, which, however is similarly irrorated with black scales and bars; a conspicuous subterminal series of pearly-white patches. An intermediate form of the female is common, in which the black area on both fore and hindwing is reduced, to a simple terminal edging that spreads diffusely inwards and obscurely encloses a subterminal series of white, diamond-shaped spots. Antennæ in both sexes black, checkered with white spots; head and thorax with bluish-grey hairs; abdomen black with sparse white scaling; beneath: head, thorax and abdomen white.

*Dry-season brood.*—Male *upperside*; similar to specimens of the wet-season form, but the black colour on costa, apex and termen very much reduced in extent. *Underside*: the black, curved band on forewing very short, often diffuse and obscure; apex of fore and entire hindwing light earthy brown, more or less densely irrorated with black scales that on the hindwing run together in places and form ill-defined, zigzag markings.—Female *upperside*; similar to that of the male the black on forewing of somewhat greater extent; termen of hindwing obscurely irrorated with black scales. *Underside*: similar to that of the male; the oblique, black band on forewing broader. Antennæ in both sexes dark brown; head with ochraceous-brown, thorax with bluish-grey, hairs; abdomen blackish; beneath: head, thorax and abdomen white. Expanse 54—74 mm.

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* For drawing showing the difference between (*a*) *indra* & (*b*) *narendra*, *see* Vol XXI, p. 1133

Race **narendra**, *Moore*.—A slightly differentiated and more or less local form, notwithstanding that a few specimens from Assam, which should properly belong to *A. indra*, more closely resemble typical *narendra* from South India and Ceylon.

*Wet-season brood*.—Male, *upperside*: differs chiefly from that of male *indra* in the hindwing, which is bordered narrowly with black along the termen. *Underside*: as in *indra*, but the yellow colour more vivid and the black, bisinuate band that crosses the forewing notably broader.—Female. Differs from female *indra* on the upperside in the restriction of the black colour, which has also its inner margin more clearly defined. No female *narendra* (according to Colonel Bingham) is ever so dark above as the extreme rain-season form of female *indra*. *Underside*: similar to the underside in *indra* female, but more closely sprinkled with black scales on the hindwing.

*Dry-season brood*.—The difference between the seasonal forms is less marked than in *A. indra*.—Male, *upperside*: differs in the hindwing which is always margined along the termen, though often very narrowly, with black; his colour also extends shortly in a few lines along the veins. *Underside*: as in *A. indra*, but the shade of brown on apex of forewing and over the whole of the hindwing is darker, the irroration of black scales more dense, the black, bisinuate band that crosses the wing broader.—Female *upperside*: differs from the wet-season from only in the width of the black on the terminal margin of the hindwing, which band is about half as wide as in rainy-season specimens. *Underside*: similar to the underside in female of the wet-season form. Expanse 58-70 mm.

Neither *Appias indra* nor this race *narendra* have been bred as far as is known. The former is distributed over "the Himalayas, Nepal, Sikhim, Bhutan, Lower Bengal, Assam, Burma, Tenasserim, extending to the Malay Peninsula, Cochin China and China." *Narendra* is confined to Southern India, Ceylon and Assam. It is extremely doubtful whether it exists in the Bombay Presidency at all.

**105. Appias albina.**—*Wet-season brood*:—Male, *upperside*: pure chalk white. Forewing costa, apex and termen irrorated, not very densely, with black scales; this irroration narrowed on termen posteriorly and not extended to tornus. Hindwing: a much lighter irroration of black scales along posterior portion of termen. *Underside*: apex of forewing and the whole surface of hindwing pale, dull ochraceous, sometimes with a faint pinkish tint, never pale yellow. Female dimorphic; 1st form *upperside* forewing: white, irrorated at base and up to as far as two-thirds of the cell with blackish scales which give that part a bluish-grey appearance; costa broadly and apical half of the wing jet-black; the inner margin of this black area is irregularly curved, extended inwards and forms a right angle on vein 3; thence the black area is diffuse and bounded by a straight line terminating on the dorsal margin just before tornal angle and has three, rarely four, yellowish spots, placed in an outward curve preapically up on it. Hindwing: pale yellow, the terminal margin broadly black, this colour extended triangularly up the veins for a short distance; base and interspaces 1, 2, irrorated with black scales. *Underside* forewing: as on the upperside but the apex a beautiful, nacreous, bluish white; the oblique curved, black band not broad, its outer margin irregularly zigzag, never evenly curved. Hindwing: the whole surface the some beautiful nacreous, bluish white as the apex of the forewing.

2nd Form: markings as in the 1st form but the ground-colour on the upperside entirely pale yellow. *Underside*: apical half of cell and disc of forewing up to the black band pale sulphur-yellow; the oblique, curved, black band as in the 1st form; interspace a whitish; the rest of the forewing and the entire surface of the hindwing rich chrome-yellow.—Male and female: antennæ dusky black speckled with minute white dots; head in front with dusky greyish-green hairs; abdomen blackish; beneath: thorax yellow in female, white in male, the abdomen white in both sexes.

*Dry-season brood.*—Male and female *upper* and *undersides*: similar to the same in the wet-season specimens, but in the male the dusting of black scales on the upperside has almost, in some specimens completely, disappeared, while on the underside the ochraceous colouring is much paler. Female: both dimorphs differ but little from the dimorphs of the wet-season form, only on the upperside the black on the apical half of the forewing and on the terminal margin of the hindwing is more restricted, while on the underside the oblique, curved, black band that crosses the forewing is distinctly narrower with a tendency to become diffuse. Expanse 60-74 mm.

*Habits.*—Nothing is on record as to the habits. The distribution is said to be "Sikhim up to 4,000 feet; Bengal; Western and Southern India as represented by Guzerat, Poona, Kanara, Travancore; Ceylon; the hills of Assam, Burma and Tenasserim; also found in Malacca, Borneo, Sumatra, Java and the Philippines." Now de Nicéville named the Kanara specimens sent to him, *neumbo* and that is the only authority for the above "Kanara" being given as a locality where *albina* (=*neumbo*) occurs; as remarked already, the insect that occurs in Kanara is *leis* or *wardi* and not *albina*. The locality "Poona" is probably upon Swinhoe's authority; but Swinhoe has made so many mistakes about butterflies and moths occurring in Poona, where he kept his collections and employed collectors, that it is quite probable this is another; although, of course, it is possible that *leis-wardi* may again have been mistaken for *neumbo* (it is the males that are so alike). Guzerat simply *must* be a mistake for both one and the other, *leis-wardi* feeds upon, a fact also already mentioned, a tree that is only found in the evergreen forests in Bombay; and these exist as far north as Khandala which is in the Poona District, but there are none further north, certainly not in Guzerat. That tree is the euphorbiaceous *Hemicyclia venusta*. It is just possible, of course, that *albina*, *leis* and *wardi* may be one variable species occurring from Ceylon right through India wherever there is forest of the requisite description, up through Bengal to Sikhim and Assam and down through Burma and the Malay Peninsula, and right away across the Archepelago to the Philippines. Some rare individuals have been caught in Kanara of female *leis-wardi* which have the apex of the forewing, and the whole hindwing, on the undersides, bright chrome-yellow, nearly orange.

**106. Appias leis** — *Wet-season brood.*—Male, *upperside*: white. Forewing: base and costa broadly and somewhat thickly irrorated with black scales;

apex broadly black; termen with a series of inwardly pointed, triangular, black spots at the apices of the veins; these spots confluent along the extreme margin; between veins 3 and 6 a short, postdiscal, black line that ends posteriorly in a large black spot in interspace 3; this line confluent along the veins with the black on the termen, the two thus enclosing between them a vertical series of three prominent, white spots. Hindwing: a terminal series of black spots at the apices of the veins, these spots elongate and prominent anteriorly, posteriorly diffuse. *Underside*, forewing: white, apex from above an oblique line that passes through base of vein 6, ochraceous; a very diffuse, black-irrorated, curved, oblique band from costa to termen borders the ochraceous apex; in most specimens this is obsolete or only a trace of it is to be seen; a prominent, large, quadrate, postdiscal spot in interspace 3 and a greenish-yellow tinge at base of wing. Hindwing: entirely ochraceous yellow.—Female, *upperside*: white. Forewing: base up to and a little beyond middle of cell thickly irrorated with black scales which gives these parts a dark grey appearance; costa and a little more than the apical half of the wing jet black; the inner margin of the black irregular, formed into a square, angular projection on vein 3, thence it extends outwards along that vein, crosses transversely to vein 2, below which it projects inwards diffusely in interspace 1 and thence extends obliquely outwards to the dorsum; finally there is an oblique, preapical row of four white spots in pairs enclosed within the black area. Hindwing: the base and a broad band to the tornus thickly irrorated with black scales; terminal third of wing black, the inner margin of the black area curved and diffuse; a slight yellowish-green tinge on dorsal margin and at base. *Underside* forewing; similar to upperside but the cell, except at his lower apical portion, yellowish green; apical area broadly nacreous blue tinged at the extreme apex with greenish. Hindwing; nacreous blue, sometimes pink, the vains and the terminal margin narrowly and diffusely bordered by greenish yellow; curved postdiscal and subterminal, ill-defined and irregular, broad bands purplish black. Antennæ black speckled with white; head and thorax in male with bluish-grey, in female with greenish-grey, long hairs; abdomen greyish black; beneath: thorax yellow, abdomen white. Anal tufts in the male brown.

*Dry-season brood.*—Male, *upperside*: similar to the wet-season specimens but the black markings on forewing much restricted and often diffuse; the postdiscal, short, black band and the black spot in interspace 3 often only indicated by a few diffuse scales. On the hindwing the terminal series of spots is much less prominent. *Underside*: as in the wet-season form but of the black markings only the square spot in interspace 3 is left. Female, *upper* and *undersides*: very similar to those of the wet-season male. Extreme dry-season specimens lose the postdiscal, short, black band on the forewing. Antennæ, head, thorax and abdomen in both sexes as in the male of the wet-season form. Expanse 48—66mm.

*Habits.*—There is no record of the breeding of this species, as such. The distribution of *leis* as given by Colonel Bingham is "Burma and Tenasserim." He says he has "seen specimens from Siam, the Malay Peninsula, Java down to Lombok" also.

**107. Appias wardi.**—*Wet-season brood.*—Male, *upperside*: White. Forewing: base densely and broadly irrorated with black scales which gradually merge, along the costa, into the black, apical area that occupies about one-third of the wing; the inner margin of this area irregular, passing in a curve from costa to vein 4, thence vertically to vein 3 outwards in interspace 2 and irregularly to dorsum; a curved, preapical series of four or

five white spots superposed on the black area. Hindwing: slightly irrorated with black scales at base which leave a terminal series of large, somewhat diamond shaped, black sports at the apices of veins 8 to 7. *Underside*, forewing: white, apex butter-yellow; a somewhat narrow, zigzag, curved, irregular, black band from middle of costa to tornus. Hindwing: uniform butter-yellow.—Female, *upperside*: somewhat similar to that in the male but differs in the much greater extent of the black area which occupies the outer apical half of the forewing and on the hindwing forms a broad, continuous, terminal band: the superposed spots on the black area of forewing reduced to two and the irroration of black scales at the bases of the wings more dense; on the hindwing this extends subdorsally to the black, terminal margin. *Underside*: forewing white, basal half of cell suffused with sulphur-yellow; a very broad, curved, black band crosses the wing from costa to tornus, the inner margin of this irregular, the outer margin fairly even; apex pearly bluish-white. Hindwing uniform, pearly bluish-white.

*Dry-season brood*.—Male, *upperside*: similar to the wet-season form but on the forewing the irroration of black scales at the base and the black on apical area much restricted, the latter in most specimens has a more or less rubbed appearance; the white, preapical spots very ill-defined. Hindwing entirely white, in some specimens with a faint yellowish tinge. *Underside*: forewing white, with a bluish tint broadly along the basal two-thirds of the costal margin; apex butter-yellow; in a few specimens the usual black, curved band that crosses the wing is indicated by a few detached, black scales, but in most is entirely absent. Hindwing uniform butter-yellow. Female, *upperside*: similar to that in the wet-season form but the black area on both wings much restricted just as it is in the male. *Underside*: also similar to that in the wet-season form but on the forewing the curved, black band is very much narrower and the nacreous surface of the hindwing has more or less of a yellowish tinge. In both sexes and in both seasonal forms the antennæ are black minutely speckled with white, the tufted hair on the head and thorax anteriorly greyish-green, abdomen white beneath; head and thorax pale yellowish white, abdomen white. Expanse 65 to 76 mm.

*Habits*.—This has always been supposed to be the species that is characteristic of the District of North Kanara in the Bombay Presidency, but, as already remarked, the specimens caught and bred there do not tally with the description in all respects, some of them resembling *leis*. But enough has been said about the matter already and, until further experience is gained, the subject will not repay further consideration. The distribution is given by Colonel Bingham as "Kanara and the Nilgiris."

*Larva of leis-swardi*.—The larva is very like that of *A. hippo*, Cramer, in appearance but is, as a rule, more thickly covered with black tubercles. The body is more or less cylindrical but narrows somewhat in segments 2 and 3, and still more in the anal segments; the anal flap is thick, semicircularly rounded and inclined at an angle of 45° to the longitudinal axis of the larva, and has a small, very slightly developed, conical tubercle before the extremity on each side of the dorsal line; the front half of the flap is shiny and black and has some conical tubercles of different sizes all over it, each surmounted by a single, fine hair, there being one subdorsal tubercle larger than the rest; the posterior half is green and smooth except for the tubercle just before the extremity just mentioned; the body is somewhat stouter in the middle; the head is broader than the

body at segment 2. Head round, shiny, oily-yellow all over with a rather large, narrow, triangular clypeus; the labrum and antennæ coloured like the rest; the surface covered with small, conical, setiferous, black tubercles, three subdorsal on vertex, two subdorsal on each side of clypeus-apex and one above that apex, about eight besides on each lobe, and a few small, cylindrical points; all tubercles and points surmounted by a fine hair; the eyes are only four in number on each side and are arranged in an arc above the base of the antennæ and are shiny, of the same colour as the rest of the head, generally bordered with black. Surface of body rugose with six transverse rows, from above the spiracular region over the dorsum, of small, shiny, conical, setiferous, black tubercles to each segment; segments 2, 12 and 13 have only a few transverse rows of such tubercles, the front row of each segment is generally composed of larger tubercles than the others and especially the subdorsal tubercle of that first row is generally large, the tubercles of segment 2 nearly render the whole segment black; the surface is shiny as well as the tubercles and has, besides, a few cylindrical, setiferous, black points. Spiracles of the ordinary size, flush, oval and white. The colour of the body is a rather light green, sometimes with a tinge of lilac, with a yellow-white, narrow, spiracular band from segment 2/3 to segment 12 where the band expands somewhat. The black tubercles may sometimes be very small: just black specks. L.: 30 mm; B.: 3·75 mm.

*Pupa of leis-wardi.*—The pupa is also like that of *A. hippo*, the head process or snout is long, flattened laterally, slightly curved, pointed at the extremity and directed upwards and forwards, sometimes straight out in a line with the axis, sometimes inclined to it; it is as long as segments 4 and 5 together (in the dorsal line); and the edges of the ventral surface are minutely serrated. The front margin of segment 2 is produced into a small subdorsal tooth and the dorsal line is rather strongly carinated; the thorax is highly carinated in the dorsal line, the lateral outline of the carina being a curve which is slightly broken at the apex just before which the carina is double and the edges somewhat minutely serrate; the lateral teeth of segments 6, 7 and 8 are all the same size and pointed; the dorsal line of the abdomen from segment 6, 7 somewhat carinated, the carination splitting down the sides of cremaster on segment 14; the cremaster is rather small, square as seen from above, slightly bifid from the ends of the lateral carina running out behind, this carina continued forwards on to segments 13, 12, 11. The spiracles of segment 2 are thin, yellow lines; the other spiracles are oval, flush and white. The surface of the pupa is shiny, smooth except for a superficial wrinkling, the carina and the teeth; there is a round, blunt, low production of the shoulder. The colour of the pupa is dirty whitish with a pink shade on segments 4-14; the same but transparent-looking on the rest; the snout, the points on segment 2, the teeth of segments 5—7 sometimes and the extremity of the cremaster are black—only the top and lower edge of the snout however; there is a black spot on the hinder margin of segment 2 dorsally, one just behind the shoulder, one lateral on segments 3-12 and one dorsal on the front margins of segments 9 and 10; there is always a semi-circle of 6 darkish dorsal spots on segments 6 and 7. The colour of the pupa when formed under a leaf is probably green with the markings more or less as above. The ventrum of pupa is always light in colour. L. 21·25 mm.; of which the snout is 2·75 mm.; B. at shoulders: 5 mm.; B. at segment 7 from tip to tip of teeth: 7·5 mm.

*Habits.*—Eggs are laid on the tender leaves, probably singly though there are generally many larvæ on each tree which looks as

if the eggs might be laid in clusters. The larvæ have no habits that distinguish them in any way from those of *A. hippo*. The pupa is generally attached to the underside of a leaf by a strong tail-fixing and a close body-band, or to the trunk of a tree or branch either horizontally or upright. The caterpillars are quick growers, eating continuously ; and the pupal stage is of short duration. The butterflies are fast, strong fliers like the rest of the genus and frequent the evergreen parts of the North Kanara District in the Bombay Presidency from sea-level up to 2,500 or 3,000 feet. They are not found in the plain country being seemingly confined to the hill jungles where the rain is heavy. They like the sunshine and may be found drinking in nalla-beds and on muddy roads in the hot weather in great numbers at times, though they do not seem to frequent flowers much ; they fly very high and round the tops of the highest trees.

# A LIST OF BUTTERFLIES COLLECTED BY CAPTAIN F. M. BAILEY IN WESTERN CHINA, SOUTH-EASTERN TIBET, AND THE MISHMI HILLS, 1911.

BY

RICHARD SOUTH, F. E. S.

With the exception of some twenty-eight species, the butterflies enumerated in the following list (about two hundred and forty species) were collected by Captain Bailey last year when journeying through a previously unsurveyed portion of South-Eastern Tibet and the Mishmi Country.

The collection as a whole is of very great interest, but of course it is to the butterflies from the newly explored region that scientific value more especially attaches.

A number of species new to science, and some new forms of described species, were obtained. In many cases our knowledge of the distribution of species, described from Western China, is much extended.

As some of the localities mentioned may not be shown on maps it may be well to state that between June 6th and June 10th Captain Bailey was East of the Mekong, marching from Batang to Yer-ka-lo. From June 11th to 15th he was between the Mekong and Salween, marching from Yer-ka-lo to Menkong. His route in South-East Tibet, June 16th to July 7th, was Menkong, Drowa Gompa, Sanga Chu-Dzong, Shiuden Gompa, back to Drowa Gompa, thence down to Rima. From July 8 to August 7 he was in the Mishmi country, Rima to Sadiya.

## FAMILY—NYMPHALIDÆ.

### Sub-Family.—SATYRINÆ.

#### 1. NEOPE SIMULANS.

*Neope simulans*, Leech, Entom. xxiv., Suppl. p. 66 (1891); Butt., China, Japan and Corea, p. 49, pl. viii, fig. 2, ♂ (1892).

Two male specimens.

Drowa Gompa (10,00 ft.), June 21 and 22.

Var. *confusa*, nov.

Similar to typical *simulans*, Leech, but the general brown colour is somewhat redder in hue; the black markings, especially those of forewings, are more or less obscured, and the yellow markings are more ochreous in tint: the lower yellow spot on the forewings is completely divided, and there is an ochreous spot at the outer extremity of cell of hindwings. On the underside the yellow spot on forewings is not black centred; the pattern on the hindwings is less clearly defined, the neuration is not paler, and the second ocellus is less elongate.

Expanse 70 mm.

One male specimen.

Au Yang (7,000 ft.), May 9.

2. NEOPE AGRESTIS.

*Satyrus agrestis*, Oberthür, Etud. d'Entom. ii, p. 27, pl. ii, figs. 3*a*, *b* (1876.)

*Neope agrestis*, var. *albicans*. Leech, Butt., China, Japan and Corea, p. 54, pl. vii, fig. 7, ♂ (1892).

Several specimens, some of which vary in the direction of var. *albicans*, Leech.

La Gong (10,000 ft.), June 13; Tondu-la (9,000 ft.), June 14; Menkong (1,000 ft.), June 16.

3. NEOPE MUIRHEADII.

*Lasiommata muirheadii*, Felder, Wien. ent. mon. vi, p. 28 (1862).

*Neope muirheadii*, var. *felderi*, Leech, Butt. China, Japan and Corea, p. 54, pl. viii, fig. 4, ♂ (1892).

Two specimens: one closely approaching var. *felderi*, Leech, Shing Ting Hsien (1,800 ft.), April 27.

4. TATINGA THIBETANUS.

*Satyrus thibetanus*, Oberthür, Etud. d'Entom. ii, p. 28, pl. ii, fig. 4 (1876).

*Pararge thibetanus*, Leech, Butt., China, Japan and Corea, p. 63 (1892).

Ab. *albicans*, nov.

A female specimen in which all the fulvous markings of the type are replaced by white.

Polu (9,653 ft.), July 2.

The typical form of *T. thibetanus* was not obtained.

5. LETHE BAILEYI, sp. n.

♂. Forewings fuscous brown, clouded with blackish on terminal area; a paler spot in the cell, preceded and followed by blackish marks; postmedial band blackish from costa to vein 4, thence velvety black and inwardly oblique to dorsum, slightly contracted below vein 2; three obscure whitish spots on costal area before apex. Hindwings fuscous brown, rather paler on outer third; postmedial line black, outwardly oblique to vein 4, thence curved and dentate to dorsum; subterminal line whitish, inwardly edged with blackish; terminal line ochreous, edged with blackish; fringes pale grey checkered with darker. Underside greyish, slightly ochreous tinged, a pale spot in cell of forewings, edged on each side with dark brown; postmedial line dark brown, obtusely angled above dorsum, area beyond paler, clouded with greyish brown; three white spots towards apex; subterminal line whitish; hindwings traversed by two dark brown lines, the first almost straight from about middle of costa to median nervure along which it turns inwards to base of vein 2, thence curved and dentate to dorsum; the second line rather broad, oblique to vein 4 then incurved, angled at vein 3 and slightly bent at vein 2; a series of seven black spots, each centred with white and ringed with yellowish white, subterminal line and shading as on upper side.

Expanse 60 mm.

Allied to *L. nigrifascia*, Leech.

1 ♂, Loma (11,000 ft.), July 1.

6. LETHE MARGARITÆ.

*Lethe margaritæ*, Elwes, Proc. Zool. Soc. Lond., 1882, p. 405, pl. 25, fig. . Bingham, Fauna Brit. Ind., Butt. i., p. 83 (1905).

*Dionæa margaritæ*, Moore, Lep. Ind. i., p. 271, pl. 86, figs. 1-1 *b* (1892).

One male specimen agreeing with Sikkim examples, but the oblique fascia of forewings is obsolescent.

Ta Shian Liang (5,000 ft.), July 29.

7. LETHE KANSA.

*Debis kansa*, Moore, Cat. Lep. E. I. C. i, p. 220 (1857) : Lep. Ind. i, p. 241, pl. 78, figs. 1-1*b* (1892).

*Lethe kansa*, Bingham, Fauna Brit. Ind., Butt. i., p. 92 (1905).

One female specimen.

Panye (2,000 ft.), July 26.

8. LETHE VERMA.

*Satyrus verma*, Kollar, Hügel's Kashmir, iv, p. 447, pl. xvi, figs. 1-2 (1844).

*Lethe verma*, Leech, Butt., China, Japan and Corea, p. 23 (1892); Bingham, Fauna Brit. Ind., Butt. i, p. 84 (1905).

*Tansima verma*, Moore, Lep. Ind. i, p. 273, pl. 86, figs. 3-3*b* (1892).

One male specimen.

Ding (2,000 ft.), July 27.

9. LETHE CHANDICA.

*Debis chandica*, Moore, Cat. Lep. E. I. C. i, p. 219 (1857), Lep. Ind. i, p. 247, pl. 79, figs. 2-2*b* (1892).

*Lethe chandica*, Leech., Butt., China, Japan, and Corea, p. 19 (1892); Bingham, Fauna Brit. Ind., Butt. i, p. 94 (1905).

One typical male specimen.

Salam Gam (1,000 ft.), July 28.

10. LETHE CONFUSA.

*Lethe confusa*, Aurivillius, Ent. Tijdsk., 1897, p. 142 ; Bingham, Fauna Brit. Ind., Butt. i, p. 82 (1905).

Three specimens.

Rima (5,500 ft.), July 7 ; Kahup (5,000 ft.), July 15.

11. MYCALESIS PERDICCAS.

*Mycalesis perdiccas*, Hewitson, Exot, Butt. ii, (Mycalesis) pl.iii, fig. 15, (1862) ; Leech, Butt., China, Japan and Corea, p. 13, pl. ii, fig. 6, ♀ (1892).

*Gareris perdiccas*, Moore, Trans. Ent. Soc. Lond. 1880, p. 157.

Two specimens.

Lu Ku Pa, Szechuen (3,000 ft.), May 2 (♂); Pangam (2,500 ft.), July 24 (♀).

12. MELANITIS BELA.

*Melanitis bela*, Moore, Cat. Lep. E. I. C. i, p. 223 (1857) ; Lep. Ind. ii, p. 128, pl. 126, fig. 1, *c*, *d*, *e*, ♂, ♀ (1894).

*Cyllo aswa*, Moore, Proc. Zool. Soc. Lond., 1865, p. 769.

*Melanitis aswa*, Leech, Butt., China, Japan and Corea, p. 108 (1892).

Three male specimens and one female.

One example of each sex, referable to *bela*, the dry season form of the species.

Minzong (3,500 ft.), July 19; Muku (3,400 ft.) July 21; Panye (2,000 ft.), July 26.

13. YPTHIMA BALDUS.

*Papilio baldus*, Fabricius, Syst. Ent. App. p. 829 (1775).

*Thymipa baldus*, Moore, Lep. Ind. ii, p. 58, pl. 106, figs. 1-1 i (1893).

*Ypthima philomela*, Leech, Butt., China, Japan and Corea, p. 90 (1892).
*Ypthima baldus*, Bingham, Fauna Brit. Ind., Butt. i., p. 134 (1905).
Two specimens.
Minzong (3,500 ft.), July 19; Salam Gam (3,000 ft.), July 28.

14. YPTHIMA SAKRA.

*Ypthima sakra*, Moore, Cat. Lep. E. I. C. i, p. 236 (1857); Leech, Butt., China, Japan and Corea, p. 83 (1892); Bingham, Fauna Brit. Ind., Butt. i, p. 137 (1905).
*Thymipa sakra*, Moore, Lep. Ind. ii, p. 69, pl. 109, figs. 2-2*b* (1893).
Several specimens agreeing in the main with those from Western China.
One example (Giada) has four large ocelli on the upper side of hindwings.
Giada (9,500 ft.), July 3; Tsachung (7,000 ft.), July 4; Rima (3,500 ft.), July 7; Kahap (5,000 ft.), July 8.

15. YPTHIMA NEWARA.

*Ypthima newara*, Moore, Proc. Zool. Soc. Lond., 1874, p. 567; (*chinensis*) Leech, Butt., China, Japan and Corea, p. 89, pl. x, fig. 5 (1892); Bingham, Fauna Brit. Ind., Butt. i, p. 139 (1905).
*Pandima newara*, Moore, Lep. Ind. ii, p. 87 (1893).
Several specimens.
Salam Gam (4,000 ft.), July 29.

16. YPTHIMA BEAUTEI.

*Ypthima beautei*, Oberthür, Etud. d'Entom. ix, p. 18, pl. ii. fig. 1 (1884); Leech, Butt., China, Japan and Corea, p. 85 (1892).
Three male specimens.
Ridong (12,000 ft.), June 17.

17. YPTHIMA PUTAMDUI, sp. n.

♂. Very closely resembling *Y. beautei*, Oberthür, on upper side, but on the underside the linear markings are different. The antemedial line is barely traceable, the postmedial line is strongly projected outwards between veins 3 and 6, the subterminal line runs in towards the projection thence to termen below costa; all the lines are darker, narrower, and more crenulate than in *beautei*.
One male specimen.
Nya Chuka (10,000 ft.), May 25.

18. YPTHIMA BAILEYI, sp. n.

♂. In size, and in colour and marking of the upperside similar to *Y. beautei*, Oberthür, but the yellow ring of apical ocellus of forewings somewhat narrower; the hindwings have two yellow ringed ocelli on terminal area towards tornus, the upper ocellus smaller than the lower. On the underside the transverse lines of hindwings are reddish brown, the middle line is inwardly angled between veins 2 and 4, outwardly angled between veins 4 and 6, and there is a pale greyish patch below the lower angle.
One male specimen.
Batang (10,000 ft.), June 2.

19. YPTHIMA INSOLITA.

*Ypthima insolita*, Leech, Entom., xxiv, Suppl., p. 66 (1891); Butt., China, Japan and Corea, p. 86, pl. ix, fig. 1, ♂ (1892).

Two ♂ specimens. These are smaller than the type, the termen of forewings straighter, the subapical ocellus smaller, and there is no ocellus between veins 2 and 3.

Tondu la (9,000 ft.), June 14.

20. YPTHIMA DROMONIDES.

*Ypthima dromonides*, Oberthür, Etud. d'Entom. xv, p. 15, pl. ii, fig. 14 (July 1891).

Several specimens; ocelli small, tending to complete absence.

Ching Chi Hsien (6,000 ft.), May 3; Nyachuka (10,000 ft.), May 25; Batang (9,000 ft.), June 6; Gera (9,000 ft.), June 7; Nun Chou (12,500 ft.), June 9; Trong ze (10,000 ft.), June 11; Menkong (8,000 ft.), June 16.

21. YPTHIMA IRIS.

*Ypthima iris*, Leech, Entom. xxiv, Suppl. p. 57 (June 1891); Butt., China, Japan and Corea, p. 84 (1892).

Five male specimens.

Leng Chu (4,500 ft.), May 7; Ta pen ba (5,000 ft.), May 8.

23. CALLEREBIA MEGALOPS.

*Callerebia megalops*, Alphéraky, "Iris" 1895, p. 184; Rom. Sur. Lep. ix, p. 108, pl. ix, fig. 2 ♂ (1897).

One example of each sex. As the female appears to be unnoted the Gera specimen is here described.

♀. Paler brown than the male on the upperside; the medial area of forewings tinged with fulvous: the subapical ocellus is larger and set in an ashey-grey cloud. Four ocelli on terminal area of hindwings, each with distinct fulvous ring and white pupil, the 2nd ocellus largest; a fifth ocellus, represented by a white point between veins 6 and 7; the subterminal line more distinct and the fringes paler. Underside similar to that of the male, but the wavy postmedial line of hindwings is inwardly suffused with fulvous and the ocelli are much more distinct.

Nun Chou (12,500 ft.), June 9 (♂); Gera (9,000 ft.), June 7 (♀).

23. CALLEREBIA POLYPHEMUS.

*Eebia polyphemus*, Oberthür, Etud. d'Entom. ii, p. 33, pl. ii, fig. 2 (1876).
*Callerebia orixa*, Leech, Butt., China, Japan and Corea, p. 104 (1892).

One male specimen.

Menkong (8,000 ft.), June 16.

24. CALLEREBIA INNUPTA, p. n.

♀. Smoky brown with a slight greyish tinge on the outer third of all the wings. A diffuse tawny streak on subcostal area of forewings, extending from the base to the tawny ringed black subapical spot; the latter subovate, oblique enclosing two white dots; a much smaller tawny ringed black spot, with a white central point, between veins 2 and 3; a blackish shade-like postmedial band is bluntly angled below middle; subterminal band blackish, rather narrow, interrupted by the veins. Hindwings have three white centred black spots between veins 2 and 5, all are ringed with tawny and vary a little in size, the white centre of the upper spot larger than that of either of the other two; subterminal band blackish, interrupted, narrowed towards tornus. Fringes of all the wings pale grey, blackish at ends of veins, preceded by a black line. Underside of forewings reddish tawny on basal two-thirds, greyish marked with black on outer third; postmedian line brownish; ocelli as above but rings yellowish; hindwings greyish,

darker freckled; postmedian line dark grey indented near costa coarsly serrate between veins 2 and 6; followed by a grey-clouded yellow band on which are two ocelli, one between veins 2 and 3, the other between veins 4 and 5; subterminal line dark grey, crenulate.

Expanse 56 mm.

Two female specimen.

Near *C. albipunctata*, Leech.

Menkong (8,000 ft.), June 16; Ruta (8,500 ft.), June 16.

In the specimen from Ruta the lower ocellus on forewings, and the middle one on hindwings, are rather larger than in the specimen described.

25. CALLEREBIA BAILEYI, sp. n.

♂. Blackish, terminal area of all the wings whitish sprinkled with blackish brown; this area on hindwings broad and thinly sprinkled; traces of a wavy blackish, subterminal line towards costa; subapical ocellus, margined with tawny, enclosing two white dots set obliquely; tornal ocellus of hindwings ringed with tawny, white pupilled; fringes white. Underside of forewings as above but the apical area is whiter and the ocellus is larger; hindwings white freckled with brownish chiefly on costal half; a small yellow ringed ocellus, with white centre between veins 6 and 7, a smaller one without white centre between veins 5 and 6; two larger ocelli, faintly ringed with yellow and centred with white, before tornus; traces of a brownish subterminal line.

♀. Similar to the male but browner in colour; on the hindwings the upper ocellus is almost, and that between veins 5 and 6 entirely absent; two diffuse brownish lines, the outer bluntly dentate, represent margins of a medial band.

Expanse 60—64 mm. ♂, 60—67 mm. ♀.

Six male specimens and three females.

Allied to *C. annada*, Moore.

The ocelli of upperside vary in size and those of the underside of hindwings vary in number. Where the subapical ocellus of forewings is much reduced in size on the upperside it looses one white pupil, although remaining bipupilated and of normal size on the underside. The brown sprinkling is heavier in some specimens than in others, and in one male (Dichu) it extends over most of the wing.

Drowa Gompa (10,000 ft.), June 26 and July 3 (♀ type); Giada (9,500 ft.), July 2 (♂ type); Chikung (9,000 ft.), July 3 (7 00 ft.), July 4; Dicuh (6,000 ft.), July 8.

26. CALLEREBIA PHYLLIS.

*Callerebia phyllis*, Leech, Entom. xxiv., Suppl. p. 57 (1891); Butt., China, Japan and Corea, p. 101, pl. ix, fig. 9 (1892.)

One male specimen.

Gera (9,000 ft.), June 7.

27. CALLEREBIA INCONSTANS, sp. n.

♂. Brownish or sooty black with a diffuse, reddish fulvous band on outer area of each wing, not reaching costa or dorsum on either wing; subapical spot black, enclosing two white points. Underside of forewings reddish fulvous, terminal border greyish brown, sprinkled with whitish grey on apical area; an undulated darker transverse line before the apical spot which is rather larger than above; underside of hindwings greyish irrorated with darker; antemedial line brownish, irregular, not distinct; postmedial line brownish, bluntly dentate, outwardly bordered with ochreous; a subterminal series of white points.

♀. Rather paler. Ocellus larger.

Expanse 46 mm.

Closely allied to *C. phyllis*, Leech, but distinguished by the reddish fulvous on terminal area of the wings and by the smaller and much less oblique subapical spot on forewings. On the underside the hindwings are greyer, the postmedial line and the white points on outer area more distinct.

The subapical spot in one specimen (Sanga Chu Dzong) is without white points, and in two specimens (Shiuden) the spot, which is small and round, has only one white point and this central.

Polu (10,000 ft.), June 22 (Type ♂); Loma (11,000 ft.), June 23; Sanga Chu Dzong (12,000 ft.), June 25 and July 1; Shiuden Gompa (13,500 ft.), June 27.

28. EREBIA DISCALIS, sp. n.

♂. Blackish brown, forewings, costa yellowish; a reddish tawny dash in the cell extending beyond the black discocellulars to a yellowish patch; subapical ocellus black, minutely white centred; fringes yellowish checkered with blackish towards apex. Underside similar to above but the ocellus of forewing ringed only with yellowish; hindwings tinged with yellowish and mottled with black.

♀. Similar, but the ocellus very small and the reddish tawny in cell does not extend beyond the discocellular.

Expanse 50 mm.

W. of Rong se la (14,000 ft.), June 1, (♀); Kiala (14,700 ft.), June 10 (♂)

Allied to *E. herse*, Gr.-Gr. (Hor. Ross. 1891, p. 457).

29. PARARGE MAJUSCULA.

*Amecera majuscula*, Leech, Butt. China, Japan and Corea, p. 67, pl. xii, fig. 6, ♂ (1892).

One male specimen. The fulvous colour in subapical ocellus very pale.

Gera (9,000 ft.), June 7.

30. AULOCERA PADMA.

*Satyrus padma*, Kollar, Hügel's Kashmir, iv, pt. 2, p. 445, pl. xv, figs. 1, 2 (1848).

*Aulocera padma*, Leech, Butt. China, Japan and Corea, p. 71 (1892).

One specimen.

Kahao (6,000 ft.), July 8.

31. AULOCERA IOLE.

*Oeneis pumilis*, var. *iole*, Leech, Butt. China, Japan and Corea, p. 75, pl. xi, fig. 2, ♂ (1892).

*Satyrus sybillina*, var. *bianor*, Grum-Grshimailo, Hor. Ent. Soc. Ross. xxv, p. 458 (1891).

Several male specimens, intermediate in form between typical *iole* and var. *bianor*.

Ridong (12,000 ft.), June 18; Dokong (13,500 ft.) June 19; Poda (12,000 ft.), June 25.

32. OENEIS BUDDHA.

*Oeneis buddha*, Grum-Grshimailo, Hor. Ent. Ross. 1891, p. 458; Leech, Butt. China, Japan and Corea, p. 76 (1892).

Five male specimens and one female. Three males and the female (Litang) all exceed the normal size of the species ranging up to 56 mm. in expanse.

Litang (13,800 ft.), May 28; Toutang (14,500 ft.), May 29; Pugo (14,900 ft.), June 29.

33. Cœnonympha sinica.

*Cœnonympha sinica*, Alphéraky, Rom. Sur. Lép. v., p. 118.

*Cœnonympha typhon*, var. *tydeus*, Leech, Butt. China, Japan and Corea, p. 97, pl. xi., fig. 3, ♂ (1892).

Four specimens (3 ♂, 1 ♀).

Shiuden Gompa (13,500 ft.), June 29.

Sub-family—AMATHUSINÆ.

34. Nandogea diores.

*Thaumantis diores*, Double day, Ann. Nat. Hist., 1845, p. 234; Bingham, Fauna Brit. Ind., Butt. i, p. 190, pl. iv, fig. 32 (1905).

*Nandogea diores*, Moore, Lep. Ind., ii, p. 182, pl. 148, fig. 1, 1*a*, 1*b*, ♂, ♀ (1894).

One male specimen.

Panye (2,000 ft.) July 26.

35. Stichopthalma howqua.

*Thaumantis howqua*, Westwood, Trans. Ent. Soc. Lond., 1851, p. 174, vol. iv, p. 178, pl. 18, figs. 2, 2*a* (1858).

*Stichopthalma howqua*, Leech, Butt. China, Japan and Corea, p. 113; var. *suffusa*, pl. i, fig. 3 (1892); Bingham, Fauna Brit. Ind. Butt., i, p. 193 (1905).

One male specimen of a form intermediate between typical examples from India and var. *suffusa*, Leech, from Western China.

Pangam (2,500 ft.), July 24th, 1911.

Sub-family—DANAINÆ.

36. Caduga tytia.

*Danais tytia*, Gray, Lep. Ind. Nepal., p. 9, pl. ix, fig. 2 (1846); Leech, Butt. China, Japan and Corea, p. i (1892); Bingham, Fauna Brit. Ind., Butt., i, p. 13 (1905).

*Caduga tytia*, Moore, Lep. Ind., p. 61, pl. xv, figs. 1, 1*c*, ♂, ♀ (1890).

One specimen.

Drowa Gompa (10,000 ft.), June 21.

37. Caduga melaneus.

*Papilio melaneus*, Cramer, Pap. Exot. 1, pl. xxx, fig. *d*. (1775).

*Caduga melaneus*, Moore, Lep. Ind., p. 60, pl. xiv, fig. 2, 2*b* (1890); Leech, Butt. China, Japan and Corea, p. 3 (1892).

*Danais melanea*, Bingham, Fauna Brit. Ind, Butt. i, p. 14 (1905).

One specimen.

Muku (3,400 ft.), July 21.

38. Tirumala septentrionis.

*Tirumala septentrionis*, Butler, Ent. Mo-Mag., xi, p. 163 (1874); Marshall and de Nicéville, Butt. Ind. i, p. 48, pl. vi, fig. 8 (1882); Leech, Butt. China, Japan and Corea, p. 3 (1892.)

*Danais septentrionis*, Bingham, Fauna Brit. Ind., Butt. i, p. 17 (1905).
One specimen.
Minzong (3,500 ft.), July 20.

39. TREPSICHROIS MULCIBER.

*Papilio mulciber*, Cramer, Pap. Exot. ii, pl. 127, figs. *c*., *d*. (1779).
*Trepsichrois linnæi*, Leech, Butt. China, Japan and Corea, p. 7 (1892).
*Euploea mulciber*, Bingham, Faun. Brit. Ind., Butt. i, p. 45 (1905).
Five male specimens.
Gabu (4,000 ft.), July 17; Tinai (4,000 ft.), July 16; Tulang (3,500 ft.), July 18; Minzong (3,500 ft.), July 20.

40. PARANTICA MELANOIDES.

*Parantica melanoides*, Moore, Proc. Zool. Soc. Lond., 1883, p. 247; Lep. Ind. i, p. 54, pl. 12, fig. 3, 3*a*, ♂, ♀ (1890).
*Danais aglea*, Bingham, Fauna, Brit. Ind. Butt. i, p. 18 (1905).
Three male specimens.
Minzong (3,500 ft.), July 20; Tila (3,100 ft.), July 23; Khupa (2,500 ft.), July 25.

41. DANAIS PLEXIPPUS.

*Papilio genutia*, Cramer, Pap. Exot. iii, pl. 206 (1779).
*Danais genutia*, Leech, Butt. China, Japan and Corea, p. 6 (1892).
*Salatura genutia*, Moore, Lep. Ind. i, p. 45, pl. 10, fig. 1-1*a* (1890).
*Danais plexippus*, Linn., Bingham, Fauna Brit. Ind., Butt. i, p. 10 (1905).
Several specimens.
Minzong (3,500 ft.), July 20.

SUB-FAMILY—ACRÆCINÆ.

42. PAREBA VESTA.

*Papilio vesta*, Fabricius, Mant. Ins. ii, p. 14 (1787).
*Pareba vesta*, Leech, Butt. China, Japan and Corea, p. 114 (1892); Moore, Lep. Ind. v, p. 31, pl. 387, figs. 1-1 (1901); Bingham, Fauna, Brit. Ind., Butt. i, p. 469 (1905).
One male specimen.
Dichu Nullah (6,000 ft.), July 8.

SUB-FAMILY—NYMPHALINÆ.

43. ARGYNNIS NIPHE.

*Papilio niphe*, Linn, Syst. Nat. xii, 785 (1767).
*Argynnis niphe*, Leech, Butt. China, Japan and Corea, p. 243 (1892).
*Acidalia hyperbius*, Moore, Lep. Ind. iv., p. 232, pl. 373, figs. 1-1 *b* (1900).
*Argynnis hyperbius*, Bingham, Fauna, Brit. Ind. Butt. i, p. 438, pl. v, fig. 36 (1905).
Several specimens, including both sexes.
Kahao (5,300 ft.), July 7; Minzong (3,500 ft.), July 20; Khupa (2,500 ft.), July 25.

44. ARGYNNIS LATHONIA.

*Papilio lathonia*, Linn, Syst. Nat. xii, p. 786 (1767).
*Argynnis lathonia*, Leech, Butt. China, Japan, and Corea p. 227 (1892).
*Argynnis lathonia*, Bingham, Fauna, Brit. Ind., Butt. i. p. 441 (1905).
One female specimen.
Ridong (12,500 ft.), June 18.

45. ARGYNNIS GONG.

*Argynnis gong*, Oberthür, Etud. d'Entom. ix, p. 15, pl. ii, fig. 9 (1884); Leech, Butt. China, Japan and Corea, p. 224 (1892).

Several specimens.

Ridong (12,000 ft.), June 18; W. of Tsongla (13,500 ft.), June 19; Zhashala (14,500 ft.), June 20; Shiuden Gompa (14,000 ft.), June 29.

46. ARGYNNIS ADIPPE.

*Papilio adippe*, Linn, Syst. Nat. xii, p. 786 (1767).
*Argynnis locuples*, Butler, Ann. and Mag. Nat. Hist. (5) vii, p. 134 (1879).
*Argynnis adippe*, Leech, Butt. China, Japan and Corea, p. 232 (1892).

Four male and two female specimens, all referable to *locuples*.

Drowa Gompa (10,000 ft.), June 4; Chikung (7,500 ft.), July 4.

47. MELITÆA JEZABEL.

*Melitæa jezabel*, Oberthür, Etud. d'Entom. xi, p. 17, pl. ii, fig. 14 (1886); Leech, Butt. China, Japan and Corea, p. 217 (1892).

Four male specimens.

Pugo (14,000 ft.), June 27; Shiuden Gompa (13,500 ft.), June 29; Poda (15,000 ft.), June 30.

48. MELITÆA SIKKIMENSIS.

*Melitæa sindura*, var., Elwes, Trans. Ent. Soc. Ind. 1888, p. 336.
*Mellieta sikkimensis*, Moore, Lep. Ind. v, p. 5, pl. 380, figs. 4, 4 *a* (1901).
*Melitæa sindura*, Bingham, Fauna, Brit. Ind., Butt. i, p. 451 (1905).

Fourteen male specimens and one female. Three of the males (Tsongla) have the hindwings almost entirely black.

Ridong (12,000 ft.), June 18 (♀); West of Tsongla (12,500 ft.), June 19; Zhashala (14,500 ft.), June 20.

49. CYNTHIA EROTA.

*Papilio erota*, Fabricius, Ent. Syst. iii, p. 76 (1793).
*Cynthia erota*, Moore, Lep. Ind. iv, p. 188, pl. 354, figs. 1, 1*a*, *b*, *c* (1900); Bingham, Fauna, Brit. Ind., Butt. i, p. 406 (1905).

Three male specimens.

Tashianliang (1,500 ft.), July 31; Dze Pani (1,500 ft.), August 1.

50. KANISKA CANACE.

*Papilio canace*, Linn, Syst. Nat. xii, p. 779 (1767).
*Vanessa canace*, Leech, Butt., China, Japan and Corea, p. 255 (1892); Bingham, Fauna, Brit. Ind., Butt. i, p. 371 (1905).
*Kaniska canace*, Moore, Lep. Ind. iv, p. 92, pl. 315, figs. 1-1*a* (1899).

Two specimens.

Dabla (8,000 ft.), July 4; Kahao (4,800 ft.), July 15.

51. EUVANESSA ANTIOPA.

*Papilio antiopa*, Linn, Syst. Nat. x, p. 476 (1758).
*Vanessa antiopa*, Leech, Butt. China, Japan and Corea, p. 256 (1892); Bingham, Fauna, Brit. Ind., Butt. i, p. 370 (1905).
*Euvanessa antiopa*, Moore, Lép. Ind. iv, p. 83, pl. 316, figs. 1, 1*a* (1899).

One female specimen.

Ta Chien lu (8,400 ft.), May 17.

52. PYRAMEIS CARDUI.

*Papilio cardui*, Linn, Syst. Nat. x, p. 475 (1758).
*Pyrameis cardui*, Leech, Butt., China, Japan and Corea, p. 251 (1892); Moore, Lep. Ind. iv, p. 105, pl. 320, figs. 2, 2*b* (1899); Bingham, Fauna, Brit. Ind., Butt. i, p. 365 (1905).
Several specimens.
Chin jih ho (Szechuan) (2,000 ft.), April 21; Ramala (13,000 ft.), May 26; Shiuden Gompa (13,500 ft.), June 27; Rima (5,500 ft.), July 7.

53. PIRAMEIS INDICA.

*Papilio atalanta indica*, Herbst, Naturs. Schmett. vii, p. 171, pl. clxxx, figs. 1, 2 (1794).
*Pyrameis indica*, Leech, Butt., China, Japan and Corea, p. 252 (1892); Moore, Lep. Ind. iv, p. 103, pl. 320, fig. 1 (1899); Bingham, Fauna, Brit. Ind., Butt. i, p. 366 (1905).
One male specimen.
Minzong (3,500 ft.), July 20.

54. VANESSA URTICÆ.

*Papilio urticæ*, Linn, Syst. Nat. x, p. 477 (1758).
*Vanessa urticæ*, var. *chinensis*, Leech, Butt., China, Japan and Corea, p. 258, pl. xxv, fig. 1, ♀ (1892).
*Vanessa ladakensis*, Moore, Ann. and Mag. Nat. Hist. (5) i, p. 227 (1878).
Several specimens all but one are referable to *chinensis*. The exception, a male, agrees with specimens of *ladakensis* from N. E. Tibet in the British Museum.
Liu Yang (7,000 ft.), May 9; Nyachuka (9,000 ft.), May 25; Ponghamo (12,000 ft.), June 2; Batang (9,000 ft.), June 6; Tsong-en (11,000 ft.), June 9; Sangachu Dzong (12,000 ft.), June 30.

55. POLYGONIA AGNICULA.

*Grapta agnicula*, Moore, Proc. Zool. Soc., Lond., 1872, p. 559.
*Polygonia agnicula*, Moore, Lep. Ind. iv, p. 99, pl. 319, figs. 2, 2*a*, *b*, *c*. (1899).
*Vanessa calbum agnicula*, Bingham, Fauna, Brit. Ind., Butt. i., p. 372 (1905).
Three specimens.
Shentsang (12,500 ft.), June 1; Panghamo (12,000 ft.), June 7; Sangachu Dzong (12,000 ft.), June 25.

56. ARASCHNIA DAVIDIS.

*Araschnia davidis*, Poujade, Bidd. Soc. Ent. Fr. 1885, p. xciv; Leech, Butt., China, Japan and Corea, p. 274 (1892).
Five male specimens.
Ponghamo (12,000 ft.), June 2; Tondula (9,000 ft.), June 14; Menkong (10,000 ft.), June 16.

57. ARASCHNIA LEVANOIDES.

*Vanessa prorsoides*, var. *levanoides*, Blanchard, Comptes Rend. Acad. Sci. lxxii, p. 810 (1871).
*Araschnia prorsoides*, Leech, Butt., China, Japan and Corea, p. 273 (1892).
Three male and one female specimens.
Liu Yang (7,000 ft.), June 9.

58. JUNONIA ORITHYIA.

*Papilio orithyia*, Linn., Syst. Nat. x, p. 473 (1758).
*Junonia orithyia*, Leech, Butt., China, Japan and Corea, p. 279, pl. xxv, figs. 8-10 (1892); *(ya)* Bingham, Fauna, Brit. Ind., Butt. i, p. 258 (1905).
Seven male and three female specimens.
Chikung (7,500 ft.), July 4; Rima (5,500 ft.), July 7; Kahao (5,000 ft.), July 15.

59. JUNONIA IPHITA.

*Papilio iphita*, Cramer, Pap. Exot. iii, pl. ccix, figs. *c*, *d* (1779).
*Precis iphita*, Leech, Butt., China, Japan and Corea, p. 276 (1892); Moore, Lep. Ind. iv, p. 64, pl. 309, figs. 1-1*c* (1899).
One specimen.
Khupa (2,500 ft.), July 25.

60. SYMBRENTHIA SILANA.

*Symbrenthia silana*, de Nicéville, Journ. Asiatic Soc. Bengal, 1885, p. 117. pl. 2, fig. 9; Moore, Lep. Ind. iv, p. 121, pl. 329, figs. 2, 2*a*, ♂ (1899).
*Symbrenthia niphanda*, Bingham, Fauna, Brit. Ind., Butt. i, p. 379 (1905).
One male specimen.
Tulang (3,500 ft.), July 18.

61. SYMBRENTHIA HYPOSELIS.

*Vanessa hyposelis*, Godart, Enc. Mith. ix, Suppl., p. 818 (1823).
*Symbrenthia hyposelis*, Bingham, Fauna, Brit. Ind., Butt. i, p. 378 (1905).
One male specimen.
Kahao (4,800 ft.), July 18.

62. SYMBRENTHIA HIPPOCLUS.

*Papilio hippoclus*, Cramer, Pap. Exot. iii, p. 46, pl. ccxx, figs. *c*,*d*, ♂ (1779),
*Papilio lucina*, Cramer, Pap. Exot. iv, pl. cccxxx, figs. E, F (1780).
*Symbrenthia hippoclus*, Leech, Butt., China, Japan and Corea, p. 284 (1892).
*Symbrenthia lucina*, Moore, Lep. Ind. iv, p. 111, pl. 321, figs. 1-1*g* (1899); Bingham, Fauna, Brit. Ind., Butt. i, p. 376 (1905).
Several specimens.
Tulang (3,500 ft.), July 18; Minzong (3,500 ft.), July 19; Panye (2,000 ft.), July 26.

63. CETHOSIA BIBILIS.

*Papilio, bibilis*, Drury, Ou. Exot. Ent. i., pl. iv., fig. 2 (1770).
*Cethosia bibilis*, Leech, Butt., China, Japan and Corea, p. 120 (1892); Moore, Lep. Ind. iv, p. 184, pl. 352, figs. 1-1*d* (1900); Bingham, Fauna, Brit. Ind., Butt. i, p. 402 (1905).
One male specimen.
Khupa (2,500 ft.), July 25.

64. KALLIMA INACHIS.

*Paphia inachis*, Boisduval, Cuv. Régne Anim., Ins. ii, pl. 139, fig. 3 (1836).
*Kallima inachis*, Leech, Butt., China, Japan and Corea, p. 122 (1892); Moore, Lep. Ind. iv, p. 165, pl. 340, figs. 1-1*c* (1900); Bingham, Fauna, Brit. Ind., Butt., i. p. 394 (1905).
Four male specimens.
Pangam (2,500 ft.), July 24; Khupa (2,500 ft.), July 27; Paiyan River (1,000 ft.), August 6.

65. APATURA NAMOUNA.

*Apatura namouna*, Doubleday, Ann. Mag. Nat. Hist., 1845, p. 178.
*Potamis ambica*, Moore, Lep. Ind. iii, p. 4 (1896).
*Apatura ambica*, Bingham, Fauna, Brit. Ind., Butt. i, p. 230 (1905).
One male specimen.
Khupa (2,500 ft.), July 25th, 1911.

66. NAIAS POPULI.

*Papilio populi*, Linn, Syst. Nat. x, p. 476 (1758).
*Limenitis populi*, Leech, Butt., China, Japan and Corea, p. 187 (1892).
Three male specimens, all of the typical form.
Latrong (10,000 ft.), June 13; Menkong (10,000 ft.), June 16.

67. REHANA PARISATIS.

*Apatura parisatis*, Westwood, Gen. Diurn. Lep. ii, p. 305 (1850); Bingham, Fauna, Brit. Ind., Butt. i, p. 233 (1905).
*Rehana parisatis*, Moore, Lep. Ind. iii, p. 17, pl. 194, figs. 2-2c. (1896).
Three male specimens.
Tila (3,000 ft.), July 22; Khupa (2,500 ft.), July 25; Ding Manou (2,000 ft.), July 27.

68. PATSUIA SINENSIUM.

*Limenitis sinensium*, Oberthür, Etud. d'Entom. ii, p. 25, pl. iv, fig. 8 (1876); Leech, Butt. China, Japan and Corea, p. 179 (1892).
Four male specimens.
Menkong (10,000 ft.), June 16.

69. BHAGADATTA AUSTENIA.

*Lebadea austenia*, Moore, Proc. Zool. Soc. Lond., 1872, p. 560.
*Bhagadatta austeniæ*, Moore, Lep. Ind. iii., p. 155, pl. 251, figs. 2, 2*a* (1898).
*Auzakia austenia*, Bingham, Fauna, Brit. Ind., Butt. i, p. 301 (1905).
One male specimen.
Tashianliang (5,000 ft.), July 29.

70. DICHORRAGIA NESSEUS.

*Dichorragia nesseus*, Grose Smith, Ann. and Mag. Nat. Hist. (6) xi, p. 217 (1893); Rhop. Exot. vol. iii, *Euthalia*, pl. v, figs. 3, 4 (1898); Leech, Butt., China, Japan and Corea, p. 653.
Two male specimens.
Menkong (10,000 ft.), June 16.

71. LITINGA COTTINI.

*Limenitis cottini*, Oberthür, Etud. d'Entom. ix, p. 17, pl. ii, fig. 5 (1884); Leech, Butt., China, Japan and Corea, p. 180 (1892).
Four male specimens.
Menkong (10,000 ft.), June 16; Drowa Gompa (10,000 ft.), June 21.

72. NEPTIS ASPASIA.

*Neptis aspasia*, Leech, Entom. xxiii, p. 37 (1890); Butt., China, Japan and Corea, p. 193, pl. xviii, fig. 5, ♂ (1892).
A female specimen.
Rima (6,000 ft.), July 5.

73. NEPTIS ANANTA.

*Neptis ananta*, Moore, Cat. Lep. E. I. C. i, p. 166 (1857); Bingham, Fauna, Brit. Ind., Butt. i, p. 340 (1905).
*Stabrobates ananta*, Moore, Lep. Ind. iv, p. 22, pl. 297, figs. 1-1 *g* (1899).
Two male specimens agreeing in form with W. China examples.
Chikung (7,500 ft.), July 4; Dichu (6,000 ft.), July 8.

74. NEPTIS MIAH.

*Neptis miah*, Moore, Cat. Lep. E. I. C. i, p. 164, pl. iv*a*, fig. 1 (1857); Leech, Butt., China, Japan and Corea, p. 198, pl. xix, fig. 3 (1892); Bingham, Fauna, Brit. Ind., Butt. i, p. 341 (1905).
Two male specimens.
Khupa (2,500 ft.), July 25; Pangam (2,500 ft.), July 27.

75. NEPTIS EXTENSA.

*Neptis mahendra*, var. *extensa*, Leech, Butt., China, Japan and Corea, p. 202; pl. xix, fig. 5 (1892).
Two male specimens both referable to *extensa*, Leech.
Drowa Gompa (10,000 ft.), June 22.

76. NEPTIS COLUMELLA.

*Papilio columella*, Cramer, Pap. Exot. iv (1782).
*Andrapana columella*, Moore, Lep. Ind. iii, p. 218, pl. 271 (1899).
*Neptis ophiana*, Moore, Proc. Zool. Soc., Lond. 1872, p. 561.
*Neptis columella*, Bingham, Fauna, Brit. Ind., Butt. i, p. 326, pl. ix, fig. 66 (1905).
One male of the *ophiana* form.
Kobo (500 ft.), October 15.

77. NEPTIS SANKARA.

*Limenitis sankara*, Kollar, Hügel's Kashmir, iv, 2, p. 428 (1844).
*Bimbisara sankara*, Moore, Lep. Ind., iv, p. 4, pl. 289, figs. 1-1*g* (1899).
*Neptis sankara*, Bingham, Fauna, Brit. Ind., Butt. i, p. 332 (1905).
A male specimen.
Mango (4,000 ft.), July 16.

78. NEPTIS SOMA.

*Neptis soma*, Moore, Proc. Zool. Soc., Lond., 1858, p. 9, pl. xlix, fig. 6, ♀; Lep. Ind. iii, p. 241, pl. 284, figs. i-if (1899).
*Neptis nandina*, Moore, (pt.), Cat. Lep. E. I. C. i, p. 768 (1857).
Three specimens agreeing with a specimen from Darjeeling, labelled "*nandina*, Moore, type," in the British Museum Collection.
The true type of *nandina*, Moore (Cat. Lep. E. I. C. i., pl. iva, fig. 7) is from Java.
Khupa (2,500 ft.), July 25; Ding Manon (2,000 ft.), July 27; Salamgam (3,000 ft.), July 28.

79. NEPTIS PSEUDOVIKASI.

*Bimbisara pseudovikasi*, Moore, Lep. Ind. ii, p. 7, pl. 291, figs 1-1e (1886).
*Neptis vikasi pseudovikasi*, Bingham, Fauna, Brit. Ind., Butt. i, p. 338 (1905).
Three male specimens.
Khupa (2,500 ft.), July 25; Ding Manon (3,000 ft.), July 27.

80. NEPTIS INTERMEDIA.

*Neptis intermedia*, Pryer, Rhop. Nihon, p. 24, pl. vi., fig. 1 (1886).
*Neptis aceris*, Leech, Butt., China, Japan and Corea, p. 203 (1892).
A number of specimens, chiefly males.
Lengchu (4,500 ft.), May 7; Tapenba (5,000 ft.), May 8; Liu Yang (7,000 ft.), May 9; Menkong (10,000 ft.), June 16; Tondula (9,000 ft.), June 19; Drowa Gompa (10,000 ft.), June 22; Kahao, July 8.

81. NEPTIS EURYNOME.

*Limenitis eurynome*, Westwood, Donovan's Ins. China (2nd Ed.), p. 66, pl. 35, fig. 4 (1842).
*Neptis astola*, Moore, Proc. Zool. Soc., Lond., 1872, p. 560; Lep. Ind. iii, p. 227, pl. 274, figs. 1-1*g* (1890).
*Neptis eurynome*, Bingham, Fauna, Brit. Ind., Butt., i, p. 323, pl. ix, fig. 64 (1905).
Several specimens of the *astola* form.
Kahao (5,000 ft.), July 8; Kahao (5,000 ft.), July 15; Minzong (3,500 ft.), July 19; Pangam (2,500 ft.), July 23.

82. ATHYMA JINA.

*Athyma jina*, Moore, Cat. Lep. E. I. C. i, p. 172 (1857); Leech, Butt., China, Japan and Corea, p. 172 (1892).
*Tharasia jinoides*, Moore, Lep. Ind. iii, p. 181 (1899).
Two male specimens of the *jinoides* form.
Tila (3,000 ft.), July 22; Ding Manon (2,000 ft.), July 27.

83. STIBOCHIONA NICEA.

*Adolias nicea*, Gray, Lep. Ins. Nepal, p. 13, pl. xii, fig. 1 (1846).
*Stibochiona nicea*, Leech, Butt., China, Japan and Corea, p. 133 (1892); Bingham, Fauna, Brit. Ind., Butt. i, p. 250, pl. vi, fig. 46 (1905).
Several specimens including both sexes.
Tulang (4,000 ft.), July 17; Minzong (3,500 ft.), July 19; Muku (3,400 ft.), July 21.

84. ADOLIAS DIRTEA.

*Papilio dirtea*, Fabricius, Ent. Syst. iii, pl. i, p. 59 (1793).
*Adolias dirtea*, Moore, Lep. Ind. iii, p. 68, pl. 213, figs. 2-2*a* (1897).
*Symphoedra dirtea*, Bingham, Faun. Brit. Ind., Butt. i, p. 253 (1905).
One male specimen.
Khupa (2,500 ft.) July 25.

85. CIRROCHROA AORIS.

*Cirrochroa aoris*, Doubleday, Gen. Diurn. Lep. i, p. 157, pl. 21, fig. 2 (1847-8); Moore, Lep. Ind. iv, p. 212, pl. 364 (1900); Bingham, Fauna, Brit. Ind., Butt. i, p. 427 (1905).
Five male specimens and one female.
Minzong (3,500 ft.), July 2; Pangam (2,500 ft.), July 22; Ding Manon (2,000 ft.), July 27; Tashianliang (1,500 ft.), July 31; Habong River (1,700 ft.), August 2.

86. CHARAXES MARMAX.

*Charaxes marmax* Westwood, Cat. Or. Entom., p. 43, pl. 21 (1848): Bingham, Fauna, Birt. Ind., Butt. i. p. 211 (1905).

*Haridra marmax*, Moore, Lep. Ind. ii, p. 233, pl. 170, figs. 1-1c (1895).
One male agreeing with Sikkim specimens.
Tashianliang (1,500 ft.), July 31.

87. CHARAXES POLYXENA.

*Papilio polyxena*, Cramer, Pap. Exot. i, pl. liv, figs a, b (1779).
*Charaxes pleistonax*, Felder, Reise Nov. Lep. iii, p. 443 (1867).
*Charaxes jalinder*, Butler, Lep. Exot., p. 98, pl. xxxvii, fig. 4 (1872).
*Charaxes polyxena*, Bingham, Fauna, Brit. Ind., Butt. i, p. 216 (1905).
Two male specimens, one referable to *pleistonax*, Felder, the other two *jalinder*, Butler; also a female of the typical form.
Panye (2,000 ft.), July 20 (*pleistonax*); Dze River (1,500 ft.), August 1 (*jalinder*); Sadiya (500 ft.), October 25.

88. CHARAXES NARCÆUS.

*Nymphalis narcæus*, Hewitson, Exot. Butt. i, pl. i, figs. 1, 4 (1854).
*Charaxes narcæus*, Leech, Butt., China, Japan and Corea, p. 126 (1892).
One specimen.
Liu Yang (6,000 ft.), May 9.

89. CHARAXES ATHAMAS.

*Papilio athamas*, Drury, Ill. Exot. Ent. i, p. 5 (1770.)
*Eulepis athamas*, Moore, Lep. Ind. ii, p. 252, pl. 184, figs. 1—1d (1896); Bingham, Fauna, Brit. Ind., Butt. i, p. 220 (1905).
Four male specimens.
Minzong (3,500 ft.), July 20; Khupa (2,500 ft.), July 25; Tashianliang (1,500 ft.), July 31.

90. EUTHALIA CONFUCIUS.

*Adolias confucius*, Westwood, Gen. Diurn. Lep., p. 290 (1850).
*Euthalia confucius*, Leech, Butt. China, Japan and Corea, p. 135, pl. xxi, fig. 6, ♂ (1892).
Two male specimens.
Tulang hills, (4,000 ft.), July 17; Minzong (3,500 ft.), July 19.

91. EUTHALIA DURGA.

*Adolias durga*, Moore, Cat. Lep. E. I. C. i, p. 196 (1857.)
*Labranga durga*, Moore, Lep. Ind. iii, p. 159, pl. 246, figs. 1, 1a, b, ♂, ♀ (1896).
*Dophla durga*, Bingham, Fauna, Brit. Ind., Butt. i, p. 260 (1905).
Two examples of each sex.
Minzong (3,500 ft.), July 19; Muku (3,400 ft.), July 21; Tila (3,000 ft.), July 22; Panye (2,000 ft.), July 26.

92. SEPHISA CHANDRA.

*Castalia chandra*, Moore, Cat. Lep., E. I. C. i, p. 200, pl. 6, a, fig. 4, ♂ (1857); Lep. Ind. iii, p. 298, pl. 198.
*Sephisa chandra*, Bingham, Fauna, Brit. Ind., Butt. i, p. 246 (1905).
A male specimen.
Ding Manon (2,000 ft.), July 27th, 1911.

93. ABROTA GANGA.

*Abrota ganga*, Moore, Cat. Lep. E. I. C. i, p. 178, pl. 6, a, fig. 1, ♂ (1857); Lep. Ind. iii, p. 81, pl. 219, figs. 1, 1a, (1897); Bingham, Fauna, Brit. Ind., Butt. i, p. 251 (1905).
One male specimen.
Muku (3,900 ft.), July 21.

94. MODUZA PROCRIS.

*Papilio procris*, Cramer, Pap. Exot., ii, pl. 106, figs. E, F, ♀ (1777).
*Moduza procris*, Moore, Lep. Ind., iii, p. 161, pl. 253, fig. 1 (1898); Bingham, Fauna, Brit. Ind., Butt. i, p. 291 (1905).
One female specimen,
Kobo (500 ft.), October 15.

95. AUZAKIA DANAVA.

*Limenitis danava*, Moore, Cat. Lep. E. I. C. i, p.180, pl. vi, a fig. 2, (1857); de Nicéville, Butt. Ind., ii, p. 157 (1886); Leech, Butt. China, Japan and Corea, p. 188, pl. xiv, fig. 1, ♂, 1892.
*Auzakia danava*, Moore, Lep. Ind., iii, p. 149, pl. 249, figs. 1-1c (1896).
One specimen.
Tulang (4,000 ft.), July 17th, 1911.

96. CYRESTIS THYODAMAS.

*Cyrestis thyodamas*, Boisduval, Cuvier's Règne Animal, Ins. ii, pl. cxxxiii, fig. 4 (1836); Leech, Butt. China, Japan and Corea, p. 248 (1892); Moore, Lep. Ind. iv, p. 48, pl. 306, figs. 1-1c (1899); Bingham, Fauna, Brit. Ind., Butt. i, p. 349 (1905).
*Cyrestis chinensis*, Martin, Iris, xvi, p. 87 (1903).
Two male specimens.
Tulang (4,000 ft.), July 17.

97. CHERSONESIA RISA.

*Cyrestis risa*, Doubleday and Westwood, Gen. Diur. Lep. ii, p. 262, pl. 32, fig. 4 (1850).
*Chersonesia risa*, Moore, Lep. Ind. iv., p. 55, pl. 307, figs. 3, 3a, b, ♂, ♀ (1899).
One specimen.
Panye (2,000 ft.), July 26.

Sub-fam.—PSEUDERGOLINÆ.

98. PSEUDERGOLIS WEDAH.

*Ariadne wedah*, Kollar, Hügel's Kashmir, iv, pt. 2, p. 437 (1848).
*Pseudergolis wedah*, de Nicéville, Butt. Ind. ii, p. 120, pl. xxiii, fig. 109 ♂; Leech, Butt., China, p. 275 (1892).
Two male specimens.
Minzong (3,500 ft.), July 20; Tila (3,000 ft.), July 22.

Sub-fam.—LIBYTHEINÆ.

99. LIBYTHEA LEPITA.

*Libythea lepita*, Moore, Cat. Lep. E. I. C. i, p. 240 (1857); Leech, Butt. China, Japan and Corea, p. 288 (1893).
Three male specimens.
Menkong (10,000 ft.), June 16; Chikung (8,200 ft.), July 11.

Sub-fam.—CALINAGINÆ.

100. CALINAGA SAKA.

*Calinaga davidis*, Leech, Butt. China, Japan and Corea, pl. xx, fig. 1 (1894).

*Calinaga saka*, Moore, Lep. Ind. v, p. 49 (1901).
One male specimen, in worn condition.
Menkong, (10,000 ft.), June 16.

FAMILY—PAPILIONIDÆ.

Sub-family—THAIDINÆ.

101. ARMANDIA THAIDINA.

*Armandia thaidina*, Blanchard, Compt. Rend., lxxii, p. 809 (1871); Leech Butt. China, Japan and Corea, p. 489 (1893).
A male specimen.
Liu Yang (77,000 ft.), May 9.

Sub-family—PARNASSIINÆ.

102. PARNASSIUS SZECHENYII.

*Parnassius széchenyii*, Frivaldszky, Term. Füz. x, p. 39, pl. iv, figs. 1, 1a, (1886); Leech, Butt. China, Japan and Corea, p. 501 (1893).
Several specimens representing both sexes.
Drika la, (15,000 ft.), May 27; Tizu (13,800 ft.), May 21; Litang 17,000 ft.), May 28.

103. PARNASSIUS ORLEANS.

*Parnassius orleans*, Oberthür, Etud. d'Entom., xiv, p. 8, pl. i, fig. 2 (1891); xvi, p. 3, pl. ii, fig. 14, ♀ (1892); Leech, Butt., China, Japan and Corea, p. 502 (1893).
Four male specimens identical with those from Ta-chein-lu (Ex coll. Leech) in the British Museum.
Kia la 17,000 ft.), June 10; Tsema la (15,500 ft.), June 17; Zhasha la (15,000 ft.), June 20.

104. PARNASSIUS ACCO BAILEYI, nov.*

Generally larger in size, more strongly marked with black, the red spots richer in colour, and the tornal pair of sub-terminal spots frequently enclose some bluish scales; the fringes of the forewings are always checkered at ends of the veins, and sometimes the fringes of the hindwings are slightly marked in this way.
In expanse the male specimens from Litang range from 62-69 millim, and the females from 60-66 millim. The only specimen, a male, obtained at Rama La measures 76 millim in expanse.
Sixteen specimens (9 ♂♂; 7 ♀♀).
Rama la (15,000 ft.), May 26; Litang (13,800 ft.), May 28.

Sub-family—LEPTOCIRCINÆ.

105. LEPTOCIRCUS CURIUS.

*Papilio curius*, Fabricius, Mant. Ms. ii, p. 9 (1787).
*Leptocircus curius*, Gray, Cat. Lep. Ins. Brit. Mus. *Papil*, p. 73 (1852); Leech, Butt., China, Japan and Corea, p. 509 (1893).
Two specimens.
Panye (2,000 ft.), July 26; Tashianliang (1,500 ft.), July 31.

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* Smallest specimen from S. W. Thibet in Mus. Coll. is only 50 millim. Type *P. acco* measures 62 millim.

106. LEPTOCIRCUS MEGES.

*Papilio meges*, Zinken-Sommer, Nov. Act. Accd. Nat. Cur. xv, 1831, p. 161, pl. 15, fig. 8.

*Leptocircus meges*, Moore, Lep. Ind. v., p. 136, pl. 417, figs. 2, 2 b, (1902); Bingham, Fauna, Brit. Ind., Butt. ii, p. 6, pl. xi, fig. 8 (1907).

*Leptocircus virescens*, Butler, Cat. Fab. Lep. B. M., p. 259 (1869); Moore, Lep. Ind. v, p. 136, pl. 417 (1902).

One specimen referable to *virescens*, Butler.

Pangam (2,800 ft.), July 29.

Sub-family—PAPILIONINÆ.

107. ORNITHOPTERA ACACUS.

*Ornithoptera acacus*, Felder, Wein. Ent. Mon. iv, p. 225 (1860).

*Ornithoptera (Troides) acacus*, Moore, Lep. Ind. v, p. 148, pl. 422, figs. 1, 1a, ♂, ♀ (1902).

One male specimen.

Salam Gam (3,000 ft.), July 29.

108. PAPILIO VARUNA.

*Papilio varuna*, White, Entom. i, p. 280 (1842).

*Papilio astorion*, Westward, Ann. & Mag. Nat. Hist., ix, p. 37 (1842).

*Pongerana astorion*, Moore, Lep. Ind. v, p. 153, pl. 423, figs. 1, 1b (1902).

*Papilio varuna astorion*, Bingham, Fauna, Brit. Ind. ii, p. 25 (1907).

One male specimen.

Tila (3,100 ft.), July 23.

109. PAPILIO GANESA.

*Papilio ganesa*, Doubleday, Gray's Zool. Misc., p. 73 (1842).

*Sabaria ganesa*, Moore, Lep. Ind. vi, p. 56, pl. 487, figs. 1, 1a (1903).

*Papilio polyctor ganesa*, Bingham, Fauna, Brit. Ind., Butt. ii, p. 83 (1907)

Two male specimens similar to Assam examples.

Tulang (4,000 ft.), July 17; Kukfea (2,500 ft.), July 25.

110. PAPILIO MACHAON.

*Papilio machaon*, Linn, Syst. Nat. i, 2, p. 750 (1767); Leech, Butt., China, Japan and Corea, p. 516 (1893).

Several specimens, two of which (June 22 and 23) agree with Yatung example; all others are similar to specimens from Western China.

Tizu (13,500 ft.), May 21; Tilang pass (14,000 ft.), May 28; Gera (9,000 ft.), June 7; Drowa Gompa (10,000 ft.), June 22; Sanga Chu Dzong (11,000 ft.), June 23; Chikung (8,500 ft.), July 3.

111. PAPILIO TAMERLANUS.

*Papilio tamerlanus*, Oberthür, Etud. d' Entom. ii, p. 13, pl. ii, fig 1, (1876); Leech, Butt., China, Japan and Corea, p. 521 (1893).

Several specimens.

Oroshi (10,000 ft.), May 22; Puda (14,000), June 30.

112. PAPILIO XUTHUS.

*Papilio xuthus*, Linn, Syst. Nat. i, 2, p. 751 (1767); Leech, Butt., China, Japan and Corea, p. 514 (1893).

Three specimens, all males.

One specimen agreeing with Western Chinese examples of the species.

Rima (6,500 ft.), May 7; Kahao (4,800 ft.), July 15; Giada (10,000 ft.), July 2.

113. Papilio xuthulus.

*Papilio xuthulus*, Bremer, Bull. Acad. Petr. iii, p. 463 (1861); Lep., Ost. Sib., p. 4, pl. i, fig. 2 (1864).
*Papilio xuthus*, Leech, Butt., China, p. 514.
One example of each sex, similar to specimens from Western China.
Batang (9,500 ft.), June 2.

114. Papilio sarpedon.

*Papilio sarpedon*, Linn., Syst. Nat., i, 2, p. 747 (1767); Leech, Butt., China, Japan and Corea, p. 524 (1893).
One male specimen.
Tila (3,100), July 23.

115. Papilio bianor.

*Papilio bianor*, Cramer, Pap. Exot., ii, pl. ciii, fig. c, (1777); Leech, Butt., China, Japan and Corea, p. 527 (1893).
*Papilio syfanius*, Oberthür, Etud. d' Entom, xi, p. 13, pl. i, fig. 3 (1886) Leech, l. c. p. 532.
A male specimen referable to ab. *syfanius*, Oberth.
Nyachuka (15,000 ft.), May 23.

116. Papilio paris.

*Papilio paris*, Linn., Syst. Nat. i, 2, p. 745 (1767); Leech, Butt., China, Japan and Corea, p. 535 (1893).
One male specimen.
Pangam (2,500 ft.), July 24.

117. Papilio philoxenus.

*Papilio philoxenus*, Gray, Zool. Misc. p. 32 (1831); Leech, Butt., China, Japan and Corea, p. 537 (1893).
*Papilio dasarada*, Moore, Cat. Lep. E. I. C. i, p. 96 (1857); Lep. Ind. v., p. 161, pl. 427, figs. 1, ♂ 1 a, b, ♀ (1902).
One male referable to the typical form of *philoxenus*, and one female of the *desarada* form.
Tsachung (7,000 ft.), July 4; Panye (2,000 ft.), July 26 (*dasarada*).

118. Papilio plutonius.

*Papilio plutonius*, Oberthür, Etud. d'Entom ii, p. 16, pl. iii, fig. 2 (1876). Leech, Butt., China, Japan and Corea, p. 541 (1893).
Two male specimens.
Gera (9,000 ft.), June 7.

119. Papilio chiron.

*Papilio chiron*, Wall, T. L. S. xxv, p. 66 (1865).
*Zetides chiron*, Moore, Lep. Ind. vi, p. 6, pl. 469, figs. 1, 1 c (1903).
One male specimen.
Dze River (15,000 ft.), August 1.

120. Papilio demetrius.

*Papilio demetrius*, Cramer, Pap. Exot, iv., p. 196, pl. 385, figs., E. F. (1782); Leech, Butt., China, Japan and Corea, p. 546 (1893).
Three male specimens.
Minzong (3,500 ft.), July 19; Muku (3,900 ft.), July 21; Sanpura (1,000 ft.), August 8.

121. PAPILIO HELENUS.

*Papilio helenus*, Linnæus, Syst. Nat. i, 2, p. 745 (1767); Leech, Butt., China, Japan and Corea, p. 542 (1893).
Two specimens.
Minzong (3,500 ft.), July 19; Khupa (2,500 ft.), July 25.

122. PAPILIO POLYTES.

*Papilio polytes*, Linn., Syst. Nat. i, 2, p. 746 (1767); Leech, Butt., China, Japan and Corea, p. 552 (1893).
Two specimens.
Cheng tu (Sze-chuen) (1,700 ft.), April 22.

123. PAPILIO ALCINOUS.

*Papilio alcinous*, Klug, Neue Schmett, p. i, pl. i, figs., 1—4 (1836); Leech, Butt., China, Japan and Corea, p. 539 (1893).
One male specimen and two females.
Leng chu, Sze-chuen (4,500 ft.), May 7.

124. PAPILIO MEMNON.

*Papilio memnon*, Linn., Syst. Nat. i, 2, p. 747 (1767); Leech, Butt., China, Japan and Corea, p. 544 (1893).
One male specimen.
Chin-jih-ho (2,000 ft.), April 21.

(*To be continued.*)

# SOME NOTES ON MAMMALS AND BIRDS IN SOUTH EASTERN TIBET.

BY

CAPT. F. M. BAILEY.

The following notes were made on a journey made last year from Ta Chien lu to Rima *via* Batang and Menkong on the Salween, with a diversion North-West to Shiuden Gompa. A good deal of the country had not been collected in before, so that, though only two new species were found the geographical distribution of others will, I think, be interesting. A collection of butterflies and moths was also made, and a paper on the former appears in this number of the journal.

## MAMMALS.

Specimens of the following were collected and presented to the British Museum and have been identified by Mr. Oldfield Thomas :—

1. *Mustela siberica.*—One specimen obtained near Tachienlu at about 9,000 feet. Tibetan name—*Suri* or *Se Tong*; Chinese name—*Huang Shi.*

2. *Lepus kozlovi.*—This hare was found near Tachienlu at about 11,000 ft. and at many places on the road as far as Shiuden Gompa where it was very plentiful. Tibetan name—*Regong.* One shot near Shiuden Gompa on 27th June was about to give birth to six young.

3. *Myospalax baileyi.*—One specimen obtained at Rama-Song-Tu, 50 miles west of Tachienlu at 12,000 feet.

4. *Marmota robusta.*—Seen at several places between Tachienlu and Batang and also on the Jo la at altitudes from 14,000 to 16,000 feet. Eastern Tibetan name *Shu-A.* Central Tibetan *Chi-wi.*

5. *Ochotona roylei chinensis.*—New variety. One specimen obtained at Yara-Tsa-Ga 20 miles south of Tachienlu, at 13,000 feet. Eastern Tibetan name *Ara.* Central Tibetan name *Abra.*

6. *Ochotona tibetana.*—One specimen at Tasho, 30 miles east of Batang at 13,000 feet. Tibetan names *Abra* and *Ara.*

7. *Dremomys pernyi.*

8. *Sciurus castaneoventris michianus.*—Tibetan name for both these squirrels *Tong-Le* and *Ka-ji-ra.* Chinese name *Tiao-lin-tzu.* Squirrels were plentiful in the forests at altitudes of 10,000 to 13,000 feet.

In addition to the above small mammals, Takin and Goral were shot. One of the latter which was obtained at Ho-kou was of a greyish colour, while near Rima the Goral is a foxy red and skins of these animals are used for making coats. I also saw foxes and musk deer and traces of serow. Burhel are also found locally and I saw skins and horns in the villages. Bears and leopards were also said to occur but none were seen. A considerable trade in stag horns is carried on at Litang and Tachienlu. Mr. Elwes had asked me to look out for these and to bring back some horns if possible. The horns which I did buy I was obliged subsequently to throw away owing to transport difficulties.

I give the following notes obtained from natives for what they are worth :—

There are 3 varieties of stag whose horns are brought for sale to Tachienlu called in Tibetan (1) *Sha-na*, (2) *Sha-me* (3) *Sha-jia.*

(1) The *Sha-na* is said to be dark in colour and to have only 6 points to the horns. I saw horns of this stag which appeared to be those of a Sambur. Their stages are found 2 days march to the south of Litang.

(2) The *Sha-me* is reddish brown and has 12 points in the horns. It is found at a place called Yara-Tsurong-Kar, 2 days' march to the north-west of Tachienlu.

(3) The *Sha-jia* is grey with 12 to 16 points to the horns. It is found 3 days west of Tachienlu at La-li-shi.

## BIRDS.

The following specimens of birds were also collected and have been identified by Mr. Ogilvie Grant:—

1. Hodgson's Eared Pheasant *(Crossoptilon tibetanum.)*—This very conspicuous and noisy pheasant was seen at many places between Tachienlu and the Tong la, the pass at the head of the Irrawady Valley. They move about in the thin forest near the tree level in flocks of from 6 to 10. They were nesting at 12,000 feet near Tachienlu in the middle of May but I did not succeed in finding a nest. Tibetan name near Tachienlu *Cha-kong*. Tibetan name further west *Cha-kai*. Chinese *Machi*.

2. Lady Amherst's Pheasant *(Thaumalea amherstiæ).*—These pheasants were plentiful on the Fei-yueh-ling, a pass three days south-east of Tachienlu and a few were seen at Tachienlu itself. They live at altitudes from 7 to 9,000. The cocks are noisy birds and will not fly. I did not see a single hen. Tibetan name *Ja*. Chinese name *Sen-chi*.

3. Himalayan Snow Cock *(Tetrogallus tibetanus).*—This bird was found on the passes west of Tachienlu above tree level. I did not see any west of Litang. Tibetan name *Kongmo*. Chinese name *Pe-mo-chi*.

4. Stone's Pheasant (*Phasianus elegans*).—I shot a specimen of this on the Fei-yueh-ling pass south-east of Tachienlu. It was plentiful at Tachienlu itself and a few were seen in suitable places up to Batang and again in the Yangtse Valley, two days' march south of Batang and near the Kia-La which is on the watershed between the Yangtse and the Mekong, but I did not see it west of the Yangtse Valley. Tibetan name *Teo-ka*.

5. Szechenyi's Pheasant-Grouse *(Tetraophasis szechenyi).*—A few were seen about 14,000 feet in the forests on the Ka-ji-la and Rama-la, two passes between Tachienlu and Litang. Tibetan name *Kwa-kwa-dzu*. Chinese name *Hua-we-tzu*.

6. Prjevalsky's Partridge *(Perdix sifanica).*— Found at heights of between 12,500 and 15,000 at suitable places from Litang to Dokong in the Upper Irrawaddy Valley. Eastern Tibetan name *Sakpa*. Central Tibetan name *Rhak-pa*.

7. Geoffroy's Blood Pheasant *(Ithagens geoffroyi.)*—Plentiful near Tachienlu between 11,000 and 13,000 feet. This bird lives in the highest forest and I have seen it in snow. It is very easy to approach and shoot but seldom flies. Tibetan name *Siri*. Chinese name *Sung-chi*.

8. Woodcock *(Scolopax rusticula).*—I shot one Woodcock near Tachienlu at 10,500 feet. Tibetan name *Chi-chia*.

9. White-bellied Pigeon (*Columba leuconota.*)

10. Lord Derby's Poroquet( *Palæornis derbyanus*) was found up to 12,000 feet from the Yangtse Valley south of Batang up to Sangachu Dzong at the head of the Lohit Valley, where this parrot was nesting in holes in trees at about 11,000 feet at the end of June. Tibetan name *Na-dzo*.

11. Common Cuckoo (*Cuculus canoris*).—One specimen shot at Tachienlu. Cuckoos were heard at many places along the road and on the Gara-la at 16,000 feet. I also heard them at Sangachu-Dzong. The Tibetan name is the same as the English.

12. Great Black Woodpecker *(Picus martius).*—Shot at Hsi Ngolo, 12,000 feet. Tibetan name *Nak-po Tung-ta*. Tibetans valued the flesh of this Woodpecker as medicine.

13. The Eastern Jackdaw (*Colœus neglectus*).—Sangachu-dzong, 13,000 feet. Tibetan name *Paya*.

14. Blyth's Willow Warbler (*Phylloscopus lugubris*).—Liang Ho Kao, 2 days south of Tachienlu, 13,500 feet.

15. Kamtschatka Willow Warbler (*Phylloscopus homeyeri*) —Poda, 14,200 feet, near Sangachu Dzong.

16. Rusty-breasted Blue Flycatcher (*Poliomyias hodgsoni*).—Ta Sho (near Batang) 13,000. feet. Tibetan name *Paon-Pali*.

17. Yellow-bellied Flycatcher (*Chelidorhynx hypoxantha*)—Michi (in Upper Lohit Valley, 12,000 feet).

18. Sooty Flycatcher (*Hemichelidon siberica*)—Sanga-chu-dzong, 11,000 ft.

19. Robin Accentor, (*Accentor rubeculoides*).—Gara La, 16,000 feet (west of Litang).

20. Eastern Alpine Accentor (*Accentor nipalensis*).—Tsema La, 15,600 feet (Irrawaddy-Salween watershed).

21. Black throated Accentor (*Accentor atrigularis*).—Pugo, 14,900 feet, between Sangachu-dzong and Shiuden Gompa. A nest on the ground in a tuft of dwarf rhododendron, containing 3 eggs on 27th June.

22. Blue-fronted Redstart (*Ruticilla frontalis*)—Tsema-La, 15,600 feet.

23. Daurian Redstart (*Ruticilla aurorea*).—Two nests containing 3 and 4 eggs were found. One was on the ground under a root at Kong Se Ka, 12,500 feet, on 8th June and the other in a hole in a wall at 11,000 feet between Yen ching and the Kia La, 11,000 feet, on 10th June.

24. Tibet Ruby-throat (*Erithacus tschebaiewi*).—Poda, 14,200 feet. Nest on ground in dwarf rhododendron with 3 eggs, 26th June.

25. Whitehead's Redstart (*Chimarrhornis bicolor*).—Hills, south-east of Rima, 10,000 feet; nest under stone with 4 eggs.

26. The large Laughing Thrush (*Ianthocincla maxima*).—Two specimens, one at Nenda, 13,500 (between Litang and Batang), and the other at Poda, near Sangachu Dzong at 13,500 feet. Tibetan name *Gya Tra*.

27. Elliot's Laughing Thrush (*Trochalopterum ellioti*).—Two specimens, one at Batang, 9,000 feet, and one at Lagyap in the Upper Irrawady Valley at 13,000 feet. Tibetan name *Gyamo*.

28. Hodgson's Grandala, (*Grandala cœlicolor*).—Boi-la-To pass, 13,500 feet, near Tachienlu.

29. Rock-Thrush (*Monticola cyanus*).—Fuchuang, 4,000 feet, east of Tachienlu

30. Gould's Thrush (*Turdus gouldi*).—Yulung Kung, 10,500 feet, one march from Tachienlu. Nest of twigs and moss lined with grass, situated in a bush 6 feet from the ground. The nest contained three eggs of a pale greenish ground colour with reddish brown markings. The eggs varied very little in size and averaged 2·95 c. m. × 2·01 c. m. Tibetan name *Chiama Gunka*.

31. Red-billed Liothrix (*Liothrix luteus*).—Tsa Chung, 7,000 feet, one march north of Ria.

32. Yunnan Nutcracker, (*Nucifraga yunnanensis*).—Below Sanga Chu Dzong, 11,000 feet, Tibetan name *Tong-she-sha-ga*.

33. Dabry's Yellow-backed Sun-bird (*Æthopyga dabryi*)—north of Ta-Hsiang-ling, 7,000 feet, 5 days east of Tachienlu.

34. Godlevski's Meadow Bunting (*Emberiza godlewski*).—Two specimens, one at Ta-Pen Ba, 5,000 feet, one day's march east of Tachienlu, and one at Batang, 9,000 feet.

35. Grey-backed Shrike (*Lanius tephronotus*).—Two nests found, one at Rama Song To, 11,000, 50 miles west of Tachienlu on 21st May and one at Bamutang, 13,000 feet, 8th June. There were four eggs each.

36. White-faced Wagtail (*Motacilla leucopsis*).—One nest at Nenda, 13,500 feet between Litang and Batang, on 31st May. The nest was in a hole in a wall and contained five eggs.

37. White-winged Grosbeak (*Nycerobas carneipes*).—Lagyap. 13,500 feet, Upper Irrawaddy Valley.

38. *Alauda cælivox*.—Lagyap, 13,000 feet, Tibetan name *Chu-Te*.

39. Long-billed Calandra Lark (*Melanocorypha maxima*).—Gara La, 16,000 feet (near Litang).

40. Kozlowi's Babler (*Babax kozlowi*).—Shiuden Gompa, 13,500.

41. Indian Bush Chat (*Pratincola maura*).—A nest with five eggs on De-Ri-Ka-La, 14,000 feet, between Tachienlu and Litang on 27th May.

# A THIRD LIST OF MOSSES FROM WESTERN INDIA.

BY

L. J. SEDGWICK, I.C.S.

Reference is invited to the first and second lists published in this Journal on 28th February 1910 and 20th May 1911 respectively. Since the latter date I have had hardly any opportunities for collecting, and the mosses mentioned below belong almost entirely to the collections, made by me in 1909 at Mahableshwar and Panchgani, in 1908-09 at Lonavla and in 1910-11 at Purandar Fort. Mr. Dixon has published two more articles in the Journal of Botany (for May 1911 and May (?) 1912) describing both mosses sent by me, and mosses sent by several other collectors from various parts of India. Two more new genera have been founded, one in the family of *Pottiaceæ*, to which the name *Hyophilopsis* has been assigned, and one in the *Entodontaceæ* which has been named *Bryosedgwickia*. The former, if maintained, will fall naturally between *Pottia* and *Hyophila*. The latter, belonging as it does to a family of pleurocarps which it is difficult to break up satisfactorily into genera, may or may not be accepted by other bryologists. Mr. Dixon differentiates it from *Pylaisia*, to which genus he was at first inclined to refer the moss, on the ground of structural peculiarities of the endostome only. This moss appears to be very common on trees throughout the Western Ghats. *Hyophilopsis* on the other hand I have so far only found on the chunam of one house at Purandar Fort. In addition to these two new genera Mr. Dixon describes two new species of *Bryum* with one variety, and one new variety of an already known species of *Bryum*. *Bryum ghatense*, and *B. ghatense*, var. *Satarense*, both appear to be common mosses of the Ghats, as I have gathered the type at Mahableshwar, Lonavla, and Purandar, and the variety at the first and third of the places named. On Purandar they are especially common on dry banks and rock faces. The type and the variety frequently grow together. *Bryum Sahyadrense* also grows in similar situations on Purandar Fort, which appears to be a locality particularly suitable to this group of *Bryum*, called on account of the lax areolation of the cell-structure of the leaf *Areodictyon*. *Bryum pseudo-alpinum* var. *latifolium* also grows in damper places on earthy banks on the Fort, but is only found sterile.

New genera and species are marked with an asterisk. Unless otherwise stated all mosses mentioned below were collected by me.

*Philonotis heterophylla*, Mitt. Purandar, on earthy banks in shady places, st.

* *Hyophilopsis entosthodontacea*, Card. and Dix. gen. et. spec. nov. (Dixon in J. of B. for 1911, p. 137), on wall of a house, Purandar Fort, c.fr.

* *Bryum Sahyadrense*, Card. and Dix., sp. nov. (Dixon in J. of B. for 1911, p. 144), on rocks, Purandar Fort, c.fr.

* *Bryum ghatense*, Broth. and Dix., sp. nov. (Dixon in J. of B. loc. cit. p. 146), on stones of a wall, and on a stone pillar, Mahableshwar, on stone-work of a bridge, Lonavla, on earth banks, and on the face of a quarry, Purandar Fort, all c.fr.

* Var. *Satarense*, Broth. and Dix., var. nov. (Dixon loc. cit.), in the same localities, c.fr.

*Bryum argenteum*, var. *Australe*, Rehm. ms. in sched. (= *B. oranicum*, C. M. in Hedwigia, 1899, p. 68), Castle Rock, Western Ghats, October 1892, C. A. Gammie (in Herb. of Agricultural College, Poona), st.

* *Bryum pseudo-alpinum*, var. *latifolium*, Card. and Dix., var. nov. (Dixon in J. of B. for 1911, p. 149), Purandar Fort, on earthy banks, st.

*Entodon Thomsoni* (Mitt.) Jaeg. on banks and rocks, Purandar Fort, c.fr.

*Entodon plicatus*, C. M., on trees, Lonavla, C. A. Gammie, 1903 (in Herb. of Agricultural College, Poona).

* *Bryosedgwickia Kirtikarii*, Card. and Dix., gen. et spec. nov. (Dixon in J. of B. for 1912, p. 154), on trees, Mahableshwar, Panchgani and Purandar and on stems of *Euphorbia*, Purandar.

In addition to the above I have to correct several names mentioned in the earlier lists.

*Diaphanodon procumbens* (C. M.), Ren. and Card., is the latest name for the moss mentioned in the first list as *Trachypodiopsis blanda*, Fleisch.

*Neckeropsis Andamana* (C. M.), Fleisch. for *Neckera Andamana*, C. M., in the first list.

*Symphyodon* (?) *angustus* (C. M.), Broth. for *Symphysodon angustatus* (C.M.), Jaeg., in the first list.

*Orthomnium crispum*, Wils., for *O. subcrispum*, C. M., in-ed. in the second list.

# WOOD-DESTROYING WHITE ANTS OF THE BOMBAY PRESIDENCY.

BY

JOSEPH ASSMUTH, S.J.

*With Plates I—V.*

The following notes were first read, in a much condensed form, as a paper before the Bombay Natural History Society. They are now published, revised and enlarged, at the suggestion of Mr. H. V. R. Kemball, Secretary to Government, P. W. Dept., whom I cannot thank too much for the continued practical interest he has shown in my work. It was he who induced Government to order a large number of copies of this article for distribution among the officers of the P. W. D., to grant facilities for the further prosecution of my studies of the White Ants, who applied to the Railway Companies for co-operation, etc. I take this opportunity of tendering my sincerest thanks to the Agents of the G. I. P., B. B. & C. I., and M. & S. M. Railway Companies, who generously granted free passes for travels in connection with my investigations. My thanks are likewise due to my faithful assistant, Mr. J. P. Mullan, M.A., without whose help it would have scarcely been possible to obtain the many photographs illustrating this article, and whose services have been invaluable to me in many other ways. I am under special obligations to Professor Dr. Holmgren of Stockholm for his kindness in checking the determination of the Termites mentioned in this paper. Moreover, I have experienced kind assistance from many others, too numerous to mention; to each and all of them I give my heartiest thanks.

As the title of this paper implies, wood-destroyers of the Bombay Presidency only are dealt with*—seven species in all. This number is most likely incomplete, but it is at present impossible to treat the subject exhaustively. The reason for this deficiency is not far to seek. Incredible as it may seem, it is nevertheless a fact that up to now deplorably little attention has been paid to the investigation of the Termite Fauna of India in general; and as to the discussion of the wood-destroyers in particular, the following—as far as I am aware—is the first venture altogether. Consequently I have to rely almost exclusively on my own observations which have as yet been hardly extended beyond the borders of this province. They comprise the following areas: Bombay and Salsette Island; Hubli and Bangalore in the south; the Bhor Ghats (especially Khandala), Poona, Kirkee and the Ahmednagar Districts in the east; lastly the Kaira District (Gujarat) in the

* One of the species mentioned below, *Calotermes Assmuthi*, has so far been found only at Bangalore; it is however very probable that it occurs also in the southern forests of this Presidency.

north. Since large tracts of country are thus left out of consideration, this paper can only be regarded as a preliminary treatise on the wood-destroying Termites of the Bombay Presidency.

We start with a few introductory remarks intended for the benefit of those not yet familiar with the natural history of the Termites. "White Ants" have nothing to do with common ants as their popular name seems to imply. Their nearest relations in the insect world—so science tells us—are the Blattids, the best known representative of which is our common cockroach. (Real ants, on the contrary, are closely allied to wasps and bees, together with which they form the order Hymenoptera.) The scientific name of the White Ants is "Termites," and they form the natural order, Isoptera, which means "insects, having wings (*viz.*, fore as well as hind wings) of equal length."

In each fully developed colony of Termites, we always find a queen, *i.e.*, an egg-laying female, usually of much larger proportions than the other individuals of the colony, a king or male, and numerous workers and soldiers.* Workers as well as soldiers are "neuters," *i.e.*, their reproductive organs are not developed and consequently functionless. The workers, as their name implies, do all the work that is required for the maintenance of the colony, *viz.*, building the nest, procuring food, nursing the offspring, etc. The soldiers are responsible for the defence of the nest; for this reason they are, as a rule, provided with specially strong and pointed mandibles, a sort of small pincers protruding from the head. At certain seasons of the year (not all the year round) winged individuals, usually in large numbers, are found in the Termité nests; they are males and females. As soon as they have reached their full development, they fly out of the nest ("swarming" of Termites), then shed their wings, unite in pairs, and settle on some suitable spot to form a new colony of which they become king and queen respectively.

So much for the general introduction: we now proceed to discuss our special subject and first ask the question. "What about the wood-destroying propensities of White Ants? Do all Termites, indiscriminately, attack wood?" The wiseacres, specially such as have never thought it worth their while to look attentively at these "unsightly creatures," are at once ready with their answer. They put it tersely thus: "A White Ant is a White Ant," meaning thereby that all White Ants are alike or of the same species; consequently, if one is found to be fond of wood it goes without saying that all without exception are of the same disposition. Now nothing could be more remote from truth than such an opinion; a glance at plate I must convince everybody of

* Only one Indian species, *Anoplotermes cyclops* Wasm., is destitute of soldiers.

this fact. This plate shows photographs of 10 soldiers, and certainly each of them is so different from all the others (except Nos. 2 and 3 which are closely related members of the same genus) that there can be no doubt but that they belong to really distinct kinds.* As it is wrong, then, to believe that all White Ants are alike, it is likewise wrong to suppose that all of them are injurious to wood. A good many of them, no doubt, are wood-eaters, but others are not.

A close observation of facts shows that Termites may be divided into three classes: first those that make wood their staple diet in preference to anything else; second those that feed occasionally on wood and then only to a smaller extent; and third those that never touch wood at all. The first class are truly noxious insects, the second are more or less indifferent, and the third are altogether harmless (*i.e.*, as far as wood is concerned). To the first class belong *Leucotermes indicola* Wasm., the genuine Indian "house termite" (see plate I, fig. 1), *Coptotermes Heimi* Wasm. (pl. I, 2), *Coptotermes parvulus* Holmgr. (pl. I, 3), and *Odontotermes Feae* Wasm. (pl. I, 4). These four are the most important wood-destroyers; Termites occurring in houses or dry timber of any sort will in a large majority of cases be found to belong to one of these kinds. But they are not our only noxious species, three others have to be added which, however, are of decidedly rarer occurrence; they are not, as a rule, present in houses but only in beams, logs and the like in the open: *Calotermes (Neotermes) Assmuthi* Holmgr. (pl. I, 5) *Microtermes anandi* Holmgr. with the distinct forma *curvignathus* (pl. I, 6), which is usually met with in the central parts of the Presidency, and *Microcerotermes Heimi* Wasm. (pl. I, 7).

The second class—occasional wood-eaters—is rather large and comprises a great many different species. Especially noteworthy among them are the mound-builders, *i.e.*, all those Termites that build overground structures above their nests. The real nest is, as a rule, situated in holes excavated underground, the mounds are merely an accumulation of earthy material brought up from below when enlarging the nest quarters. All our mound-builders are "fungus growers," that is to say, they prepare within their nest-holes a kind of porous structure looking somewhat like a honey-comb or sponge, on which they grow the chief item of their diet, a certain fungus. Consequently they venture but rarely out of their nests in search of other food, and this apparently only when about to ameliorate the old, or construct fresh, fungus beds. For this purpose they are commonly satisfied with small fragments of wood (dry branches and the like) and dry leaves or grass lying

* There are, of course, many more different species of White Ants to be found in India; but the ten photos represent Termites either more nearly concerned with the subject in question or of more common occurrence in the Bombay Presidency.

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## Explanation of Plate I.

and

## Short Descriptive Notes of the Wood-destroying Species.

(All photos taken with Zeiss' Combined Horizontal and Vertical Camera, and Micro-Planar 75 mm.)

Fig. 1.—*Leucotermes indicola.* (Indian White Termite.)—Head elongate, parallel-sided, cylindrical; yellow, bronzed in front; scantily covered with hair.—Mandibles brown, strongly built, slightly curved; left mandible with a few rudimentary teeth at base.—Antennæ (feelers) of 15 joints.—Body whitish, rather densely hairy.

Fig. 2.—*Coptotermes Heimi.* (Heim's Cutting Termite.)

Fig. 3.—*Coptotermes parvulus.* (Small Cutting Termite.)—Both species very much alike, the latter a trifle smaller than the former.—Head oval, arched, narrowed in front, much longer than broad.—Forehead with comparatively large circular opening on slightly raised tubular prominence, midway between feelers.—Mandibles brown, curved inwards and slightly upwards; left mandible little indented at base.—Antennæ of 13-14 joints. (*N.B.*—The left antenna of No. 2 is broken off and lies, in inverted position, just behind its basal joint.)

Fig. 4.—*Odontotermes Feæ.* (Fea's Toothed Termite.)—The biggest of our *Odontotermes*—species.—Head somewhat rectangular, rounded, slightly narrowed in front.—Mandibles strong; left with a prominent sharp tooth near middle.—Antennæ of 17 joints.—Abdomen rather densely covered with strong setæ (stiff hair).

Fig. 5.—*Calotermes* (*Neotermes*) *Assmuthi.* (Assmuth's Fair [Fresh] Termite.)—Head big, arched, somewhat flattened towards front, nearly parallel-sided.—Mandibles strongly built, both of them with several strong, rather blunt teeth; right mandible somewhat more curved than left.—Antennæ of 15 (-16) joints.

Fig. 6.—*Microtermes anandi* f. *curvignathus.* (Small Termite of Anand, form "with curved mandibles.")—The smallest of our wood-destroyers.—Head yellow, oval, distinctly narrowed in front; scantily covered with fine hair.—Mandibles slender, in the main straight, but the long tip bent strongly inwards; outer half dark-brown.—Antennæ of 14 joints, gradually thickening towards the tip.

Fig. 7.—*Microcerotermes Heimi.* (Heim's Small-horned Termite.)—Head yellow, slightly brown in front; rectangular, much longer than broad, truncated anteriorly; with two tiny protuberances (horns) near base of feelers.—Mandibles dark-brown, slightly curved, inner margin distinctly but irregularly serrate.—Antennæ of 13 joints, pale yellow.

Fig. 8.—*Odontotermes obesus.* (The Fat Toothed Termite.)—Mound-builder.

Fig. 9.—*Capritermes incola.* (The Inquiline Goat-Termite.)—"Inquiline," because it is usually found associated with other Termites: "Goat-Termite," because of its twisted mandibles.

Fig. 10.—*Eutermes biformis.* (The Double-formed Fine Termite.)—"Double-formed," because of the two forms of soldiers—bigger and smaller—found in each colony.

round about the mound. Since, therefore, the Termites forming the second class are of little consequence as wood-destroyers, only one species is given as a representative of them, *viz.*, *Odontotermes obesus* Ramb. (pl. I, 8) which is the common mound builder in the Bhor Ghats, Salsette Island, etc.

The third class—harmless Termites—is by no means small and insignificant, as many will be inclined to believe; the species it is composed of are, in fact, fairly numerous. Some of the kinds included in this class are well characterised and easily recognisable by the peculiar build of their soldiers, *e. g.*, *Eutermes biformis* Wasm. (pl. I, 10) where no biting mandibles are developed, but instead of them a nose-like outgrowth from the head, through which a sticky secretion is discharged as a means of defence, and *Capritermes incola* Wasm. (pl. I, 9), where the mandibles are curiously twisted and unfit for inflicting any bite. Other kinds belong to what may in a certain sense be called "parasitic Termites," for they build no separate nests of their own, but, as a rule, take up their abode in the nest quarters of the mound builders, like *Synhamitermes quadriceps* Wasm., and others.

Now the question arises, how are we to know one species of White Ants from the other? That some such knowledge is extremely useful for the practical engineer, the architect, etc.—so as at least to enable them to tell a noxious from an indifferent or harmless kind—need hardly be emphasised. But for the man who is going to try experiments whether such and such a kind of wood, either in its natural state or treated with certain preservatives (creosote, carbolineum, or the like), is termite-proof or not, it is not only useful but altogether indispensable. This is evident to anyone who reads the sometimes rather voluminous reports on these matters. Or, what can be the decisive value of experiments of which but the following scanty information is given: "pieces of different kinds of wood buried in the nests of White Ants" or "placed in ant-hills," and "found intact when dug up after three months," etc.? The principal point is completely left out of consideration, *viz.*, which were the Termites made use of for this trial? If the experimenter put his pieces of wood in nests of the third class of Termites mentioned above, it was not at all remarkable that he found them safe after the three months or so they had been in the nests; even if he had left them there for double the time and more the Termites would not have cared for them. But let the timber be exposed to the attacks of the species of the first class, and the result will probably be altogether different from what it has been.

Even experiments carried on with species of the second class, the mound-builders (and this is apparently the usual course taken, though no scientific name of a single species is mentioned in any of the reports), are bound to be misleading. Logs of wood buried

in, or driven into, mounds will, I believe, in the majority of cases, be attacked only when the pieces obstruct nest holes or passages built by the White Ants; for it is quite natural that the Termites should try to remove the obstacle by destroying the wood. If, however, the wood put into the mound does not block any passage, it is quite probable that the White Ants will not go out of their way to feed on it. Real test experiments can only be brought about by giving the wood to genuine wood-destroyers (Termites mentioned under class I); if they leave it alone after sufficient trial, it may be said to be "termite-proof," but not otherwise.

What has been said so far seems sufficient to make good our previous statement that some knowledge of the specific differences of White Ants is required from all who by their professional work are brought in contact with them. But how far is this knowledge to extend? Ought everyone to be able to find out the scientifically correct name of any given specimen? This seems clearly to be asking too much, since even the experienced specialist often finds this by no means an easy task. Opinions on this point may, of course, be divided, but to my mind it is quite sufficient for the practical purposes of the architect or engineer, if he is able to tell the really noxious Termites from the others.

To accomplish this minimum, a careful study of the photographs on plate I and their detailed comparison with actual specimens is all, I believe, that is required; the photos alone will, it is hoped, prove more serviceable to the practical man than lengthy scientific descriptions or elaborate determinative tables. All our wood-destroyers, as far as at present known to the writer of this paper, are represented on plate I, * magnified to the same scale, *viz.*, about ten times their natural size (the latter is indicated by the hair-line accompanying each figure). Their chief distinctive marks—peculiar build of head and mandibles, and natural size—come out with sufficient clearness, so that with a judicious application of a common pocket lens (not to mention a good amount of patience and perseverance, so indispensable for this rather trying work) everyone ought to be able to say, with a fair degree of certainty, whether a specimen examined by him belongs to the kinds injurious to wood, or otherwise. Since the mound-builders and several other equally easily recognisable forms need not be taken any special notice of—their tendencies for destroying wood, as has been pointed out, not being of any great importance,—only seven species remain for exact identification. This task ought not to appear so difficult as to discourage one from trying to master it.

* Photographs of soldiers only are given because they alone have such conspicuous peculiarities of form as to mark off sufficiently well one species from the other. The workers of the various kinds look all more or less alike save that they differ in size.

It will be rendered yet a good deal more easy if attention is paid to some noteworthy facts—chiefly of a biological nature—which I propose to discuss in the following pages. In doing so I limit myself in the main to the more important noxious forms *Leucotermes*, *Coptotermes* and *Odontotermes* (*Fece*).

In the first place I mention a feature which is not just very striking, but yet must not be passed over in silence, as it is, in a higher or lesser degree, found in all true wood-destroyers—*Odontotermes Fece* alone excepted—*viz.*, the opaque white appearance of the body or abdomen of soldiers as well as workers. The whitish colouring of the latter is specially noteworthy: for the workers of almost all non-wood destroying species have their abdomen coloured distinctly dark and blackish, owing to the earthy material contained in the intestinal canal.

As regards *Coptotermes*, it is to be noted that the colour of the head is a very pronounced brown red, which is much deeper than in any other kind of Termites. Still more characteristic of this form is the large amount of milky white fluid which the soldiers give off from their mouth when irritated (*v. g.* when squeezed with a pincette, or disturbed in any other way). When the soldiers are put in alcohol, this fluid rapidly coagulates and forms a little white ball of the size of a pin-head or so, fixed between the mandibles. No other termite shows this phenomenon in like manner.

It may here be added that the soldiers of *Microtermes*—the most conspicuous feature of which is their small size—are likewise distinguished by their giving off a relatively large drop of secretion. But in their case the fluid is transparent, and when placed in alcohol, turns into a sticky, semi-transparent, jelly-like mass to which everything rather firmly adheres which comes in contact with it.

When Termites are found actually feeding on wood, the task of identification is considerably lightened by a close study of the peculiar way in which each species attacks wood. It is a well-known fact that the bark-boring beetles (*Scolytidæ* and others), and specially their larvæ, mine the bark in such a manner that the ensuing figure is quite characteristic of the species by which it has been made. Thus by examining the said figures an expert will be able to ascertain the name of the particular species to which they are due. Now I believe that something quite similar is to be observed with regard to our wood-eating White Ants. They also produce what I propose to call "feeding-figures" (from the German "Frassbild") characteristic of the several noxious species. Plates II, III, and IV give photographic representations of the different feeding-figures. I add detailed descriptions of those of our chief wood-destroyers.

*Leucotermes indicola* always attacks first—and in many cases (especially as regards dealwood) exclusively—the soft portions of wood, leaving intact the harder parts, *i. e.*, the annual rings and knots. Thus a very striking feeding-figure results which is shown in the first photo of plate II. There we see the annual rings stand out as well marked parallel lines, each two adjacent ones being separated by a deep groove. In such kinds of wood, where the annual rings are not so well developed as in dealwood, the feeding figure is, of course, not quite so striking, yet it is in all cases constructed on the same lines.

Where *Leucotermes* meets small empty spaces such as in little boxes, it fills them up in a peculiar way. Broad patches of a rather thin greyish material—consisting apparently for the greater part of the excrements of the Termites—are arranged in more or less horizontal layers one above the other, with vertical partitions between them, so as to form a number of irregularly built chambers of different sizes. The chambers are connected by a good many smaller or bigger holes to enable the Termites to pass from one into the other. The general appearance of such a structure is made evident by the second photo of plate II which shows a small dealwood box attacked by *Leucotermes*. The inner space of the box (lower portion of photo) gives a picture of the just described "fillings" of *Leucotermes*, while the lid (upper portion of photo) exhibits the abovementioned lines of the annual rings with grooves between them.

Similar fillings—commonly on a smaller scale but after the same pattern as detailed above—are constructed by *Leucotermes* in any sufficiently large hole forming in the wood as a result of prolonged feeding in a limited area. We are sure to find them in such places where the annual rings are close together and, at the same time, their hard portions greatly reduced, as is the case with timber cut from near the bark of a tree. In wood of this sort the Termites devour everything between the upper and lower surface of the board, plank or the like, leaving only two sheets—sometimes as thin as card-board—above and below; in the empty space between they build their peculiar fillings.

Something akin to these structures we find also on nearly every piece of wood on which *Leucotermes* have been allowed to feed undisturbed for a long while, even if larger holes as mentioned above are missing. The fillings are then constructed on quite a simple plan showing only the ground—or predominant form of the more elaborate pattern, *viz.*, a ribbon or sheet-like structure. They are easily recognised on the first photo of plate II as a sort of small ridges or broader patches built across the deep grooves cut into the wood.

*Coptotermes*—as appears from the deal-board represented in the first photograph of plate III—has a feeding figure similar to that of

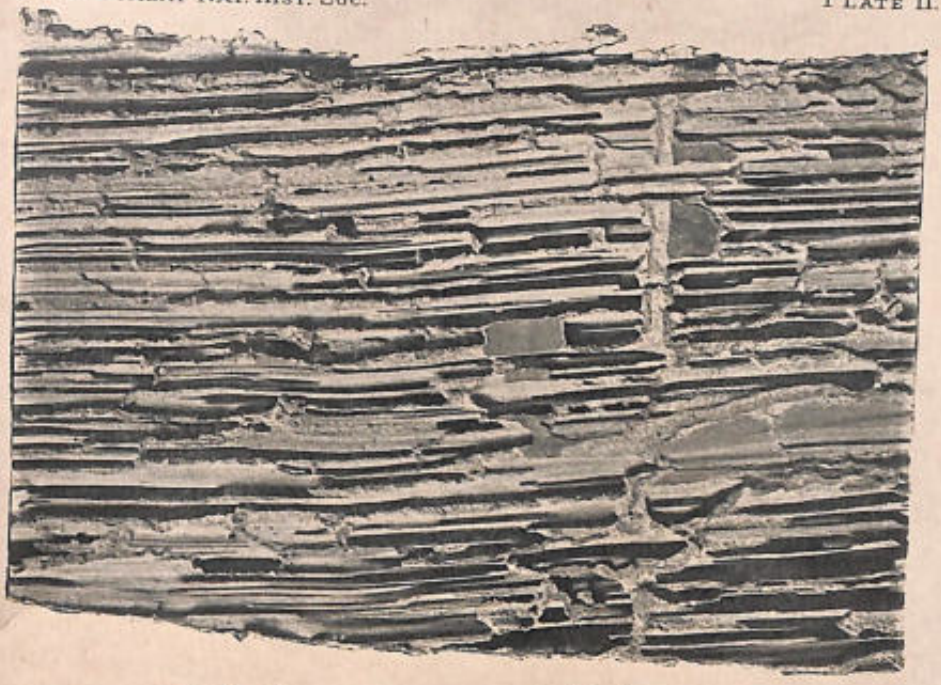

Fig. 1. Board of deal-wood attacked by *Leucotermes.*

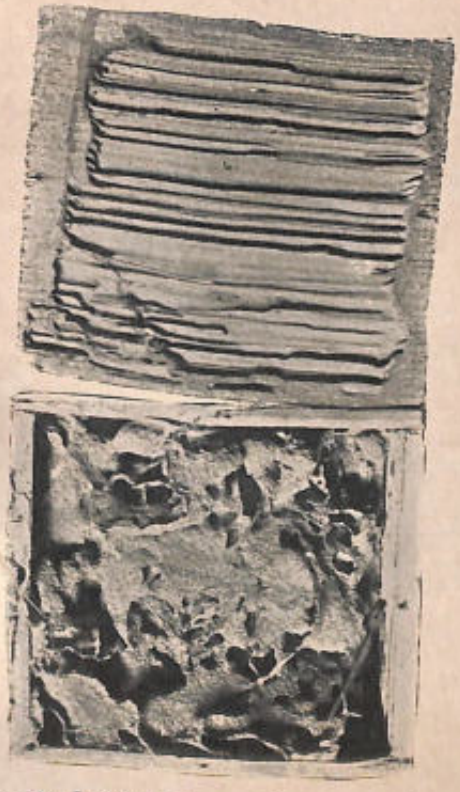

Fig. 2. Lower part: small deal-wood box, with fillings of *Leucotermes.*
Upper part: lid of box partly destroyed by *Leucotermes.*

Fig. 3. Block of "pukka" teak-wood attacked by *Leucotermes.*

*Leucotermes*. But there is this difference that the soft woody tissue is not completely destroyed; larger or smaller bits of it have been left intact together with long strands of harder tissue ("the late summer-wood" of the annual rings). These strands do not, therefore, stand out like parallel clear-cut lines which are so conspicuous a feature in the feeding figure of *Leucotermes*; but their appearance is more like that of strips of varying breadth placed irregularly side by side. The Termites make not unfrequently cross-cuts even through the hard tissue of the annual rings; this is marked on our photo by the short transverse lines by which neighbouring grooves (represented by the long black lines) communicate with each other.

The fillings of *Coptotermes* are altogether different from those of *Leucotermes*, and quite characteristic of this kind. They are not made up of broad thin ribbons or sheets as described above, but of a wire or string-like material intertwined in such a way as to form a sort of irregular network. Sometimes the "strings" of the network appear rather flattened and coarse as in the upper part of the left half of the first photograph of plate III, sometimes their shape is more slender and roundish as in the lower portion of the photo. The fillings of *Coptotermes* are a good deal tougher and not so easily breakable as those of *Leucotermes*.

Yet another curious habit of *Coptotermes* must here be mentioned. Wherever these Termites come across very smooth surfaces they cover them with their excrements, probably to facilitate the passage over them; they often do the same also on the inner walls of the holes and tunnels they have eaten into the wood. The first photograph on plate IV shows a wine bottle* taken from a nailed-up box into which the Termites had found their way. The coating of excrements on the surface of the glass comes out quite distinctly; it forms, as usual, an unequally spread cover: in some places it appears rather thick, in others it is scanty or altogether wanting. *Leucotermes* makes a similar coating on smooth surfaces, but it is somewhat more fine-grained and lacks the numerous whitish dots so clearly visible all over the layers deposited by *Coptotermes* (unfortunately not appearing on our photo).

With regard to the last of our common wood-destroyers, there is one peculiar feature to be noted which marks them off at once and quite unmistakably from the two kinds already mentioned: *Odontotermes Feæ* invariably destroys wood from the surface inwards, whereas *Leucotermes* as well as *Coptotermes* attack the inner tissues leaving the outer layer almost entirely intact. The latter forms are

* My grateful acknowledgments for this valuable present are due to Mr. R. A. Spence of Messrs. Phipson & Co.—I call special attention to a very remarkable fact clearly appearing on the photo: even the tinfoil capsule of the bottle has in some places been destroyed by *Coptotermes* which is, perhaps, the most formidable of our wood-destroyers.

consequently not so easily noticed when feeding in wood, while the presence of the former can at once be detected. This is rendered all the more easy for the following reason. Nearly all Termites—except the grass-feeders, like *Eutermes*, etc.—avoid light and air as much as possible. Now *Odontotermes Feæ* feeding on the surface of a board or so, would necessarily be exposed to these two from the termite-standpoint undesirable elements; so to guard against them the White Ants build a cover of mud taken from the surrounding ground over the space chosen for the attack, and then start eating the wood underneath the shelter. These coatings of mud—which are either red or black or greyish according to the colour of the soil—form at times patches of considerable extent over the surface of the wood, and cannot be possibly overlooked by any tolerably attentive observer.

It should be noted that both *Leucotermes* and *Coptotermes* construct covered passages as well when for some reason or other they are forced to appear on the surface, *e.g.*, when trying to get at wood some distance away from their underground nests. But these passages have always the appearance of lines, never of broad sheets as with *Odontotermes Feæ*. They are just large enough to allow the Termites to pass each other when meeting in the tunnel. Moreover, these passages are constructed of the same material as the fillings, that is to say, they consist for the most part of excrements of Termites; in no case are they made of earthy material taken from the ground near by. The tunnels of *Coptotermes* are slightly larger and their building material looks somewhat more coarse, than with *Leucotermes*.

The feeding figure of *Odontotermes Feæ* is represented in the second and third photographs of plate IV. Its characteristics are that the wood of the whole area on which the Termites have been feeding, is destroyed from the surface inwards, not even the hard portions of the annual rings being left intact. It is, moreover, a striking fact that usually not the entire surface is attacked by *Odontotermes Feæ*, but only certain portions of it (*cp.* especially the last photo). Thus the wood presents the view of an irregular arrangement of holes—some deep, some shallow—interspersed with narrower or broader patches of untouched wood.

In the second photo we see parts of three deal-wood staves taken from a cement-barrel. The middle piece is an instance of a rather exceptional case: the entire surface of the wood has been attacked and eaten up to various depths. The other two pieces show what commonly happens: in some places the surface area has been left intact (the dark patches appearing in the picture), in others it has been destroyed together with portions of the wood-tissue underneath (light patches of picture).

On the third and last photo a big branch cut down from a live

Fig. 1. Deal-wood attacked by *Coptotermes*. To the left: fillings of *Coptotermes*.

Fig. 2. Block of yarra-wood attacked by *Coptotermes*.

fig-tree (*Ficus religiosa*) is represented*. The heart-wood of the branch has not been touched by the Termites, but otherwise a good many holes varying in depth have been made from the bark inwards.

The fillings of *Odontotermes Feæ* are quite distinctive of this species. They invariably consist of coarse earthy material—red, black, or grey, as the case may be—taken from the surrounding ground. The Termites are in the habit of stuffing with this material any cavities in the wood, no matter whether already existent as v.g., in hollow bamboo-poles, or made by the Termites themselves. Small tunnels traverse the frequently large masses of mud piled up in the holes; here and there widened chambers are constructed where usually a great many Termites may be found together. The inner surface of the tunnels as well as the chambers is rather rough, hardly any polishing being noticeable. The mud seems scarcely to be impregnated with special secretions to make it hard as most of our mound-builders are wont to do with the building material of their nests; consequently the fillings of *Odontotermes Feæ* are easily broken especially when they are dry.

Beside the characteristic feeding figures and fillings, there is another very noteworthy means to find out the three just mentioned kinds of wood-destroyers, *viz.*, their particular time of swarming. As has been said before, numbers of freshly reared winged forms (males and females) leave the nests at certain seasons of the year. These swarming periods are the same every year, and more or less different for the different species—or, at least, genera—of White Ants. Now with regard to our common wood-eaters, I have been able to ascertain the following through observations extending over a couple of years: *Leucotermes* swarm in the morning (8 o'clock and later) during the first showers of the monsoon; *Coptotermes* leave the nest towards sunset at various times during the dry season, specially in January, February and March; *Odontotermes* take wing before nightfall shortly after the close of the rainy season, usually in the last third of September. So, when we see winged Termites coming out of an underground nest at the said periods, we may be sure that they are either *Leucotermes*, or *Coptotermes*, or *Odontotermes*, as the case may be.

Concerning the other less frequent, and therefore less important, kinds of wood-destroying Termites, I regret to be for the present unable to give reliable details about their feeding figures and fillings; the investigations I have so far been able to make are not sufficiently numerous to allow of general conclusions. However I doubt not that also with regard to these kinds similar characteristic features will be brought to light by further studies. For the time being we

* I have to thank Mr. J. W. MacKison, Executive Engineer to the Bombay Municipality, for this fine specimen now in the Biological Museum of St. Xavier's College.—None of our wood-eaters destroy live trees, but only dry portions of them.

must be satisfied with the facts furnished in the preceding lines, *i.e.*, that our common noxious wood-eaters construct, and may be known by, their quite distinct feeding figures as well as fillings.

I add some few remarks about the localities in which wood-destroyers are known to exist. *Leucotermes* is frequently met with in houses in Bombay; I have also found it occasionally as an inquiline in nests of mound-building Termites in Salsette (in the jungle along the Tulsi river, east of Borivli village, about 20 miles north of Bombay), and Khandala (Bhor Ghats). *Coptotermes* abounds in houses and all sorts of timber in Bombay; I have also taken specimens from logs of firewood in Gujarat (Anand and Vadtal, Kaira District); another lot was sent to me from Karachi.* *Odontotermes Feae* is of common occurrence in all kinds of dry wood in Bombay, Borivli Jungle, Khandala and Poona. Once I observed them feeding on railway sleepers piled up at Karjat Station (G.I.P.R.). *Calotermes* was found in a big branch of a dry tree at Bangalore; *Microtermes* in dry wood (board, logs, and the like) at Valan (Ahmednagar District), Anand, Bombay and Khandala (in the latter place as an inquiline in mounds of other species); *Microcerotermes* in dry bamboo stumps in Borivli jungle, in a pole stuck into the ground at Poona, in logs of firewood at Vadtal, and at Valan. Other habitats of the different kinds of wood-destroyers will no doubt be added in course of time if more general attention is paid to these matters.

It is as yet impossible to give an answer to the burning question, "Which woods are undoubtedly termite-proof?" Teakwood is often mentioned as such, and more recently the Australian Jarra-wood is time and again praised for possessing this quality. That such assertions are not altogether in harmony with facts is evident from the third photograph on plate II showing a piece of "pucka" teakwood attacked by *Leucotermes*, and the second photo on plate III representing a block of Jarra-wood partly destroyed by *Coptotermes*.† Experiments so far made to ascertain which different kinds of wood—treated as well as untreated—are safe from the attacks of White Ants, are in my opinion largely unreliable, because it has been left out of consideration whether the Termites made use of for these trials were genuine wood-destroyers, or not. Further investigations are, therefore, necessary, if the question is to be settled definitely.

Before concluding this paper, I beg to add a few remarks on an all-important desideratum in relation to widening our knowledge of the various noxious White Ants. This desideratum is:

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* My sincere thanks are due to Mr. Kundanmal Utamsing, S. D. O., who was kind enough to collect these specimens for me in a house badly infested with them.

† A present to my collection from Mr. L. H. Savile, Executive Engineer to the Bombay Port Trust, to whom I am greatly indebted.

Fig. 1. Wine-bottle covered with excrements of *Coptotermes*.

Fig. 2. Staves of deal-wood destroyed by *Odontotermes*.

Fig. 3. Dry branch of live banyan tree attacked by *Odontotermes*.

co-operation. What we know so far of Indian Termites in general, and of the wood-destroying forms in particular, is deplorably little, and this, in spite of the fact that the ravages of White Ants are so well known to every resident in the country, and that nearly everyone has had, and has still, to complain of them. All wish, of course, to get rid of the pest, but nobody appears to be prepared to take his share in the necessary investigations into the subject. And yet, if we want to succeed in protecting ourselves from the damage caused by White Ants, our first and foremost endeavour must be to study them, so that we may know as much as possible of their various habits. To try to fight the Termites without this indispensable information is just as useless as to attempt combating a disease without knowing anything of its nature and specific symptoms.

But what of the many "Termiticides" now offered for sale as so many "infallible means to utterly exterminate all White Ants?" If a single one of them would fulfill what is claimed for it, further studies of the Termites would, of course, seem superfluous from the practical or economic point of view. But this is, unfortunately, not the case; all Termiticides have so far been found unavailing when put to the test. The reason why is clear. At present we know only how to get at single Termites found outside their nests; we are altogether ignorant of the Biology of the White Ants, *i.e.*, of their mode of life, the structure and position of their nests,* the dwelling-place of their queen. Yet with all this—and especially the last—we must be well acquainted before we can destroy Termites effectually. As long as a reproductive female (a queen) remains in the nest, the colony will survive, because the loss of some workers or soldiers will soon be made good by the fertile female.

This, then, is our task for the future: to find out which species are true wood-destroyers, and study their Biology. But even the most strenuous efforts of one man—or a few—are altogether insufficient to solve this problem for so vast a country as India. The generous co-operation of all who are interested in the war to be waged on the White Ants, especially of the Officers of the Public Works Department, Railway Engineers, etc., is an imperative necessity. If everyone would make a point of helping to the best of his power in clearing away the darkness still prevailing regarding our knowledge of the noxious Termites, great things could, no doubt, be achieved within a short time.

And what is required of the co-operator in this great plan is, after all, but little: whenever and wherever you come across White Ants in wood or near it, drop as many as you can get hold of—

* All our wood-destroyers seem to have their nests underground, not in the wood attacked by them.

especially soldiers—in a tube or small bottle filled with common methylated spirit (such as used for burning purposes); write locality, date and any other remark you have to make, with lead-pencil (not with ink) on a slip of paper and place it into the tube; secure, if possible, a bit of the wood attacked; pack both—tube and wood—securely in a box, and send it to the writer of this paper (Rev. Joseph Assmuth, Professor of Biology, St Xavier's College, Bombay [Fort]).* That is all you are requested to do. If advisable I am perpared to go personally to places badly infested with Termites to make investigations on the spot.

Thus—by the active co-operation of all concerned—it will be possible to gain, in course of time, a clear insight into what must be our first and foremost endeavour to know about the White Ants: which species are genuine wood-destroyers, which districts are free from and which are infested with them, which is their mode of living, nesting, breeding, etc. Then, and not till then, the further and final step may, with a fair chance of success, be taken: the finding of suitable means to combat the White Ants.

* My friend, Mr. T. Bainbrigge Fletcher, Imperial Entomologist, Agricultural Research Institute, Pusa, Bengal, is also ready to receive specimens and answer inquiries.

## PROGRESS OF THE MAMMAL SURVEY OF INDIA, BURMA AND CEYLON.

Since the last report of the progress of the Survey was made, some very interesting collections have been received. From the north Mr. Crump has sent in an interesting collection from Kathiawar including several specimens not before obtained by the Survey. He is now at Danta in Mahi Kantha, having worked up through Palanpur to Mount Abu. It is proposed now to shift him right away to Kumaon from which district a number of new species were described by the older authors.

When writing in the last Journal we mentioned that Mr. Shortridge was busy in Coorg and from there we received, just before the Journal was published, one of the finest collections so far received and numbering some 800 specimens. The collection contained a number of Southern Indian specimens new to the Survey. Mr. Shortridge tells us that a large number of specimens were collected for him by Mr. Graham. Other people besides Mr. Graham, whose names will appear in the report on the collection, rendered great assistance to Mr. Shortridge but we specially wish to mention Mr. Graham's name because, not only while Mr. Shortridge was there did he collect, but also after he left he has continued and when his specimens are sent here, it will in all probability be found that he has added one or more species to the Mammals of Coorg. Mr. Shortridge when he had finished Coorg was sent to Burma where, after interviewing different people in Rangoon and Maymyo, he started collecting in the Northern Shan States and a collection is shortly expected from him. He has received great assistance from the officials of the Burma Government, and the British India Steam Navigation Company have kindly promised to carry specimens and materials free of freight for which we are most grateful.

Our third collector, Major Mayor, arrived in Bombay in the middle of March and after a short stay here went to Ceylon, starting at Kottawa in the Southern Province. There unfortunately the weather conditions turned out to be most unfavourable but in spite of many difficulties a small collection was made and which we have since received and seems to contain several specimens of considerable interest. He is at present at Hambantota which is right in the South-East corner of the Colony. Major Mayor has received great help from the Ceylon Government who amongst other concessions have granted him a free pass for himself and his servants on the railways. It should also be mentioned that Dr. Pearson of the Colombo Museum has kindly consented to allow Major Mayor to use the Museum as his headquarters and has arranged to forward on specimens to us.

A set of specimens from the Central Provinces has been sent to the Nagpur Museum and a general set to the Indian Museum at Calcutta.

As regards finance, money is, we are sorry to say, coming in but slowly. The Government of Ceylon have however promised Rs. 2,500 and the Government of the Central Provinces a similar sum. The Executors and Trustees of the will of the late Mr. N. M. Wadia, C.I.E., have given us Rs. 500 and promised us a further sum of Rs. 500. Another member of the Tata family, Sir Dorab Tata, Bart., has generously helped us by a second contribution of Rs. 1,000, and one of the Burmese Nobles gave us Rs. 250. We must however look to the members of the Society for further contributions and we hope that every member will see his way to contribute at least Rs. 10 per annum.

## MAMMAL FUND.

FURTHER LIST OF SUBSCRIPTIONS UP TO 21st JUNE 1913.

| Names. | Amount. | | |
|---|---|---|---|
| | Rs. | a. | p. |
| Amount previously acknowledged in Journal No. 1, Vol. XXII .. .. .. .. .. .. | 47,977 | 9 | 7 |
| Bridgeman, The Hon'ble H. G. O. .. .. .. | 30 | 0 | 0 |
| Burma Government .. .. .. .. .. | 1,000 | 0 | 0 |
| Conley, A. .. .. .. .. .. .. | 15 | 0 | 0 |
| Crawford, W. M. (I.C.S.) .. .. .. .. | 30 | 0 | 0 |
| Executors and Trustees of the late Mr. N. M. Wadia, C.I.E. .. .. .. .. .. | 500 | 0 | 0 |
| Hay, Capt. G. W. .. .. .. .. .. | 15 | 8 | 0 |
| Kemball, H. V. R. .. .. .. .. .. | 18 | 0 | 0 |
| London Zoological Society .. .. .. .. | 748 | 8 | 7 |
| Radhanpur, H. H. The Nawab .. .. .. | 200 | 0 | 0 |
| Saw Bwa Hke .. .. .. .. .. .. | 250 | 0 | 0 |
| Tata, Sir Dorab J., Bart. .. .. .. .. | 1,000 | 0 | 0 |
| Minor Subscriptions .. .. .. .. .. | 9 | 8 | 0 |
| Total .. | 51,794 | 2 | 2 |
| **Promised.** | | | |
| Mr. Ratan Tata (2nd donation) .. .. Rs. 1,000 | | | |
| H. H. The Rao of Cutch (2nd donation). „ 1,000 | | | |
| H. H. The Maharaja of Jodhpur .. „ 1,000 | | | |
| Government of Central Provinces .. „ 2,500 | | | |
| Government of Ceylon .. .. .. „ 2,500 | | | |
| The Executors and Trustees of the late N. M. Wadia, C. I. E... .. .. „ 500 | 8,500 | 0 | 0 |
| Total .. | 60,294 | 2 | 2 |

# REVIEWS.

## INDIAN MUSEUM RECORDS.

Mr. Kemp of the Indian Museum accompanied the Abor expedition as Naturalist, and Volume VIII of the 'Records' is being devoted to the Zoological results.

So far two parts have been published containing eleven papers on different groups by various specialists.

Mr. Kemp is to be congratulated on his collections which have given wonderful results considering the adverse conditions under which they were made.

In the first part Dr. Annandale deals with the *Batrachia*, the *Reptilia* and the *Porifera* (sponges), describing a number of new species. The paper on *Batrachia* is divided into three parts, a systematic, a biological and a geographical. In the second part he discusses the habits of tadpoles and the way in which they cling to rocks, &c., to prevent themselves being carried away by floods. Owing to the time of the year at which it was made, the butterfly collection, reported on by Capt. Evans, contains little of interest. Writing on the *Scolopendridæ* Mr. F. H. Gravely describes two out of the eight specimens of Centipedes collected as new.

In part II Mr. H. C. Robinson writes on the Mammals, Mr. Malcolm Burr on *Dermaptera* (earwigs), while various foreign specialists report on the *Coleoptera* and Mr. Brunetti on the *Diptera*.

The Mammals are distinctly disappointing, the collection consisting of 26 species.

Mr. E. E. Green continues his notes on the *Coccidæ* (scale insects) in the Indian Museum in Part I of Vol. IX and Mr. E. Brunetti describes some new *Empidæ*. Part II of the same Volume is a specially valuable number. There is an important contribution by Signor Silvestri on some *Thysanura* (bristle-tails, fish-insects, etc.) in the Indian Museum, and in "Notes from the Bengal Fisheries Laboratory." Mr. S. Southwell writes on Trematode and Cestode parasites found in fish. The collection of Tortoises in the Indian Museum is a very complete one and for some time past Dr. N. Annandale has been occupied with a full revision of the Indian Chelonia. In the present number he has a paper dealing with Tortoises of the Chota Nagpur District.

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## THE GROWTH OF GROUPS IN THE ANIMAL KINGDOM. *

In his introductory chapter, Capt. R. E. Lloyd tells us that "although most biologists regard natural selection as a creative agency, yet there are dissenters from the accepted opinion" and in the following pages he brings forward some facts in support of the dissenters.

While studying the rats sent into the Indian Museum from all parts of the country, Capt. Lloyd had exceptional opportunities of investigating the great variation to which the black rat *Mus rattus* is subject to. From the material he has seen he shows that the variation in colour of the ventral surface and tail—characters used to distinguish species—are to be found amongst ordinary coloured districts. In Naini Tal, for instance, he caught two rats in the same house, the one answering to the description of *Mus viceroy* and the other that of *M. beardmorei*. Capt. Lloyd writes at considerable length on the appearance in certain towns of the white-bellied rats, the variety which in Plague Commission's reports is called

* The Growth of Groups in the Animal Kingdom by R. E. Lloyd, M.B., D.Sc.—Longmans, Green & Co., 1912, price Rs. 5.

*Mus alexandrinus*. He mentions a case at Poona where a small colony of these rats was discovered. They were confined to nine houses, and apparently no other white-bellied rats were found in Poona amongst the 45,000 caught between 26th May 1908 and 22nd May 1909. In Capt. Lloyd's opinion there are only two possibilities to account for these rats, the one that they were mutants and the other that they had migrated in from outside.

On page 74 a table is reproduced, giving the number of whole coloured and white-bellied rats caught in different towns throughout India to show how rare (?) this variety is supposed to be.

It is interesting to compare some of these figures with the Mammal Survey Results and as the town of Belgaum is no great distance from the Dharwar and Kanara Districts, it may well be compared with them.

| | Whole coloured rats. | White-bellied. | |
|---|---|---|---|
| Belgaum.. .. .. | 39,460 | .. | Plague Commission. |
| Dharwar and Kanara Districts .. .. | 52 | 43 | Mammal Survey Collector. |

It might also be added that out of 84 rats caught by the Survey Collector in the Central Provinces 39 were of the white-bellied variety.

Of course to a certain extent the survey specimens may be selected, but even then it shows that the white-bellied variety is commoner than Capt. Lloyd supposes. Perhaps the whole-coloured *M. rattus* may be more of a domestic animal than its white-bellied cousin.

The origin of species from mutants is discussed, and Capt. Lloyd is of the opinion that species have arisen in that way without the help of natural selection.

Towers, work on the potato beetles in America is quoted and compared with the Author's work on rats and a coloured plate is reproduced from that paper showing the different sports and mutants found amongst these beetles. In Chapter X the author points out the bearing of the mutation theory in practical matters and its connection with certain branches of pathology, especially in regard to diseases.

We can recommend this book to any one interested in evolution: it is well printed and nicely got up, but it is unfortunate that there is no index or table of contents, so that it is almost impossible to find anything without going through the whole book.

# MISCELLANEOUS NOTES.

## No. I.—BOLDNESS OF PANTHERS.

In February 1912 at Jamalpur in South Bihar, I was informed that near the village of Abhyapur an exceptionally large male panther was killing cattle every few nights on the outskirts of the village, and had killed a valuable bullock the previous night. I had recently had an electric lamp given me and was anxious to try it, so went out to the spot. I found the kill near a small mango tree within 100 yards of the village and 300 yards from the foot of a range of stony hills covered with thorny scrub.

I had a pole driven into the ground and hung the lamp directly over the kill, and erected a machan in the mango tree about 15 feet above the ground; the lamp switch was a cumbersome arrangement which required two hands to work, so I decided to take my shikari into the machan and get him to turn on the light when I gave the signal; unfortunately this shikari was not staunch and had lost his nerve. On two occasions I had lent him to other sahibs to assist them in following up wounded panthers, and on both occasions he had been mauled. I warned the villagers against making any noise or movement after dusk, and climbed into the machan; just as the sun was going down a dog came and started feeding on the kill but just after dusk he bolted back to the village barking and seemingly terrified, so I knew the panther was not far off; in ten minutes or so I could just dimly discern a long low shadow creeping up to the kill, and when all was comfortable I gave the sign to turn on the light but to no effect; the shikari was terrified and for some time helpless. I turned to look at him and he switched on, the panther immediately bounded 20 yards outside the circle of light, and stood looking at the lamp; I had a shot and missed and then put out the light; in half an hour the panther returned, the light was again bungled, I had another fleeting shot and missed again.

At nine o'clock a hyæna came along uttering the most unearthly yells and screams, and circled the scene of events several times, the panther was sitting directly under my machan growling and muttering, and made several rushes in the direction of the hyæna when he aproached the kill, drove him off, and then returned to his position under my tree; this continued for about two hours when the hyæna gave it up as a bad job and went off; the panther then came on the kill and was again missed; this and the succeeding shots were taken in the dark as the shikari by this time was absolutely incapable of holding the switch at all; after this a small panther (apparently the female) appeared on the scene, but the male would not allow her to feed; several times she approached the kill and each time the male darted out and drove her off; once she took refuge in the lower branches of my tree where she sat whilst they snarled at one another, this reduced my poor shikari to a jelly. Occasionally, at half hour intervals the panther would go to the kill and start feeding; I took the switch into my own hands and turned on the light, but each time directly the light appeared the panther bounded off without a moment's hesitation and stood just outside the illuminated circle. In all I had six shots, the last at about half past two in the morning, after this the panther went away altogether. The next night he did not return, although I had the kill carefully preserved on the same spot.

The night was intensely dark and I was using a high velocity rifle with a nineteen inch barrel and very straight in the stock, and I found that all my shots had gone high. This panther would not come out of the jungle on moonlight nights, but in the dark of the moon was very destructive,

pulling goats and calves out of the huts. I eventually bagged him on a pitch dark night with a lethal bullet using a radium foresight; he had killed a quarter of a mile from the edge of the jungle within 30 yards of a village and was killed half an hour after dusk. He taped seven feet four as he lay and was a very heavy beast.

E. BROOK-FOX.

JUNAGADH, *May 26th*, 1913.

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### No. II.—THE BROWN PALM-CIVET IN NORTH KANARA.

While collecting near Castle Rock in the middle of October last Mr. S. H. Prater, assistant in the Society's Museum, shot an example of the brown Palm-Civet (*Paradoxurus jerdoni*). According to Blanford in the "Fauna of British India" this species has only been found for certain in the Palni and Nilgiri Hills. It was not obtained by Mr. G. C. Shortridge in North Kanara which points to it only being a rare straggler in that district.

N. B. KINNEAR.

BOMBAY, *28th May* 1913.

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### No. III.—CHINKARA SUFFERING FROM GUINEA-WORM.

Early last March I shot a chinkara (*Gazella bennetti*) buck: the first shot struck him rather far back, the second through the shoulder; he was in good condition but the coat was staring and patchy. On examining him closely I noticed that the blood flowing from the wounds contained half a dozen thread-like semi-transparent worms varying in length from 2 to 5 inches all alive and vigorous; the animal was *hallaled* and eaten by the Mohamedan forest guards.

In Junagadh State—particularly in the south—guinea-worm is a common complaint amongst all classes, occurring chiefly in the families of those who draw their drinking water from step wells or *Vaos*.

Dr. Dave of Junagad tells me that from my description the Chinkara was undoubtedly suffering from guinea-worm.

This fact may be of interest to the medical members.

E. BROOK-FOX.

JUNAGAD, *May 12th*, 1913.

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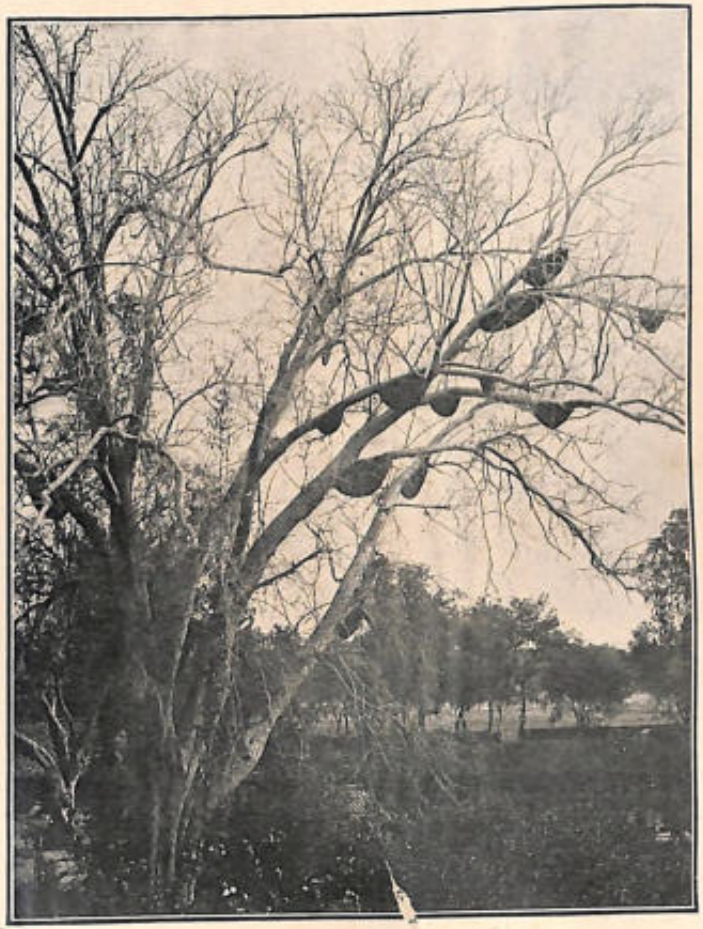
### No. IV.—THE COLOURATION OF THE EYES OF THE DOMESTICATED BUFFALO.

While I was shooting in the Central Provinces during March this year, I was very much struck by the number of buffaloes I met which had the abnormal pale blue iris to the eye. Not only this, but some animals had one eye normal and the other of the abnormal colour, while others had both eyes a sort of mixture of the two, a small segment of the eye only being of the normal or abnormal colour in such cases. I have often noticed this abnormal colouring of the buffalo's iris before, but never to such an extent and never before as partial or in only one eye.

C. R. PITMAN,
27th Punjabis.

CAMP, C. P.,
*5th April* 1913.



Swarms of Bees (*Apis indica*)

Large Samber Head from Panna C. I.

## No. V.—LARGE SAMBAR HEAD.

I send herewith a photograph (Plate A.) of a Sambar (*Rusa unicolor*) which you may like to reproduce in the Journal. I shot the Sambar in His Highness the Maharaja of Panna's jungles, and the trophy is an interesting one from the fact that there are three complete tines on the right side. The measurements can be seen from the photo reproduced. The greatest length round the curve, as can be seen from the photo, is from the burr to the tip posterior right tine which is 41 inches, and I should like to know your opinion and that of other members of the Society as to whether these horns can be in anyway regarded as a record, taking into consideration the fact that there are three tines on the right side and that one of these measures 41 inches from burr to tip.

F. D. S. FAYRER, MAJOR, I.M.S.

SUTNA, E. I. RY.,
*June 3rd*, 1913.

[The measurements are not shown on the block but the principal ones, not given on the table below, are as follows :—

Length of left horn 38", length of brow outters R. 19", L. 17¼".

According to the latest edition of Rowland Ward's "Records" the record head measures 50⅛" along the outside curve. There are many heads longer than that of Major Fayrer's, and in no measurement does his excel heads already obtained. Two heads with extra points are mentioned, and the measurements are as follows :—

| Length on outside curve. | Circumference above brow tine. | Tip to tip. | Widest inside. | Points. |
|---|---|---|---|---|
| 43 | 6½ | 33 | 35 | 4+3 |
| 42½ | 6¼ | 15 | 27⅞ | 4+4 |
| 41 | ... | 22 | ... | 4+3 Major Fayrer's head. |

EDS.]

## No. VI.—HOW WILD BOAR FIGHT.

On the 2nd April at about 8-30 in the morning I was walking through grass jungle in the Chanda District of the Central Provinces where I was shooting.

Suddenly two Wild Boar rose out of the grass on their hind legs and fought in this position, with fore legs locked for more than half a minute.

At first they were about 60 yards off, but I got much closer and saw them on the ground rolling over and over each other, squealing and hacking at each other with their tusks.

When they eventually separated the smaller of the two came my way and I shot it. It had a very deep gash in its near shoulder as a result of the fight. The wound was nearly 4 inches long and made the pig limp.

C. R. PITMAN,
27th Punjabis.

CAMP C. P.,
*5th April* 1913.

## No. VII.—NOTES ON THE CHESTNUT-HEADED SHORTWING.

The following notes on the Chestnut-headed Shortwing, *Oligura castaneicoronata*, may be of some interest. Oates in the Fauna of British India, Birds, Vol. I, states that this bird is found from 3,000 ft. to 6,000 ft., and also mentions it as a bird of the higher ranges of the Himalayas. It would appear to be subject to a seasonable movement, as here in the Bhutan Duars

it comes down as low as 500 ft. in winter, leaving us again about the 15th of March. It is fairly common in suitable localities such as ravines, the thick brushwood on whose sides afford it ample cover. In habits it somewhat resembles the Slaty-bellied Short-wing, *Tesia cyaniventris*, but is slightly more active than that bird in hopping about and flying from bush to bush. Its loud and piercing note "seek" usually repeated twice in succession is not altogether unmusical. The following are the measurements and notes on the soft parts of a male specimen I secured: length 3'-6"; wing 1'-9"; tarsus ·92"; tail 1"; bill ·5.' Iris dark-brown, upper mandible black, lower yellow. Legs pale reddish-brown.

H. V. O'DONEL.

HASINARA, T. E., BHUTAN DUARS,
18*th February* 1913.

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## No. VIII.—MISSLE THRUSH NEAR LAHORE.

Early in the year Captain C. A. Rocke sent in for identification the skin of a Missle Thrush which had been shot in the beginning of January by Mr. Joseph, I.C.S., at a place called Gugera on the banks of the Ravi, about 60 miles from Lahore. This Missle Thrush was an example of the large Eastern race *Turdus viscivorus bonapartei* which inhabits Transcaspia, Turkestan, Central Asia, Afghanistan and the Himalayas. In India this species breeds in the Himalayas and Kashmir, and is also found in the Kurram Valley and near Quetta but seldom visiting the plains.

BOMBAY.

N. B. KINNEAR.

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## No. IX.—THE RUFOUS-BACKED SPARROW, *PASSER DOMESTICA PYRRHONOTA*, BLYTH.

In continuation of my note in the Society's Journal (Vol. XX, p. 1151), I have now to add that this species is abundant at Ferozepore, Punjab. About 5 miles from Ferozepore Cantonments, the main line of the railway crosses the River Sutlej into the Kasur Subdivision of the Lahore District. On both sides of the river large bunds have been constructed, and about them is a variety of swamp and grass jungle, broken by large Shisham and Kikur trees which grow in patches or along the bunds. This is the chosen haunt of the Rufous-backed Sparrow, which is found in fair numbers, usually in flocks, which perching among and feeding on the seeds of the tall pampas grass. They roost in parties in the thorn bushes on the bunds. I did not remain at Ferozepore long enough to ascertain whether the birds are residents, but I obtained several specimens in November and January.

HUGH WHISTLER,
INDIAN POLICE.

JHELUM,
13*th May* 1913.

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## No. X.—THE OCCURRENCE OF THE HIMALAYAN YELLOW-BACKED SUN-BIRD, *ÆTHOPYGA SEHERIÆ* IN THE CENTRAL PROVINCES AND EXTENSION OF ITS HABITAT.

In the "Fauna of British India" Birds, Vol. II, page 348, the range of this species is given as follows:—

"The Himalayas from Gurhwal to Dibrugarh in Assam up to 7,000 feet in summer, Cachar; Sylhet; the Khasi hills; Manipur. This species is also

found in the plains, having been recorded from Seheria in Borabhoom by Tickell and an *Æthopyga* was seen in Singbhoom by Ball." It may, therefore, be worth recording that on the first of April 1913 I secured a male of this species at Laugher (1,933 feet) in the Balaghat District of the Central Provinces.

My specimen agrees with Oates' description except that the middle tail-feathers are only ·25″ longer than the rest, and there is a slight difference in the colouration of the tail, due probably to immaturity.

E. A. D'ABREU, F.Z.S.

THE MUSEUM, NAGPUR,
17*th June* 1913.

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## No. XI.—THE PALE SAND MARTIN, *RIPARIA RIPARIA DILUTA.*

*(SHARPE AND WYATT.)*

So little is known about the distribution of this bird, that the following facts seem worthy of record. While camping along the River Sutlej in the Jellalabad Haḳuah of Ferozepore District last year I came upon large numbers of Sand Martins that were nesting in the sandy bank of a tributary channel of the river. I accordingly dug out many of the holes but only found 2 eggs in two nests, [illegible] eggs in another, the majority of the nests being unfinished. I secured a couple of the parent birds (S. R. 547 and 548—23-2-1912) and found them to belong to this race—an identification kindly confirmed by Dr. C. B. Ticehurst. Two eggs were unfortunately broken, but the others measure as follows:—c/3, 16×13; 15·5×13; 15·5×12·5 and c/2, 17·5×13; 17×12·5.

On re-examination of a Martin obtained in September, when there were several about (S. R. 439—24-9-1911, ♀ ad.), I find it also belongs to the above race.

HUGH WHISTLER,
INDIAN POLICE.

JHELUM,
13*th May* 1913.

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## No. XII.—NOTES ON THE NESTING OF THE BROWN-NECKED SPINE-TAILED SWIFT, *CHÆTURA INDICA* AND THE WHITE-RUMPED SPINE-TAILED SWIFT, *CHÆTURA SYLVATICA.*

It may interest some members to know that the Brown-necked Spine-tail roosts and breeds in large hollow green trees on the Travancore hills.

I have on several occasions seen colonies of 30 to 50 birds roosting in trees, but have only just succeeded in finding them breeding. On the 12th instant I discovered a tree in which the birds were popping out and in, at the only entrance which was at a height of about 45 feet; the tree was hollow from top to bottom, and, on cutting a hole in it near the ground, I found 2 nests, each containing 2 fresh eggs. The nests were mere depressions in the earth at the foot of the tree lined with dry leaves and straw. The eggs are pure porcelain white with very hard shells, the average size of the 4 eggs is 1·28″ × 1″.

I have since tapped another tree in the same way and found three nests at the foot of it, two nests were empty and the third contained two young birds.

All the trees I have seen occupied by this Swift have been at elevations of 1,000 to 2,000 feet in heavy forest.

Since sending the above notes last month on the habits of this swift, I have been fortunate in obtaining a considerable number of their eggs. Although the birds roost in trees at times in large colonies, I have not found more than 2 pairs breeding in one tree, in most cases only one pair of birds breeds and occupy a tree during the breeding season. I have found as many as 5 eggs in a clutch but 3 or 4 seem to be the usual number.

The white-rumped Spine-tail (*Chætura sylvatica*) also breeds on the Travancore hills in open forest at elevations of about 2,000 feet. It hawks about during the day in parties of about a dozen birds, but does not breed in colonies. The nest is made of vegetable fibre, strongly attached to the inside of a hollow tree with saliva. The eggs are white and glossy, and are usually 4 in number, the average size of 15 eggs is ·64″ × ·40″.

J. STEWART.

KALTHURITTY P.O., TRAVANCORE,
10*th April* 1913.

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## No. XIII.—EGGS OF THE MALAY EAGLE OWL, *HUHUA ORIENTALIS* (*HORSF*).

As the eggs of this species are seldom seen in authentic cabinets, it may, perhaps, be as well to give a short description, etc., of two clutches, which were generously presented to me the other day by Mr. E. C. Stuart-Baker, F.L.S., F.Z.S.

The eggs in question were taken on the 24th and 26th January 1912 in a range of hills, about 16 miles inland from Perak, Federated Malay States.

The normal number in a clutch appears to be 2.

The colour is, of course, spotless white. The shape of one of the clutches of eggs is a broad oval, verging almost into spherical, slightly pointed towards the small end. The shape of the other clutch is a longish oval, slightly pointed towards one end.

The shells exhibit little gloss. The texture is rough, and several white pimply lumps are scattered here and there over the large ends of the specimens. They measure:

1st clutch. (*a*) 2·1″×1·7″ | (*b*) 2·11″×1·75″

2nd clutch. (*c*) 2·25″×1·7″ | (*d*) 2·22″×1·67″

Average mersurements of 4 eggs=2·17″×1·7″.

P. T. L. DODSWORTH,
F.Z.S., M.B.O.U.

SIMLA, 21*st May* 1913.

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## No. XIV.—TAKING OF THE NEST OF THE CINEREOUS VULTURE.

Last year I received a request from a gentleman, who is an enthusiastic egg collector, to obtain for him, if possible, one or more eggs of the Cinereous Vulture (*Vultur monachus*). Major Marshall, Royal Garrison Artillery, who was then still quartered in Quetta, kindly gave me the name of a Pathan, whose home is in the Urak Valley, who would be able to show me nests of this vulture. Apparently this is the only part within Indian limits where this species is known with certainty to breed, and specimens of the eggs were obtained by Major Marshall last year. On March 31st the Pathan, Haji Nur Mahommed, came and brought me news that he had found a vulture's nest with an egg in it. I accordingly went to Urak and

put up in the dak bungalow there on Friday, April 4th. The next day I started at 9 a.m., with a Pathan named Shah Nur Khan, deputed by Haji Nur Mahommed, for the vulture's nest. It was a long climb, and it took me 4 hours to reach it. The nest was an enormous collection of sticks on the top of a Juniper tree about 25 feet high, and was close up under the highest crags of Zarghun Mountain, at an elevation of at least 10,500 feet, if not more. Wherever it was not too steep for snow to lie, there was a foot of snow on the ground all round and the air was very fresh and pure. Although I felt pretty sure that the bird was *Vultur monachus*, I decided to shoot it, if possible, so as to make certain of its identity beyond any doubt. As I approached the nest the bird flew off, and I, misjudging the distance, failed to bring it down, though I saw that a couple of its large wing feathers were broken by the shot. It was, however, none the worse for this, as it swept across the valley, and then commenced to soar in ever-widening circles till it had reached a point so far up in the blue above us, that it appeared a mere speck in the sky. I sat down to take a little refreshment after my climb, and for about 20 minutes the vulture remained sailing about like an aeroplane at an immense height above us. I saw that it had no intention of coming down, while we were in view, so I sent Shah Nur Khan away, with orders to hide himself completely at some distance, while I hid myself at the very foot of the tree on which the nest was, where I had complete cover. After waiting for about an hour, I had the satisfaction of hearing the swish, swish, swish, of the vulture's wings, as it flew up and settled on the nest. After giving it a few minutes to settle down, I emerged cautiously from my hiding-place, and as the bird flew off, had no difficulty in dropping it dead, as it was quite close. It proved, beyond any doubt, to be *Vultur monachus* and measured 8 feet 11½ inches across the wings. I kept the wings, tail, head and feet, for identification purposes, if required. The egg measured 3·63 inches by 2·75 inches and is dull white, thinly splashed with dark chocolate brown, principally at its narrower end. On my way back to the Urak bungalow I discovered a nest, in the course of construction of the Eastern Rock Nuthatch (*Sitta tephronota*). These curious little birds were very busy carrying large lumps of mud from the bed of the streams to the nest, which they were building against the face of a large wall of rock.

H. DELMÉ-RADCLIFFE, Lt.-Col.,
R.W.F., F.Z.S.

Quetta, Baluchistan,
10*th April* 1913.

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## No. XV.—VORACITY OF VULTURES IN THE GIR FOREST.

In December last whilst travelling in the Gir with Mr. Boyd, Superintendent of Police, we came across a buffalo freshly killed by lions near a Ness or a buffalo camp; as it was half moon we decided to sit up and watch the lions feed. As the surrounding trees were full of vultures the forest Guards suggested our waiting till it was fairly dark, otherwise the vultures would leave nothing for the lions; two men were left to guard the kill and they had to exert the utmost vigilance to prevent it from being devoured, several vultures being killed by sticks on the kill. When driven off they did not fly away but ran into the thick underbrush; after dusk we sat up in machans. When we were comfortably seated all vultures were driven out of the neighbouring trees and the men went away. Soon after they had gone hundreds of vultures ran out of the underbrush and in a few minutes the kill was a seething mass of birds; we whistled up the men who came up

and pulled the birds off by their wings and necks and clubbed them right and left, killing several of them in the melee; the birds made no attempt to fly away but merely ran into the jungle. This continued until 11 o'clock when the men were tired and our patience worn out. We then went away and abandoned the kill which was finished off in a few minutes.

I have sat over hundreds of kills and have never known vultures to descend after dusk, the forest men of the Gir however inform me that vultures here feed at night and kills must be very carefully screened if one wishes to sit up.

E. BROOK FOX.

JUNAGADH,
12*th May* 1913.

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## No. XVI.—THE LUGGER FALCON (*FALCO JUGGER*, J. E. GRAY.)

10*th April* 1913, *Camp Chakwal Tahsil*. Seeing a pair of Lugger Falcons haunting a low earth cliff above a dry watercourse near a village, I went to investigate. The birds kept on perching on various points along the cliff edge, thence launching forth in pursuit of passing Kites; from time to time they would settle in small hollows on the cliff face, behaving in such a way as to make me feel sure of the presence of a nest. There were two rather battered looking stick nests near together on the face of the cliff, one in a fissure and the other on a ledge. The ledge nest was so situated as to be visible from the top of the cliff, so sending my orderly round to look into the nest I sat and watched the graceful movements of the Falcons as they "stood on" in the air above the cliff or wheeled round to take up a fresh position near by; occasionally they would settle for a short time on the cliff. While I was waiting a pair of Ravens, who had appeared once or twice before, settled on the ledge by the nest and proclaimed their ownership so loudly that I thought they must have young—however the nest was empty as also proved to be the one in the fissure. While I was waiting for ropes for the investigation of the second nest I had been much amused by the way the Falcons had treated the Ravens. I saw the Falcon making several stoops in the direction of a heap of debris at the bottom of the cliff some little way from the nests I was examining. The glasses shewed that the object of these stoops was the pair of Ravens who cowered down in crevices amongst the debris every time the falcon swished close above their heads. My attention was temporarily diverted and I returned to the falcons to find that one Raven has escaped but the other was still under fire. It was trying to hurry away from the forbidden spot (which afterwards proved to be hard by the Falcon's nest), shambling along uneasily on foot along the base of the cliff, and croaking most dismally. Every few seconds it had to cower against the cliff to escape the indignant Falcon who was making a succession of splendid stoops, passing every time within an inch or two of the Raven's devoted head. I could not make sure whether the Falcon was in earnest and trying to strike the Raven or whether she was satisfied with giving him a good fright.

It was now growing late and I had begun to despair of finding the nest as there seemed no more likely spots on the cliff; there was a hole, it is true, in one place from which one of the birds had dashed out but this was only a roosting place. However just as I was leaving I saw a stick or two in a norrow vertical crack eaten out by rain water down the face of the cliff, and the glasses revealed the existence of a small chamber in the cliff behind the sticks—here was the nest. A boy went down on a rope next morning and brought out the solitary young bird which was in down

and only a day or two old. As the down plumage is not described in the Fauna of British India I append a description.

13*th April* 1913, *Camp Chakwal Tahsil.* I found a nullah near my camp which ended in a miniature cliff basin—the sides being formed of low sandstone cliffs worn into ledges. As I looked down into the basin from on top of the cliff a Lugger tiercel dashed away from one of the ledges below me; however the only nest I could see was an untidy Neopheon's on which the old bird was brooding a single egg. Walking round the cliff on one side of the basin I caught sight of the Lugger Falcon squatting on a ledge of the opposite cliff. I could not make out what she was doing as there was no nest and beside her was something white. Field glasses were taken out and shewed that she was brooding young birds in down; crossing over I was able to walk up the debris at the base of the cliff to within a few feet of the ledge—the bird not moving until a stone was thrown up. The ledge was then reached and 5 young birds in down but with the quill feathers sprouting well were found lying on the sand and pebbles that strewed the ledge. There was no vestige of a nest and there was no nest in the nullah from which they might have been removed. The nestings were noisy when moved and inclined to resent being touched. I took one of them and reared it successfully, so for purposes of reference I have recorded below a full description of the 1st plumage.

17*th April* 1913, *Banks of R. Jhelum.* Went to examine a nest of *Haliætus leucoryphus* which had been reported. I arrived to find it an enormous structure at the top of a large cotton tree which was only scaled with the greatest difficulty. When I arrived a Lugger Falcon was perched near the nest and she kept on coming back to the tree and perching and calling, or making vicious stoops at the Parrakeets and doves that were in the tree. Indeed I felt sure that she had a nest near and would have suspected her of appropriating the Eagle's nest, had not my informant assured me that he saw the Eagle at the nest daily—so much for the veracity of the native! When the nest was reached it was found to contain the Lugger's two eggs—moderately incubated. She had not troubled to remove various relics of the real owners of the nest—a fish skeleton, and the beak and portion of the leg bones of a Heron.

For the sake of completeness in describing the various nesting sites used by this falcon I include the following nest though it was not found in Jhelum District.

25*th February* 1912. *Jellalabad, Ferozepore District.*—Close to my camp there was a nest of the Lugger Falcon in a kikm tree; this was a large bulky structure placed on a sloping bough at no very great distance from the ground; contained 3 fresh eggs. The male was caught in a net baited with a live bird; the female continued to haunt the nest after the eggs were taken.

*Description of Down Plumage.*—Colour of skin plumbeous bluish-grey; moderately well covered with white down, very slightly tinged with grey; young quills contained in blue black cases. Iris, brown; bill, cere, and eyelids, dull plumbeous blue; tarsus and feet, dull plumbeous grey; claws blackish, egg tooth, very small, white.

*Description of first plumage.*—Age about one month. The entire head and neck are pale buff with a creamy almost pinkish tinge and marked with dark-brown as follows:—the forehead with very narrow shaft streaks; the crown with broad shaft streaks, the feathers being almost entirely brown in two patches above the supercilia; a narrow line above the eye below the bare ledge; a slight patch below the front of the eye, continued below the gape in moustachial streaks that meet the dark breast; a broad

line from the eye, above the earcoverts, produced to meet the dark colour of the back. The earcoverts, chin, and throat are tipped with arrow marks of a lighter brown; the feather bristles of the lores have black ends.

The upper parts from the lower neck including the tail and wings are dark sooty brown with a dark bluish sheen, all feathers edged with pinkish brown, the edges growing more pronounced on the wing coverts and rump; the tail with a terminal bar of pale buff, about half an inch wide, and with some pinkish buff markings on the basal portion of the inner webs. The wing quills spotted with pinkish buff. The edge of the wing pale buff. The underwing coverts dark-brown with buff and rufous edges, the larger feathers, being only tipped with those colours, and with a spot on each side of the shaft near the base. Axillaries similar but wanting the basal spot.

The underparts from the throat are very dark-brown with the base of the feathers, buff in varying degrees—the buff being more or less visible; the flanks edged with buff. Vent and undertail coverts very dark-brown with buff tips, the brown being partly concealed.

H. WHISTLER, M.B.O.U.,
Indian Police.

JHELUM, 12*th May* 1913.

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## No. XVII.—OCCURRENCE OF THE EMERALD DOVE, *CHALCOPHAPS INDICA* (LINN) IN THE SIMLA DISTRICT.

Last February, I came across this species on several occasions, in a wooded ravine, about 30 miles east of Simla, elevation 5,000 feet. Strange to say, however, I found it nowhere else in these parts. It is possible I may have overlooked it, and that it extends throughout the lesser ranges of the Punjab Himalayas. Its extreme western range is still doubtful—it is apparently not Kashmir proper, as Ward is emphatic that it does not occur in that country.

P. T. L. DODSWORTH, F.Z.S., M.B.O.U.

SIMLA, 21*st May* 1913.

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## No. XVIII.—MIGRATION OF FULL SNIPE.

As I was riding along the left bank of the old bed of the Ravi at Sundhar Chak at 5-30 p.m. on the 10th May, I saw a full snipe *Gallinago cœlestis* flying due north up the millstream. A half gale and dust-storm was blowing from the north at the time, and the bird seemed to find some difficulty in making headway. I saw him rise and make a flight of about 50 yards, then flushed him, and sent him another 50 yards. He went away quite silently and my first impression was that he was a wounded bird. But when I flushed him a second time he went away very strong indeed right in the teeth of the wind and almost straight. I then concluded that he was flighting to the hills. Sundhar Chak is about seven miles below Madhopur where the Ravi debouches from the hills. The Ravi water is barely 60° F. at this time of year and never rises above 76°, so perhaps migrants who frequent land watered by it are enabled to make better weather of the heat in May here than in other places. Snipe were about in the Permanand *jhil* on April 5th, but had by then evidently started to migrate; and I suspect that my friend of May 10th was very belated in his movements.

G. C. L. HOWELL.

MALIKPUR, UPPER BARI DOAB CANAL,
13*th May* 1913.

## No. XIX.—BAER'S POCHARD, *NYROCA BAERI* AND OTHER RARE DUCKS IN MANIPUR STATE.

I am sending to you by registered post two duck skins, one is undoubtedly a male specimen of Baer's pochard, or the Eastern White-eye *Nyroca baeri*. It is, as far as I know, the first specimen obtained in Manipur and was shot on Ekop jhil, some 12 miles south of Imphal, on 15th March 1913, by Col. W. Campbell of the Black Watch.

The second specimen I believe to be a female Baikal or Clucking Teal *Nettium formosum*. I have consulted Oates, Stuart Baker, Hume and Marshall, Finn and LeMesurier and the plumage seems to me to leave no doubt that the bird belongs to this species. But a keen and expert Ornithologist up here holds the opinion that it is not a clucking teal on the ground that the feet and legs are not of the colour usually given in the text books. I shall be grateful if you will kindly confirm my identification or inform me what the bird really is. I shot it out of a flock of 8 or 10 on Ekop on 16th March 1913. The skin is unfortunately not in good condition as the bird dived and was somewhat damaged by the boatman killing it with his paddle.

The following other rare or locally rare birds have been accounted for since I have been here :—

(1) Mallard, *Anas boscas*—Mr. Stuart Baker only records one instance of Mallard having seen in Manipur. This year, however, Col. C. E. Nichol, R.A.M.C., saw one on the Logtak Lake on 20th February 1913, Mr. F. B. Blackie saw 4 on a jhil a little south of the Logtak on 3rd March 1913, and Mr. R. E. Forrester of the Black Watch shot a single drake on Ekop on 16th March 1913.

(2) Pinkheaded Duck, *Rhodonessa caryophyllacea*.—I saw a pair with a flock of Spot Bill on Senaput, 10 miles S. W. of Imphal on 23rd October 1910 and shot the male.

(3) Nukhta, *Sarcidiornis melanonotus*—Mr. A. H. D. Barron of the 17th Infantry shot a pair last year.

(4) Common Sheldrake, *Tadorna cornuta*.—A shikari shot one in 1910.

(5) Bronze-capped Teal, *Eunetta falcata*.—Col. H. C. Tytler has a beautiful specimen of a male in his Tealery, which was brought in two or three months ago, having been caught in a net.

(6) Hume's Bush Quail, *Microperdix manipurensis*.—Mr. F. B. Blackie shot two specimens in the S. W. corner of the valley on 24th February 1913. The skins of one has already been sent to the Society by Col. H. C. Tytler. Both were males, but must have been immature as the plumage of one exactly resembled the description given of the female, while the second had the characteristic bay marking of the face only very slightly developed.

J. C. HIGGINS, I.C.S.

IMPHAL, MANIPUR STATE,
*28th March* 1913.

[The Baer's pochard was a very fine specimen and the teal was undoubtedly a Backal Teal. Both birds are welcome additions to the Society's collections—EDS.]

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## No. XX.—DUCK IN BURMA.

On page 1085 of the Journal, Vol. XXI, No. 3, Major Harington gave a list of the bags recorded from Tongyi and Nyaungwun at Christmas 1912.

The attached list will serve as an appendix to his note, and gives the bag of two parties at Tongyi and Nyaungwun respectively :—

| | Tongyi | Nyaungwun. |
|---|---|---|
| Gray Lag Goose (*Anser rubirostris*) .. .. | 14 | 22 |
| Bar-head Goose (*Anser indicus*) .. .. | .. | .. |
| Brahminy Duck (*Casarca rutila*) .. .. | 1 | 1 |
| Nukhtas (*Sarcidiornis melanonotus*) .. .. | 2 | .. |
| Burmese Grey Duck (*Anas haringtoni*) .. | 12 | 8 |
| Chinese Grey Duck (*Anas zonorhyncha*) .. | .. | .. |
| Pintail Duck (*Dafila acuta*) .. .. .. | 7 | 13 |
| Gadwall ( *Chaulelasmus streperus*) .. .. | 7 | .. |
| Wigeon ( *Mareca penelope*) .. .. .. | .. | .. |
| Shoveller (*Spatula clypeata*) .. .. | 6 | 4 |
| Tufted Duck (*Fuligula fuligula*) .. .. | 15 | 36 |
| Common Pochard (*Nyroca ferina*) .. .. | .. | .. |
| White-eyed Pochard (*Nyroca africana*) .. | 5 | .. |
| Common Teal (*Nettium crecca*) .. .. | 26 | 68 |
| Garganay Teal (*Querquedula circia*) .. | 39 | 7 |
| Cotton ,, (*Nettopus coromandelianus*) .. | 11 | .. |
| Whistling ,, (*Dendrocycna javanica*) .. | 15 | .. |

At Nyaungwun this year there was a lot of water and birds were not plentiful, except Tufted Duck who were in flocks on the open water.

C. N. BELL, I.C.S.

MANDALAY, 22*nd March* 1913.

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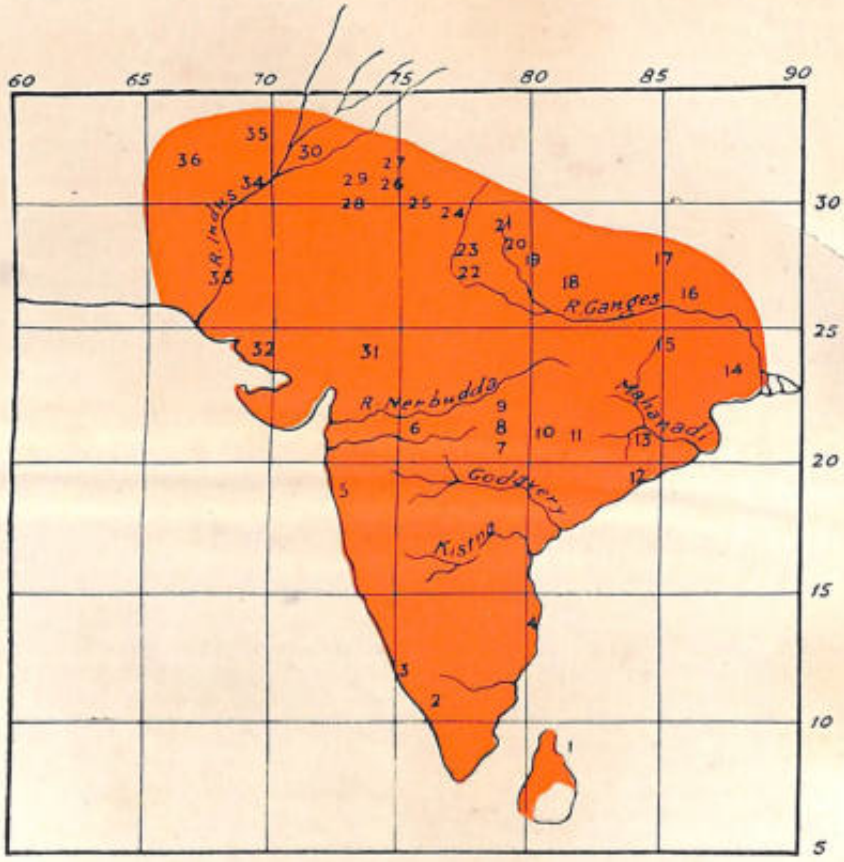
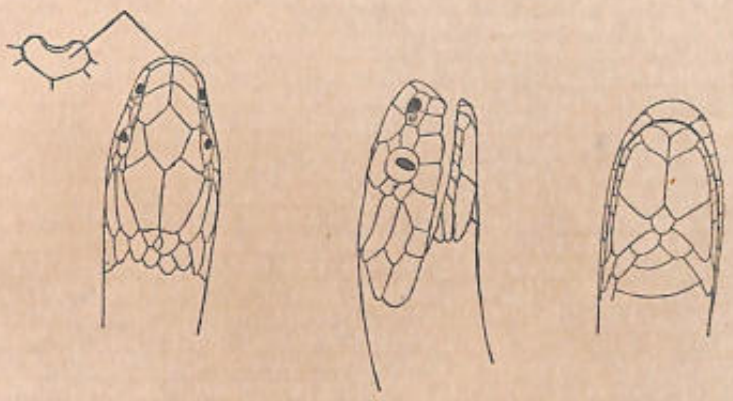
## No. XXI.—A RARE SNAKE *ELACHISTODON WESTERMANNI* FROM THE JALPAIGURI DISTRICT.

Our Society's collection of snakes has been enriched by a specimen of this rare snake sent by Mr. W. L. Travers among many interesting species collected in the Jalpaiguri District. The species was described in 1863 from a specimen obtained at Rungpore which is preserved in the Copenhagen Museum. A second specimen is in the Indian Museum, Calcutta, and was found at Purneah. The Jalpaiguri specimen is the third known. I have examined the last two specimens, and have notes furnished me by the Superintendent of the Copenhagen Museum on the type specimen, so that I feel justified in giving further details of the species. The Jalpaiguri specimen may be described as follows: *Length* 2 feet 6 inches, tail 5 inches. *Ventrals* 213. *Anal* entire. *Subcaudals* 62, divided. *Costals* two headslengths from head 20, midbody 15, two headslengths before vent 15; the rows become 19, about two headslengths behind the head and reduce to 17; three headslengths behind the head by a fusion of the 3rd and 4th rows above the ventrals; they further reduce to 15 by a fusion of the two rows next to the vertebrals on each side, about four to four-and-a-half headslengths behind the head; vertebrals are very distinctly enlarged, the breadth being subequal to the length, and as broad as the last row of costals; the scales other than those in the vertebral and ultimate rows are slightly oblique and smooth.

*Rostral.*—Large, touches 6 shields, the rostro-internasal sutures being as long as the other two sutures taken together. *Internasals.*—The suture between them equal, the inter-præfrontal suture about three-fifths the internaso-præfrontals. *Præfrontals.*—The suture between them is about two-thirds the præfronto-frontal suture; touch the internasal, postnasal, loreal, præocular and supraocular. *Frontal.*—Touches 6 shields, the præfronto-frontal sutures rather longest, the præfronto-parietals rather shortest.




To show distribution of 15 scaled Kraits—Ventrals 195-223, subcaudals 36-53. (From records referring to 137 specimens in my note books.)



Elachistodon westermanni (Slightly enlarged).

*Supraoculars.*—Length about three-fourths the frontal, breadth less than half the frontal along a line connecting the centres of the eyes. *Nasals.*—Divided in contact with the 1st and 2nd supralabials, a dimple in the posterior shields. *Loreal.*—In contact with the eye. *Præocular.*—One small above the loreal. *Postoculars.*—Two. *Temporals.*—Two anterior, the lower touching the 5th, 6th and 7th supralabials. *Supralabials.*—7th, the 3rd and 4th touching the eye, 7th much longest. *Infralabials*—seven, very narrow; the 5th, 6th and 7th, touching the posterior sublinguals. *Sublinguals*—Two large and broad pairs, with no mental groove separating them. *Eye* moderate with vertically eliptic pupil. *Head* rather elongate. *Body* compressed. *Colour*—Black above, with a conspicuous light-brown vertebral stripe from the neck to tail tip, and a few short variegations of the same colour costally. Head light brown with a large black sagittate mark, a black stripe passes through the lore to well behind the eye. Chin, throat and belly uniform, yellowish with some black basally on each side of the ventrals. No maxillary teeth, but one (two ?) large grooved fangs at the posterior limit. Four (?) small palatine teeth with a long edentular internal before and behind. No (?) pherygoid teeth.

The specimen in the Indian Museum agrees except *Costals*, two headslengths behind head 19. The two steps from 19 to 17 and from 17 to 15 are intermixed but the fusion of rows is as above. *Ventrals* 208, *Subcaudals* 63. *Supralabials* 6 on the right side.

In the type specimen the costal rows are 19 at a point two headslengths behind the head. The ventrals are 217 and subcaudals 59 (Gunther).

F. WALL, MAJOR, I.M.S., C.M.Z.S.

ALMORA, *4th June* 1913.

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## No. XXII.—ON THE COMMON (*BUNGARUS CÆRULEUS*) AND SIND KRAITS (*BUNGARUS SINDANUS.*)

Among other specially interesting specimens sent to me by our Society recently are two kraits which it seems to me justify the conclusion that *Bungarus sindanus* cannot in future be considered a species apart from *Bungarus cæruleus*. Specimen No. 1 was obtained by Captain F. L. Hughes at Jhelum.

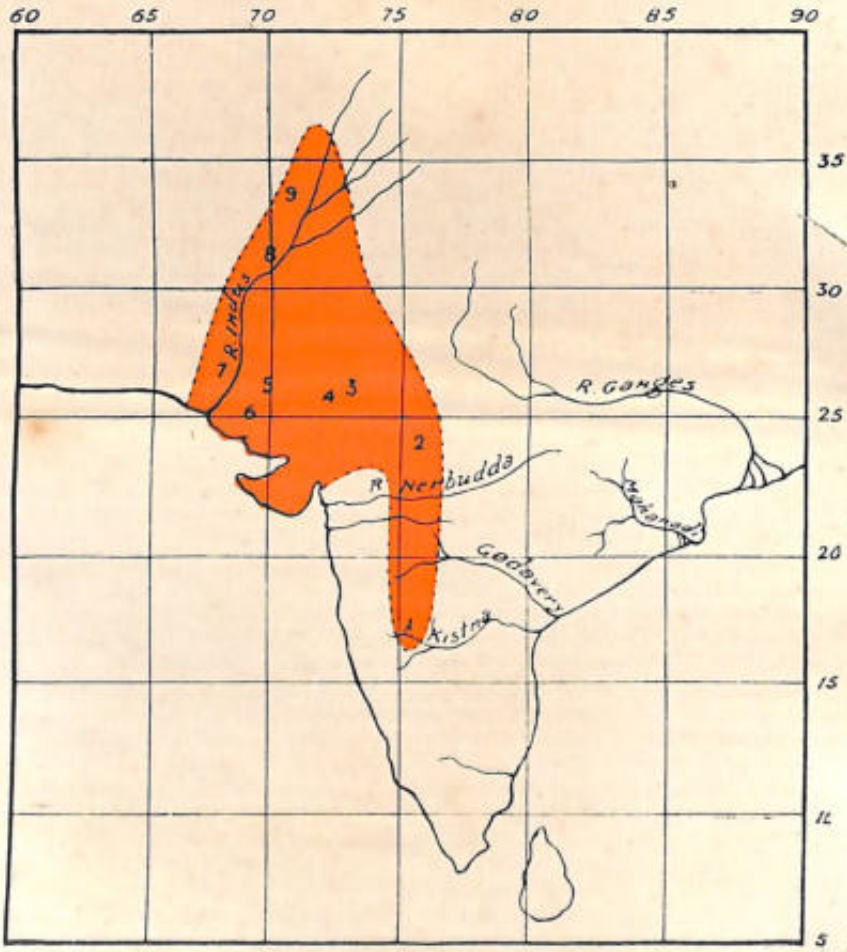
It is peculiar in that the scales are in 17 rows in the whole bodylength. The scales in the vertebral row are decidedly broader than long, the ventrals 206, subcaudals 43, and the 2nd supralabial is not narrower than the 1st and 3rd. The body is as far as I can judge not compressed. In all particulars excepting the scale rows, the specimen agrees with typical *Cæruleus*. This is the first krait I have any knowledge of with 17 rows of scales from the Punjab.

Specimen No. 2 is still more interesting. It was collected at Sholapur (Lat. 17° Long. 75°) by Mr. R. E. Macpherson. This specimen also has 17 scale rows in the entire body. The scales in the vertebral row are as broad as long, the ventrals 194, subcaudals 44, and the 2nd supralabial is very slightly narrower than the 1st and 3rd. If anything the body is depressed rather than compressed. It is among other things remarkably coloured and is perhaps a melanotic specimen, being quite black dorsally except for a series of white distant vertebral spots. Low in the flanks corresponding with some of these spots are very short indistinct indications of a cross bar which is otherwise suppressed. Here again the most important characters in identification are in agreement with *cæruleus*, the scale rows being the only exception.

Hitherto I have never seen a *Bungarus* south of the Ganges basin and Rajputana with 17 scale rows. Again I have only seen one *Bungarus* from Baluchistan with 15 scale rows, they all have 17 usually. The new conception of the species finds a very good parallel in the case of the Cobra (*Naia tripudians*). Specimens of variety *typica* from the south part of the Peninsula usually have 23 to 25 scale rows in midbody, whilst those in the Punjab and the Western Himalayas have usually but 21.

I have 5 skulls of *cæruleus* in my collection from Fyzabad and Almora, and 2 of kraits, I have hitherto called *sindanus* from Indore, and Fort Sandeman. A very critical examination of these side by side reveals to me nothing distinctive in the cranial osteology or dentition that might lead one to suppose they were different species. The dentition is as follows:—

| Scale rows. | | Teeth. | | | | | Habitat. |
|---|---|---|---|---|---|---|---|
| | | Fangs in maxilla. | Teeth in maxilla. | Palatine. | Pterygoid. | Mandibular. | |
| 15 | Left .. | 2 | 4 | 11 | 11 | 16 | Fyzabad. |
| | Right .. | 2 | 4 | 10 | 11 | 15 | |
| 15 | Left .. | 2 | 4 | 11 | 9 | 16 | Do. |
| | Right .. | 2 | 3 | 11 | 9 | 16 | |
| 15 | Left .. | 2 | 4 | 12 | 10 | 16 | Do. |
| | Right .. | 2 | 3 | 14 | 13 | 16 | |
| 15 | Left .. | 2 | 4 | 13 | 12 | 15 | Do. |
| | Right .. | 2 | 4 | 14 | 14 | 16 | |
| 15 | Left .. | 2 | 3 | 14 | 11 | 14 | Almora. |
| | Right .. | 2 | 3 | 12 | 10 | 15 | |
| 17 | Left .. | 2 | 4 | 12 | 12 | ? | Indore. |
| | Right .. | 2 | 4 | 14 | 12 | 19 | |
| 17 | Left .. | 2 | 4 | 13 | 17 | 18 | Fort Sandeman. |
| | Right .. | 2 | 4 | 14 | 16 | 19 | |




To show distribution of 17 scaled Kraits—Ventrals 194-237, subcaudals 43-52. (From records of 19 specimens in my note books).....implies uncertain limits.

A summary of all the kraits upon which I have notes, which have been referred by me to the two supposed species (now united) may prove instructive to others, and I have shown their distribution on the accompanying maps :—

LOCALITIES ON MAPS.

MAP C.

| | | |
|---|---|---|
| 1. Ceylon. | 13. Sambalpur. | 25. Umballa. |
| 2. Trichinopoly. | 14. Kalna. | 26. Jullundur. |
| 3. Cannanore. | 15. Gaya. | 27. Bakloh. |
| 4. Madras. | 16. Godda. | 28. Ferozepore. |
| 5. Bombay. | 17. Champaran. | 29. Lahore. |
| 6. Khandwa. | 18. Fyzabad. | 30. Multan. |
| 7. Wardha. | 19. Sitapur. | 31. Saugor. |
| 8. Bhandara. | 20. Bareilly. | 32. Bhuj. |
| 9. Pachmarhi. | 21. Almora. | 33. Sukkur. |
| 10. Raipur. | 22. Agra. | 34. Dera Ghazi Khan. |
| 11. Bilaspur. | 23. Delhi. | 35. Bannu. |
| 12. Berhampore. | 24. Dehra Dun. | 36. Sharigh. |

MAP D.

| | | |
|---|---|---|
| 1. Sholapur. | 4. Jodhpore. | 7. Sukkur. |
| 2. Indore. | 5. Jessalmere. | 8. Fort Sandeman. |
| 3. Marwar. | 6. Umarkot. | 9. Jhelum. |

F. WALL, C.M.Z.S., MAJOR, I.M.S.

ALMORA, *4th June* 1913.

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## No. XXIII.—AN UNUSUALLY LARGE SEA-SNAKE (*DISTIRA BRUGMANSI*).

Whilst at anchor in Penang Harbour last year, I was leaning over the rail watching some small fish, when my attention was called to a large sea-snake swimming by the ship. I immediately called two lascars and sent them away in a boat with sticks, to try and catch it; they however were afraid to go close to it, but managed, after a lot of bad shots to strike it on the head with a stick, which stunned it; by this time I had a line ready, with a slip knot at the end, and by good luck, flung the loop just over its head, and we hauled it up on deck. The moment it was on deck though it came to life again and got out of the loop of the line. The boatswain and carpenter arrived by this time with more sticks, and we had quite a lively time, owing to there being not much space to jump about in; we struck at it several times, missing of course, much to the delight of the passengers, who were collected along the hurricane deck rail, watching the sport and giving advice. At last I got in a blow, which again stunned it, we then quickly tied a stout piece of logline round its neck; the boatswain and myself pulled together with all our might and tried to choke it. The snake however refused to be choked in this way, so after about half an hour we hauled it on to the forecastle head and hung it up in the rigging, so that its whole weight came on the cord round its neck; even then I regret to say it took a very long time to die.

The same evening after leaving Penang we cut it down and with the assistance of the ship's surgeon started to skin it, as I had no means of preserving the whole specimen, which was a great pity as this was the largest sea-snake I have ever seen. It measured 9 feet from snout to tip

of tail, its colour was black, with yellow bands on back and bright yellow on belly; it had a flat tail, something like an eel; it had plate shields on the head and two large fangs in the upper jaw; these I removed and kept; it was evidently poisonous as the fangs were hollow.

We made rather a bad job skinning it, as the butcher came along and would help, which made too many cooks; the surgeon also wanted the heart to examine and in his hurry to get it, made several bad cuts in the body, just where the heart wasn't, it not being in the place he thought it would be.

Its scales were very thin and during the process of skinning nearly all came off. When skinned we nailed it on to a 10 feet board and dried it.

I have the skin and fangs now, but very much regret not being able to have kept the whole specimen for proper examination.

F. H. S. STONE.

P. & O. S.S. Arcadia,
Bombay, 15*th February* 1913.

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Mr. Stone very kindly submitted the skin of the snake referred to above for my examination. It measured 8 feet 9 inches, part of the head being imperfect. With a certain degree of doubt I am of opinion that the specimen is Brugman's sea-snake *Distira brugmansi* (Boie). The various details I observe agree with those of that species. The costals two head lengths from the head are 30, midbody 33, two head lengths before vent 32, imbricate. The ventrals are entire everywhere, and are about 366. I think I see a single temporal on the left side, and two cuneate scales after the 3rd infralabial.

Dorsally it is olive-green, each scale being heavily bordered with black to form a reticulate pattern (skin varnished). The subcosta is of a paler hue, and the reticulation fainter, becoming entirely lost in the last five rows. There are 53 bands on the body, black dorsally where they involve 2 or 3 rows in the body length, fading at midcosta, and indistinct below this. The intervals involve from 5 to 7 scales. There are intermediate black spots in five consecutive spaces on the vertebral region, in the middle of the body, in the last interval, and the first two intervals on the tail. The bands are not connected ventrally.

This is much the largest genuine sea-snake I have any knowledge of.

F. WALL, C.M.Z.S., Major, I.M.S.

Almora, 4*th June* 1913.

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## No. XXIV.—ON THE HABITS OF THE ROCK LIZARD (*AGAMA TUBERCULATA*).

As Boulenger in his "Reptilia and Batrachia," Fauna of British India, makes no mention of the habits, etc., of this species, the following particulars may be of some interest:—

This Agama is the common Rock Lizard of these parts, and is usually to be seen either solitary or in pairs. It lives entirely in holes, crevices of rocks, and stone-walls, over which it crawls with great facility. Its diet consists of ants, butterflies, and other such like insects. My friend, Mr. J. Fairley, informs me that these lizards are very destructive to plants, and that he has frequently seen them nipping the petals off the flowers in his garden.

During the cold weather it hibernates, but a few are occasionally to be seen basking in the sun on bright days. In the summer months it

becomes very abundant. I have frequently noticed it drinking water from the streams; though some of these lizards, inhabiting the tops of dry hills, must never drink.

It breeds during May, June, July, and perhaps the first half of August. A female killed in May was found, on dissection, to contain 7 eggs, which were ready for expulsion. Another killed on the 30th June had 9 eggs.

During the breeding season the males are very pugnacious, and are often to be seen fighting and chasing each other. One of these battles, which I happened to witness some years ago, lasted for several minutes, and both the combatants appeared to have suffered, and were much exhausted. I have frequently seen these lizards going about with only the stumps of their tails—the rest of the appendages having come to grief in some way—and it is very possible that these injuries, to a large extent, are due to love encounters.

P. T. L. DODSWORTH, F.Z.S., M.B.O.U.

SIMLA, *May* 1913.

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## No. XXV.—SIZE OF *BARILIUS GUTTATUS*.

In the Fauna of British India Day gives *Barilius guttatus* as known up to 7 inches. It might be of interest to record that I caught one of this species in the Gunzalin River (Salween District) weighing ½ lb. and measuring 9¾ inches from the fork of the tail or 10¾ inches from tip to tip. This fish, a female, contained ripe ova on the 3rd February, a full month earlier than I have known any species of carp to be ready to spawn in this river.

J. B. MERCER ADAM, F.C.H., I.F.S.

MOULMAIN, LOWER BURMA,
*16th February* 1913.

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## No. XXVI.—RECENT OBSERVATIONS ON THE MURRAL (*OPHIOCEPHALUS STRIATUS*).

Definite information as to the spawning habits of Indian fish is hard to come by. And the average Indian angler, keen observer though he frequently is, is neither a subscriber to scientific journals nor conversant with the somewhat specialised language of ichthyologists. No apology therefore is needed for introducing to his notice an interesting discovery relating to the nidification of one of the best of the Indian sporting and food fishes.

Those who wish to read up the subject in full detail should buy "Spolia Zeylanica"[1] Vol. VI, Part XXIII, December 1909.

The article is headed "Observations on the Nests, Eggs, and Larvæ of *Ophiocephalus striatus*," and the author, Dr. A. Willey, has a world wide reputation as an accurate observer.

It is necessary at the outset to issue a warning. Dr. Willey's observations were confined to one only of some 30 known species of Ophiocephaloid fishes, viz., *Ophiocephalus striatus*. It is not proved that the other *species*

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[1] Colombo. H. C. Cottle, Government Printer, Ceylon. Copies may be obtained from the Director, Colombo Museum, post free, for R. 1·25; or from Messrs. Wyman & Sons, Ltd., Fetter Lane, E. C., for 2s. 7½d.

have the same or even similar habits. And there is, therefore, a wide field for further observation by sportsmen and naturalists, for three species occur in Africa, and the others "in Southern and Eastern Asia and the islands to the southward. In the Philippine Islands are found at least 5 species."[1] There are six species in India which grow to three feet and over and are known as "Murral" among Europeans, and "Saul" in the vernacular of Northern India: with three smaller species called Black Caboose in English and Dhok or Dhaula in Hindustani. The *locus classicus* for the habits of the fish from the angler's point of view is Chapter XVI of Thomas's "Rod in India." Generally speaking, the fish is to our sportsmen the oriental counterpart of the pike and is fished for in the same way and with the same tackle.[2] They "inhale the atmosphere direct."[3] They will in fact suffocate if they are prevented from rising to the surface to take in oxygen. Their capacity for surviving is almost unlimited. They can bury themselves in the mud of a rain fed tank, æstivate through the longest drought when the tank dries up and come up smiling and hungry with the burst of the monsoon. "In China they are often carried alive in tubs or pails of water, and slices are cut for sale as wanted, the fish selling dear while it retains life, while what remains after death is considered as of little value."[4] These unfortunate fish, be it noted, are disembowelled before this dreadful process begins! Finally they can travel considerable distances on land in the rains when both the ground and air are moist, using their pectoral and caudal fins alternately in a manner which renders the progression a true "crawl;" and their migrations from pond to pond—generally at night—are matters of common knowledge throughout India.

Their flesh is really excellent: and they can be served without bones. And it is thus evident that the "snakeheads" have two characteristics valuable from the fish culturist's point of view, edibility and extreme hardihood. Accordingly in the days before British rule, when fish culture was (alas!) a less neglected science than it is now, "murral" were freely used to stock ponds of all kinds. Probably our Mussalman predecessors knew a good deal about their spawning habits. But until 1909 we knew very little indeed. Day (1883) recorded that one species *O. striatus* made a nest and that the male of the species guarded the young. But of the actual form of the nest—oviposition—and development to the fry stage we had no written account until Dr. Willey published his paper in Spolia Zeylanica. And even now—the warning can hardly be repeated too often—our knowledge is confined to one species.

Like a wise man Dr. Willey went to a local fisherman for his first information: an old "poacher" (he deserves the name) who lived by the manufacture of the basket traps in which murral are caught on their nests in Ceylon and in the Punjab. This man showed him five nests on the first day of investigation. Apparently the nests were built near the margin of the Minneri tank and were constructed with the parent fish's tail. The nest is unfortunately not figured in the journal. But it consists of a more or less circular patch cleared of weeds at the water's edge: this is filled with a mass of eggs which, unlike the eggs of most fresh water fish, *float on the surface*. These Dr. Willey found to be "characteristic translucent golden yellow and amber coloured eggs some newly hatched, spread like a sheet flush with the surface in a subcircular area behind a tussock

[1] Parental Care among Fresh Water Fishes, by Dr. Theodore Gill. Annual Report. Smithsonian Inst. 1905. Washington. 1906, page 490.
[2] Thomas's Rod in India, page 237.
[3] Thomas, op. cit. page 233.
[4] Gill, op. cit. page 492.

of rushes which partly served to filter the direct rays of the sun. Amongst and around the eggs were scattered the usual detached fragments of herbage consisting chiefly of aquatic plants."

Dr. Willey "did not see the adults, but the man said both parents had been near the nest, the smaller of the two aggressively protecting it: he called this one the female, not knowing that amongst fishes the male is smaller than the female."[1]

The paper is based on the observation of four separate broods. The egg had a diameter of about 1·25[2] mm. = 048" and over 100,000 to the quart: nothing is said as to whether they float individually[3] or in agglutinated masses but apparently they are non-adhesive. They "lie immediately below the surface film of water exposed to the quickening influence of air and sun," and accordingly hatch out quickly. Dr. Willey thinks "within three days after oviposition and perhaps within twenty-four hours."

Gill mentions (op. cit. page 492) that the ophiocephalids mostly breed twice a year: and the fact that the ova were found by Dr. Willey in Ceylon on February 21st, May 28th and June[4] 1st seems to bear out this theory. At any rate it is an indication of the fecundity of the species and its adaptability to piscicultural methods.

It is unfortunately impossible to reproduce the drawings Dr. Willey has made to illustrate his researches. The eggs "owe their buoyancy to the presence of a single large oil-globule which occupies the greater part of the ovum and is immersed in the golden yellow yolk." From this condition "as seen with a simple lens at 5-30 p.m. we reach overnight the stage * * * * * where the body of the embryo encircles about two-thirds of the yolk like a belt. The surface view shows that while the head is still oppressed to the yolk, the tip of the tail is becoming folded off: the eye and the auditory vesicle are also present. A few hours later the heart begins to beat and the tail to twitch." And in a short time the embryo breaks the outer covering or vitelline membrane and emerges as a *larva* or as trout breeders say an alevin measuring 3·5 mm. or 0·137."

"For three days the larvæ remain at the surface of the water, resting on one side of the yolk-sac up," and exhibiting when they swim the helplessness usual in fish at this period of their development. During the first day or most of it "the eyes are clear and devoid of pigment" which makes it difficult at the first glance to distinguish the fact that the fish have hatched out. But black pigment appears in the eyes on the second day and by the third day the larvæ are 5 mm. (0·196") in length. They are still incapable of resting at the bottom. On the fourth day the larvæ are 6·75 mm. (·265") in length and can swim freely at all levels: and on the fifth, the yolk-sac is absorbed. Dr. Willey has recorded his observations in very full and lucid detail: he kept his fry in a small enclosure in a glass tank and his records will be of the greatest value to the biologist and fish culturist. For the purposes of this paper

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[1] The generalisation is not quite justified by facts. "In most fishes whose males are differentiated by marked secondary characters, so far as is known, the male is larger than the female." Dr. T. Gill. Bull. Bur. Fisheries, U. S. A., Vol. XXVIII, 1908, page 1062 et seq.

[2] Salmon eggs = 5 mm. The largest pelagic eggs are that of the plaice = 1·65 to 1·95 mm.

[3] Pelagic eggs are always non-adhesive and free (Camb. Nat. Hist., page 412.)

[4] February is one of the coolest months in Ceylon: May the hottest up to 25th when the rains are due.

however his summary of the chronological data available will suffice. This reads :—

| *Days after hatching.* | *Total length.* | *Principal events.* |
|---|---|---|
| 1 | 3·5 mm. | Yolk-sac circulation established : pigment cells develop their black colouration : pigment begins to appear in eyes. |
| 2 & 3 | 4·5 to 5 mm. | Pectoral fins arise : mouth opens and respiratory movements commence. |
| 4 | 6·75 mm. | Larvæ leaving the surface and swimming freely at all levels. |
| 7 | 7 mm. | Larvæ swimming and turning in unison at the slightest concussion. Caudal cartilages appear. |
| 12 & 15 | 6·75 mm. | Posterior end of notochord bends up. |
| 28 | 8 to 10 mm. | Caudal rays jointed and articulated with the basal cartilages. Larvæ rise to the surface to take air. |
| 37 | 10 mm. | Primordia of dorsal and anal rays. |
| 40 | 10·25 to 13 mm. | Rudiments of central fins appear. Dorsal and anal fins separating from caudal. |
| 63<br>73 | 17 mm.<br>25 mm. | The fry now hide in the mud. |

The yolk-sac is absorbed and the fish get on the feed on the fifth day after hatching.

Here then is a fish which, as Dr. Willey rightly concludes, " could be reared with comparative ease in protected ponds and could be distributed subsequently as required. " It is prolific : extraordinarily hardy : adaptable in its habits to extremes of climate : very good to eat : easily brought fresh to market : and finally by no means contemptible as a sporting fish.

There is a tardy but distinct tendency nowadays to recognise the responsibility of Government with regard to the maintenance and replenishment of the stock of food fishes. And sportsmen will be doing a service not only to their " brethren of the angle " but to the public generally if they will collect and record *data* as to the breeding habits, not only of Ophiocephaloid but of all useful fish.

Even Dr. Willey's invaluable paper does not answer all the questions which a fish culturist would ask before undertaking to stock waters with *Ophiocephalus striatus* : and this point is easily illustrated.

The species is plainly adapted for pond culture. That is, pairs of fish should be turned into breeding ponds at the beginning of the spawning season and left to nest as in a state of nature. Ponds must be supplied at the shallow edges with reeds in which the " small rounded clearings" forming the nests may be cleared. Bushes for shade : " other aquatic plants " whose " small leaves " are used apparently for purposes of concealment of the floating ova : tussocks of grass to conceal and shade the young fish : all these forms of plant life are evidently essential in order to supply suitable spawning conditions. Dr. Willey does not tell us what plants he found round his nests and the first point to emphasize is the necessity for discovering these. Species would vary no doubt in different parts of India. But native fishermen sometimes possess considerably more extensive and more accurate knowledge of these matters than is generally accredited to them, and with proper co-operation *data* applicable to any district in India should be easily obtainable.

*Secondly*, as to the spawning period. We know that spawn is obtainable in Ceylon in February, May and June, that is just before the beginning of and throughout the Ceylon hot weather. How far do these periods vary in the different parts of the Indian Empire?

*Thirdly*, the male guards his nest and eggs for some time and is known to develop subsequently cannibalistic tendencies. What are the chief enemies which threaten the spawn, larvæ and fry? At what period does the parent drop the *role*[1] of protector and develop that of destroyer?

*Fourthly*. The spawning habits of the American basses are in some respects analogous to those of the "murral". It has long been customary in the United States to protect the bass, nest with "a light cylindrical "frame of iron covered with cheese cloth, one end of which protrudes "above the water. This prevents the young fishes from wandering away "from the nest and makes it possible for them to be removed to nursery "ponds with the dip net,"[2] where they are safe from all enemies including the voracious parents. How can similar precautions be taken in the case of "murral"? Here is obviously a fine field for experiment by sportsmen and naturalists all over India.

*Fifthly*, how many pairs of "murral" should be turned down to breed in (say) one acre of water under ordinary conditions?

*Sixthly*. Can the ova be handled and transferred before they reach the larval stage?

*Seventhly*, or is it more economical to stock by transferring young fish?

*Eighthly*, if so is it better to put them into the waters in which they are to remain immediately after the absorption of the umbilical sac? Or at some later period? On this point Dr. Willey records that on the seventh day thirty of his "surface hatchlings" were eaten up by older fry of an allied species. This indicates clearly the necessity for adequate protection during the helpless period when the fish are suspended at the surface by their buoyant sacs. And it will be particularly interesting to ascertain whether parental care continues up to and beyond this time of extreme danger. Our author has described the feeding of murral fry with mosquito eggs and larvæ. Fishes of the seventh day would not touch the culicine egg rafts but would take detached eggs, and also the "minute larvæ" as they hatched out. For practical purposes outside of aquaria however it would be impossible to depend on a sufficient supply of culicine larvæ to feed large quantities of fish. And if artificial feeding were resorted to, as it would be in nursery ponds, some other form of food would no doubt be efficacious. Finally, what has been done for *Ophiocephalus striatus* should be done for all the other Ophiocephalids, and for all valuable food fishes. Dr. Willey's method should as far as possible be followed. The local poacher *par excellence* in India if properly handled will generally produce much valuable information. If this is followed up whether with Dr. Willey's thoroughness by daily observations in aquaria, or by observations in the field aided by a water glass "knowledge of the breeding habits of fishes under natural conditions," knowledge which Dr. Willey rightly describes as fundamental to economical and sound methods of culture, will soon be collected. A passage occurs in a report by an eminent official writer on Indian fisheries which would no doubt interest Dr. Willey and should be useful in the light of his paper to naturalists in Bengal. He writes:—"The second method (of propagation) "is only found in the suburbs of Calcutta and in the neighbouring districts

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[1] Thomas says "till about 2" long." Rod in India. Chapt. XXIII.

[2] The Cultivation of Fishes in Natural and Artificial Ponds. Charles Huskins Townsend, Sc. D., Eleventh Annual Report, New York Zoological Society.

"of 24 Parganas, Howrah and Hooghly. The impregnated eggs float in "small lumps near the shallow edges of rivers and are collected in a piece "of cloth by certain low caste people and also by fishermen. They are "bought by the rearers at the rate of Rs. 5 to Rs. 8 for a handful and "put in shallow ponds where they hatch in a few days. *In about a "month's time it becomes possible to distinguish the various kinds.* The fry "are then caught with fine nets, sorted and put in different tanks: at the "same time some are disposed of to hawkers who carry them about for "sale to stockers of tanks. Eggs and spawn are largely caught in the "Hooghly from above Cossipore and in the Rupnarayan, Amta in Howrah "being considered one of the largest centres."*

It is unfortunate that the report should have omitted to name the species dealt with in this manner: but the sentence italicised shows that Bengali fishermen know of more than one species which produces floating spawn. And should this paper meet the eye of the Commissioner of Fisheries, Bengal, or of the authorities of the Calcutta Museum, we shall no doubt be told the names of the species indicated, whether their eggs float of their own buoyancy or otherwise and other details. Meantime the methods described strike a fish culturist as wasteful and crude. For spawn floating down rivers must be subject to the attacks of innumerable enemies from whom it would be easy to protect it at inconsiderable expense in such a way as to double (at least) the percentage of successful hatchings.

Undoubtedly however there exists in India an ancient and deeply rooted love of fish culture. This, as Dr. Day and Mr. Thomas pointed out to deaf ears many years ago, only needs direction and encouragement along simple lines to solve the question of the exhaustion of inland fisheries. It is not too late. And Government is apparently at length awake to the necessities of the situation. May it never forget that the success of its efforts will depend on "knowledge of the breeding habits of fishes under natural conditions," and that such knowledge will be available to all anglers who will cultivate the good will of the professional fishermen. It is perhaps not too much to hope that time will see the establishment of some central office which will collect, sift and diffuse in popular form the *data* collected for it by the many good naturalists who explore the waters of the Empire.

G. C. L. HOWELL, F.Z.S.

GURDASPUR, 30*th April* 1913.

Since the above was written (I understand) Mr. H. C. Wilson, Pisciculturist Expert to the Madras Government, has carefully investigated the breeding habits of *Ophiocephalus punctatus* at the Sankesula Fish Farm. Those interested in Natural History in India will look forward with interest to an account from the pen of this able naturalist.

G. C. L. H.

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## No. XXVII.—NOTES ON THE HABITS OF SOME COMMON BUTTERFLIES, ETC.

As it appears from the article on Butterflies in Vol. XXII, Part I of the Journal that the habits of some species mentioned have not yet been recorded, the following notes may be of interest.

*Pieris brassicæ nepalensis.*—Many larvæ closely resembling those of *P. brassicæ*—though like the butterfly averaging I should say a little larger

*K. G. Gupta, I.C.S. Bengal Report No. 39. Revenue Department, dated 20th February, 1907. Calcutta 1908, para. 101 (obtainable from Messrs. Constable & Co. 10, Orange Street, Leicester Square, W.C.)

than the English form—were noticed by me on cauliflower plants at Peshawar and Bannu.

*Pieris canidia*.—Abundant at Peshawar, common also at Bannu and Mussoorie, seems out here to largely take the place of the small cabbage white—*P. rapæ*—at home, but the flight of *canidia* is more rapid, particularly if the butterfly is alarmed, and more graceful than that of the 'cabbage whites.' It is I consider a very graceful butterfly.

The female of *canidia* may often be seen hovering quite close to the ground, around a small low growing plant, presumably ovipositing.

Noticing the small size of many females of *canidia* both at Naini Tal and Peshawar and measuring 20 consecutive captures of each sex I found the average expanse to be—

Male 56·4 m.m. Female 53·1 m.m.

Two males taken on one day measured 41 m.m. and 61 m.m., one being under and the other over the limits given by Col. Bingham. What is the reason for females of *canidia* in the N. W. of India so often being smaller than males, for a friend tells me this is not the case among specimens examined by him from further East?

*Synchlæ lucilla*.—This pretty little butterfly is common on the N. W. Frontier in early spring, about rough stony undulating ground with small scattered bushes, and owing to its size and markings escapes notice until it is close. I have secured a number of good specimens by knocking them over with a stick, for want of a net, though the loose stones and uneven nature of the ground coupled with the erratic flight of the butterfly sometimes make the chase difficult. It has an obliging way, when much harrassed, of settling for a moment or two on the ground or on a leaf as some *colias* occasionally do and so affords an opportunity of covering it with the net. The green underside—deeper green in the female—assists concealment of the butterfly among the yellowish green leaves of the little bushes so common where it occurs.

*Neope (Lethe) pulaha* and *Hestina nama* both exhibit such attachment to a particular spot that they will often allow repeated attempts at capture, until, becoming too occupied with some rival, they are taken easily on the wing.

A *Sephisa dichroa*, settled about 20 feet up on an oak-tree, allowed me to throw handfuls of shale and stones over it from below without its leaving the tree. Sometimes it would remain on the leaf in spite of the stones showering on and around it, or it would fly up towards a passing stone; until after about half an hour of this, its hind wings much torn by the stones, it came down lower and was captured. Leech gives a very similar account under this genus in his "Butterflies of China."

On a bright sunny day early last spring I saw a small bat flying at noon close above me about a stream, evidently enjoying the sunshine. It settled on a tree and flew off when I was about 10 feet away and soon settled again somewhere about the bank overhanging the stream.

When after butterflies one day in Surrey not long ago, on scraping some sand I came upon a good specimen of a paleolithic flint instrument and an unexpended Lee-Metford (blank) cartridge, two curious companions!

H. D. PEILE, Major, I.M.S.

Mussoorie, 21*st May* 1913.

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## XXVIII.—NOTE CONCERNING *ZEPHYRUS ATAXUS*.

In the Murree Hills *Zephyrus ataxus* appeared last year (1912) about June 21st, and from that date to the end of June was out in considerable

numbers. I only found it in the thickly wooded valleys which go down to the Jhelum at a height of about 4,500 to 5,000 feet. It is a shade loving butterfly and seems to spend most of its time sitting on the branches of a shrub which has been kindly identified by Colonel Bamber as *Sarcocca pruniformis* of the Euphorbiaceæ (see Journ. B.N.H.S., Vol. XIX, page 959). This shrub grows in great quantities along the sides of the nullahs, being in some places the only undergrowth under large trees. When *Zephyrus ataxus* was not sitting on the above shrub it was usually sitting on the shady sides of large rocks in as dark a place as possible in company with *Euaspa milionia*, which was also to be found there in large numbers. *Zephyrus ataxus* was difficult to distinguish against its background in the shade, but once seen was easy to capture, as it would sit still with the greatest patience. One day my wife and I caught seventy within a space of one or two hundred yards square.

June 30th was the last day I went down to that valley just then, so I am unable to say how long they remain out; but I found one worn and battered ♀ at the same height on 21st September after the rain had stopped.

C. W. WATNEY, Captain,
S. and T. Corps.

Peshawar, *3rd March* 1913.

## No. XXIX.—NOTE ON *ZEPHYRUS ZIHA*.

Last year (1912) I took 5 specimens of *Zephyrus ziha* in the Murree Hills at heights of 6,000 to 5,000 feet. "Murree Hills" should therefore be added to the list of localities given for this butterfly by Captain Evans in his List of Indian Butterflies, Vol. XIX, p. 988.

C. W. WATNEY, Captain,
S. and T. Corps.

Peshawar, *3rd March* 1913.

## No. XXX.—MIMICRY IN SILKWORM MOTHS.

With reference to the article in the last Number of the Journal on the serpent-like apices possessed by some moths—and the case of an owl's face being simulated—it may be interesting to turn to a letter by E. H. Aitken in Vol. XVI, No. 1 (1904), headed "The Enemies of Butterflies." In this "Eha" is speaking certainly of butterflies alone, but it seems probable that the protective resemblance to a snake's head shown by the wings of some of the Atlas Moths may be not so much a guard against birds as lizards. A lizard will not walk into the jaws of a snake, if he can help it, and he certainly will not try conclusions with an owl. I make the suggestion with all reticence and stand open to correction; but from the comparative number of (*a*) lizards, (*b*) birds, found in the stomachs of snakes would one not infer that for one bird scared, a good many lizards would be driven off. And again it would be a bird of some size that would tackle an Atlas Moth anyway, whereas one knows well what an extraordinary large moth or insect even the little wall gecko will go for.

C. BEADON.

Tayoy, L. Burma,
21*st May* 1913.

## No. XXXI.—ON THE LIFE HISTORY OF *COPTOSOMA CRIBRARIA, FABR.*

This Pentatomid bug is one of the commonest insects found attacking *Dolichos lablab*. It does not however confine its ravages to this plant alone

it has been found to infest agathi, red gram, indigo and cluster bean plants also. The insect enjoys a wide distribution, and it has been noted in several districts in the Madras Presidency.

*Life History.*—The whole life history of the bug from egg to imago is spent on the plant itself. As is usual in bugs, coupling takes place in opposition. This process was noted in some cases and found to occupy a period ranging from 50 to 70 minutes.

*Egg.*—In from 4 to 7 hours after union, egg-laying takes place. After coupling, the female crawls about the tender shoots and leaves evidently on the search for a suitable spot to deposit the eggs; they are generally laid on the leaf-surface but they are also often found on the tender stems and the beans. One bug lays from 10 to 40 eggs, the commonest number being 35. The eggs are laid invariably in two parallel rows arranged back to back. Each egg when laid is cemented to the plant surface by a sticky fluid secreted by the bug. The eggs are very soft on being laid, but soon harden when exposed to air. Each egg is a tubular object measuring $\frac{3}{5}$ m.m. along its long axis. In colour it is creamy white showing iridescent colours in certain lights. That end of an egg which is away from the adjacent parallel row is circular and has a toothed rim; it is covered up by a circular lid-like structure. The long axis is faintly sculptured and granular. The eggs hatch on the sixth day after being laid. As the hatching time approaches the egg group appears darker in colour. Just before hatching the lid at the end of the egg shell is pushed open from inside and the young insect slowly emerges out along the passage made. The young nymph takes a long time to extricate itself completely from the egg shell. The lid when open remains like a door on its hinge. (*See* Plate B.)

1*st Instar.*—The just-hatched nymph is a tiny oval object, having a shining orange colour. From head to the tail end it measures $\frac{3}{4}$ m.m. and across the body transversely $\frac{1}{2}$ m.m. The antennæ are fairly long: the small eyes are bright red. The dorsal and lateral portions of the body are hairy, being covered by short setæ. The insect at this stage is not active, a number of them remaining gregariously at one spot. Owing to its minute size the insect is easily overlooked at this stage. (*See* Plate B.)

2*nd Instar.*—The period of the first stage occupies 8 days, at the end of which the first moult takes place. The insect now measures $1\frac{1}{8}$ m.m. long and has a pale brownish colour. The body is as before hairy with setæ. The wing rudiments appear as very faint dark spots. The mid-dorsal region of the abdomen has a pinkish patch (probably the beginnings of the stink glands). The eyes turn paler from their original bright red colour.

3*rd Instar.*—Six days after the first moult the insect casts its skin for the second time and gives rise to the third instar. The nymph is now decidedly bigger, being $2\frac{1}{8}$ m.m. long. The colour becomes pale-green. The wing pads appear clearer and of a darker green than before. The pinkish patch on the mid-dorsal region of the abdomen now appears as two or three small oblong patches.

4*th Instar.*—The third instar lasts 9 days, after which the 3rd moult takes place. The insect now measures $2\frac{3}{4}$ m.m. The body is light whitish-green in colour. The wing pads form dark olive patches slightly lengthened backwards. The setæ around the abdomen on the lateral plates (?) are brownish green. Body and head hairy. Two small black spots are found on the middorsum of the abdomen.

5*th Instar.*—Another 9 days pass and the skin is cast by the nymph for the fourth time. This is the last stage in the nymphal period of the life of the bug. It is now 4 m.m. long. The body is oval in shape

and slightly convex above. Antennæ fairly long and setose. Colour of head and thorax olive-green. Abdomen greenish ; wing-rudiments dark ; the region corresponding to the wing pads on the ventral side of the body is also dark. The spines on the lateral edges of the abdomen are borne in groups on light-green patches (plates). The ventral side of the abdomen is greyish-fuscous. The two black spots on the middorsum of the abdomen appear clear. The proboscis extends a little beyond the second pair of legs. In ten days more the insect sheds its skin for the last time and assumes the adult stage. (*See* Plate B.)

*Nymphal habits.*—In the first two stages in the nymphal period, being minute in size the creatures crawl about gregariously on the leaves and tender stems and easily escape detection. The later stages, especially the fourth and fifth instars, display their hiding habits remarkably. During these periods they are almost always found hiding under cover of the small stipules or leaflets found at the junction of one stem with another or at the nodes. Their colour is also so similar to that of these structures, that the nymphs appear very well-hidden in such situations. The younger nymphs often collect in a group on the undersurface of the short thick stalks of the tender leaves. Of all the stages the last instar is the most active and displays the habits of the adult to a great extent. It crawls along the tender vines and leaves and when touched or detected either drops down or crawls along the lower surface of the stem or leaf. The nymph in the different instars differs from the adult so much in external features that the immature bug is liable to be mistaken for an entirely different insect. The body of the nymph is more or less flat and clearly covered with hairs and setæ, while the adult has a smooth convex body and a pale ochraceous green colour. So far as observations in nature and in captivity were made, the nymphs have been found to remain on the plant only and not in soil. (Compare p. 672, Lefroy, *Ind. Ins. Life.*)

The whole life period of the insect from egg to imago occupies roughly a month and a half, the periods passed in the various stages being approximately as under :—

| | | |
|---|---|---|
| Egg | .. .. | 6 days. |
| 1st Instar | .. .. | 8 ,, |
| 2nd ,, | .. .. | 6 ,, |
| 3rd ,, | .. .. | 9 ,, |
| 4th ,, | .. .. | 9 ,, |
| 5th ,, | .. .. | 10 ,, |

The adult was found to live in captivity for a week. Thus the life cycle of one generation extends roughly over a period of two months.

T. V. RAMAKRISHNA AIYAR,
Asst. in Entomology, Madras.

[*Coptosoma cribraria* is a common small green bug, about one-fifth of an inch in length and of a stout squat build, which is very liable to be mistaken for a beetle by a non-entomological eye. The species is described and figured in Vol. I, pages 22-23, of Mr. Distant's "Rhynchota" in the *Fauna of India* Series.—T.B.F.]
(*See* Plate C.)

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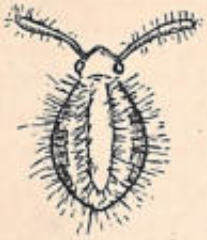
## No. XXXII.—LARGE SWARMS OF BEES.

I send herewith a photograph (Plate A) of a peepul at Jullundur which has 21 swarms of wild bees on it, the largest being six feet long and thirty inches in depth. There were 19 swarms on the same tree last year, probably on account of its being near several large gardens. The photo was

A batch of eggs of *Captosoma* (enlarged).

One eggshell showing open lid (enlarged).

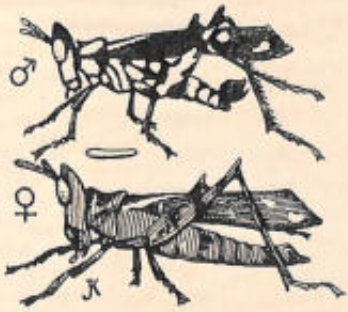


1st Instar (enlarged).

5th Instar (enlarged).

Perfect insect.

Life history of *Coptosoma cribraria*, Fabr.




*Mastax* sp. from Macao, China, male, female and egg.

taken on the 21st April, the peepul being bare of leaves at this season for about a fortnight. The bees were *Apis indica*.

H. FOOKS, Lt.-Col., I.M.S.

Jullundur, Punjab,
*25th April* 1913.

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## No. XXXIII.—ANT-MIMICRY BY A *FORMICOMUS* (*COLEOPT., ANTHICIDÆ*).

One evening about the end of July 1912, I noticed a small ant swarming from its nest below ground under a grass lawn at Coimbatore. For some days previously there had been heavy rain and the ants were probably busy in clearing out their galleries after the wet weather. There were no winged individuals amongst them and the workers seemed to be doing very little excavation-work, but were pouring in and out of the three or four entrances to the nest (mere holes in the ground, without any embankment of any sort) and were running about over the adjacent ground in an apparently aimless but excited manner. At such times myrmecophilous beetles may sometimes emerge from the nest and I therefore looked to see if I could find any. Sure enough, several small beetles were soon found to be present. They were running about over the ground intermingled with the ants, which in life they mimicked so exactly that (particularly as dusk began to fall) I caught an ant in mistake for a beetle, and *vice versa* on several occasions. The beetles did not seem to be in any way pets of the ants. Generally they took little notice of one another and, if an ant and a bettle met, they usually avoided one another mutually, but occasionally the ant attacked the beetle and both rolled over and over in a rough-and-tumble struggle which always ended by the ant letting go its hold and running off in precipitate retreat. It seemed to me (though I could neither see, smell, nor hear the explosion) that the beetle, when thus attacked, discharged some volatile liquid highly disagreeable to the ant.

I could not see a beetle emerge from the nest nor enter, and those I caught and dropped into the entrances were at once expelled. But the beetles were so common amongst the ants—and only on that area where these ants were swarming; I could find none on other parts of the lawn beyond the radius of this particular ants' wanderings—and mimicked the ants so exactly that I supposed there must be really some association between them.

Father E. Wasmann, S.J., has kindly examined these beetles and writes that they belong to the family *Anthicidæ* genus, *Formicomus*, and has returned a few specimens labelled *F. indicus*, Wasm MS., the species being undescribed and the name as yet unpublished. He says further: "You are right in supposing that there is no friendly relation between these beetles and the ants. The species of *Formicomus* live in the *neighbourhood* of ants-nests, probably devouring isolated ants. The ant-mimicry in these beetles is very high." The ant is *Monomorium salomonis indicum*, Forel, a common species in India.

Probably readers of the *Journal*, who will observe ants when they are swarming, may find this and probably several other quite new cases of beetles which mimic ants and live either with them or on them.

T. BAINBRIGGE FLETCHER.

Coimbatore,
*18th February* 1913.

## No. XXXIV.—LIFE-HISTORY OF EUMASTAX, sp.

Dr. David Sharp, in the Cambridge Nat. Hist., Insecta, Pt. 1, p. 301, says of the tribe *Mastacides* of the Family *Acridiidæ* that nothing seemed to be known at that time (1901) of their habits or development. In 1906-7, therefore, since a sp. of *Mastax* or *Eumastax* was common near Macao in South China, I worked out the life-history and sent the paper and figures to Dr. Sharp, but unfortunately it was lost. I have recently found some of the principal rough notes from which the paper was written, and send the following brief account, as I believe very little is even yet known of the habits of these insects.

This species is usually very common but exceedingly local near Macao, and is only abundant in a small patch of wood at Pak-sa-liang village. It is not found except in wooded districts, and appears to browse entirely on shrubs and woody plants; I have never seen it feed on grasses. One of the favourite food-plants is *Pavetta indica*, L., N. O. *Rubiaceæ*. The males much outnumber the females, and are very brilliantly coloured with vivid yellow-green and two spots of blue-green on one of the abdominal segments. There are a few hyaline spots in the wing and one spot of green. The general ground colour is very dark brown and black, the tegmina being black. The female is larger than the male, and sombrely coloured with various shades of brown and dusky black. The parts left white on the figure of the male are chiefly bright, almost metallic, green. The few spots left white on the figure of the female are dull ochreous. (*See* Plate C.)

Eggs were laid on September 14th, 1906. They are slightly curved, smooth, rather shiny and of a darkish yellow.* They are deposited in small batches in the ground in the usual manner, except that very little collaterial fluid is used, though the eggs are slightly cemented together. One pair of the insects remained in copula about three hours in the early morning, and the eggs were laid in the afternoon. The first nymphs hatched out on the morning of April 8th, 1907.

Summary of life-history:—

| | | | | |
|---|---|---|---|---|
| Eggs | laid, | September | 14, | 1906. |
| „ | hatched, | April | 8, | 1907. |
| 1st | moult, | May | 26 | „ |
| 2nd | „ | June | 6 | „ |
| 3rd | „ | „ | 21 | „ |
| 4th | „ | July | 5 | „ |
| 5th | „ | „ | 24 | „ |
| 6th | „ | August | 20 | „ to adult. |

After the final moult the male takes about five days to arrive at full adult colouring, passing through various brown and ochreous colouring before the green tints become gradually visible.

From these few notes it will be seen that there is nothing special about the development of this insect, except that the eggs seem to be deposited in a careless and rough manner, with very little protection from collaterial matter, no real covering over the egg-batch being formed. The batches seem to always contain few eggs, and there is but one brood a year; about the beginning of November all the *Mastax* seem to have died off. The females appear to live about a month longer than the males. There are periods of really cold weather in S. China from November to March, and this is also the dry season.

The great difference of colouration between the sexes is unusual in the *Acridiidæ*.

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* The eggs are large compared to the size of the insect.

In S. China, where I observed them several years, these insects never increased noticeably in any season; they are slow breeders and their eggs are probably often destroyed. They are also somewhat restricted in their food, and exposed in their habit of sitting on leaves of shrubs, and are inactive compared to most of the *Acridiidæ*. In countries like China where every form of woody vegetation is cut for fuel; it is probable that the *Mastacides* are rapidly diminishing in numbers, and their place taken by other forms of *Acridiidæ* which can better adapt themselves to altered conditions of life. I much regret having done no anatomical work on the *Mastacides* when I had plenty of material: they appear to me to be a very ancient form of the *Acridiidæ*.

J. C. KERSHAW.

TRINIDAD, B.W.I.,
*7th January* 1913.

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## No. XXXV.—NOTES ON THE CUTCH AMMONITES.

### IV.

### THE LER-HAMUNDRA ELLIPSE.

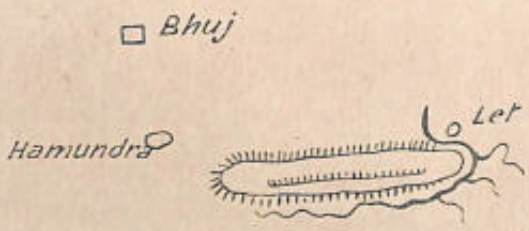
After digressing to Keera on the S. edge of the Great Runn I return to the line of the Charwar Fault. While calling it a fault in obedience to Blanford and Wynne, one cannot help having a secret desire that it may not be a fault so much as a crumple. I know it is heresy to say so, and I am prepared for the stake: but the fascination lies in this, that if it is a crumple, the whole scheme of Cutch simplifies itself into three crumples, caused I suppose by the drift or suction of land towards the North. The following sketch would represent a section from Putchum Island due South:—

1. Gulf of Cutch.
2. Alluvium.
3. Tertiary.
4. Trap—of Cretaceous Era.
5. Cretaceous and highest Jurassics.
6. Jurassics (Kimeridge, Oxford and Callovian).
7. Highest Jurassics, Plain of Bhuj.
8. Jooria Hills (Kim., Oxf. Callov.)
9. Runn—overlying out-crops of Jurc. (Kim., Oxf. and Up-Callov.).
10. Putchum: Gora Donger, Low-Callov. and Bath.
11. Putchum: Kala Donger, Bathonian.

The question at present is this:—Is No. 6, the Katrol-Charwar range, faulted or not along its N. side: or does it curve under No. 7, the Bhuj plain. As said before, the N. scarp of the 'Vanguard' hills of the Fakirwadi section looks as if faulted: there is no sign of any N. slope of an anticline. But in many other parts of the range—Samatra, Bharasar, parts of Fakirwadi, and the Ler-Hamundra section, the last that one sees of the range of hills before one gets down on to the Bhuj plain, is the N. slope of an anticline, with E. and W. axis. Hence though faulted in parts by extra strong folding or crushing, I am inclined to believe that the beds of No. 6 do curve under No. 7, to reappear at 8 (the Jooria-

Habye-Keera line). From 8 the beds do undoubtedly curve down; and though it seems that their next rise and out-crops is covered by the Runn, yet the beds below them are found in Putchum Island. The highest (latest) beds of Putchum are as a fact the same as the lowest beds of Keera (see Waagen's note on *Steph. grantanum*) : and the northerly out-crop in Putchum (No. 11) shows the lowest and earliest Cutch beds. But after all to fight over the question of No. 6 being faulted or curved is not so very interesting, and I dare say I am wrong.

Ler lies 7 miles S.-E. of Bhuj at the foot of the Charwar Hills. Hamundra is a tank 3½ miles S. of Bhuj at the foot of the same hills. The distance




from Ler to Hamundra is 5 miles. As 1½ miles E.S.E. of Hamundra the great Ellipse begins. Its length is 3½ miles: its breadth across the middle about 1½. Its ends off in a fine curve of hills steeply dipping outward, just S. of Ler village ; a nulla and broad valley separate it off from the wider moss of hills behind, so that it forms a complete unit. The backbone of the Ellipse is a range of ridges, flat topped or slightly domed, perhaps 300 feet above the plain, set a bit south of the long diameter, their crest and slope to the North being eroded.

The South side of the Ellipse can fairly quickly be dismissed: it is a fairly steep slope of S. dipped hills running down to the nullah. The nullah bed first drains the white grey shales of the higher Katrol beds: soon it is found flowing over the smooth floor of the hard brown pavement of the lower Katrol. Presently it has cut down to the yellow crimson pitted pavement of Dhosa Oolite with its swarms of Belemnites and other Molluscs standing out in relief. Further west it reaches Athleta beds, and leaves a cliff on its right of D. O., and, over it, Katrol. On gaining Anceps beds, it scours the soft shale well out, and the cliff on the right shows a good exposure of the white muddy shales and big white nodules of the *Athletas*, below the D. O. belt. And on this Anceps floor it sweeps round the curve to Ler, leaving the Sub-Anceps or "Vanguard" hard brown sheets upstanding on its left. The beds of Katrol, D. O. and Athleta curve round too on the right and run up in a tongue to Ler: but their back only dips down slightly to the east, soon rising again to form the back of another Ellipse which starts just beyond Ler and runs east. Besides being an excellent means of following out the succession of strata, the nulla is a perfect mine of fossils. The characteristic fossils of the Katrol beds—*torquatus, katrolensis, bathyplocus, chlorcolithicus*, &c.—stand out in relief on the hard brown rocks. Thorny *Aspidoceras* and worn *Stephanoceras* may be found amid the mollusc swarms of the D. O. slabs: while lower down, there is a regular jumble of all sorts: big ironstone Katrol specimens, D. O. *Belemnites, Athleta Harpoceras, Anceps Omphalodes*, and large plate-shaped Ammonites of the Vanguard slabs—like *Paramorphus* or *Congener*. In such a medley a new fossil's origin cannot easily be traced. One fragment of a huge Oppelia has a whorl of the following dimensions:—height 97 mm., height from preceding whorl 60: breadth 41: with a series of 8 lobes

visible from siphon to umbilical edge; but I cannot say from which bed it came. So with some others. Katrol beds have produced three specimens of what looks like *Phylloceras mediterraneum*, of which Waagen says:—"In Europe this species has a very large vertical distribution and ranges from the Bathonian to the uppermost Jurassic group: not so in Kachh, where it seems to be limited to upper Callovian beds" (Athleta). My specimens from Katrol beds (Kimeridge) agree very closely with Dr. Waagen's description except that the second lateral lobe is almost as long as the first: and in the one specimen which is almost (*ad hoc*) complete there are 6 furrows to the half whorl.

The hills at the east end of the Ellipse—inside the nullah bend—are of the Sub-Anceps or "Vanguard" type, hard crimson brown rock in great sheets. At one place they hold a swarm of small white *Trigoniae*: in other slabs some big Ammonites like *Paramorphus* or *Congener* can be found: they seem like some of the numerous plate-shaped fossils of Belt 6 (Sub-Anceps) of Keera, but the 1st lateral lobe prevents their being *Paramorphus*, nor do they quite agree with *Congener*.

The hills at the west end also curve (or nose) round in the same way, but are more difficult to trace, nullahs having broken through westwards and left much debris. At this end, a high point on the south side shows a protruding ridge of rock, which can be traced for some distance W., gradually sinking. This belt is of D. O., and the rocks capping it are of the Katrol beds, of the black-grey quartz-speckled variety. The slope below the D. O. is of Anceps with many *Terebratula biplicata?* a few *Anceps* fragments, *Rhynconellae* and other Molluscs common to Anceps beds.

The north side of the Ellipse varies. For some distance at each end (E. and W.) we have the outer rocks all dipping very steeply N. Towards the west, the relics of this wall are seen in four great humps, at the top of which Katrol beds, with fragments of *Per. torquatus*, lie; a bit lower on their inner face (S), the D. O. belt crops out; and below it the crimson and white Anceps beds. On the similar hills at the east end (N. side) the Katrol, D. O. and Anceps beds have been worn down almost to the level of the Bhuj plain, the high upstanding hill being of Vanguard or Sub-Anceps type.

But for about a mile in the middle, we find that the outermost rocks (N.) are dipping S., leaving a scarp exposed to the north. This seems to be due to a secondary anticline, pushed up by the mass of hills behind and faulted, or more probably sea worn, for by following out the top of this ridge eastwards, a complete anticline, running parallel with the main anticline, is observed. A. N. and S. section of the east and west ends, and of the middle appear thus:—

Fig i.

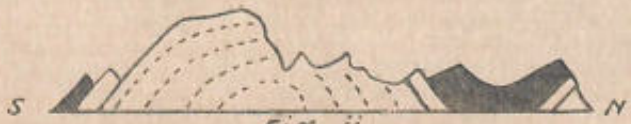


Fig ii

The N. syncline shown in Fig. ii is very conspicuous at a point S. of the village Bajodi. Here the Dhosa Oolite and the superjacent red Katrol beds come to an end in the form of the end of a paper boat with steeply inwardly-dipping sides; and 200 yards from its upstanding curved end rises a biggish cone of Katrol beds, just like the "mast" of a paper boat—a similar but much wider basin appears at the west end of the syncline.

The D. O. along this syncline is very hard and tough: few Ammonites have weathered out, but I have found what I believe to be *Pelt. arduennense*, *Per. rota*, and *Asp. baheanum*, all known to be natives of D. O. seas. The Athleta beds are here covered up with debris: but an *Athleta* fragment was found on its expected level. Fragments of *Per. anceps* and *Per. obtusicosta* were picked up on the Anceps beds.

So far I have described the outer shell of the Ellipse. Now for the kernel, which is interesting. The west end of the Ellipse shows the subjacent beds best, for there I have found the best-preserved fossils.

From under the ordinary Anceps beds, there emerges a great sheet of hard brown Vanguard rock, running up to a crest. (Sub-Anceps 1): next a mass of cold crimson shale, much like proper Anceps (Sub-Anceps 2): below that another flat expanse of slab rock (Sub-Anceps 3), much like Sub-Anceps 1.; and below that nothing but weather-blackened cold grey sandstone, in places impregnated with lime, to a considerable depth. Sub-Anceps 1 is not a good fossil field: at the east end I have found some small white *Trigoniæ*: also the large plate-shaped *Congener?* or *Paramorphus?* In the shales, Sub-Anceps 2, a long hunt only unearthed two small broken *Harp. crassefalcatum* (?).

In Sub-Anceps 3 a fairly good crop was gathered:—fragments of *Steph. fissum*; *Steph. opis*; *Perisph. Perdagatus*, *Balinensis* and one like *Congener*; *Naut. calloviensis*; and others that might be *Perdagatus* and *Fissum* except for lobes. Now these finds show the similarity of these beds to the highest Sub-Anceps beds at Keera: but *there* the rock is of light yellow-brown: *here* it is of dark crimson-brown. Nearly all the specimens found in these Sub-Anceps beds here have brothers in the Keera highest Sub-Anceps or top-Macrocephalus beds. At the east end on a long transverse ridge running up to the highest cone, these lower Sub-Anceps beds—there of a coarse yellow-grey—contain worn fragments of what was not improbably *Per. altiplicatus*, another Macrocephalus-bed fossil: and also a *Bel. sub-hastatus* which, Waagen confines to Macrocephalus beds.

Thus far down these Sub-Anceps beds here seem to agree with the outer Macrocephalus ring of Keera. But here comes the rub. At Keera below this outer ring, comes the inner, lower, ring of crowded molluscs and of corals: then thick belts of golden oolite; and then yellow and purple shales, all stocked full of Ammonites, chiefly *Stephanoceras*. Here on the other hand below the Sub-Anceps bed, we get nothing but the cold grey weather-blackened sandstone, without the sign of a fossil. Black, grey and grim these beds extend from east to west of the Ellipse, forming the whole kernel of the range. They dip conformably, it seems, with the dip of the shell, but I am not satisfied about this. The mass it is impossible to describe without instruments. Roughly there seems to be a series of concentric semi-circles, thrown out from the main backbone ridge like onions with peeling layers, curving ridge separated from ridge by deep hollows. Three such onions take up 2 miles. If the beds are conformable with the beds of the shell, one would have looked for the same beds as at Keera where conformity is clear; whereas the actual beds are so essentially different from the Keera ones. If they are conformable, one must seek for the explanation of the difference of the sub-beds of this anticline from those of the parallel (15 miles north) anticline

of Keera and Jooria in the theory of deep and shallow water having existed in the two latitudes.

Anyhow you could not want a better hunting ground for the Cutch upper Callovian, Oxfordian and Kineridge fossils than is to be found in this Ellipse.

J. H. SMITH.

BHUJ, 20*th March* 1913.

(*Where Ammonites are named in the above, it should be understood that their identity is not yet established. They merely appear to Mr. F. H. Stone and myself to agree with those described and illustrated by Dr. Waagen.*)

## No. XXXVI.—CUTCH AMMONITE BEDS.

Writers on Cutch Palæontology have followed Dr. Stoliczka's classification of beds. Summarized, it comes to this—

| | | | | | |
|---|---|---|---|---|---|
| | | No. 0 Trap Rocks. | | | |
| Umia ... | No. 1 | with Crioceras ... ... | ...=Aptian ... | 3,000 feet. | |
| | „ 2 | „ Cycadaceæ ... ... | ...=Barremian... | | |
| | „ 3 | „ Per. eudichotomus ... | ...=Neocomian... | | |
| Katrol ... | No. 4 | „ Phyll. ptycheicum ... | ...=Kimeridge... | 1,000 | „ |
| | „ 5 | „ Steph. maya ... ... | ...=Sequanian... | 50 | „ |
| Charee ... | No. 6 | „ Asp. babeanum ... | ...=Oxfordian... | 25 | „ |
| | „ 7 | „ Pelt. athleta ... ... | ...=Callovian ... | | |
| | „ 8 | „ Per. anceps ... ... | ...=Callovian ... | 1,000 | „ |
| | „ 9 | „ Steph. macrocephalum | ...=Callovian ... | 500 | „ |
| Putchum... | No. 10 | „ Opp. serriger ... | ...=Bathonian... | 500 | „ |
| | „ 11 | „ Trigoniæ, Corbulæ, Cucullææ | ...=Bathonian... | | |

Mr. Vredenburg (Sum. Geo. Ind.) has given the above depths. What strikes one at first sight is the great disparity in the "Zoning": Why should Athleta beds of 25 feet have as great a standing as the 500 feet of No. 10. Probably with the modern recognition of more numerous zones, an expert could sub-divide several of these beds into more minute divisions. I should fancy from what I saw of it that the No. 9 bed as exposed at Kéera might well be found to consist of definite zones of various forms of Stephanoceras.

I do not know where the line between the Umia and the Katrol beds is drawn. Umia beds are classed as Cretaceous, Katrol as Jurassic. Waagen is of opinion that the higher beds which here lie under the stratified traps are cretaceous: but as yet the few cretaceous fossils found come only from Umia, some 50 miles W. N. W. of Bhuj. Now between No. 6 and No. 0 lies a very great depth of beds—mainly flaky shale below, and sandstone slabs and rock above. To cross this extent of Katrol and Umia beds, you drive 11 miles along the Bhuj-Mandvi road, pretty well at right angles to the strike; and as you go the exposed rocks are all dipping—more or less—to the south: and the road is fairly level. The 6th milestone is just at the upper edge of Belt 6: and the 17th marks the change to Belt No. 0. And Belt No. 5 does not exist here: so if you allow Belt 4,500 feet depth, the eleven miles carry you through only 3,500 feet of uptilted strata.

Descending from No. 4 to No. 9 the beds are mainly of shales with thin sheets of rock of various natures laminated among them. These harder beds serve to mark the distinctions of the lower Ammonite beds. Some kinds of Ammonites managed to struggle through from one bed to the next, but the majority of species are confined each to its own layer. The Katrol beds proper (No. 4) along the Charwar out-crop lie flat on the Dhosa Oolite (No. 6). [No. 5 is a local bed, and its claim to rank as intervening here

was decided on palæontological grounds (Waagen p. 230). Anyhow it is absent in the western half of Cutch. Its chief appearances are noted at Kuntkote in N. E. Cutch and the Island of Gangta Bet in the Runn: it appears to be of a red sandstone.] The layers of Katrol rock are of a very hard red-brown sandstone; in places, a black grey with minute quartz pebbles. In one spot (N. W. of the tank on the Bhuj-Bharapur road) the layers succeed one another closely with hollows where the intervening shales have been washed flat. They seem to be here of a depth of about 300 feet. They contain very numerous specimens of *Per. torquatus, katrolensis, bathyplocus, Pottingeri, chloroolithicus*: also *Asp. Iphiceroides, binodiferum* and several of the Hybonote group (not supplied to Dr. Waagen); *Phyll. mediterraneum* (?), and others (not given by Waagen); *Opp. kachhensis, trachynota* and others, some being very big.

No. 6. (Dhosa Oolite) is a very marked and easily recognizable layer, quite distinct from the Katrol beds above and the Athleta and Anceps beds below. The main layer of rock is of a very hard crimson and yellow calcareous sandstone. It forms long ridges, often protruding distinctly from a hillside or from a plain. The underlying shales which complete the bed are of a yellowish grey. Where a stream has run along the back of D. O., it leaves the rock exposed in great sheets, pitted but very compact and unworkable. Big *Aspidoceras* (*perarmatum* and *babeanum*) and big *Stephanoceras* (*Transiens* and others) may be found protruding, but have to be abandoned because of the hardness of the rock. *Belemnites* and hosts of other molluses swarm in the rocks. If anywhere you come across an angular cube of yellow green rock with a steely blue Belemnite inset, you may be pretty sure that D. O. is not far off. Even away from water, where wind and decay have swept clean the back of a sloping D. O. layer, you will find a great pavement of slabs with big Stephanoceras preserved in fairly good condition and more broken-up discs of large *Aspidoceras*. Judging from big fragments often picked up, some kinds of *Aspidoceras* must have been huge. At Bharasar where the ledge of D. O. protrudes from under the side of the Charwar hills, one can collect great numbers; being dry-weathered they come out of the rock much more easily than they do from a watercourse. Of other species, *Per. rota* is very common; some good *Phylloceras* can also be had, and not a few *Harpoceras*. One *Hecticum* (verified by Mr. Burton of Calcutta) was a welcome find. The 50 ft. assigned by Mr. Vredenburg fairly represents the average depth of the D. O. bed.

No. 7. (Athleta beds) has been estimated at 25 feet. In many parts of the Charwar line, the beds do not appear, but are perhaps only covered by debris. Where they occur in a nulla, they are of a white clay shale with layers of big rounded white nodules. In the Fakirwadi "Bowl" they seem to me to alternate for a bit with the crimson Anceps layers. At Samatra the prevailing tone of the beds is a golden colour or a greeny yellow; and perhaps there they are deeper than 25 feet; but it is not easy to draw the line of the beds. *Pelt. athleta* is found in this level only: even where the beds are apparently non-existent between D. O. and Anceps a fragment of *Athleta* may be found here and there. But the soft nature of the bed shale has left no full specimen of this kind findable. To find anything beyond the fragment of one whorl is rare. But other specimens are not so bad. Excellent *Harp. dynastes* and *lairense*, and fairly complete *Asp. ponderosum* are obtainable. The absence of *Stephanoceras* is to be marked. This family swarmed in *Macrocephalus* times and again in D. O., but it seems to have been in abeyance in Anceps and Athleta eras.

No. 8. Anceps beds. The matrix is of white, soft, often gypseous

shale: seams of crimson iron nodulelets or cubes thread the shales, and the exposed surface is a mass of small crimson debris, soft to walk over. A similar belt also occurs in the shales above the Katrol brown rocks; so one cannot be sure of being on Anceps ground until one has noted the overlie of the D. O., or found 'Anceps' fossils. The thickness is not given: I should put it down as about 200 feet, varying of course. You can be pretty sure of picking up something nice in a belt of Anceps rock. *Perisp. omphalodes* is fairly common and in good preservation. *Perisph. obtusicosta* is not infrequent, but seldom complete. Waagen says *Per. anceps* is rare: but on the S. E. side of Keera Hill, they are fairly plentiful. Here too I found two pretty *Per. pseudorion*. *Phylloceras* of the *feddeni* type occur: also *Lytoceras adeloides*.

No. 9. Macrocephalus beds are best seen at Keera Hill, as recently described. The sub-Anceps beds in the Ler-Hamundra Ellipse (along Charwar) contain many specimens of the same species as are found in the upper Macrocephalus beds at Keera. *Steph. fissum* and *Opis*: *Perisph. Balinensis*, *Perdagatus*, &c.: so though the two beds have a different colour and structure, yet they belong to the same period. Waagen has divided the Keera beds roughly into golden oolite below and Macr. shales above: but where the thickness is so great, quite 1,000 feet, I should say, this seems capable of improvement. In my previous notes, I gave a rough description of the succession of beds there, but it needs expert diagnosis to mark out actual zones. The upper layers at Keera contain *Lyt. adeloides*, *Phyll. disputabile*; *Harp. ignobile* and *Crassefalcatum*, and *Steph. fissum*; the beds below it numerous other species of *Stephanoceras*.

No. 10. Putchum beds. Waagen says that *Opp. cf. Serrigera* marks this upper Putchum bed: however his 3 specimens came from Nurrha, which is on the Cutch mainland, not from Putchum island. I suppose beds lower than Callorian are found at Nurrha as well as in Putchum. Putchum itself produces, it seems, only very badly preserved specimens: and no Ammonites have been found yet in the lower Putchum Stratum, No. 11.

Waagen calculated the main Putchum beds to be Bathonian, chiefly on the character of Molluscs other than Ammonites. The upper-most Putchum beds are Callovian (see his note on Steph. Grantanum).

But though at Keera the Macrocephalus beds full of Ammonites come in regular succession below the Anceps beds, yet in the Ler Hamundra Ellipse only the top Macrocephalus beds appear, to be succeeded by considerable depths of grey sandstone without the sign of an Ammonite. Of this I write above.

J. H. SMITH.

# PROCEEDINGS

## OF THE MEETING HELD ON 18TH MARCH 1913.

AN "At Home" of members and their friends of the Bombay Natural History Society took place on Tuesday, the 18th March 1913, H. H. the Rao of Cutch, G.C.I.E., presiding.

### NEW MEMBERS.

The election of the following 24 members since the last meeting was announced :—

Mr. E. R. Stakelum, Bombay; Mr. C. C. Garbett, I.C.S., Lahore; Mr. E. Alban Williams, Bombay; Mr. E. J. Godfrey, B.Sc., Bangkok; Capt. G. A. Nevill, Sadiya, Assam; the Honorary Secretary, Upper Burma Club, Mandalay; Miss E. A. Montgomery, Broach; Mr. B. C. Rake, Burma; Mr. M. P. Walsh, Bar.-at-Law, Akola, Berar; the Mess President, 98th Infantry, Saugor, C.P.; the Librarian, Students' Library, St. Xavier's College, Bombay; Mr. J. H. Sanders, I.C.S., Ahmednagar; Mr. W. E. Copleston, I.F.S., Belgaum; Mr. R. E. Haslam, Travancore; Capt. H. W. de B. Prescott, Bombay; Mr. R. Trevor Jenkin, I.F.S., Saugor, C.P.; the Honorary Secretary, Library, Peshawar Club, Ltd., Peshawar, N.W.F.P.; Mr. H. D. Coggan, Kamptee, C.P.; Major J. H. Barbour, R.A.M.C., Kamptee, C.P.; Director of Agriculture, Federated Malay States, Kuala Lumpur; Mr. D. D. Nanavati, I.C.S., Burma; Mr. P. A. R. Barron, Bangkok; Mr. Charles S. Prince, Travancore, and Capt. T. R. H. Keppel, Bombay.

### ELECTION OF OFFICE BEARERS.

The following gentlemen were elected as office bearers for the present year:—President, H. E. the Right Hon. Lord Sydenham, G.C.M.G., G.C.I.E., G.C.S.I., F.R.S.; Vice-Presidents, Mr. J. D. Inverarity, B.A., LL.B., Rev. F. Dreckmann, S.J., and the Hon. Mr. Justice N. C. Macleod; Honorary Secretary Mr. W. S. Millard; Honorary Treasurer, Mr. L. H. Savile; Managing Committee, Rev. J. Assmuth, S.J., Mr. T. Bainbrigge Fletcher, F.E.S., F.Z.S., Mr. T. R. Bell, I.F.S. Mr. C. L. Burns, Mr. E. Comber, F.Z.S., Lt.-Col. G. H. Evans, F.L.S., C.I.E., Capt. W. H. Evans, R.E., Prof. G. A. Gammie, Mr. E. E. Green, F.E.S., Mr. F. Hannyngton, I.C.S., Mr. G. S. Hardy, I.C.S.; Mr. N. B. Kinnear, Lt.-Col. K. R. Kirtikar, I.M.S. (Retd.), Major W. G. Liston, C.I.E., I.M.S., Mr. McNeill, I.C.S., Dr. A. Powell, Mr. E. L. Sale, I.C.S., Mr. R. A. Spence, Major F. Wall, I.M.S., C.M.Z.S., and Mr. John Wallace, C. E.

### THE ACCOUNTS FOR 1912.

Mr. L. H. Savile, the Honorary Treasurer, said in presenting the accounts for the year ending 31st December 1912:—The opening balance at the beginning of the year was Rs. 3,540, the closing balance being Rs. 3,120, showing a deficit on the year's working of Rs. 419. The expenditure during the year was Rs. 37,439, an excess over last year of Rs. 5,947, while the receipts were Rs. 37,019, which is Rs. 4,822 in excess of 1911. So that in spite of a very fair increase in the receipts, the expenditure has exceeded the income. The amount paid in subscription by members during 1912 was Rs. 24,783. The amount actually received for 1912 subscriptions including those paid in 1911 was Rs. 22,431 and there will probably be about Rs. 1,000 still to come in 1913. So we may take it that the amount of subscriptions for the year under review is Rs. 23,500 representing 1,560 members, in addition to 106 life members. The cost of the Journal, plus postage, printing, and stationery and salary of staff (less that of the Keeper of the Museum), amounted to Rs. 24,705 and as

this represents the cost of the production and issue of the Journal it shows that the subscriptions received from the members does not cover the cost of the production of the Journal in its present form. The number of new members this year as shown by entrance fees was 195, a good increase over last year. As I intimated last year I think the time has now come if we are to maintain the work of the Society in the efficient manner that it is now being carried on, to seriously consider the question of an increase in the annual subscription of members and I would suggest that after the end of the current year the subscription be increased from Rs. 15 to Rs. 20 per annum which would place the Society on a sound financial basis and I hardly think that members, taking into considertion the value they now get in the Journal will object to this small increase.

Mammal Survey Fund.—The opening balance of this fund was Rs. 17,090 and the closing balance Rs 15,517, showing an expenditure over receipts of Rs. 1,572. Donations received during the year amounted to Rs. 11,541. We have had two collectors, Mr. Crump and Mr. Shortridge, working during the year, and it has been decided that the receipts justified our obtaining a third collector ( Major Mayor ) who will start work early in 1913. The total amount received towards this fund up to the end of 1912, including interest on deposits, amounted to Rs. 35,703 and it is hoped that sufficient further donations may be forthcoming to enable the Society to complete the Mammal Survey of India, Burma and Ceylon.

## EXHIBITS.

Mr. G. C. Shortridge exhibited a collection of mammals from Coorg. While there he received a very large amount of assistance from Mr. J. A. Graham, Mr. F. Hannyngton, I.C.S., Mr. H. Cuthell and others, the consequence being that the collection is an exceptionally fine one, comprising a large number of species not hitherto obtained by the Survey. Among the most interesting of these were, the black langur—not previously known to occur North of the Nilgiris—the large short-tailed fruit bat, the leopard cat, Jerdon's toddy cat, the striped necked mongoose —the largest representative of its genus in Asia—the Nilgiri brown mongoose, the hill and clawless otters, the South Indian marton, the pigmy striped squirrel, and the Malabar spiny rat. The others include a very interesting series of three forms of the large Malabar squirrel and the flying squirrel. Besides the species not represented in previous collections—many of the others obtained show very striking variations from those collected further north.

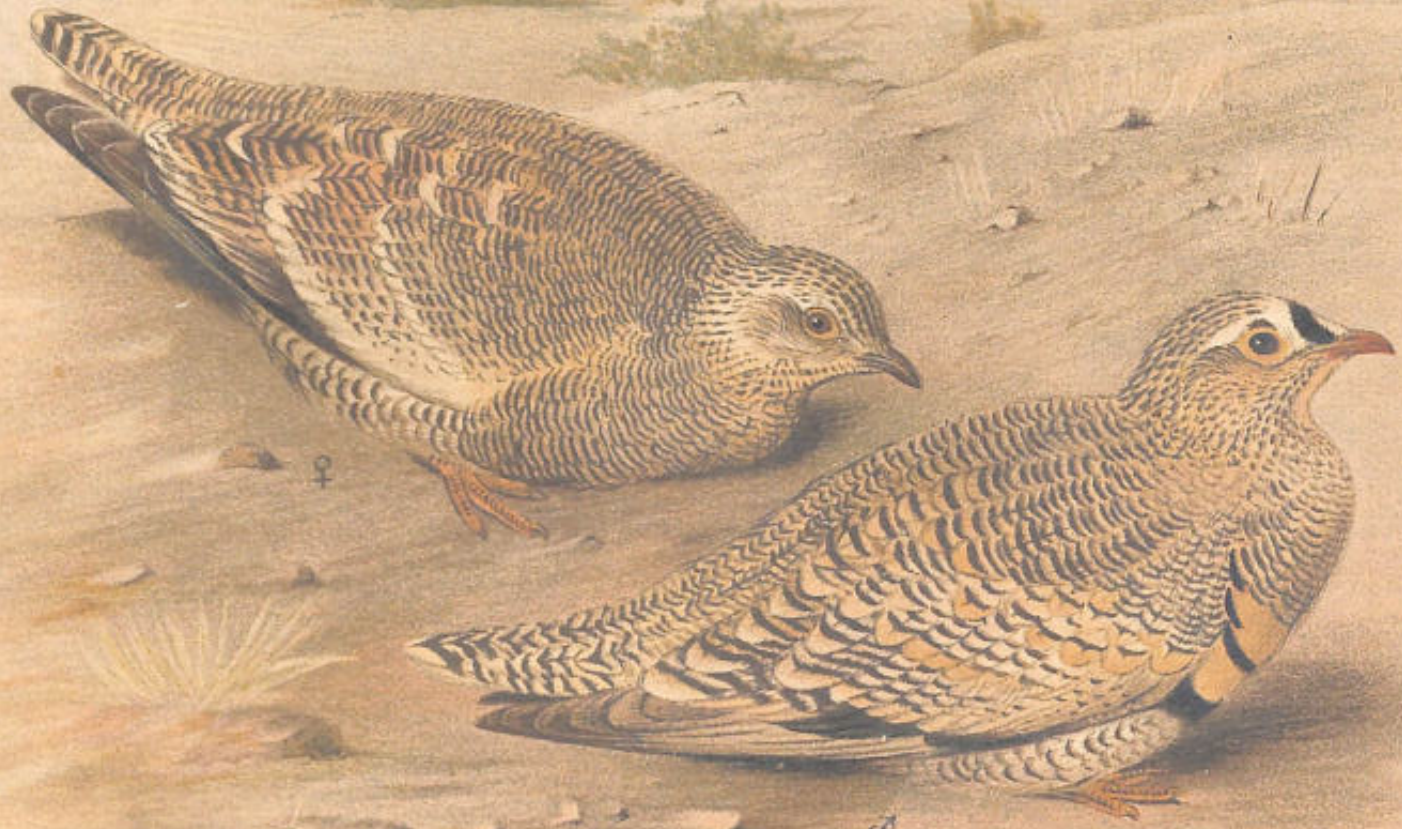
Mr. Mahaluxmiwala exhibited the flowers of the following trees and shrubs grown in the Victoria Gardens, Bombay :—" Cochlospermum gossypium," " Brownea ariza," " Brownea coccinna," and " Pachira insignis."

H. H. the Rao of Cutch congratulated Mr. Shortridge on the interesting collection of animals which he had made in Coorg and which they saw before them and expressed a hope that his work in Burma and Major Mayor's efforts in Ceylon would result in further valuable collections. His Highness said that he took great interest in the work of the Society and particularly in the Mammal Survey.

A vote of thanks was passed to His Highness for presiding and the meeting terminated.

Owing to the large numbers of specimens exhibited by Mr. Shortridge no specimens presented to the Society since the previous meeting were exhibited.

A full acknowledgment list will however appear in the account of the next meeting.




LICHTENSTEIN'S SANDGROU steini).

JOURNAL
OF THE
Bombay Natural History Society.

DEC. 1913. VOL. XXII. No. 3.

# THE GAME BIRDS OF INDIA, BURMA AND CEYLON.

BY

E. C. STUART BAKER, F.L.S., F.Z.S., M.B.O.U.

PART XI.

*With Plate XI.*

*(Continued from page 229 of Volume XXII.)*

## PTEROCLES CORONATUS ATRATUS (*Hartert.*)

*The Coronetted Sand-Grouse.*

*Pterocles coronatus.*—Lich Verz. Doubl., p. 65, (1823) Hume *ibid.*, 1872, p. 468; *id.* Str. Feath, 1, p. 224; Wise *ibid.*, iii, p. 267; Hume *ibid.*, p. 41; Wise, *ibid.*, p. 230; Blanford, East Persia, ii, p. 272; Hume, Str. Feath, vii, p. 161; Hume and Marshall, Game Birds, 1, p. 57; Butler, Cat. Birds of Sind, etc., p. 53; Tufnell, Str. Feath. ix., p. 200; Barnes, *ibid.*, pp. 219, 458, Lean, *ibid.*, p. 296; Barnes. B. of Bombay, p. 209; *id.* Jour. B. N. H. Soc. v., p. 336; Ogilvie Grant, Cat. B. M. xxii, p. 23; Blanford Fauna of B. I. Birds iv., p. 37; Oates Game Birds of India, i., p. 41; Ogilvie-Grant, Game Birds, i., p. 18; Le Mess. Game Birds, p. 57.

*Pteroclis coronatus.*—Sharpe, Hand List, p. 51; Oates, Cat. Eggs. B. M. i., p. 51.

*Pterocles coronatus atratus.*—Hartert Bulletin, B.O.U., February 1902.

*Vernacular name.*—Katinga. *(Sin.)*.

*Adult male.*—Centre of forehead white, a broad patch of black on either side carried round the base of the bill and down the centre of the throat as a broad streak; crown dull vinous grey or vinous buff, surrounded by a pure French grey which forms a broad supercilium

and divides the crown posteriorly from the bright, deep ochre of the collar on the neck; lores and next the anterior black of the chin and throat, white merging into the yellow ochre of the side of the face, throat and neck. Rest of the upper parts is abelline, the feathers of the inter-scapulary region and the lower back and upper rump with pale centres giving a faintly mottled appearance to these parts; scapulars the same but with a bar of grey below the pale spot produced on either side towards the tip. Primary coverts and bastard wing brown, primaries brown, the fifth edged pale buff on the tip of the inner web, this buff tip increasing in width on each succeeding feather and forming a broad buff band obliquely across the inner primaries, secondary coverts buff, median coverts rufous buff or vinous buff, with pale centres and oblique grey patches on the outer visible webs; small shoulder coverts vinous buff gradually changing into the same as the median coverts, as these are approached. Lesser and median underwing coverts and axilliaries white; under-primary coverts brown. Body below buff, greyish on the upper breast next the head and more ruddy buff on the abdomen. Feathers round vent dull chestnut brown, undertail coverts white, the bases chestnut brown; feathers of thigh and tarsus buff, the latter often marked with chestnut brown. Tail isabelline, the central rectrices faintly tipper paler, the other feathers rufous-buff broadly tipped white and sub-tipped dark-brown.

The principal variation in the colour of the upper parts of the male bird is in the extent of the pale markings to the scapulars and dorsal plumage; in some birds these are very large and make the upper part appear paler and brighter in tone. The general tint of Asiatic specimens varies a good deal in depth but there are none so pale as the same bird beomes in North Africa and Spain. There are but three males in British Museum Collection other than those from India or adjacent countries, but these can be separated at a glance from the rest by their very pale vinous isabelline of their upper parts.

The colour of the forehead between the two black patches varies from pure white, which is rare, to the same colour as the crown.

Below the birds vary in purity of colour and extent of white on the abdomen, but Asiatic and other specimens vary equally *inter se* in this respect.

Asiatic birds in the British Museum Collection average; wing 7·30" (=185·4 mm.); tarsus ·89" (= 22·6 mm.) and bill ·43" (= 10·9 mm.) and the three African birds, wing 7·81" (= 198·3 mm.); tarsus 1·00" (= 25·4 mm.) and bill ·50" (= 12·7 mm.). Weight 8½ ozs. (Lean).

"In the *immature male* the tips of the primaries, centre pair of tail-feathers and some of the secondary coverts and scapulars are buff vermiculated with black." (Ogilvie Grant).

*Adult female.*—Crown vinous buff, each feather with a central streak of black; lores, supercilium and round, the eyes grey, with fine black striæ; chin, throat, foreneck and sides of the head ochreous yellow, less vivid than the male and spotted with black, much so in young birds, scantily so in those fully adult; the yellow is produced round the hind neck as a rather indistinct collar. Whole upper surface dull, sandy buff, each feather barred with black, those of the upper back being also sub-edged black, and having a small black centre spot. Inner secondaries and coverts like the back but with the ground a clearer buff; primaries and primary coverts coloured like those of the male; underwing coverts and axillaries white. Breast dull buff, each feather sub-edged black forming crescentic bars which gradually become less and less defined, becoming mere dots on the stomach and thighs and disappearing altogether on the undertail coverts and tarsi, the feathers round the vent and the extreme bases of the undertail coverts are dull reddish-brown.

The extent of the yellow on throat and neck varies equally in both sexes, otherwise Asiatic females vary above very little *inter se* and this only as regards the general tone, some birds being darker than others, caused by the amount of black marking being more numerous, and again some birds being very lightly marked on the abdomen. Western female birds are distinguishable as easily as the males having a beautiful vinous pink tinge above and below with fewer black bars and spots.

The females in the Tring Museum shew the differences, if anything more than the males.

The females average slightly smaller than the males. Asiatic specimens, wing 7·24″ (= 21·8 mm.); tarsus ·87″ (= 183·8 mm.) and bill at point ·44″ (= 11 mm.). African specimens have these parts averaging 7·41″ (= 18·8 mm.), 1·01″ (= 25·6 mm.) and ·49″ (= 12·1 mm,) respectively. Ogilvie-Grant gives the average of the wings of the females in the British Museum as 6·6″ (= 167·3 mm.) only.

The Tring Museum has more African specimens of the Coronetted Sand Grouse than the British Museum and these have been placed at my disposal by the Hon. Walter Rothschild for examination.

In 1902 Dr. Ernest Hartert described, in the bulletin of the British Ornithologist's Club for February, our Indian bird as a sub-species of *Pt. coronatus* and gave it the name of *Pt. coronatus atratus*, and this is the name our bird will have to bear.

An examination of all the material available to me seems to show that this species is divisible into three races or sub-species. I have examined in Tring and the British Museum 39 Asiatic birds and 15 African birds, besides a further considerable series in India of both sexes, for the difference in the three races is as marked in the females as in the males.

The Asiatic birds, with the exception of three from Palestine, are birds with the dominant tone on the upper plumage buff and with the dark markings very profuse and therefore the general aspect of the bird decidedly dark.

The African birds, with the exception of one from the Nile, have the back a most beautiful vinous isabelline tint, the markings very sparse and the general aspect altogether paler than the Asiatic form.

A single specimen from the Nile and three specimens from Palestine are intermediate between these two races having the upper parts vinous as in *Pt. c. coronatus* but of a deeper tint and also rather more marked with black. The bird from the Nile perhaps more nearly approximates the African specimens whilst the three from Palestine are nearer the other Asiatic sub-species.

The African birds, as I have already said, are also decidedly larger than the Asiatic, the birds from Palestine and the Nile being intermediate in size as well as colouration. Thus all the African birds examined have a wing averaging ♂ 7·92 ♀ 7·48. The Nile and Palestine birds ♂ 7·56 ♀ 7·31 and the Asiatic including the Indian birds measured which not in the British Museum Collection ♂ 7·28 ♀ 7·05.

Ogilvie-Grant has noted in reference to the differences above referred to " in some African specimens, the whole of the upper parts are washed with vinacious, and the black marks and bars on the upper parts and chest are very much reduced, nearly absent on the scapulars, while the throat, breast and belly are immaculate."

*Distribution.*—Coronetted Sand-Grouse are found throughout North Eastern Africa from Algeria and Tunis in the North-West, through the Sahara and parts of the Soudan, Egypt, Nubia the Eastern Soudan and parts of Abyssinia, Arabia, Palestine, Persia, Afghanistan, Baluchistan and so into India.

Within Indian limits our sub-species *atratus* it is found in the extreme North West from Fort Jamrud at the mouth of the Khyber Pass in the North-West Provinces all along the country between the Indus and Afghanistan and Baluchistan in that Province and in Sind. Outside this comparatively narrow slip it has hardly ever bee obtained although there are three specimens in the British Museu Collection obtained by Colonel Swinhoe in the Mhow district, whi is in Dhar, to the south of West Central India.

As far as can be ascertained from the scanty records now in existence, we find that the Coronetted Sand-Grouse enters Indian limits during the latter part of October and remains until about the end of March; as, however, it undoubtedly breeds in both Baluchistan and Afghanistan it may be found to occur in India in suitable places in almost any month of the year, even if it is never actually proved to breed in this country.

There is very little on record about this beautiful little Sand-

Grouse as to its habits, etc., when in India, Lieut.-Colonel J. M. Anderson informed Mr. E. Oates that he "shot several *Pterocles coronatus* in October in the Western desert near the hills of Karachi: they were in flocks of from six to twenty and were very tame: very different to *P. arenarius*, which was found one of the most difficult birds to approach."

St. John in the *Ibis* for 1889 speaking of this grouse writes:—"This is the only small Sand-Grouse of Southern Afganistan, and is very generally diffused, though nowhere numerous. It is commonly seen in small parties of a dozen or so, and is more active on the ground than other Sand-Grouse, running about and picking up seeds like a Partridge, whereas *P. alchata* and *P. arenarius* are leisurely and stayid in their gait."

"It breeds in the Helmund Desert, for I found it common between Kandahar and the river in July."

Mr. R. H. C. Tufnell has a rather curious note on this bird's flight; he says "Sir William Merewether tells me that the flight and cry of *P. coronatus* is quite different from those of all the other species. They have a curious fluttering flight, and appear often to hover in the air, especially before settling, and their cry is a twittering one." This, however, does not agree well with Whitaker's account of the same bird's flight. This is contained in the best and fullest account of the habits of the Coronetted Sand-Grouse I have come across, and I, therefore, though it is written of the African subspecies, quote it *in extenso*.

First in his "*Birds of Tunisia*," p. 243, he says of *P. coronatus* that it is "not at all uncommon in Southern Tunisia, and it also occurs in the Algerian Sahara and in Tripoli."

"It's range in the Tunisia appears to be confined to districts south of the Atlas, where, however, it is in some parts abundant."

"Then, in the Ibis for 1894, Whitaker writes in the article to which I refer, "During my journey I met with it at only one place, *viz.*, at Oglet Alima... where it was plentiful, coming in flocks of from ten to fifty birds to drink at the water holes made by the Arabs in the dry river-beds. I saw it first on March 12th, when the flight commenced about 7 a.m., and lasted till nearly 10 o'clock, after which hour the birds disappeared. During the remainder of the day I only met with an occasional straggler in the plains near Oglet-Alima, and think the bulk of the birds must have gone further south towards the desert, nor did they return to drink here in the evening. The following morning, however, they were at the water-holes again in full force. They are very strong on the wing and fly at a considerable height, ring a loud clucking note all the time, something like that of Common Fowl. So loud is the note and so high do the birds at they can often be distinctly heard when scarcely visibly to ted eye. Though very shy and difficult to approach they do

not leave the neighbourhood when disturbed but return to the water holes or their immediate vicinity till the hour arrives for their departure. As in *P. arenarius*, their feathers lie very closely together necessitating heavy shot to bring them down. The flesh of this Sand-Grouse is excellent eating and not at all tasteless, the breast having dark and light meat the same as the Black Game."

Later on in the same chapter he adds: "On the ground its walk resembles that of a Pigeon. Its note is very different from that of the two above species (*P. arenarius and P. alchata*) and may be very fairly well rendered by the syllable "Ka" or "Kla" repeated several times."

"In the stomachs of those which I have examined I never found anything but seeds and vegetable matter."

"I have never been fortunate enough to discover its eggs, but apparently this species is a late breeder, and does not lay until the middle of May."

"Loche states that he has taken the eggs of this species and that they are of a pale greyish colour, covered with indistinct violet grey and dull rufous markings and measure about 44 × 32 mm., but these measurements seem more applicable to eggs of the larger species of the Sand-Grouse."

*Nidification.*—Lieut. E. Barnes found the Coronetted Sand-Grouse breeding in Chaman in Afghanistan. In this place he flushed a pair of the sand-grouse both of which he shot, and at the spot from which he flushed them he found three eggs, unfortunately too hard set to preserve, so we have no description of them beyond the fact that they measured 1·5" by 1·06" (38·1 × 27· mm.)

There is another egg taken by the same Collector which is now in the British Museum. In colour the specimen is a very pale yellowish stone colour, rather than cream as described by Oates; the superior markings consist of small blotches, spots and specks of pale vandyke-brown, whilst the secondary or underlying spots are of pale lavender grey. Both are fairly equally distributed over the whole surface of the egg, perhaps rather more numerous in the central portion where they also seem to average darker in tint. The shape is, of course, the usual elliptical one of all Sand-Grouse, and the texture is smooth and fine with a strong gloss.

It measures 1·62" × 1·07" (41 × 27·3 mm.) and was taken at Chaman on the 27th May 1908. Elsewhere Barnes records the fact that these Sand-Grouse breed during May and June in Chaman, South of Afghanistan.

Tristram found it breeding in the South Sahara. He says: "I found it only in small companies of four or five, but this may have been owing to the extreme scarcity of plants in the district w'never it roams. The egg is of an ashy white, with a few almost oblite pale-brown markings." ıe Sand-

The only other egg I know of this Sand-Grouse is an oviduct egg, in my collection which I owe to the generosity of Mr. Chas. M. Inglis. This egg is a pale grey, or pinkish grey stone-colour and the markings consist of small blotches of pale sepia disposed in a thin ring at one extremity and scattered here and there over the rest of the egg. The secondary markings are of very pale lavender and consist of blotches, a good deal larger than the primary markings though still fewer in number and confined entirely to the ring-marked half of the egg.

The surface of this egg is very smooth and decidedly glossy; the shape is the usual ellipse and it measures 1·63" × 1·09" (41·4 × 27·6 mm.)

*(To be continued.)*

# SCIENTIFIC RESULTS FROM THE MAMMAL SURVEY.

By Kathleen V. Ryley.

V.

*In working out these results, Mr. O. Thomas, F.R.S., has very kindly given me the advantage of his help and advice.*

## A.—Two New Species of Spiny-Mice of the Genus Leggada from Coorg.

The Leggads collected in Coorg must be divided into two species; those taken in Wotekolli, at an elevation of 2,000 feet, differing from those obtained at Makut, at an altitude of only 250 feet. If the large series from Dharwar described as *L. platythrix* by Mr. Wroughton, is true *platythrix* (and if not absolutely the true *platythrix*, they are at least nearer to it than anything else we have), then neither of the series from Coorg can be classified as *L. platythrix*, but must be described as new species.

### Leggada grahami, sp. n.

*The Coorg hill Spiny-Mouse.*

A *Leggada* resembling *L. platythrix* in size, but differing from that species in having a greyer undersurface and slightly different skull characters and coarser spines. General colour dark-brown, decidedly darker than *platythrix* (the Dharwar specimens are taken for comparison, as the type is in spirit and the locality, being simply "Dekhan," is vague) which has a more buffy appearance; the spines, which are coarser and more numerous, are grey with brown tips, intermixed with grey hairs tipped with light-brown. The belly is white in the centre, but there is no distinct line of demarcation, the grey of the flanks gradually shading into white, the spines being white and the underhair grey, the underside of the legs is greyish also, and the feet are grey. The tail, which is thinly covered with short hair, is very dark above and slightly lighter below.

Mammary formula 3—2 = 10.

Skull like that of *platythrix*, according to measurements, but the mesopterygoid fossa opens squarely just behind the third molars, whereas in *platythrix* it commences further back and then is very much narrower. The palatal foramina are considerably shorter, only extending as far back as the first root of $m^1$, in *platythrix* they reach the second root of $m^1$; $m^3$ is also slightly smaller.

*Dimensions of type* (measured in the flesh).—Head and body 109mm; tail 72; hindfoot 18·5; ear 15.

*Skull.*—Condylo-incisive length 26mm.; basilar length 22·3; zygomatic breadth 13·5; nasals 10; diastema 8; upper molar series 5.

*Habitat.*—Wotekolli, South Coorg, altitude 2,000 feet.

*Type.*—Old female. B. M. No. 13.6.21.1; original No. 2202. Collected by G. C. Shortridge. The adults are very constant in colour, but the young present a lighter and more speckled appearance, as they have a larger number of buff hairs and also have a fawn lateral line of demarcation. The very young are dark, ashy grey, all over, and as they grow the fawn colour commences on the shoulders and gradually extends down the back.

I have pleasure in naming this species after Mr. J. A. Graham, who helped the survey most materially by, himself, collecting 100 specimens in North Coorg.

LEGGADA HANNYNGTONI, sp. n.

*The Coorg lowland Spiny-Mouse.*

A *Leggada*, exactly like the last species in general colour, but with a pure white undersurface and a larger hind foot.

General colour dark-brown, speckled with some buff.

Fur composed of grey spines with dark tips, intermixed with hairs tipped with buff. Undersurface composed of pure white spines and hairs with a distinct line of demarcation; feet white, tail dark-brown above and paler below, thinly covered with hairs.

Mammary formula 3—2 = 10.

Skull like that of *grahami* in all its characters.

*Dimensions of type* (measured in the flesh).—Head and body 120 (average of five specimens 110); tail 88; hindfoot 22·5; ear 17·5.

*Skull.*—Condylo-incisive length 29; basilar length 25; zygomatic breadth 15; nasals 12; diastema 9; upper moral series 5.

(The above measurements were taken on a very old specimen, the others being either young or having broken skulls, so that the dimensions given may be rather above the average.)

*Habitat.*—Makut, South Coorg; altitude 250 feet (below Ghats.)

*Type.*—Old female. B. M. No. 13.6.21.2; original No. 2297. Collected by G. C. Shortridge, 12th January 1913, and presented to the National Collection by the Bombay Natural History Society.

Mr. Shortridge obtained 5 specimens of this mouse, but unfortunately the skulls were all damaged except two.

I have named this species after Mr. F. Hannyngton, I.C.S., a member of the Society, whose keenness and assistance helped Mr. Shortridge in obtaining such good results in Coorg.

*B.*—RATUFA.

The fine series of Giant Squirrels received in this collection are of remarkable interest and add very materially to our knowledge of the group. As indicated by Mr. Shortridge in his field notes, they

belong to three different forms, of which two require new subspecific names.

There is firstly a series of a red-tailed form, like the Dharwar and N. Kanara *R. indica*, but so considerably larger as to need distinction.

Secondly, ten specimens from Kutta and Nagerhole are like the form described by Blanford as being that of W. Bengal, and, in fact, absolutely agrees with his type, which was unfortunately a specimen without locality and may have come from Coorg. Whether this form really occurs in Bengal still remains to be proved, but there is no question that the Coorg squirrel must bear the (possibly inappropriate) name of *bengalensis*.

Thirdly, one specimen taken across the Mysore boundary belongs to the form of which about twenty skins were received with the Central Provinces collection, and were provisionally referred by Mr. Wroughton to *bengalensis* but with the suggestion that it would probably have to be separated later, as I now find to be the case. The descriptions of the new forms are as follows:—

RATUFA INDICA SUPERANS, subsp. n.

Like the *Ratufa indica* of Dharwar but much larger, as indicated by the skull and foot measurements. Colours absolutely as in that animal.

*Dimensions.*—Head and body 410-440 (340-380); tail 440-505 (370-446); hindfoot 87-92 (73-77); ear 31-38 (25-33).

*Skull measurements.*—Greatest length 77·5-82 (68-74); basilar length 61·5-64 (53·5-59); tooth row 16-17 (14·3-15·5); diastema 17-18·2 (14-16); nasals 25-28 (22·8-25); zygomatic breadth 47·3-50 (42·5-45).

Figures in brackets refer to Dharwar and N. Kanara specimens of *Ratufa indica*.

*Habitat.*—Wotekolli, South Coorg; altitude 2,000 feet.

*Type.*—Old female. B. M. No. 13.6.21.3; original No. 2219. Collected by G. C. Shortridge on December 28th, 1912, and presented to the National Collection by the Bombay Natural History Society.

A series of 14 of the above specimens were obtained at Wotekolli and Makut.

RATUFA INDICA CENTRALIS, subsp. n.

Like *Ratufa indica bengalensis*, but with black shoulders. In size it is rather smaller than *bengalensis*, and in many cases the black extends on the hind quarters; the yellow tip to the tail is very short. The skull characters are similar.

*Dimensions.*—Head and body 309-343 (365-420); tail 382-433 (400-455); hindfoot 72-79 (80-88); ear 25-30 (30-34).

*Skull measurements.*—Greatest length 69·5-74 (74-81); basilar length 50-58 (59-64·5); tooth row 14-15 (15-16·5); diastema 14-16 (15·5-18); nasals 21·5-24 (24·5-26); zygomatic breadth 42-46 (46-49·5).

Figures in brackets refer to specimens of *bengalensis*.

*Habitat.*—Hoshangabad, Central Provinces. Type from Bori, 1,600 feet.

*Type.*—Adult male. B. M. No. 12.11.29.85 ; original No. 902. Collected 13th February 1912 by C. A. Crump, and presented to the National Collection by the Bombay Natural History Society.

### C.—Funambulus wroughtoni, sp.n.

*The Coorg Jungle Squirrel.*

The *Funambulus* from Coorg differs considerably from all the forms of *F. tristriatus* previously obtained, but is clearly an ally of that species. Examples from N. Kanara and Dharwar are decidedly smaller, and have a different general colour and are nearer to the type of *F. tristriatus* (Waterhouse) which has only Southern India as a locality ; very probably it came from Travancore as it agrees best with a small series from that district.

The series of 35 specimens from Coorg is very constant in colouring, only three out of the whole number having any black on the back, whereas the type, four of the five from Travancore, and about half of the specimens from N. Kanara have a black saddle. The tails also differ, the Kanara and Travancore examples having a more nondescript speckled appearance, while the Coorg ones have longer hair and are more bushy throughout and the general impression given is black with very white tips ; when opened out, the base of the tail hairs is bright tawny yellow, followed by a narrow black, and another narrow yellow band, then a wide black band with a white tip of from 3 to 4 mm.

General colour greyish brown finely speckled with pale yellow and black ; three pale yellow longitudinal stripes on the back, the middle one being much narrower and shorter than the lateral ones. On the whole the stripes do not extend so far on to the shoulders and rump as in the Kanara and Travancore specimens. Saddle rich chestnut, this being one of the most striking characteristics of the species. Face rufescent, but not so deep as the dorsal fur. Shoulders, legs and feet of the same general grey-brown speckled colour as the flanks. Base of fur dark slate grey. Undersurface dirty white, rarely clear white, the base of the hairs is usually greyish and the ends white or yellow ; the type happens to be particularly white on the underside and is also rather a lighter colour on the flanks, the majority being a shade browner. Tail tawny yellow underneath.

*Dimensions of type.*— (Figures in brackets represent a typical specimen of *F. tristriatus* from Kanara.) Head and body 195 (170) mm.; tail 172 (147); hindfoot 46 (40) mm.; ear 18 (17).

*Skull.*—Greatest length 48 (42) mm.; condylo-incisive length 44·2 (37·9); Basilar-length 38·8 (33·3); length of upper molar series 9·5 (8·2); Diastema 11·6 (10·2); zygomatic breadth 26·7 (23·7); nasals 15·5 (13).

In the Coorg series there are five specimens with a head and body length of over 200 mm. and fifteen over 190 mm.; unfortunately most of the largest skulls are too damaged to take many measurements on them, but at least nine have a condylo-incisive length of 44 mm.; this measurement on the Travancore specimens is about 39·5 mm. The type skull of *F. tristriatus* is broken, but such measurements as can be taken on it, agree pretty closely with those of Travancore specimens.

*Habitat.*—Coorg (Srimangala). Alt. 2,782 feet.

*Type.*—Old female B.M. Number 13. 8. 22, 48. Original number 2467, collected by G.C. Shortridge, 6th February 1913, and presented to the National Collection by the Bombay Natural History Society.

The fine series of 35 specimens was obtained in various parts of Coorg, Mr. Shortridge collected some in S. Coorg and Mr. Graham sent others from the Haleri Estate in the north.

This Squirrel can be distinguished by its large size, the conspicuous chestnut colour of the dorsal fur and the black and white appearance of its tail.

I have much pleasure in naming it after Mr. R. C. Wroughton who has taken a great interest in these Indian Squirrels and has done much towards working out their systematic arrangement.

### *D.*—Loris lydekkerianus, Cabr.

Another interesting result is that *Loris lydekkerianus* has been made a separate species from *Loris tardigradus*; this fact has been discovered by means of the fine series of *Loris* obtained in Mysore and Coorg.

### *E.*—Notes on the Langurs (*Presbytis*) of Central and Southern India.

Mr. Dollman has very kindly made a thorough examination of all the Langurs received since the survey commenced. The following are his notes on the subject :—

"I have recently examined the large series of Langurs collected by Messrs. Shortridge and Crump during their work in connection with the Bombay Natural History Society's Survey of the Mammals of India; the following notes may help to add to our knowledge of the general characters and distribution of these Langurs.

*Presbytis entellus*, Dufresne.

*Simia entellus*, Dufresne, Bull. Soc. Phil. 1797, p. 49.

*Semnopithecus entellus*, Blyth, J.A.S.B., Vol. xii, 1843, pp. 169, 172; Vol. xiii, 1844, pp. 470, 476.

The description given by Dufresne is very brief, but there is no doubt that it refers to the monkey we know as *Presbytis entellus*. "Queue très-longue, corps d'un blanc terne ou couleur de paille salie, les mains et les pieds noirs, de larges callosités sur les fesses.

L'Entelle habite au Bengale; il a beaucoup de rapport, par sa forme et sa taille, avec le Douc (*simia nemeus*). Debout, il est haut de 3 pieds et demi, et mesuré du bout du museau á l'origine de laqueue, il a deux pieds six pouces. La queue excede la longueur du corps; elle a un peu plus de trois pieds; elle est terminée par un petit floccon de poils plus longs que les autres, et d'une teinte tirant davantage sur le blanc. Ce singe doit entrer dans la division générique établie par les CC. Cuvier et Geoffroy, sous le nom de guenon."

There are no skins from Bengal available for examination, but in the Museum Collection are two Langur skulls from Bengal, and these undoubtedly represent true *entellus*; the skulls of the specimens collected by Mr. Crump in the Central Provinces are quite similar to these Bengal skulls; and, therefore, we may consider the Central Provinces Langur to also represent *entellus*.

The following description is founded on an old male individual collected by Mr. Crump at Ouda, Balaghat, Central Provinces.

Size considerably less than in the large Himalayan Langur, *P. schistaceus*; Blanford's statement that *schistaceus* is distinguished from *entellus* "by being somewhat larger, though there is probably no great difference between large individuals of both species," is now shown to be incorrect, old individuals of *schistaceus* are very much larger and more massive than specimens of *entellus* of similar age. The tail is usually very long, in this Ouda specimen it is given as 1078 mm. in length, nearly 450 mm. longer than the head and body dimension. The ears are large and prominent, not hidden by the long hair on the head and neck; in *schistaceus* the ears are almost entirely concealed. Supraorbital line of black hairs well developed, projecting from forehead without mixing with the white hairs on the crown; in *schistaceus* these black supraorbital hairs are almost hidden by the long white hairs of the crown. Hairs of body long, especially so on the shoulders and flanks, in some skins the hair on the shoulders and neck is so long that it forms a kind of mane. Crown of head and nape pale creamy white washed with a pale ashy grey tint, the colour gradually becoming darker posteriorly and passing without any sharp demarcation into the darker colouration of the shoulders and back. General colour of back between "light drab" and "mouse gray" (Ridgway, 1912), darkening on the hind quarters (between "quaker drab" and "benzo brown")

and becoming "drab gray" towards the flanks; shoulders in some individuals covered with long creamy white or silvery hairs. Long hairs on flanks pale creamy white or yellowish, in some cases producing quite a silvery effect, owing chiefly to the glossy nature of the hairs. Whiskers, sides of face and neck pale creamy white. Arms pale greyish liver colour, mixed with white, darkening gradually towards the hands, which are black or very dark brown. The amount of white on the arms is evidently a very variable character; in one of the skins the entire limbs are creamy white with a brownish wash on the hands. The hind limbs are very similar in colour, the tibial portion is usually clothed with rather long white hairs which extend, in some cases, as far as the metatarsal region; in a pale specimen from Nimar, C. P., the feet are almost entirely covered with long dirty white hairs, the toes alone being slightly tinted with brown. Entire undersurface of body creamy white or yellowish; hair on anterior portion of belly and inner sides of limbs thick and long, remainder of ventral surface sparsely covered with rather short hairs. Beard, in old males, fairly well developed, but never to such a marked extent as it is in *P. schistaceus*. Tail similar in colour to hind quarters, gradually paling towards the terminal portion; in some specimens the tail terminates in a creamy white tip, the hairs rather longer towards the tip but not forming a conspicuous bushy termination. The general appearance of the *entellus* tail is much slighter than that of *schistaceus*, where the hairs are all very much longer and of nearly equal length throughout the entire tail, giving it a thick cylindrical appearance.

As regards the cranial characters we meet with considerable variation in individuals of the same sex and age. As in *schistaceus* the males possess far heavier and larger skulls than the females, and any comparison between specimens of different sexes is useless for systematic purposes. Before dealing with individual variation it will be of interest to consider the general cranial characters of the true *entellus*; the following description is taken from the Bengal skulls already mentioned compared with a skull of *schistaceus*. Skull fairly large and stoutly built, but not approaching in size that of *schistaceus*. Anderson* comparing the two skulls writes :— "The skull of *S. schistaceus* is somewhat larger than that of *S. entellus*;" it is obvious that this statement is founded on immature material. This new series of skulls shows that the skull of *entellus* is very much smaller than that of *schistaceus*, the greatest length of an old male *entellus* skull is only 130 mm., whereas the same dimension in an old male *schistaceus* is fully 150 mm. The most striking difference between the two skulls, apart from size, is in the shape of the facial region, *schistaceus* possessing a very elong-

*Ann. Zool. Res. p. 17.

ated muzzle, more so than in any other member of the genus, while in *entellus* the facial region is not markedly prolonged, the nasals lying in a more vertical position. The orbits are large in diameter, almost equal to those of the Himalayan species, the inter-orbital breadth being considerably less. The brain case is relatively large and not so constricted in the temporal region as *schistaceus*. The zygomatic arches are widely spread and stoutly built. The palate is broad and rather deeply sunk, almost as much as in the larger species; the palates of these two monkeys are, however, strikingly distinct: in *entellus* it is flat without any conspicuous depressions, while in *schistaceus* the anterior and posterior palatal depressions are most marked, so much so that the palate is raised into a well-defined ridge down the mid-line. The teeth of *entellus*, though of good size, are considerably smaller than those of *schistaceus*: in old males the canines appear almost as long, but not so massive, as in the mountain species.

Concerning the question of individual variation, the specimens collected in Bengal, the Central Provinces and Kathiawar exhibit some astonishing differences in size, both as regards teeth and general cranial dimensions. The cheek teeth in the males show a maximum length of 37·2 mm. (Bengal), and a minimum of 32·5 mm. (Hoshangabad). At first sight this difference would appear of specific value, but when the other skulls are taken into consideration it is evident that such variation must be looked upon as individual. Thus from Kathiawar, the Hanuman's Western limit, Mr. Crump collected an old male which possesses teeth intermediate in size between those of the Bengal and Hoshangabad specimens, measuring 35 mm. in length from the front of the first premolar to the back of the last molar. In an old male from Ouda, Balaghat, Central Provinces, the teeth are exactly similar in size. Accompanying this dental difference we find a corresponding variation in the length of the palate:—48·4 mm. (Hazarebag) and 42·5 mm. (Berar). The other cranial dimensions would appear to be very much more constant, the basilar length, zygomatic breadth, and orbital breadth only varying a few millimetres throughout the series.

In the case of the female individuals we are met with a much more general variation, not only are the cheek teeth and palate subject to great differences in size but the entire skull in one of the Berar specimens shows similar variations. The following is a comparison of the cranial measurements (in millimetres) of this Berar Langur with females of similar age from Khandesh and Hoshangabad:—

| | Berar. | Khandesh. | Hoshangabad. |
|---|---|---|---|
| Basilar length .. | 64 | 77·5 | 72·6 |
| Zygomatic breadth .. | 79·3 | 93 | 87·5 |
| Orbital breadth .. | 62·3 | 70·7 | 65·5 |
| Palatilar length .. | 33·2 | 40·5 | 37·5 |
| Cheek teeth .. .. | 29 | 32·5 | 36 |

The general skin dimensions exhibit a less striking variation, the most conspicuous difference is found in the length of the tail; the following are some of the tail measurements (in millimetres) of adult individuals:— ♂, 1078, 1065, 1055, 940; ♀. 900, 935.

In general colouration the skins show a very considerable range of variation, from the pale liver coloured form as described above to the light creamy white colouration of the Nimar example. The geographical distribution has, in this case, little to do with the colour variation as the old male from Balaghat is exactly similar in colour to specimens collected in Kathiawar.

It is not possible yet to define the general distribution of *entellus*, but we now know that it extends across India from Bengal to Kathiawar; as regards its northern limit it is very doubtful if the Hanuman extends further than the Jumna and Ganges, such Langurs as occur to the north of these rivers probably belong to the *schistaceus* group. The localities represented in the British Museum Collection and the series collected by Mr. Crump are as follows:—"Bengal," Hazarebag, Balaghat, Seoni, Hoshangabad, Berar, Khandesh, Gujerat and Kathiawar.

The Langurs collected by Mr. G. C. Shortridge in Southern Bombay, Bellary and Coorg all appear rather different in colour and possess for the most part smaller skulls than the Northern specimens collected by Mr. Crump. It seems advisable to consider this series as representing a Southern race of *entellus* and for this purpose it will be necessary to revive the name "*anchises*" bestowed by Blyth in 1844 on the Deccan Langur. This Southern race must be known as

*Presbytis entellus anchises*, Blyth.

*Semnopithecus anchises*, Blyth, J.A.S.B., Vol. xiii, 1844, pp. 470, 476.

The distinguishing characters given by Blyth are now shown to be of little value, especially those relating to the length of the hair on the body and feet. There is so much individual variation, both in size and colour amongst the series collected by Mr. Shortridge that it is a matter of great difficulty to decide what characters are really of importance, and in the following brief diagnosis the conclusions are for the most part derived from the series as a whole rather than from any individual specimen.

In general size this Southern race averages rather smaller than the Bengal Langur; this feature is more conspicuous in the cranial than in the skin dimensions.

Blyth in his description of *anchises* observes that "the coat generally is much longer than in *S. entellus*, the hairs on the sides measuring four, five, and even six inches in length, and those which grow upon the toes, and in a less degree those of the fingers, which

are very copious, are also remarkably elongated, extending considerably beyond the tips of the toes, which thus present a Spaniel-like appearance." The skins now before me do not differ to any marked extent from the *entellus* series as regards the length of the coat, many of the true *entellus* skins would seem to have longer hair on the body, especially on the crown of the head, shoulders, and flanks, than the Southern series, the hair on the feet of the two forms is almost of equal length.

In general colour *anchises* appears as rather a darker monkey, without the silvery shine so evident on the coat of the Bengal species. The light coloured crown is rather more yellowish and more sharply cut off from the general dark colour of the neck and body, in this respect resembling, to a small degree, the large Himalayan *schistaceus*. The general colour of the back and hind quarters is rather darker, and the flanks are more strongly tinted with yellow. The limbs are, in the majority of cases, darker, especially the arms, which in the Kanara specimens are nearly black like those of the Malabar Langur, *P. hypoleucus*. The hands and feet are black or dirty brown. The ventral surface of the body is much as in *entellus*, on the average rather richer in colour. The tails all show a greater tendency to become bushy in the terminal portion, more so than in any of the Northern specimens; the terminal third is, as a rule, pure creamy white in colour.

The skulls are on the average considerably smaller than those of true *entellus*. The following is a comparison of the cranial dimensions (in millimetres) of old male specimens of these two forms :—

| | *P. entellus.* | *P. e. anchises.* |
|---|---|---|
| Basilar length .. .. | 88, 85·3, 90·5, 84 | 69·8, 78, 71·6, 69·4 |
| Zygomatic breadth .. | 102, 103, 101·5, 100 | 87·5, 92·4, 82·7, 83·5 |
| Orbital breadth.. .. | 77·5, 80, 78·9, 76·1 | 65, 74, 66·2, 62·9 |
| Palatular length .. | 48·4, 46·2, 47, 43·3 | 37, 40, 37, 35·5 |
| Cheek teeth .. .. | 36·7, 37·2, 35, 32·5 | 29·3, 34, 30·3, 29·2 |

At Bellary Mr. Shortridge collected a very large immature male; the teeth in this specimen are as large as in the largest of the true *entellus* skulls. There appears to be a very large amount of variation in the size of these Southern Langurs, and the only conclusion that I can come to at present is that large and small individuals exist in every community.

As regards colour variation we find an equally large range, some of the specimens from the Gersoppa District, N. Kanara, are almost as dark as the Malabar Langur, while others from Potoli, N. Kanara are nearly as light in colour as some of the specimens of true *entellus* from the Central Provinces.

Mr. Shortridge collected this Southern race of *entellus* at the following localities :—Alvanar, E. of Dharwar; Hawsbhari, S. W. of Dharwar; Devikop, S. of Dharwar; Potoli, N. Kanara; Jog, Gersoppa, N. Kanara; Bellary and S. E. Coorg."

# THE PALMS OF BRITISH INDIA AND CEYLON, INDIGENOUS AND INTRODUCED

BY

E. BLATTER, S.J.

PART IX.

*(With Plates XLIX—LVI, and text figure 29.)*

*(Continued from page 86 of Volume XXII).*

*LODOICEA SEYCHELLARUM.* (The paragraph on cultivation of this palm, which was omitted in the last paper, is now reproduced along with text figure No. 29.)

CULTIVATION IN INDIA.—Mr. W. S. Millard has supplied the following notes:—

There appears to be very little recorded on the cultivation of the Coco-de-mer in India.

From information recently received from Major Gage, I.M.S., there is only one plant living at present in the Royal Botanic Garden, Sibpur, Calcutta, from nuts introduced in 1894.

In Bombay, thanks to M. Dupont, the Director of the Botanic Garden, Seychelles Islands, a number of nuts were introduced in 1908, but although two or three germinated by placing them in a damp dark situation, no specimen survived when planted out. In most cases one leaf was thrown out, but before the second leaf appeared the plant expired, possibly owing to the soil not being suitable.

In 1911 M. Dupont forwarded me some more nuts, and out of these five germinated, but cockroaches attacked the shoots of two whilst in the dark, and these subsequently died. The remaining three are alive. One of them was planted last year on the Queen's Road, Bombay, in the vacant plot next to the B. B. & C. I. Railway Offices, and this plant has now thrown out a second leaf. The soil is very sandy having been reclaimed from the sea, and it is hoped that this plant will survive.

The second nut was planted in the garden of the Ladies' Gymkhana, Malabar Hill, and is growing slowly.

The remaining nut I still have in a tub in my garden where it is thriving and is now making its second leaf.

Some of the nuts were given to the Victoria Gardens, Bombay, and I hear that one is growing there.

In consequence of so many failures I wrote to M. Dupont asking for his opinion and advice as to their cultivation in India, and I cannot do better than reproduce his remarks on this subject:—

"I am afraid I cannot tell you much about your failure to grow successfully our Coco-de-mer. The symptoms you describe are, however, such as to warrant excess of moisture and subsequent

Sago Palm (*Arenga saccharifera*, Labill.) in the Botanic Gardens of Peradeniya.

fungoid attack being the cause of the failure of the plant to produce more than one leaf. I saw here the same thing happened in a friend's yard where he planted a germinating nut on the very spot where he had insufficiently removed a huge stump of a jack tree. The plant died after the first leaf and after subsequently planting a second nut, the same thing happened. He then dug a very large hole, removing all dead organic material and putting lime and good friable soil. He succeeded the third time and the Coco-de-mer is now producing its third leaf. I know little of Bombay soil and rainfall, but I noticed that many parts of the town are water-logged. If you can, avoid clayey soil for Coco-de-mer, but here we succeed in stiff laterite where particles of quartz reach a large percentage. Have you got any other soil than the clayey soil I came across at the Victoria Gardens? Perhaps not, and this will handicap, with a heavy rainfall, the growth of some of the palm trees. There is no reason why you should not prepare an artificial soil with coarse sand and small stones and allow the tree to make its proper growth during the first three or four years, when it will become very hardy. Here it grows in any stiff soil on mountain slopes."

In a postscript M. Dupont adds an important suggestion: "Avoid putting the nuts deep and flat on the ground, but plant superficially in a slanting or even vertical position to avoid the young stem getting bruised against the nut in sprouting."

Mr. G. T. Lane, the Curator of the Sibpur Botanic Garden, in a letter, dated 26th February 1913, to Dr. Gage, refers to this danger thus:—"I remember also that one or more of these seedlings were strangled through the radicle turning round and trying to push its way through between the lobes of the nut, and thus preventing the plumule from developing. This seems to be the only difficulty about germinating these nuts; if the point of the long radicle be injured, it dies."

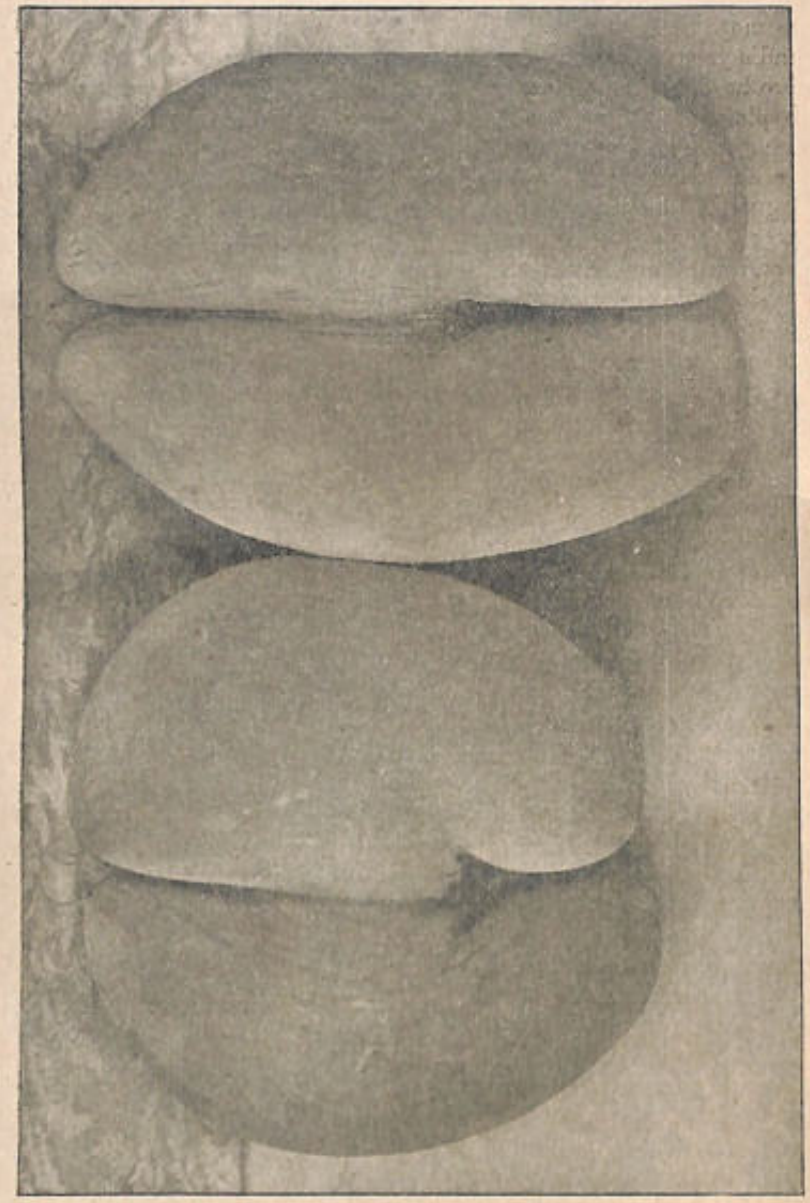
Farmer wrote to Thiselton-Dyer:—"It may interest you to know that in 1890, when I was at Peradeniya, there was a young plant (of *Lodoicea*) growing in the Gardens which Trimen told me had been planted about five years previously. The 'nut' was still in the ground and connected by the sucker with the plant. The latter bore, I think, about five leaves; the later formed ones were very large, somewhat resembling those of *Corypha umbraculifera*."[1]

Wald mentions a specimen growing in the Botanic Gardens of Buitenzorg, which in its thirtieth year had not yet begun to form a stem.[2]

H. W. Cave has an interesting note in his "Book of Ceylon":—"I first secured a photograph," he says, "of this specimen (a

[1] Thiselton-Dyer, l. c. p. 230.

[2] Wald, l. c. p. 62.



Text Fig. 49.—FRUITS OF DOUBLE COCOANUT (*Lodoicea Seychellarum.*)

*Lodoicea* in the Botanic Gardens of Peradeniya) in 1892, when it was already forty years old and had not begun to form its stem. In 1907 I took the photograph reproduced in plate 377, which will give an exact idea of the fifteen years' growth. The slower growth would appear to characterise its extreme youth, as, after taking forty

years to begin exhibiting a stem it has grown since that time at the rate of about seven inches a year. Unfortunately this specimen is a male, and therefore bears no fruit; but several young plants of the same species are placed so as to form an avenue which may interest future generations. It should certainly be a grand spectacle for posterity in about five hundred years when the trees reach maturity. It is to be hoped that the public of the year 2400 will be acquainted with the Peradeniya records of our time and feel grateful to the present Director and Curator as in flying machines they inspect the noble fruit with which they are provided through the kindly foresight of their ancestors."[1]

CULTIVATION IN EUROPE.—The cultivation of this palm in Europe is still attended with difficulties. Seemann wrote in 1856:—

"After many unsuccessful attempts to introduce this palm into our conservatories, one has at last met with complete success, and the plant is now to be seen in the Royal Gardens at Kew. Germinating nuts were disposed of in 1854 at public sales in London for £ 10 apiece, but all of them have since died."

The same disappointing difficulties were experienced in the Botanic Gardens of Georgetown. Only three plants survived of three dozen nuts which were imported from the Seychelles in the year 1893. "The first dozen," writes Waby,[2] "arrived dead; eight had germinated *en route*, and the others failed to germinate;—having passed by way of England during the winter was probably the cause of the failure. Of the second dozen four germinated in transit, and six did so afterwards, making 10, which arrived in good condition; of the third dozen only five germinated. In 1898 eight were alive, but were reduced to six during the next year. In 1902 five remained, and two subsequently died, leaving only the three present plants."

"Frequent attempts have been made to cultivate the Coco-de-mer in European Botanic Gardens, but with little success. For some years a plant, which, I think, was imported, existed in the Liverpool Botanic Garden. And a young plant was raised and perhaps still exists in the *Jardin des Plantes*. In 1889 I began a prolonged attempt to add it to the rich collection of palms at Kew. I was energetically assisted by Mr. C. Button, who sent us repeated consignments of mature nuts. Many failed to germinate at all: others did so, but only imperfectly; others again sprouted satisfactorily, but only to end their existence by disaster almost suicidal . . . .

"At Kew the nuts were buried in coco-nut fibre in a hot-bed. Germination once commenced, proceeded rapidly. Unfortunately in at least one instance it proved abortive. Before the proceeding could be detected, the growing apex managed to insinuate itself in

[1] H. W. Cave. The Book of Ceylon. London, 1908, p. 269.
[2] Kew Bull. (1910), p. 256.

some crevice, with the result that it was irretrievably injured. In a subsequent attempt the petiole did not grow to so great a length, and it was possible to guide its course, and finally establish the young plant in a pot. This grew pretty rapidly, and in 1892 was exhibited in the Victoria Regia House at Kew, still drawing nutriment from the parent seed, a process which may apparently continue for some years."[1]

This palm thrives best in a compost of rich loam and leaf mould in equal parts. Thorough drainage, an abundant supply of water, and very strong heat, are essential elements to success in the culture of this plant. The seeds being very large, one of the chief difficulties in establishing this palm is its peculiar manner of germination. If the first long outgrowth be checked or injured in anyway, success cannot be hoped for. The heavy seed can be kept on or in one pot, and the growing radicle allowed to push into another, keeping the whole dark until the development of the young plant, from which the seed should not be separated until the connection between the two falls naturally. (Nich. Dict. of Gard.)

HISTORY, USES.—Cf. our paper:—"History of the Sea Coconut" in Vol. XIX, p. 925-937 of this Journal.

*ARENGA*, Labill. Mém. Inst. Paris, IV, 209.

(From the vernacular name used in the Moluccas.)

Roxb. Fl. Ind. III, 626 (*Saguerus*).—Spreng. Gen. Nat. 2222 (*Gomutus*).—Mart. Hist. Nat. Palm. III, 191, t. 108, 147, 148.—Kunth. Enum. Pl. III, 196.—Bl. Rumph. II, 124, t. 95, 123-125 (*Saguerus*).—Griff. Palms Brit. Ind. 163, t. 235.—Miq. Fl. Ind. Bat. III, 34.—Becc. Males. I, 78.—Kurz For. Fl. II, 533.—Benth. Fl. Austr. VII, 143.—Drude Bot. Zeitg. 1877, 658, t. 6.—Wendl. & Drude Linn. 39, 229 (*Saguerus*).—Benth. & Hook. Gen. Pl. III, II, 917, 72.—Hook. Fl. Brit. Ind. VI, 421.

Tall stout palms, flowering first from an upper leaf-axil and successively from lower; trunk densely clothed above with fibrous remains of the leaf-sheaths. Leaves terminal, long, pinnatisect; leaflets long, linear, usually præmorse, with a midrib and numerous longitudinal nerves and one or two auricles at the base.

Spathes many, clothing the peduncle of the spadix. Spadices interfoliar, large, much-branched; branches slender, pendulous; peduncles short, decurved. Male and female flowers usually solitary and in separate spadices, rarely 3-nate, a female between 2 males. Male flowers symmetric; sepals 3, orbicular, imbricate; petals oblong, vulvate; stamens numerous; filaments short; anthers apiculate; pistillode O. Female flowers subglobose; sepals accrescent; petals

[1] Thiselton-Dyer, W. T., l. c., p. 226, 227.

triangular, vulvate; staminodes many or O; ovary subglobose, 3-celled; stigmas conic.

Fruit obovoidly globose, 2-3-seeded; stigmas terminal. Seeds compressed or plano-convex; albumen equable; embryo dorsal.

Species about 10. Tropical Asia, Malaya, Australia.

| | |
|---|---|
| Leaflets 4-fariously fascicled ... ... | *A. saccharifera.* |
| Leaflets bifarious ... ... ... ... | *A. obtusifolia* |
| Leaflets alternate ... ... ... ... | *A. wightii* |

* INDIGENOUS SPECIES.

*ARENGA SACCHARIFERA*, Labill. in Mém. Inst. Fr. IV, 209; Mart Hist. Nat. Palm. 191, t. 108 and 161, f. 4; Miq. Fl. Ind. Bat. III, 35; Kurz For. Fl. II, 534; Griff. in Calc. Journ. Nat. Hist. V, 472; Palmæ Brit. Ind. 164, t. 135 A; Hook. Fl. Brit. Ind. VI, 421; Brandis Ind. Trees, 648.—*A. griffithii*, Seem. *ex* H. Wendl. in Kerchov. Palm. 232.—*Saguerus rumphii*, Roxb. Fl. Ind. III, 626.—*S. saccharifer*, Wurmb. Verh. Bat. Genootsch, I, 350; Blume Rumphia II, 128, t. 123, 124.—*Gomutus saccharifer*, Spreng. Syst. II, 622.—*Borassus gomutus*, Lour. Fl. Cochinch. II, 759.—*Caryota onusta*, Blanco, Fl. de Filip. ed. I, 741.

*Names of the tree.*—Sago Palm, Malay Sago Palm, Sugar Palm, Gomuti Palm, Areng Palm (English).

Arbre au sagou, Aren à sucre, Areng, Gomonto, Gomuti, Lantar, Lontar, Palmier areng, Palmier condiar, Palmier à sucre, Rondier (French).

Echte Zuckerpalme, Gomutipalme, Sagwirepalme, Zuckerpalme (German).

Aren, Arenboom, Areng, Arengboom, Arengpalm, Arenpalm, Gamoetoeboom, Gomoetipalm, Gomoetoepalm, Sagoeweerpalm, Sagueer-boom (-palm), Saguweerpalm, Suikerboom (Dutch).

Taung-ong (Burma).

Anan (Malay).

Aren, Duk, Lirang, Kolang kaling, Buwah atap (Java).

Dhuk, Edhuk (Madur).

Kawung (Sunda Isl.).

*Names of the soft brown scurf at the base of the petioles.*—Barum (Malay).

*Names of the Fibre.*—Ejoo fibre, Gomuta fibre, Gomuti fibre, Gomutie, Gomuto fibre, Vegetable bristles, Vegetale horsehair (English).

Baleine végétale, Coir, Crin végétal, Gomoeti, Gomotuh, Gomuti (French).

Eju, Ejufasern, Ejuh, Goafasern, Gomutifasern (German). Doek (in Java).

Gemoeti, Gomoeti(e), Gomoeto(e), Plantaardig plantenhaar, Plantaardige borstels, Plantenhaar (Dutch).

*Names of the Sugar.*—Jaggery. Gomuti Palm Sugar (English).

Gaulaitam (French).

Palmzucker, Sagueerzucker (German).

Arensuiker, Bruine suiker, Jagerij, Javaansche suiker, Zwarte suiker (Dutch).

*Names of the Sago or Sago Flour.*—Farine de Sagou (French).

Ostindische Graupen, O. Tapiocca, Ostindischer Sago, Palmenstärke, Sago (German).

Bloem van sagoe, Oostindischesago, Palmensago, Sagoe, Sago, Sagoemeel, Sagomeel (Dutch).

*Names of Palm Wine or Toddy.*—Vin de palme, Sagouër. Vin de Saguère (French).

Palmenwein, Palmwein, Toddy (German).

Kolwater, Palmwijn, Sagoeweer, Sagoweer, Sagueer (Dutch).

Tuwak, Nera (Malay).

*The liquor obtained by the maceration of the Fruit is called.*—Hell Water, Infernal Water (English).

Eau infernale (French).

Helsch Water (Dutch).

DESCRIPTION.—A beautiful and magnificent palm, trunk 20-40 feet high, very stout. Crown oblong, very dense, of a sombre aspect, leaves many and large, 20-28 feet long and 10 broad, outline oblong-ovate, petiole very stout, channelled at the base, sprinked with blackish scurf; leaflets up to 115 on each side, 3-5 feet long, subsessile, linear, 4-5-fariously fascicled, coriaceous, variously toothed towards the tip, base 1-2-auricled, dark-green above, white beneath, costa stout, scurfy beneath.

Spadices several, axillary, 6-10 feet long, branched, branches attenuate at the apex, and then furnished with a few rudimentary flowers, slender, pendulous. Male and female flowers together[1] on most branches, one sex generally preponderating. Male flowers very numerous, oblong, club-shaped, of a rich purple black colour and a disagreeable smell, of considerable size, often 1 inch long; sepals 3, rounded, broad, imbricate; petals nearly 3 times as long, oblong, valvate; stamens numerous; filaments short, slender; anthers nearly as long as the petals, apiculate; pistillode O. Female flowers solitary, large, 1 inch in diameter. Sepals 3, very broad; petals 3, cordate-ovate, coriaceous. Staminodes O; ovary shortly obturbinate, 3-celled, apex 3-lobed, concave in the centre; stigma 3, tooth-shaped, triangular, erect; down the back of the lobes which are opposite the sepals, runs a slight keel.

Fruit 2-2½ inches long, oblong-turbinate, surrounded at the base by the perianth, apex flat or nearly concave, marked with 3 lines, running from the backs of the persistent stigmas to the now nearly

[1] Brandis (Indian Trees, p. 648) says, that most branches bear male and female flowers, whilst Hooker (Flora Brit. Ind. VI, 421), speaks of the "male spadix." Does Hooker call it "male spadix" because the spadix bears only male flowers or because the male flowers protoclerate ?—Drude (Palmæ, in Pflauzenfamilien II, pt. 3, p. 54) when giving the general characteristics of *Arenga*, says that the padices are unisexual by abortion This is often the case, but not always.

WIGHT'S SAGO PALM (*Arenga Wightii*, Griff.) in the Botanic Gardens of Calcutta.

obsolete lobes; outer substance coriaceous, thick, inner gelatinous, adhering for the most part to the seeds; seeds black, convex on the outer, bifacial on the inner face, attenuate at the base; albumen horny, cartilaginous; embryo dorsal.

HABITAT.—Assam; Martaban and Tenasserim; occasionally on the Pegu Yoma; commonly cultivated in India. Malay Peninsula and Archipelago (in Java up to 4,600 feet).

FLOWERS.—The palm flowers about the tenth year. Flowers may be seen throughout the year. Thes padices of the uppermost axils flower first, and have often mature fruit when the lowest come into flower.

FRUIT.—Ripens during the year following the appearance of the flowers. After all spadices have matured their seed, the tree dies.

DISSEMINATION.—Of the few animals which are able to eat the corrosive fruit of this tree, there are two mammals in Java: the Paradoxurus (Luwak) and Sus verrucosus. The Sago Palm seems to owe its wide distribution in Java chiefly to these animals. (Koorders c. I., 238).

USES.—*Arenga saccharifera* is one of the handsomest and most useful palms. The principal production of this tree is:—

(*a*) *The Toddy.*—According to Crawfurd it is obtained in the following way:—One of the spadices is, on the first appearance of fruit, beaten on three successive days with a small stick, with the view of determining the sap to the wounded part. The spadix is then cut off a little way from its root, and the liquor which pours out is received in pots of earthenware, in bamboos, or other vessels. The Gomuti Palm is fit to yield toddy when nine or ten years old, and continues to yield it for two years, at the average rate of three quarts a day. When newly drawn, the liquor is clear, and in taste resembles fresh must. In a very short time it becomes turbid, whitish, and somewhat acid, and quickly runs into the vinous fermentation, acquiring an intoxicating quality. In this state great quantities are consumed; a still larger quantity is immediately applied to the purpose of yielding:

(*b*) *Sugar.*—With this view the liquor is boiled to a syrup, and thrown out to cool in small vessels, the form of which it takes, and in this shape it is sold in the markets. This sugar is of a dark colour and greasy consistence, with a peculiar flavour. It is the only sugar used by the native population. The wine of this palm is also used by the Chinese residing in the Indian Islands in the preparation of the celebrated Batavian arrack. The *Journal of the Indian Archipelago* (Nov. 1849) gives some further interesting details with regard to the manufacture of sugar. "Like the cocoa-nut tree", it says, "the Gomuti Palm comes into bearing after the seventh year. It produces two kinds of mayams or

spadices—male and female. The female spadix yields fruit, but no juice, and the male *vice versa*. Some trees will produce five or six female spadices before they yield a single male one, and such trees are considered unprofitable by the toddy collectors; but it is said that in this case they yield sago equal in quality, though not in quantity, to the *Cycas circinalis*, although it is not always put to such a requisition by the natives; others will produce only one or two female spadices, and the rest male, from each of which the quantity of juice extracted is the same as that obtained from ten cocoa-nut spadices. A single tree will yield in one day sufficient juice for the manufacture of five bundles of jaggery, valued at two cents each. The number of mayams shooting out at any one time may be averaged at two, although three is not an uncommon case. When sickness or other occupation prevents the owner from manufacturing jaggery, the juice is put into a jar, where, in a few days, it is converted into excellent vinegar, equal in strength to that produced by the vinous fermentation of Europe. Each mayam will yield toddy for at least three months, often for five, and fresh mayams make their appearance before the old ones are exhausted; in this way a tree is kept in a state of productiveness for a number of years, the first mayam opening at the top of the stem, the next lower down, and so on, until at last it yields one at the bottom of the trunk, with which the tree terminates its existence."

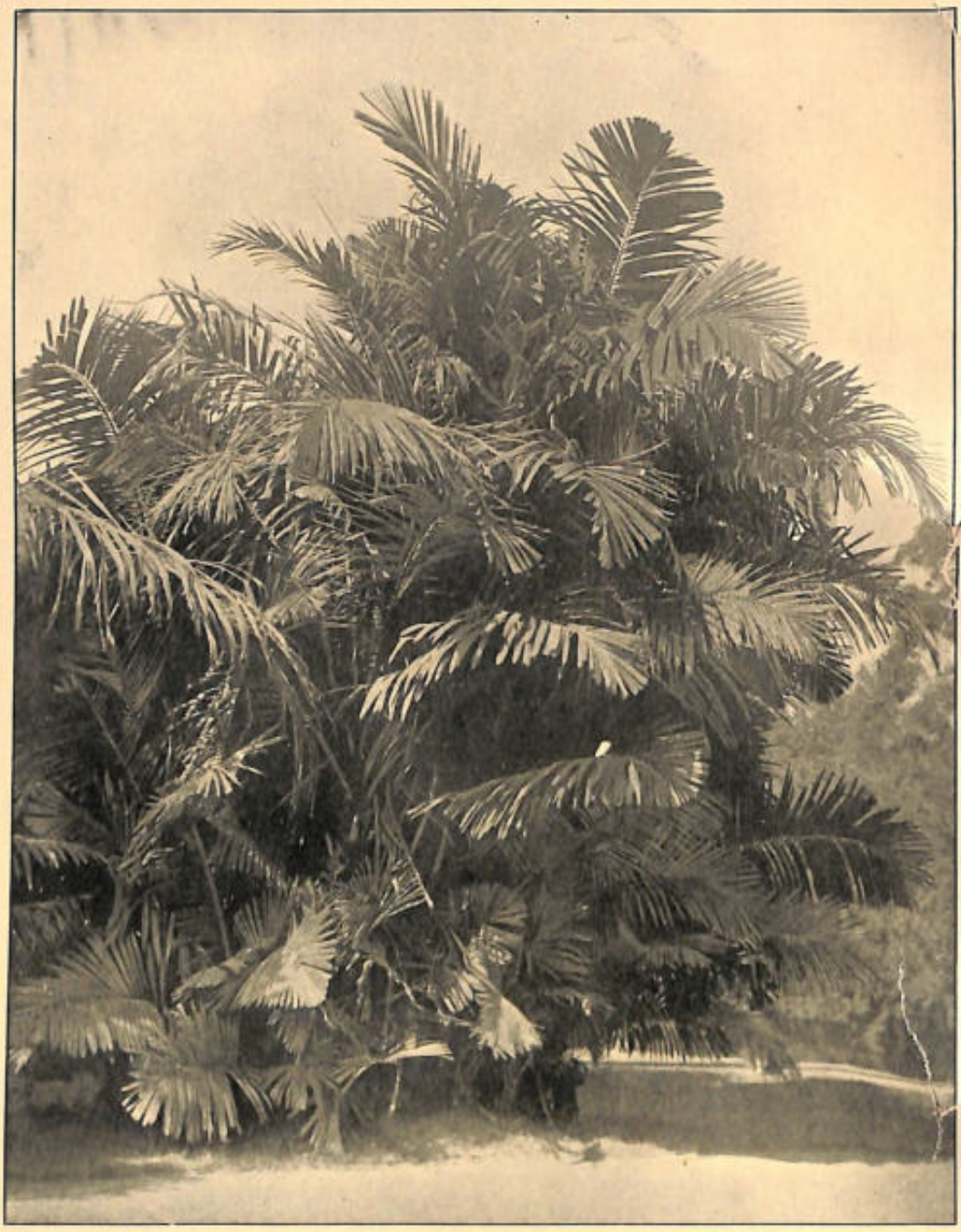
Tschirch observes "that it is not worth while to grow the palm for sugar, because its production per acre is insufficient. He gives the yield for Java at about 8,000 lbs. per hectare (say 2¼ acres). The estimate quoted by Simmonds is about 6,600 lbs. to the acre."[1]

(*c*) *Sago.*—Like the true Sago Palm, *Metroxylon sagu*, Rottb., the Gomuti Palm affords a medullary substance, from which a meal is prepared. In the western and poorer part of Java it is used in considerable quantity, and offered for sale in all the markets. It is smaller in quantity than the pith of the true Sago Palm, more difficult to extract, and inferior in quality. It has got a certain peculiar flavour from which the meal of the true sago is free.

According to Jumelle,[2] about 400 trees can be planted to the acre, and each tree yields about 154 lbs. of sago. This gives the enormous total of 61,600 lbs. to the acre. Roxburgh says that one palm gave about 150 lbs. of good sago-meal.

(*d*) *The Fruit.*—The juice of the fleshy outer covering of the fruit is highly stimulating and corrosive. If applied to the skin it causes great pain and inflammation. It is said that the inhabitants of the Moluccas were in the habit of using in the defence of posts during the war a liquor obtained by the maceration of this fruit, which the Dutch appropriately denominated "hell-water." From

1. Watt. Commerce. Prod. of India, (1908), p. 92.
2. Jumelle. Les Cultures Coloniales. Pl. (Aliment) 27; (1900).



*Arenga obtusifolia*, Mart., in the Botanic Gardens of Calcutta.

the albumen of the seed, when free from this noxious covering, the Chinese prepare sweetmeat.

(*e*) *Fibre.*—At the base of the petioles completely embracing the trunk, is found a beautiful black horse-hair-like fibre, known as the Eju or Gomuta fibre. This fibrous substance is superior in quality, cheapness and durability to that obtained from the husk of the coconut, and is well known for its power of resisting wet. It has been recommended for ropes intended for use under water and even as covering for submarine telegraph cables.

The coarsest fibre, according to Watt, is only fit for brush-making. For this purpose the leaves are first washed and then soaked in an alkaline solution.[1]

The natives of the Indian Islands use the fibre for every purpose of cordage, domestic and naval:—"The coarser parts," says Seemann, "found with this vegetable horse-hair, are used by all the tribes who write on paper as pens, and they are the arrows used by others to discharge, poisoned or otherwise, from blow-pipes or arrow tubes. Underneath this material is found a substance of a soft gossamer-like texture, which is imported into China. It is applied as oakum in caulking the seams of ships, and more generally as tinder for kindling fire; it is for this latter purpose that it is chiefly in request among the Chinese."

The fibrous material mentioned above is also used as a thatch, in the same manner we do straw, and not unfrequently over the bamboo thatch. In this case the roof is so durable as never to require removal, the fibres, of all vegetable substances, being the least prone to decay. For this reason, it is a common practice to wrap a quantity of the fibres round the ends of timbers or posts which are to be fixed in the ground. It is, besides, used, among other purposes, for making ropes, and mixing with mortar. Low mentions that "the hairy filaments are plaited by the natives of Borneo into ornaments for the arms, legs and neck, which are more pleasing in their deep black hue and neat appearance than the heads and brass with which these people are fond of adorning their persons."

(*f*) *Varia.*—When the leaves are very young they are eaten, like those of the American Cabbage Palm (*Oreodoxa oleracea*, Mart).

Griffith writes that trees which have died after the ripening of the whole crop of fruit, are almost hollow, and particularly adapted for making troughs, spouts or channels for water, and that they last extremely well underground.

From the leaf-sheath sandals are made.

GARDENING IN EUROPE.—All the species of the genus *Arenga* require a strong heat. Young specimens, it appears, do not last long when kept free in the drawing room. Much water, rich mould and good drainage are absolutely necessary.

1. Morris, Contor. Lect. Journ. Soc. Arts, Oct. 18th (1895), p. 931

ILLUSTRATION : PLATE XLIX.—The specimen of the Sugar Palm, figured on this plate, grows in the Botanic Gardens of Peradeniya. This palm has usually a much denser crown than appears from our illustration.

The photograph has been kindly supplied by Mr. Macmillan.

*ARENGA WIGHTII*, Griff. in Calc. Journ. Nat. Hist. V, 475, Palm Brit. India, 167, t. 235, E ; Hook. Fl. Brit. Ind. VI. 422, Brandis, Ind. Trees 648.

NAMES :—Wight's Sago Palm ; Dhudasal (Kan.); Alam panei (Tam.).

DESCRIPTION :—Monoecious. Trunk short, 3-30 feet high, as thick as a man's thigh, soboliferous, forming dense clumps. Leaves 20-28 feet long ; the lower naked part of the petiole is 6-8 feet long ; leaflets alternate, crowded, linear-ensiform, 3-3½ feet long by 1½-2 inches, white underneath, with 2 large auricles at the base, the lower of which (1½-2 inches long) obliquely overlying the petiole, margins sparingly toothed from the middle upwards; apex narrowed, unequally bi-lobed, erose ; the terminal lobe is narrow-cuneate, 2-3-lobed, base shortly 2-auricled, apex truncate, lobulose, coneate, jagged-dentate.

Sapdix decurved, pendulous, about 4 feet long ; peduncle before branching about 2 feet long, quite concealed by the sheathing imbricate, lacerate spathes ; male flowers strongly scented ; branches of the spadix about 2 feet long, subfastigiate, slender, with a scaly bract at the base of each ; flowers rather distant, rather large, in pairs, with a vertical scale interposed ; buds acute ; sepals 3, roundish, imbricate, with thick bases ; petals 3, oblong, very thick and cariaceous; stamens numerous ; filaments short : anthers linear, adnate, apiculate, pistillode O zero Female flowers : branches of spadix alternate towards the ends, where they bear rudimentary flowers ; flowers solitary, each in a shallow, entire or bi-lobed cup ; sepals small, broadly cordate ; petals triangular, acute or cuspidate, valvate ; staminodes several (Griffith does not find any shortly after fecundation); ovary roundish, 3-celled ; styles 3, short, recurved.

Fruit spirally arranged and crowded on the lower halves of the branches of the spadix (the upper halves being naked), about the size of a crab-apple, globosely turbinate, broader than long, much depressed at the apex, crowned with the remains of the stigmas. Seeds 3, convex on one face, unequally angular on the other, separating easily except at the base, from the black papery endocarp, brown, smooth, marked copiously with slightly branched veins, converging at the apex of the seed. Albumen horny ; embryo dorsal.

HABITAT :—Deccan and Western Peninsula: Dense forests on hills about Coimbatore, Nilghiri hills, alt. 3,000 feet ; Ankola and Divimana Ghats of Northern Kanara ; common on the Mushki Ghat at about 1,500 feet elevation ; very common on the Ghats near the falls of Gairsppa in evergreen forests. Travancore 500-3,000 feet.

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HABITAT :—Deccan and Western Peninsula: Dense forests on hills about Coimbatore, Nilghiri hills, alt. 3,000 feet ; Ankola and Divimana Ghats of Northern Kanara ; common on the Mushki Ghat at about 1,500 feet elevation ; very common on the Ghats near the falls of Gairsppa in evergreen forests. Travancore 500-3,000 feet.

Kala Aunsa (Kumaon); Takoru (Nepal); Ooh (Sikkim); *Wallichia densiflora*, Mart., in the Botanic Gardens of Peradeniya.

FLOWERS—From November to January.

USES.—The cut flower stalks yield toddy.

ILLUSTRATION: PLATE L.—A clump of Wight's Sago Palm growing in the Botanic Gardens of Calcutta. This tree, if left alone, never grows an isolated stem, but has a strong tendency towards forming dense tufts.

The photograph was kindly presented by Major Gage.

* * INTRODUCED SPECIES.

*ARENGA OBTUSIFOLIA*, Mart. Hist. Nat. Palm. III, 191, t. 147, 148-161; Mig. Fl. Ind. Bat. III. 36; Hook. Fl. Brit. Ind. VI, 421. *A. Wester, hontii* Griff. in Calc. Journ. Nat. Hist. V. 474; Palms Brit. Ind. 166, t. 235 B, C, D; Mart. l. c. 192; Miq. l. c. 37—*Saguerus langkab*, Blume Rumphia II. 131, t. 96, 125.—*Gomutus obtusifolius*, Blume mss.

NAMES.—Langkap (Penang); Anooee kutaree (Malacca.)

DESCRIPTION:—Trunk tall, very stout. Leaves ample, linear-oblong in outline, 20 feet long, 10 feet across in the broadest part, leaflets sessile, about 5 feet in length, 3 inches broad, alternate or subopposite, solitary, bifarious, very spreading with deflexed points, alternate towards the base, the upper ones alone auriculate at the lower side, coriaceous, bright green above, white underneath, together with the petiole scurfy towards the base; margins with irregular spinescent teeth; apex praemorse, dentate and erose, sometimes bilobed.

Spadix curved-pendulous. Spathes fibrous, coriaceous, often split. Spikes about level-topped. Male flowers in pairs, without an interposed rudimentary female, or solitary with a rudimentary female; calyx cup-shaped, petals oblong, fuscous-purple. Stamens numerous; filaments short, subulate; anthers with mucronate or aristate ends. Pollen hispid, with a longitudinal fold. Female flowers solitary, sessile, sepals broad, petals 3; cordate, concave, obtusely carinate; ovary roundish, trigonal, depressed at the apex, and there marked with 3 lines running from the angles to the stigma, which are 3 in number, tooth-shaped, and connivent so as to form a cone.

Fruit roundish, about the size of a small apple, with a depressed 3-lobed, trigonal vertex, terminated by the sphacelated stigmas, surrounded at the base by the perianth, 2-3-celled; outer substance thick, fibrous-fleshy. Seed separating with the thick gelatinous cellular endocarp, of black colour; when 3, convex-bifacial; embryo oblique, in the centre of the dorsal face of the horny albumen.

HABITAT.—Malay Peninsula at Naning; Penang. Cultivated in India.

ILLUSTRATION: PLATE LI.—Several specimens of *Arenga obtusifolia* from the Botanic Gardens of Calcutta. The photograph has been supplied by Major Gage.

*DIDYMOSPERMA*, Wendl. & Drude in Benth. & Hook. Gen., Pl., III, II, 917, 71.

(From the Greek "didymoi," twins, and "sperma," seed, alluding to the frequently 2-seeded fruit.)

Mart. Hist. Nat. Palm. 190, t. 157 (*Wallichia*)—Miq. Fl. Ind. Bat. III, 32. (*Wallichia*)—Griff. Palms Brit. Ind. 176, t. 238 A, B. (*Harina*)—Hook. Fl. Brit. India., VI, 420.

Small, low palms. Leaves terminal, unequally pinnatisect; leaflets few, trapezoid, erose, unicostate; nerves flabellate.

Spathes many, sheathing the peduncle of the spadix. Spadix interfoliar, stout and simple, or slender and branched. Flowers rather large. Male flowers symmetric; calyx cupular, 3-fid, imbricate; petals coriaceous, valvate; stamens 10-30; anthers linear, erect; pistillode O. Female flowers subglobose; sepals rounded, coriaceous; petals thick, triangular, incurved, vulvate; staminodes O; ovary depressed, 3-gonous, 2-3-celled; stigmas conical; ovules basilar.

Fruit ovoid or oblong, 1-2-celled and-seeded; stigmas terminal. Seeds erect, oblong, plano-convex; albumen equable; embryo dorsal.

Species 8.—Indian and Malayan.

CULTIVATION IN EUROPE.—The species of *Didymosperma* are very ornamental and graceful stove palms. They grow in a compost of loam, peat, and leaf soil, in equal parts, with a liberal addition of sand. When they are fully grown, loam should preponderate to the extent of about two-thirds, and some rotten cow-manure may be added. Propagation is effected by seeds. These should be sown in a compost similar to the one just mentioned, and placed in a moist gentle heat.

| | | | | |
|---|---|---|---|---|
| Leaflets 1-3 pairs | ... | ... | ... | *D. nana.* |
| Leaflets 6-8 pairs | ... | ... | ... | *D. gracilis.* |

*DIDYMOSPERMA NANA*, H. Wendl. & Drude in Kerchov. Palm. 243; Hook f. in Bot Mag. t. 6836; Hook. Fl. Brit. Ind. VI. 420; Brandis Ind. Trees 655.—*Wallichia nana*, Griff. in Calc. Journ. Nat. Hist. V. 488; Mart. Hist. Nat. Palm. 190, t. 315; Miq. Fl. Ind. Bat. III. 34.—*Harina nana*, Griff. Palms Brit. Ind. 176, t. 238 A. B.

DESCRIPTION.—A small erect palm; stem 3-5 feet high, slender, throwing out roots from the base, covered with rusty leaf-sheaths. Leaves pinnatisect, 18 inches to 2 feet long; petiole short, roundish, obliquely sheathing at the base, with a thin rete, above produced into a bipartite liguliform body; leaflets about 5; lateral ones 7-10 by 3-5 inches, opposite or alternate, obliquely trapeziformly lanceolate, acuminate, irregularly lobed, toothed and spinous-serrate; the terminal one flabelliform, striately veined, above green, underneath glaucous white.

Spadices erect, very stout, simple or sparingly branched, rustily scurfy, dense-flowered. Spathes several, distichously imbricate, rusty-furfuraceous, conduplicate, entirely concealing the peduncle. Male flowers: calyx of 3 rounded submembranous sepals, imbricate,

Chilputta, Belputta (Chittagong); Saingpa (Burma); *Wallichia caryotoides*, Roxb., in the Botanic Gardens of Peradeniya.

petals 3, coriaceous, valvate, with almost introflexed points, furrowed inside from the pressure of the stamens. Stamens about 14, inserted on a small prominent torus, rather shorter than the petals ; filaments very short ; anthers linear, erect ; no pistillode. Female flowers white, crowded, calyx tripartite nearly to the base ; segments rounded, coriaceous, greenish, spreading. Corolla of 3 broad, ovate, coriaceous petals ; no staminodes. Ovary trigonous, 2-celled, of a thick coriaceous substance ; no style ; stigma conical ; ovules solitary, erect, basilar.

Fruit white, oblong, ½ inch long, base surrounded by the perianth, one-seeded, 2-celled, one cell being almost obliterated. Seed erect, oblong, plano-convex ; albumen solid, radiating from a central line ; embryo dorsal.

HABITAT.—Assam and the Khasia Hills, ascending to 4,000 feet.

FLOWERS.—In July and August.

*DIDYMOSPERMA GRACILIS*, Hook. Fl. Brit. Ind. VI. 420 ; Brandis, Ind. Trees 655.

DESCRIPTION.—Stem very slender, 2 feet high, about as thick as a duck's quill, leafy upwards. Leaves 8-18 inches long ; petiole and rhachis very slender ; leaflets 6-8, 1-3½ inches long and broad, white beneath ; lateral leaflets broadly cuneate below the middle, above it triangular or 3-lobed or truncate and acutely toothed.

Spadix slender, erect, 3-branched. Fruiting spadix 8 inches long, sheathed below the middle with narrow long terete glabrous striate spathes, lateral branches 3 inches, terminal 4 inches long.

Fruit elongate, ¾ by ⅓ inch in diameter, ovoid, obtuse, base rounded. Seed elliptic-oblong, ⅝ inch long, concave-convex, equally narrowed at both obtuse ends ; raphe very obscure ; albumen equable.

HABITAT.—Assam, Daphla Hills.

This palm was discovered by Booth, Nuttall's Collector in Assam.

## *WALLICHIA*, Roxb. Corom. Pl. III, t. 295.

(After Nathanael Wallich, Superintendent of the Bot. Gardens, Calcutta, 1786—1854).

Mart. Hist. Nat. Palm. iii, 189. (excl. sp. 3), 315, t. 36 (*Harina*)—Kunth. Enum. Pl. III, 193, (*Harina*).—Griff. Palms Brit. Ind. 174, 175, 237, A. B. C.—Kurz For. Fl. II, 521 (excl. sp. 3).—T. Anders. Journ. Linn. Soc. XI.—Bot. Mag. t. 4584.—Benth. & Hook. Gen. Pl. III, II, 916, 70.—Hook. Fl. Brit. Ind. VI, 418.

Stemless or caulescent, rarely simple-stemmed, often soboliferous palms. Leaves pinnatisect ; leaflets linear or oblong, irregularly toothed, base cuneate, unicostate, nerves flabellate.

Spathes many, tubular, clothing the peduncle, of the spadix, upper large cymbiform. Spadices interfoliar, monoecious or polygamous; males ovoid, excessively branched and dense-flowered; female looser-flowered. Male flowers symmetric, calyx cylindric or cupular, membranous, truncate; corolla cylindric, deeply 3-lobed, lobes oblong, valvate; stamens 6 on the corolla-tube; filaments short, anthers large; pistillode 0. Female flowers much smaller, sub-globose, sepals orbicular, coriaceous, imbricate, petals triangular, valvate, staminodes few or 0, ovary 2-3-celled, stipitate; stigmas conic, ovules sub-basilar.

Fruit ovoid-oblong, 1-3-celled and -seeded. Seeds erect, plano-convex, albumen equable; embryo dorsal, conical.

Species about 3.

DISTRIBUTION.—Indian and Malayan.

CULTIVATION IN EUROPE.—Dwarf tufted stove palms, which must be grown in strong, rich soil. They are propagated by seeds or by suckers. These must be gradually separated in order that they may make sufficient roots before they are quite detached.

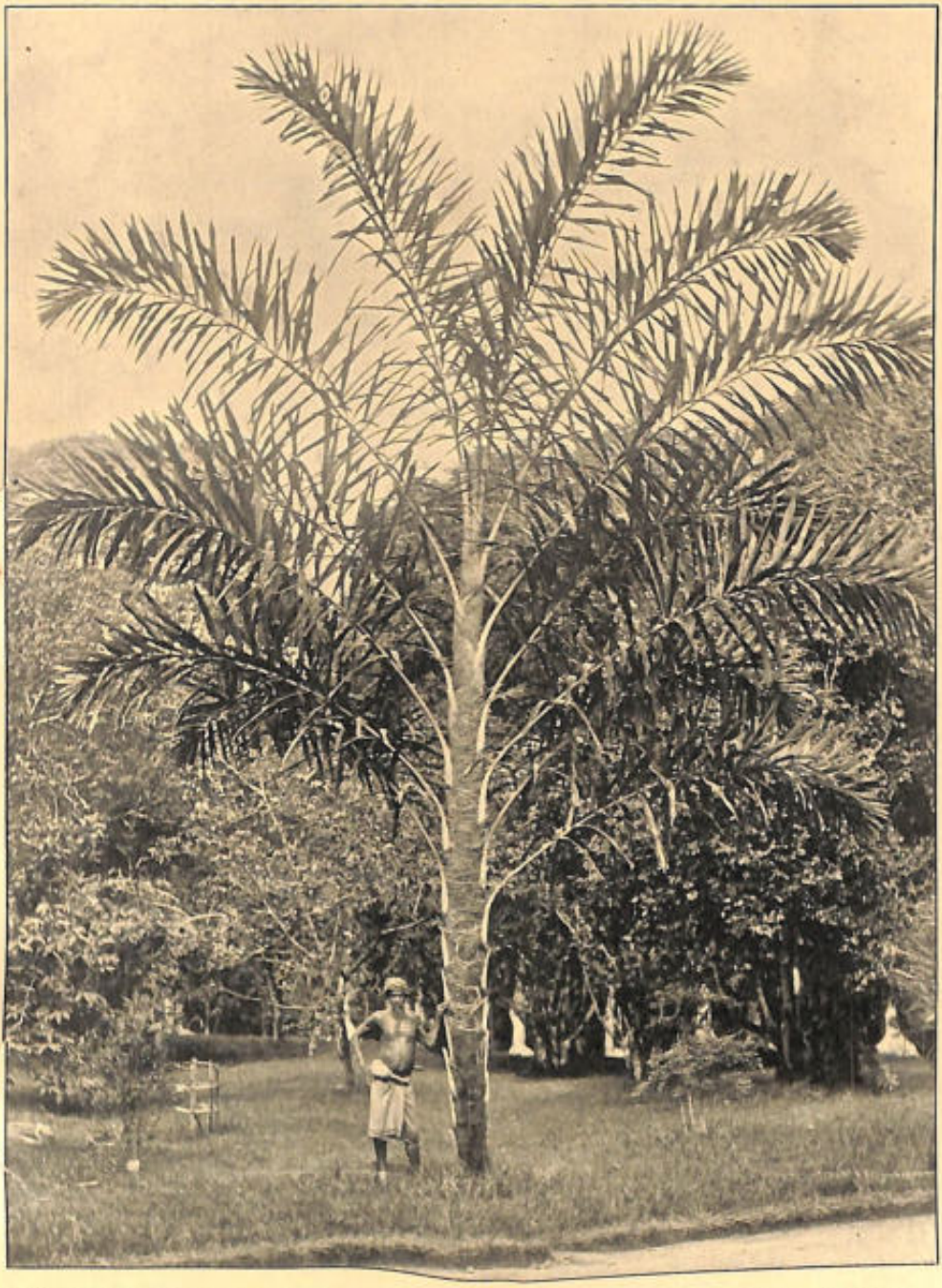
1. Male spikes almost filiform ... ... *W. caryotoides.*
2. Male spikes thick and rigid—
   (*a*) Leaves placed in a $\frac{1}{3}$ spiral ... *W. densiflora.*
   (*b*) Leaves strictly distichous ... *W. disticha.*

*WALLICHIA DENSIFLORA*, Mart., Hist. Nat. Palm. III, 190; Kurz For. Fl. II, 532, Brandis. For. Fl. 549.—*Wallichia oblongifolia*, Griff. in Calc. Journ. Nat. Hist. V. 486.—*Harina oblongifolia*, Griff. Palms. of Brit. Ind. 175, t. 237, A. B. C.—*Wallichia caryotoides*, Wall. Cat. 8596 B.

NAMES.—Kala Aunsa, Gor Aunsa. (Kumaon); Takoru (Nep.); Ooh (of the Lepchas in Sikkim); Zanoung (Burma).

DESCRIPTION.—An elegant palm, forming thick tufts, stems very short or 0; trunk sheathed, scurfy, sheaths villous, resolving into strong fibres. Leaves 8-10 feet long; leaflets 1-2 feet, very many, alternate or often sub-opposite, or the lower 2-4-nate, oblong or linear-oblong, sinuately lobed, acutely toothed, with a brown midrib and many parallel nerves, bright green above, white beneath; the terminal pinnules are broadly cuneate, 3-lobed, the central lobe being itself 2-lobed and eroso-dentate; sheaths scurfy.

Male spadices axillary, curved, often pendulous; the ends of the lowermost touching the ground, about $1\frac{1}{2}$ foot long. Spathes densed imbricated, the innermost almost membranous, striate, tinged with dark purple, equalling the flower-bearing part of the spadix. Spikes slender, very numerous, level-topped, pendulous, their points projecting beyond the opening of the spathes. Flowers very numerous, yellow, solitary, or the lower in pairs, with a rudimentary female between. Calyx cylindric, nearly entire, corolla as long as the calyx, tripartite nearly to the base; segments reflexed. Stamens 6; filaments adnate to the petals; no pistillode.



Minbaw (Upper Burma); Zanaung, Letme (Lower Burma); *Wallichia disticha*, T.†Anders. in the Botanic Gardens of Peradeniya.

Spathes of female spadix brown, conduplicate, the outer one sometimes very long and accuminate. Branches very stout, green, variously ascending, tapering at the ends, where they are caudiform and notched, the notches bearing rudimentary flowers. Bracts 2, right and left. Flowers purplish, crowded, occupying the lower part of a flattish areola, bases somewhat immersed. Calyx very short, divided to the middle into 3 broad rounded teeth. Corolla shorter than the ovary, trifid, segments broadly half ovate, obtuse, depressed. Stigma an indistinctly emarginate point.

Fruit oblong, about ½ inch long, dull purple, surrounded at the base by the perianth, on the apex presenting a brown spot, the remains of the stigma. Epicarp tough, rather thin; flesh scanty with a mucilaginous acrid juice. Seeds plano-convex. Albumen horny and solid; embryo dorsal.

HABITAT.—Tropical Himalaya from Kumaon eastwards up to 4,000 feet; Assam, Khasia Hills; Chittagong.

(Assam, Sikkim, up the Teesta Valley to Chakung, at 4,400 feet, growing side by side with the birch, willow, alder, and walnut. Kumaon, in shady and moist valleys, ascending to 3,500 feet, and at times to 4,000 feet, forming extensive thickets in the valleys of the Kali and Sarju; Bamauri Pass, below Naini Tal, and in the Patli Dun, which seems to be its north-west limit. Brandis.)

FLOWERS.—May, June and July.

USES.—In Kumaon the leaves are used as thatch and are said to be imperishable. In Darjeeling the leaves are used as fodder for poneys.

ILLUSTRATION :—Plate LII. The photograph, taken by Mr. Macmillan, shows a tuft of *Wallichia densiflora* growing in the Botanic Garden of Peradeniya.

*WALLICHIA CARYOTOIDES*, Roxb. Cor. Pl. III, t. 295; Mart. Hist. Nat. Palm. III, 180, t. 136; Wall. Cat. 8596 A; Griff. in Calc. Journ. Nat. Hist. V, 485; Kurz For. Fl. II, 532; Miq. Fl. Ind. Bat. III, 34; Hook. Fl. Brit. Ind. VI, 419—*Wallichia densiflora*, Brandis, *non* Mart. *ex* Dammer Palmenz. (1897) 81—*Harina caryotoides*, Ham. in Mem. Wern. Soc. V, 317; Griff. Palms Brit. Ind. 174, t. 237—*Wrightia caryotoides*, Roxb. Hort. Beng. 68; Fl. Ind. III, 621—*Harina Wallichia*, Steud. *ex* Salomon, Palmen (1887), 127.

NAMES.—Chilputta, Belputta (Chittagong); Saingpa (Burm.).

DESCRIPTION.—An elegant tufted palm, stemless or short-stemmed. Leaves ascending curved, 8-9 feet long, oblong in outline. Petiole naked and roundish throughout the lower four feet. Leaflets oblong or linear-oblong, panduriformly excised and acutely toothed, white beneath.

Male corolla half as long as the calyx; mouth of calyx 3-toothed. Female spadix terminal, shorter than the leaves, erect or almost nodding. Spathes closely imbricated, concealing the peduncle.

Spikes spreading, stout, marked under each flower with a distinct areola, with attenuate points, bearing neuter flowers with 6 barren stamens and no pistil. Next to these there are some nearly, if not quite hermaphrodite flowers, with usually 3 full sized stamens and apparently a well developed pistil. The other flowers are female, with 3 bracts. Sepals 3, short and rounded. Petals 3, ovately cordate, erect, acute, almost spinously pointed, about twice as long as the ovary, greenish. No staminodes. Ovary with a conical stigma.

Fruit as large as a nutmeg, ovoid-oblong, rarely 2-seeded.

HABITAT.—Chittagong; Upper Burma, hills west of Katha, 2-3,000 feet, in evergreen forests; Martaban and Tenasserim.

ILLUSTRATION: PLATE LIII.—The specimen, photographed by Mr. Macmillan, grows in the Botanic Garden of Peradeniya. It forms dense tufts. A comparison of the leaflets of this palm with those of the foregoing species will at once show the difference between the two palms. A few fruiting spikes have been exposed in front.

*WALLICHIA DISTICHA*, T. Anders., in Journ. Linn. Soc. XI, 6; Hook Fl. Brit. Ind. VI, 419.—*W. yomae*, Kurz For. Fl. II. 533.—*Caryota mitis*, Herb. Calc.—*Didymosperma distichum* Hook f.

NAMES.—Minbaw (Upper Burma); Zanaung, Letme (Lower Burma); Katong (Lepcha).

DESCRIPTION.—An evergreen simple-stemmed palm; trunk 10-20 feet high, 6-12 inches in diameter, naked, annulate. Leaves 8-10 feet long, distichous, erect; leaflets narrowing from near the truncate apex to the base and with a large tooth on each side about the middle, 1-2 feet long, 2-2½ inches broad, glaucous beneath; petiole and sheath short, scurfy.

Male spadix 3-4 feet long, very narrow, linear in outline, with innumerable, recurved, slender, crowded branches. Male calyx cupular, 3-lobed, corolla thrice as long. Female spadix 6-8 feet long, pendulous; branches stout, simple. Female flowers disposed in many spiral series, green; corolla longer than the ovary.

Fruit oblong, top obscurely 2-3 lobed, reddish.

FLOWERS.—April.

HABITAT.—Gonda Hills, Oudh; valleys of Sikkim Himalaya to 2,000 feet; Makum forest, Assam; Upper Burma, ascending to 4,000 feet in the hills east of Bhamo; Pegu Yoma, chiefly on the eastern slopes.

USES.—The Lepchas fell the tree to eat the pith of the stem near its summit. Anderson remarks that the berries and perhaps the leaves irritate the skin (Gamble).

ILLUSTRATION: PLATE LIV.—The photograph presented by Mr. Macmillan, shows a well-developed specimen of *Wallichia*

Cadda-panna (Teling.); Varu Kamavu (Mal.); *Bentinckia coddapanna*, Berry, in the Botanic Gardens of Peradeniya.

*disticha*. The fact that the leaves arise on two diametrically opposite sides of the stem and thus form two rows is a distinguishing character of this species. *Wallichia disticha* is, besides, the only species of its genus which grows a stem of some size.

*B. Sub-tribe: Geonomeæ.*

Spadix between or rarely below the leaves, simple or branched. Flowers ternate, sunk in cavities of the stout spadix or its fleshy branches. Calyx of 3 narrow, free leaves, imbricate. Corolla valvate, ovary 3-locular with 3 seeds, or by the abortion of 2 carpels unsymmetrical with 1 cell and 1 seed. Fruit by the abortion of 2 carpels consisting usually of 1 carpel (rarely 3-carpellary with 3 seeds). Embryo basilar (except *Sclerosperma*) in the uniform albumen.

DISTRIBUTION.—Tropical America, tropical West-Africa, India. *Podococcus*, Wendl. & Mann, *Sclerosperma*, Wendl. & Mann, *Bentinckia*, Berr., *Manicaria*, Gærtn., *Leopoldinia*, Mart., *Calyptronoma*, Griseb., *Geonoma*, Willd., *Asterogyne*, Wendl., *Calyptrogyne*, Wendl., *Welfia*, Wendl. & Hook.

In India only 1 genus:

*BENTINCKIA*, Berry in Roxb. Fl. Ind. III, 621.

(After William Henry Cavendish-Bentinck, Governor-General of the East-Indies, 1774—1839.)

Mart. Hist. Nat. Palm. III, 165, 228, t. 189.—Kunth Enum. Pl. III, 227.—Griff. Palms Brit. Ind. 160, Append. XXVI.—Benth. & Hook. Gen. Pl. III, II, 916, 69.—Hook. Fl. Brit. Ind. VI, 418.

Unarmed palms. Leaves terminal, equally pinnatisect.

Spathes many, 2 lower short, incomplete, upper 2-fid. Spadix interfoliar, branched; flowers minute, monœcious or polygamous, solitary or ternate with the intermediate female, clustered in spirally arranged pits on the branches; bracts forming a 2-lipped mouth to each pit; bracteoles 2. Male flowers subsymmetric, glumaceous, often reduced to ciliate scales; sepals oblong, obtuse, connate below, imbricate; petals longer, connate below into a stipes, valvate; stamens 6; anthers versatile; pistillode conical. Female flowers ovoid; sepals broad, obtuse, imbricate; petals longer, convolute; staminodes 6, minute; ovary 3-celled, 1-ovuled; stigmas minute.

Fruit small, subspherical; stigmas subbasilar. Seed pendulous from the top of the cavity, sinuately grooved or ridged; albumen equable.

Species 2.—Travancore; Nicobar Islands.

| | | | |
|---|---|---|---|
| Leaves 3-4 feet long | ... | ... | *B. coddapanna*. |
| Leaves 5-8 feet long | ... | ... | *B. nicobarica*. |

*BENTINCKIA CODDAPANNA*, Berry in Roxb. Fl. Ind. III. 621; Mart. Hist. Nat. Palm. III. 165, 228, t. 139; Kunth Enum. III, 228, Griff. in Calc. Journ. Nat. Hist. V. 467; Palms Brit. Ind. 160; Append. XXVI. Wight in Madr. Journ. Nat. Sc. II. 385; Hook Fl. Brit. Ind. VI, 418; Brandis Ind. Trees 647.—*Keppleria*, Mart. Mss. *ex* Endl. Gen. Pl. 25.

NAMES.—Lord Bentinck's Palm. Varu Kamavu (Mal.); Caddapanna (Teling.).

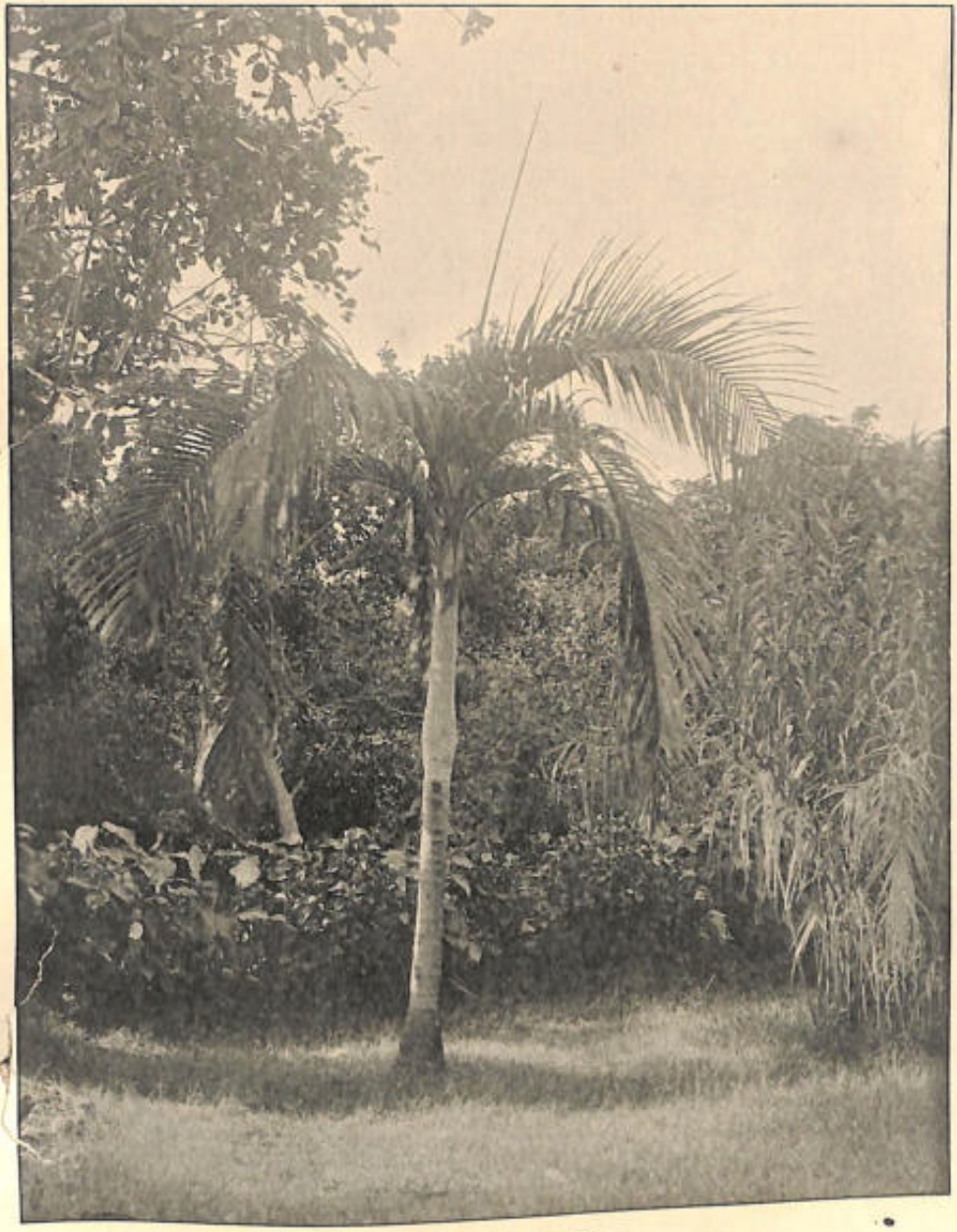
DESCRIPTION.—Trunk slender, reed-like, about 20-30 feet high and 6 inches in diameter, annulate. Leaves 3-5 feet; leaflets 30-40 pair, 2 feet or more long, and 1½ inches broad, linear, much acuminate, rigid, closely inserted, generally split at the point into two exceedingly narrow triangular portions, two to four inches long, the fissure often bearing a thread; above 2-keeled, keels paleaceous.

Spathes membranous, lower truncate, upper complete. Spadices 1-2 feet long. Common peduncle 2-3 inches long of violet colour towards the base, branches few, each with a membranous broad semi-amplexicaul bract, three or four times divided; of the female simple, generally only with two divisions. Colour of the male spadices scarlet, of the female pale lilac or violet. Spikes 6-10 inches in length, subfastigiate. Male flowers arranged in rather loose spires, immersed in pits, which are at first nearly closed, afterwards opening vertically. In each pit there are 2, 3 or even 4 flowers, with occasionally a female in those towards the base of the spikes, the upper ones opening first. An ovate-triangular bract arises from under the lowermost flower; and a small bracteole bearded on the upper margin is situated on the outer side of the upper ones. Calyx about 1 inch long; sepals glumacious, oblong, concave, rather obtuse, connate below, imbricate; petals nearly twice as long as the calyx, purplish, ovate, rather acute, valvate. Stamens 6, included; filaments subulate; anthers ovate, subcordate, versatile; pistillode conical, nearly as long as the stamens. Female flowers ovoid, sepals broad, obtuse, imbricate; petals longer, convolute: staminodes 6, minute; ovary ovate, three-celled, one-ovuled; style almost wanting; stigmas 3, triangular. Fruit bright chocolate coloured, when ripe ovate-globose, rather compressed, ½-⅔ inch in diameter, surrounded at the base by the perianth bearing the stigmata near the base. Seed subglobose, brown, with a rather deep complete furrow, and several other shorter ones. Testa obscurely chestnut-coloured, with veins arising from the groove near the embryo, and converging towards the base on the opposite face. Albumen solid, horny. Embryo basilar, conical, nearly one line long.

HABITAT.—Travancore, 2,500-6,000 feet on precipitous cliffs, local, but very common within its restricted areas.

FLOWERS.—In June: fruit ripens 8-9 months afterwards.

ILLUSTRATION: PLATE LV.—The slender thin-stemmed palm, photographed by Mr. Macmillan, grows in the Botanic Garden of



*Bentinckia nicobarica*, Becc.

Perandeniya. In the lower part of the stem the rings are not visible owing to a thick crust of lichens.

*BENTINCKIA NICOBARICA*, Becc. Illustraz. di alc. Palme viv. nel Giard. di Buitenz. 165. Hook. Fl. Brit. Ind. VI, 418; Brandis Ind. Trees, 647.—*Orania nicobarica*, Kurz in Journ. Bot. IV, p. 331, t. 171, f. 19-25.

DESCRIPTION.—Trunk tall, 60-70 feet high, 9 inches in diameter, annulate. Leaves 5-8 feet; leaflets ½-2 feet, sessile, linear, coriaceous, tip obtusely 2-lobed; petiole short; rhachis glabrous.

Spadix 1½-2 feet long, decompound, glabrous, branches and branchlets inserted in woolly grooves of the rhachis; bracteoles densely villous within. Female flowers: sepals and petals subsimilar, broadly ovate, obtuse, shining.

Fruits tristichously arranged, globose, 1 inch long, scarlet. Seed ovoid-oblong, ventrally flat, dorsally convex, rugosely ribbed; albumen equable; embryo lateral and apical.

HABITAT.—Nicobar Islands, Kamorta. Common, associated with *Areca catechu*, *Pinanga Manii*, and *Ptychoraphis augusta*.

ILLUSTRATION: PLATE LVI.—The photograph, taken by Rev. M. Maier, S.J., shows a young plant of *Bentinckia nicobarica*, growing at the Lower Gate entrance to Government House Gardens, Malabar Point, Bombay. It was planted by Mr. Millard in 1903, and has, therefore, 9 years growth by this time.

# BOMBAY NATURAL HISTORY SOCIETY'S MAMMAL SURVEY OF INDIA.

## Report No. 10.

by Kathleen V. Ryley.

*With Field Notes by the Collector C. A. Crump.*

| | |
|---|---|
| Collection ... ... | No. 10. |
| Locality ... ... | Kathiawar. |
| Date ... ... ... | September 1912—February 1913. |
| Collected by ... ... | Mr. C. A. Crump. |
| Earlier Reports .. | No. 1, E. Khandesh, Vol. XXI, p. 392, 1912; No. 2, Berars, Vol. XXI, p. 820, 1912; No. 3, Cutch, Vol. XXI, p. 826, 1912; No. 4, Nimar, Vol. XXI, p. 844, 1912; No. 5, Dharwar, Vol. XXI, p. 1170, 1912; No. 6, Kanara, Vol. XXII, p. 29, 1913; No. 7, Central Provinces, Vol. XXII, p. 45, 1913; No. 8, Bellary, Vol. XXII, p. 58, 1913; No. 9, Mysore, Vol. XXII, p. 295, 1913. |

The Honorable Mr. Claude Hill, C.I.E., late Agent to the Governor-General in Kathiawar, has kindly written a general description of the country as follows :—

"The Province of Kathiawar is perhaps more interesting *prima facie* from the point of view of political history than from the point of view of its physical conformation, having been the battle ground of invading hordes from the west and north-west at dates perhaps even anterior to those when the Punjab was the scene of Aryan immigration, and having not even escaped the influences of the Greek invasion four hundred years before the commencement of our era. The study of its political history is one of the most interesting chapters of the history of India. In relation, however, to the mammal survey of the Province, certain prosaic facts are perhaps of greater importance, even if they be of lesser general interest, than the mythological happenings of the pre-historic era.

It is an accepted hypothesis that the Province of Kathiawar, like the State of Cutch, formed originally a portion of the delta of the Indus, whose eastern branch in all probability is traceable at the present day in the *Nal* which forms part of the eastern boundary of Kathiawar. Within the Province itself there are, however, two well-marked ranges of hills, one running from south-east in a north-westerly direction which has eminences at the Gitnar Mountain rising to an elevation of some 3,000 feet, while the more northerly range running roughly north and south, rises to its extreme height at Chotila. For a description of the geological formation of the Province, the inquirer should refer to the Kathiawar Volume of the *Provincial Gazetteer*. But for present purposes it will suffice to say that (as might be inferred from what has been said) the Province varies in appearance from a sandy desert in the north-easterly,

easterly and northerly areas to a congeries of rugged hills, running roughly parallel with the southern and western coasts.

The most striking feature of the plains portion of the Province is perhaps its treelessness. At what period and how and for what reasons, if there ever existed trees, these were removed or destroyed is not precisely known, but at the present day, if a cultivator is asked why there is such a paucity of trees in the Province, he will reply that they are not good for cultivation, because they harbour birds which eat the crops; and the proposition is so far true that, save for aquatic and other game-birds, chiefly of a migratory character, the Province is singularly poor in bird-life. That this absence of trees is a result of human destructiveness, is rendered probable by the knowledge we have that the lion, which used to be common throughout portions of Rajputana, and has only become extinct at Abu within the last half century, has now disappeared, except in the sole remaining tract of forest in the Province, the Gir. The level plains of Jhalawad in the north-east and east and of Halar in the north of the Province, are roamed over now by considerable herds of black buck, and in the rougher, wilder portions chinkara are plentiful. Bordering on the *Run*, which again is presumably a former mouth of the Indus, and on the islands in it—desolate wastes of salt-land—are found the Indian wild ass, while wolves follow the numerous flocks which graze nearly all over the apparently barren stretches of this part of the Province.

The Gir Forest in the south-west and the Bardar hills in the north-westerly corner of the Province are the only localities which still harbour wild jungle-life. Mention has already been made of the lions of the Gir which, it is to be feared, must, owing to the encroachments of cultivation and the already straitened area within which they can roam, shortly disappear; and in addition to these are found in the hilly tracts numerous panther and samber, pig and chital.

The Province of Kathiawar is almost the most northerly part of Western India which is directly benefited by the rainfall connected with the south-west monsoon. It is true that in Cutch to the north they expect a rainfall averaging on the Coast not much less than that which falls in Kathiawar, but it is far less regular in its appearance in Cutch, and the State of which His Highness the Rao is the Ruler, is consequently less dependant upon agriculture than is Kathiawar. The desert-like appearance of the latter becomes, on the other side of the *Run*, desert in grim reality, and though the north-eastern portion of the Rao's dominions boasts a celebrated breed of cattle which grazes upon the salty grass-produce which borders on the *Run*, in the direction of Suigam, those territories approximate in their general desolate appearance to the desert of Marwar and Thar and Parkar. This climatic feature, indeed, is also

present in the north-eastern part, or Jhalawad Prant of the Kathiawar Peninsula, and if there were space for describing them, there are several rather interesting features connected with cattle-breeding which seem to be associated with the physical configuration of the country, which in turn results, no doubt, from the original influence of the Indus outflow and of the tidal creeks from which the sea has, in later times, receded. For example, experience in the last famine, in connection with cattle relief, gave one result of great interest. The cattle hailing from Jhalawad and Northern Gujarat, when driven for pasture to the south of Kathiawar, where grass, in the Gir forest, was plentiful, suffered very severely. Casualties were indeed as numerous among those which got plenty of Gir grass to eat as among those which remained behind to pick up what they could in their native plains. On the other hand, cattle from Southern Gujarat did very fairly well and found the fodder which grew in the Gir not ill-adapted to their constitution. It was already a fact known from the experience of the preceding famine that cattle from the districts north to the Narbada did not thrive upon the fodder growing to the south of that river and the inference from the second experience is that there is some alimentary property in the grass which grows on the salt lands in Northern Gujarat which has become necessary for the proper sustenance of the big-boned cattle which are there indigenous. It is, however, impossible in the space of this brief survey to enter upon a longer discussion of the lessons to be learnt from the cattle famine of two years back.

It is of interest, in connection with the mammal survey of this part of India, to note, as briefly as possible, the extraordinary diversity of human races which are either present in Khathiawar or have left their traces upon the Province. What precisely were the original inhabitants it is now almost impossible to tell, but that they were not very alien to the Bhils, who were indigenous in the Aravallis and the Vindhyas may perhaps be inferred from the existence in the Province, in some numbers, of outcasts calling themselves Bhils. On the other hand, it is, of course, equally possible that these, who are in general, lighter skinned than the Bhils of Malwa and Mewar, are only immigrants of comparatively recent date. However that may be, we have, at all events, fair historical evidence that Kathiawar was the point of arrival in India of at least one of the solar races of the Rajputs, and that Valabhipura, now known as Vala, was a thriving and important city, probably founded and built by a highly civilized race of Aryans, is at all events one of the usual postulates in connection with Kathiawar history. Again, from a very early time, the Coast of Kathiawar, though it presents to-day few facilities in the way of harbourage for large shipping, was the point of objective for numerous piratical invasions from Arabia

and East Africa. There has indeed, from the earliest times, been direct and almost continual ocean traffic between Egypt, Arabia and East Africa on the one hand and the Province of Gujarat on the other, and, both in its population and in its customs, Kathiawar shows very definite traces of Egyptian, African and Arabian influence.

But the sea-coast was by no means the only point of entry into India from the outer world. Gujarat was presumably from very early times famous for its fertility, and, in addition to those who emigrated by sea from Arabia or Persia, the Province of Kathiawar has suffered (or benefited) by numerous and successive incursions overland through the deserts of Sind and Cutch. Sindies, Waghirs, Mianas are, so to speak, the froth on the seashore, which has been left after the advance of a wave. By no means numerous, these have nevertheless set their mark by their predatory habits upon the whole history of the Province. On the other hand, the tribes who have given their name to the Province and who migrated from Sind and have permanently settled there, namely, the two tribes of Kathis, were of a far higher grade in civilization than those just mentioned. How far they ever completely dominated the Province may be doubtful. But they certainly were the people who ruled a considerable part of the Peninsula for a very considerable period of its history. Then from Cutch, in the persons of the Jadejas, and from Rajputana in the north, in the Jhalas and Ghoils, came incursions of various Rajput clans which carved out kingdoms for themselves wherever they found themselves strong enough to establish any form of permanent rule.

Lastly the whole of the political situation in the Province was subverted by the incursion, again from the same directions, of conquering Mahomedans. This does not purport to be even a bare summary of the political history of the Province, but enough has been said to show that the Peninsula of Kathiawar presents within a very small geographical limit a greater variety of race, creed and place of origin of its population than almost any other area of similar extent on the surface of Asia.

It remains to give some description of the climatic conditions of the Province, and these are, considering its area, unusually varied. As has already been said, Kathiawar is approximately the northern limit of the area of direct influence of the south-west monsoon, and this of course to a great extent determines its climate so far as rainfall is concerned. But even in respect of that feature the Province is the victim of large local variations. The hilly tracts to the south, which are well covered with jungle, have the benefit of a fairly regular rainfall, and, even in years, such as 1899 and 1910, the Gir forest and the Girnar Mountain—in fact, most of the Sorath Prant—received a modicum of rain, and in 1911, in particular, the rainfall

received was sufficient, as already remarked in connection with cattle preservation, to produce a good crop of grass and a fair harvest. Whether the treelessness already referred to, which characterises the rest of the Province, affects the rainfall or not; the fact that even in normal years there is a very marked difference in the amount gauged in the north of Jhalawad and that which is received in the *Gir* forest. Taking the whole Province together, the rainfall perhaps averages about 20 inches. But it is no uncommon occurrence, even in otherwise normal seasons, for the north-eastern corner of Jhalawad to receive half or even less than half that amount. As compared with Gujarat from Ahmedabad southward, therefore, it will be seen that the incidence of the monsoon in this Peninsula is an uncertain and very variable factor, and a similar variation is also noticeable in the temperature statistics. While the coast-line of the south-west coast has a climate considerably cooler than Bombay or Karachi during the hot weather and monsoon, the internal parts of the Peninsula almost, and in some parts quite, equal the maxima recorded heat-temperatures of Deesa and Ahmedabad. At the same time, being relatively drier, the heat is just as bearable as, and less exhausting than, that in the more central portions of Gujarat, and the climate generally of Halar and Jhalawad may be said to resemble more closely that of Rajputana to the east of the Aravallis. Frost is by no means uncommon in either December, January or February, and is annually dreaded by the cultivator whenever the monsoon has given favourable prospects for the cotton crop. It may be mentioned that the Province is singularly devoid of perennial rivers. It would be approximately true to say that there is not a single perennial river in Kathiawar outside the range of the Gir Forest Within that area, however, there are several streams, in which by the way the fishing is by no means to be despised, which never dry up, and water is there, as a rule, found very close to the surface. Perhaps it is that circumstance, coupled with the decay of vegetation which perennially goes on in a neglected forest area, such as the Gir, which accounts for the virulence of the malaria which characterises the forest area in the months of November, December and January. It used to be almost certain death to camp from November to March within the confines of the Gir area. Elsewhere the health statistics of the Province would, if they existed, yield a fairly favourable record.

The following notes and descriptions of the actual collecting stations are given by Mr. C. A. Crump :—

"In making this collection in Junagadh State, my work has been enormously simplified by the unfailing zeal of the Administrator, Mr. L. Robertson, I.C.S., who has throughout attended to every detail of the tour, also placing at my disposal everything necessary to help my work.

Acknowledgments are also due to Mr. E. Brook-Fox and Mr. Boyd, Superintendent of Police, for help in various ways.

My first camp was made at Junagadh in the State Gardens, almost at the foot of the Girna mountain and exactly in the line where cultivation ends and forest begins, the latter here is almost entirely composed of stunted teak. Being just after the rains, and the forest at its best, or for my purpose, its worst, I confined my attentions to the cultivated land intending to return to the neighbourhood of the Girna just before leaving the State. Jowari and bajri are grown extensively here, and I was at once surprised and disappointed to find absolutely no signs of rats or mice near the crops. The natives informed me that there had been no rats for over a year, but could give no reason. Mr. Brook-Fox suggested to me that the rats had been exterminated by a recent outbreak of plague. This solution is undoubtedly correct for the conditions were ideal for *Tatera*, *Gunomys*, *Epimys*, etc., and in the more isolated parts of the State, such as the Gir Forest and high up on the Girna Range, rats and mice were moderately plentiful.

After a short stay here, I moved on to the flat a mile or two below the city where the soil is black cotton and very fertile, and almost every square yard was covered with still standing jowari and bajri, but still small rodents were scarce.

KESHOD.—Lies midway between Junagadh and Verawal. Here collecting was carried on under difficulties, owing to the antipathy of the Jains to the taking of life. The country to the east is flat and treeless, with tracts of stony uncultivated land, otherwise cultivation is extensive. To the west the ground is more broken and growth more abundant. Fig trees being very numerous and from them I obtained a few specimens of *Epimys rufescens*. Signs of rats were wanting in the fields, and though the conditions were very favourable for *Tatera indica*, I could find only two burrows from each of which an occupant was trapped.

VERAWAL.—A move was soon made to Verawal, which is on the coast. Limestone begins to show a good deal here and the soil is lighter, signs of small rodents began to appear, but several beats in the only good cover showed a great scarcity of larger mammals, so it was deemed advisable to move at once to Talala, which is just at the edge of the Gir Forest and about 16 miles E.-N.-E. of Verawal.

TALALA.—From Verawal the country is under cultivation and is quite flat until within a few miles of Talala, when a gradual change is observed, the country becoming undulating, grass more abundant and large patches of very stunted teak at more or less frequent intervals. The soil is black cotton and very fertile, producing various crops, but vast areas are covered with long grass. A fine river flows through this part of the country, the banks of which are clothed with trees and bushes. The sub-soil is trap with limestone showing in places. Very conspicuous are several groups of Palmyra Palms which yielded a few bats.

SASAN, GIR FOREST.—Sasan is in the heart of the Gir Forest, and a stay of 16 days was made. This is the western end of a long range of hills stretching away to the east. Some of these hills are imposing in appearance, though not particularly steep, the highest point being slightly under 2,000 ft. Many are clothed with a succession of teak forests and larger areas of grass which grows in great profusion. On the low ground the forest is mixed with a fair sprinkling of large trees including a good deal of tamarin, though teak still predominates. To the west the valley opens out and there is scanty cultivation broken at intervals by nullahs and waterways, the banks of which are invariably covered with dense jungle. The village of Sasan is large but the majority of the inhabitants live by cutting grass and wood. The game observed in the Gir near Sasan was practically *nil*; this may be assigned to two causes, the first being the thickness of the cover owing to the extraordinary growth of grass. The second is that last year during

the famine many thousand head of cattle were turned into the Gir and grass-cutting was organised on a large scale, by this means the whole Forest tract was cleared of cover ; and it is probable that much game was accounted for by the hungry workers. A frequent and very careful inspection of paths and the sandy river-bed revealed remarkably few footprints of any large animals, other than lions, panthers and pigs, and as the two former take fair toll of the domestic cattle there is no difficulty in accounting for how they obtain food. I hear that the shooting in the Gir is very good, so in all probability, as I have pointed out, this is not a normal year. In the small cultivation around and in the village, signs of rats and mice were plainly discernable and trapping yielded fair results.

BARADIA.—The country here is the usual type of fertile black cotton soil, the principal produce being cotton, other crops here being irrigated by water drawn from wells. The country is flat but intersected by deep waterways, now dry. Hares were abundant and a good series was obtained.

KUDIA, GIRNA RANGE.—This, my last camp in the State, yielded some fine series of rodents and shrews, the former probably being peculiar to the Girna Range above, say 1,000 feet. On my labels I have recorded the altitude as 2,500 feet, but have since come to the conclusion that I was working principally at 2,000 feet. Up to 1,500 the jungle is all teak, above this the teak thins out and gives place to small and large leaf bushes, many having the appearance of a laurel ; the leaf of one species, I understand, is used for the outer wrap of Native cigarettes. A scanty growth of babul is also found here.

Wherever the mountain side is steep there are great masses of trap rock and piles of large boulders in the crevices of which sufficient soil lodges to give sustenance to bushes and long flowering grass, the seeds of which form an important item in the diet of *Cremnomys cutchicus*, for it is among these rocks that this interesting rat is to be found. A good stream rises much higher up the valley and finds its way to the plains below in a series of cascades and pools."—C. A. C.

"*Simia rhesus* does not occur in the State.

*Lyroderma lyra*. I cannot trace this bat here : have searched disused wells, which are favoured by this species, also caves, without avail.

*Felis leo* (Vernacular name :—SAWACH HAWACH.)

The lion is found only in the Gir Forest in this State, I understand he wanders into Baroda territory. I made many inquiries as to the numbers now living in the Gir, but the estimates given by the local people varied so vastly as to be quite unreliable, but by a good authority, I was told that there might be fifty or sixty lions now in the Gir. Lions are exceedingly noisy late in the evening, at night and in the early morning before day-break. They kill a large number of domestic cattle and goats, but are invariably driven off the kill by the villagers, who hope by this method to prevent the lion stopping in their neighbourhood. I was informed that a lion will not attack a buffalo from the front, but springs upon it from behind ; when two or three are hunting together, one lion is said to draw the buffalo on, while the remaining one or two attack from behind. Several cases were brought to my notice of lions having lately killed men, but I think in each case the man was asleep or alone in the jungle at night which is putting temptation in the lion's way. I subsequently received information that one lion turned man-eater and was shot by Mr. Brook-Fox. The lion is very bold, I heard one making a great noise in the village one night. The local people say that three lions together are often met with, they are fond of sleeping during the day in the shade of big trees, and may then, according to report, be approached without difficulty. A tame lion in Junagadh has a fair mane.

*Felis tigris* is not found in this State.

*Felis pardus.* (Vernacular name :—DIPRA.) Common in the Gir and about the Girna.

*Cynælurus jubatus,* Cheeta (Vernacular name :—CHITAH). Most of the shikaris are familiar with this species but all agree that it is now very rare in the State.

*Hyæna hyæna,* Hyæna (Vernacular name :—JARAK.) Not very common in the places I visited.

*Mellivora indica,* Ratel (Vernacular name :—BASTORA, GHOR-KHODIA.) Found near the Girna, where it visits the Hindu burning ground and is said to dig up human bodies from their graves. I sat up by moonlight for this animal but had no luck.

*Melursus ursinus,* Sloth Bear. Unknown.

*Boselaphus tragocamelus,* Nilgai (Vernacular name :—ROOJ.) Found in the Gir and about the Girna, is scarce.

*Tetracerus quadricornis,* Four-horned Antelope (Vernacular name:—GUNTLA.) Fairly plentiful in the Gir, I saw two but failed to bag the one at which I fired.

*Muntiacus vaginalis,* Barking Deer. Found in the Gir, I heard one barking in the evening.

*Rusa unicolor,* Sambar (Vernacular name:—SAMBHAR). Gir Forest and Girna Range.

*Axis axis,* Spotted Deer (Vernacular name :—PASSU.) In the Gir forest, I believe, plentiful.

*Manis crassicaudata,* Anteater. No information.

No large squirrel or flying squirrel is known in the Gir.

The second part of this Collection was made in RAJKOT, RAJKOT STATE, KATHIAWAR. Through the courtesy of the Thakur Sahib, I received much assistance, and Major W. M. P. Wood, Political Agent, Halar Prant, kindly interested himself in my doings and caused the local Vhagris to catch and bring mammals to me. Mr. J. J. Turner, Acting Principal of the Rajkumar College, and Mr. Lyon Scott, Manager of the Rajkot Branch of the Bank of Bombay, spontaneously gave me the services of their shikaries, so that the direct result of all this was a collection of 345 specimens during a stay of 27 days. Captain A. H. L. Mosse and Mr. F. Trotter also offered assistance.

RAJKOT is situated in the midst of an extensive alluvial plain, quite flat with the exception of a small group of low hills. Beyond the actual outskirts of the town, the country is almost treeless and with only occasional patches of scrub, it is almost entirely under cultivation, a great variety of crops being raised, the principal product is wheat. Frequently the only break in a featureless landscape is a cactus hedge lining the road.

Bats.—A few specimens of *Hipposideros fulvus* were taken in Porcupines' earths, otherwise the natives could not find any bats near or in Rajkot. I noti ed very few flying during the evenings, the specimens of *Rhinopoma* and *Taphozous* were brought from a fort some distance away.

*Paradoxurus niger.* A shikari said he saw two in the town."

VANKANEER.—A stay was made from January 4th to January 16th and a small collection made amongst the limestone hills which are a great feature of the immediate neighbourhood.

These hills rise to a height of 1,000 ft. and are covered with a scanty growth of short grass, cactus and a few Babul trees.

The third part of the Collection was made in DHRANGADHRA, BAJANA and BHAVNAGAR STATES, KATHIAWAR. The following field notes were sent :—

"My thanks are due to H. H. the Raj Sahib for the facilities he gave me for collecting in his State, and I was also fortunate in having the keen co-operation of Major C. F. Harold, Political Agent, Jalawad Prant, who has kindly offered to collect the larger animals and fill up the deficiencies.

JUNA BOWLI is a village which was deserted some hundred years ago, and only heaps of stones and the remnants of walls now exist to show where the village once stood; it lies about S. W. of Dhrangadhra and is on the edge of a narrow belt of soft sand which follows the course of a small river the water of which is quite brackish. This sandy tract broadens out in places and is dotted with low bushes and tufts of grass, but many parts are quite barren. A bush called Kora Jar grows here and constitutes part of the food of small rodents.

With the exception *Meriones hurrianæ* all the rats, mice and shrews between the Nos. 2512 and 2583 were trapped among the ruins of the village. There were no Bats here or Flying-foxes.

SATAPUR lies north of Dhrangadhra and quite near the Runn of Cutch. The subsoil here is all sandstone and the surface soil is of poor quality, shallow and very firm, a little bajri and cotton are cultivated, the rest of the district being covered with short grass, cactus, babul and a bush which has the appearance of a miniature babul, and bears the vernacular name of khijada.

The country near Satapur is gently undulating, there are no hills; there is a good stream of fresh water. Hares appear to be scarce, and the same may be said with regard to the carnivora. Porcupines occur, though not common.

MULI is the principal town of the small State of Muli, and lies about 20 miles W. of Wadhwan. The surroundings are flat to undulating and almost treeless. Over the sandstone the soil is good, producing very fine cotton, which constitutes almost the entire cultivation of this State. The rainfall is rather below the Kathiawar average.

Rising above Wadhwan, a river flows by the town of Muli and is bordered on each side by belts of soft sand in which I found the desert forms. This sand is either bare of cover or has in places a very thin growth of wiry grass and occasional bushes.

BAJANA STATE is a small State occupying part of the narrow neck of sandy ground in the extreme N. E. of Kathiawar. Two camps were made, the first at Moti Mojiti, some 8 or 10 miles from Viramgam, and the second at Sadla within a few miles of Patri and the Run of Cutch.

SIHOR, BHAVNAGAR STATE. Owing to unforeseen circumstances, I was able to devote only a few days to collecting here. My thanks are due to H. H. the Maharaja Sahib for great assistance.

A camp was made at Sihor, 14 miles from Bhavnagar. Rising from a flat plain is a large range of lofty hills of igneous trap and occasional sandstone; generally speaking the hills are almost barren, but a few are clothed with heavy babul and other scrub jungle. With the exception of nilgai, hares and porcupines, all mammals are scarce."

The Collection consists of 1,068 specimens, spread over 44 species in 34 genera. Rodents are especially well represented, *Dipodillus nanus* and *Gerbillus gleadowi* (the latter consisting of a fine series of 75 specimens) are new to the Survey.

PRESBYTIS ENTELLUS, Dufr.

*The Langur.*

(Synonymy in No. 1.)

1 ♂; 2 ♀♀. Talala, Kathiawar.
1 ♀. Sasan, Kathiawar.

(*See* also Reports Nos. 1, 2, 4 and 7.)

Vernacular name:—VANDRA.

"Fairly well distributed in the Gir Forest; I did not meet with many. I am informed that there are great quantities on the Girna mountain where they are fed and held sacred."—C. A. C.

PTEROPUS GIGANTEUS, Bruenn.

*The Common Flying Fox.*

(Synonymy in No. 2.)

2 ♂ ♂; 5 ♀ ♀. Junagadh, Kathiawar.
1 ♂. Baradia, Kathiawar.
6 ♂ ♂; 4 ♀ ♀. Rajkot, Kathiawar.

(*See* also Reports Nos. 2, 3, 4, 5, 7, 8 and 9.)

Vernacular name :—WHORWANGA.

"In large numbers near Junagadh where I noticed it early in the evening flying at a great height towards the Girna. Not observed in the Gir." —C. A. C.

HIPPOSIDEROS FULVUS, Gray.

*The bicoloured leaf-nosed Bat.*

(Synonymy in No. 3.)

12 ♂ ♂; 3 ♀ ♀. 21 in al. Junagadh, Kathiawar.
1 ♂. Keshod, Kathiawar.
1 ♂; 1 ♀. Talala, Kathiawar.
2 ♂ ♂; 2 ♀ ♀, 6 in al. Sasan, Kathiawar.
1 ♂; 1 ♀, 3 in al. Rajkot, Kathiawar.
1 ♀. Sadla, Bajana State, Kathiawar.

(*See* also Reports Nos. 3, 5, 6, 7, 8 and 9).

"Very common, often found in porcupine earths, frequently came into bungalows where its flight appears very rapid ; after being struck at with a net, has a peculiar habit of flying round the room, only a few inches above the floor. When this bat is alarmed, the long ears are vibrated with great rapidity. Will not live long in captivity."

Local names (all bats) :—KAN KIRRIA, CHEEPA.

PIPISTRELLUS CEYLONICUS, Kel.

*Kelaart's Bat.*

(Synonymy in No. 1.)

1 ♂; 2 ♀ ♀. Junagadh, Kathiawar.
5 ♂ ♂; 4 ♀ ♀. 1 in al. Keshod, Kathiawar.
1 ♂; 1 ♀. Talala, Kathiawar.
6 ♂ ♂. Sasan, Kathiawar.
1 ♂ in al. Rajkot, Kathiawar.

(*See* also Reports Nos. 1, 2, 3, 5, 6, 8 and 9.)

"The *Pipistrelles* from Keshod, Sasan, Bagdu and Junagadh were nearly all taken with a net in bungalows, verandahs and flying through gateways. Favourite roosts during the day are under roof tiles, cracks in walls and also porcupines' earths."—C. A. C.

PIPISTRELLUS DORMERI, Dobs.

*Dormer's Bat.*

(Synonymy in No. 1.)

1 ♂. Keshod, Kathiawar.
1 ♂. Sasan, Kathiawar.
1 ♂; 5 ♀ ♀. 2 in al. Junagadh, Kathiawar.

(*See* also Reports Nos. 1, 2, 3, 5, 7 and 8.)

PIPISTRELLUS MINUS, Wrought.

*The Southern Dwarf Pipistrelle.*

(Synonymy in No. 1.)

1 ♀. Keshod.
1 ♂. Sasan.
2 ♂♂; 2 ♀♀. 1 in al. Bagdu.

(*See* also Reports Nos. 1, 2, 3, 5, 6, 7, 8 and 9.)

SCOTOPHILUS WROUGHTONI, Thos.

*Wroughton's Bat.*

(Synonymy in No. 1.)

21 ♂♂; 11 ♀♀. 1 in al. Talala, Kathiawar.

(*See* also Reports Nos. 1, 5, 6, 7 and 9.)

"All found at Talala in the Palmyra palms where they hide in the dead leaves which hang down the trunks after the style of closed umbrellas. The presence of these bats can be detected by the droppings at the base of the trees. Both sexes found together."—C. A. C.

TAPHOZOUS KACHHENSIS, Dobs.

*The Cutch Sheath-tailed Bat.*

(Synonymy in No. 1.)

14 ♂♂; 10 ♀♀. 9 in al. Junagadh, Kathiawar.
1 ♂. Keshod, Kathiawar.
3 ♂♂; 1 ♀. Rajkot, Kathiawar.
2 ♂♂; 4 ♀♀. Vankaneer, Kathiawar.

(*See* also Reports Nos. 1, 3, 8 and 9.)

"Common in the old forts. I found it in company with *Rhinopoma*, it moves about a wall or ceilling with fair rapidity and is noisy when disturbed; some appeared to be copulating and ran about the walls without separating. Enormous deposits of fat on the hind quarters."—C. A. C.

TAPHOZOUS MELANOPOGON, Temm.

*The black-bearded sheath-tailed Bat.*

(Synonymy in No. 1.)

6 ♀♀. (2172 skull only.) 5 in al. Rajkot, Kathiawar.

(*See* also Reports Nos. 1, 2, 3, 4, 6, 7 and 8.)

RHINOPOMA HARDWICKII, Gray.

*The lesser Indian Mouse-tailed Bat.*

(Synonymy in No. 3.)

6 ♂♂; 1 ♀. 5 in al. Junagadh, Kathiawar.
1 ♀. 10 in al. Rajkot, Kathiawar.
3 ♂♂; 7 ♀♀. Vankaneer, Kathiawar.

(*See* also Reports Nos. 3, 5, 7 and 8.)

"Found in old forts; sexes were not apart. This bat often hangs from ceilings using feet and thumbs to obtain a hold, the body is kept well away from the ceiling and the head and tail curved backwards in the form of a crescent. Large deposits of fat on the hind quarters."—C. A. C.

RHINOPOMA KINNEARI, Wrought.

*The greater Indian Mouse-tailed Bat.*

(Synonymy in No. 3.)

5 ♂♂. 6 in al. Junagadh, Kathiawar.

(*See* also Reports Nos. 3 and 4.)

NYCTINOMUS TRAGATUS, Dobs.

*Dobson's Wrinkle-lipped Bat.*

(Synonymy in No. 3.)

1 ♂. Rajkot, Kathiawar.
2 ♂♂; 1 ♀. Vankaneer, Kathiawar.

(*See* also Reports Nos. 3, 5 and 9.)

PACHYURA, spp.

*Shrews.*

1 ♀. Keshod, Kathiawar.
1 ♂; 1 ♀. Verawal, Kathiawar.
2 ♂♂. Talala, Kathiawar.
15 ♂♂; 2 ♀♀. 1 in al. Sasan, Kathiawar.
1 ♂. Bagdu, Kathiawar.
13 ♂♂; 6 ♀♀. Kudia, Kathiawar.
1 ♂. Rajkot, Kathiawar.
1 ♀. Juna Bawli, Dhrangadhra.
1 ♂. Satapur, Dhrangadhra.
1 ♂. Satapur, Dhrangadhra.
1 ♂. Sadla, Bajana, Kathiawar.

(*See* also Reports Nos. 1, 3, 4, 5, 6, 7 and 9.)

Vernacular name :—CHUCHUNDA.

"Two shrews were taken from under wood stacks at Talala, they appeared unusually slender in build and their tails were very round and smooth.

Common at Sasan in the hedges near houses, they destroyed many mice in my traps.

Common at Keshod, found on the same ground as *Cremnomys cutchicus*; they destroyed quite half the rats trapped, so that I was compelled to visit all traps during the night.

Reported very rare at Rajkot, but I am informed that they are protected here which accounts for the fact that only one specimen was brought to me."—C. A. C.

PACHYURA SUBFULVA, And

8 ♂♂; 6 ♀♀. Juna Bowli, Kathiawar.
2 ♂♂; 1 ♀. Satapur, Dhrangadhra.
1 ♂. Moti Mojiti, Bajana.
1 ♂. Sihor, Bhavnagar, Kathiawar.

These small shrews agree fairly well with *Crocidura subfulva* (Andr. J. A. S. B. Vol. XLVI, p. 278, 1877) collected by Dr. F. Stoliczka in Cutch, but as his types were immature, it is difficult to say for certain that these are *P. subfulva*, still this series has rather larger measurements than those given of the type so that it would probably do.

"The shrews were caught beneath walls."—C. A. C.

ERINACEUS MICROPUS, Blyth.

*The Northern Pale Hedgehog.*

(Synonymy in No. 3).

2 ♂♂ ; 1 ♀. Junagadh, Kathiawar.
2 ♂♂ ; 4 ♀♀. Verawal, Kathiawar.
14 ♂♂ ; 7 ♀♀. Rajkot, Kathiawar.
2 ♂♂ ; 2 ♀♀. Vankaneer, Kathiawar.
1 ♂. Juna, Bowli.
1 ♀. Muli, Muli State, Kathiawar.

(*See* also Report No. 3).

Vernacular name.—SEVRA.

"Said to be fairly common where the soil is light or sandy. The natives say they do not find it in the forest. The natives in Junagadh appear to know of a dark hedgehog, but I could not obtain a specimen. Common at Rajkot, some were dug out of holes in the ground, others found beneath bushes. Nocturnal. The natives in Rajkot declare that they do not know of a dark coloured hedgehog. Kept in confinement, hedgehogs voluntarily abstain from food for many days."—C. A. C.

FELIS AFFINIS, Gray.

*The Jungle Cat.*

(Synonymy in No. 1).

1 ♀. Junagadh, Kathiawar.
1 ♀. Baradia, Kathiawar.
1 ♀. Kudia, Kathiawar.
1 ♂ ; 1 ♀. juv. Rajkot, Kathiawar.

(*See* also Reports Nos. 1, 3, 4, 5, 6 and 7.)

Vernacular names.—MUNRA, JUNGLA BILLA, JUNGLI BILLI.

"A common cat in the district, many varieties are described but much exaggerated"—C. A. C.

FELIS (DOMESTIC).

1 ♂. Junagadh, Kathiawar.
1 ♂. Talala, Kathiawar.
1 ♂. Rajkot, Kathiawar.

FELIS ORNATA, Gray and Hardw

*The Indian Desert Cat.*

(Synonymy in No. 3.)

1 ♂. Rajkot, Kathiawar.

(*See* also Report No. 3.)

"Not often observed here, this specimen was shot in a patch of grass near a tank. The stomach contained a rat and some vegetable matter."—C. A. C.

VIVERRICULA MALACCENSIS, Gmel.

*The Small Indian Civet.*

(Synonymy in No. 3.)

1 ♂; 1 ♀. Rajkot, Kathiawar.

(*See* also Reports Nos. 3, 5 and 7.)

"Fairly plentiful, is said to be very local, but is well known. The stomach of No. 2326 contained the remains of a finch and many beetles also the stones of the fruit "Ber."—C. A. C.

Vernacular name.—JUBAT. MUSHK BILLA.

MUNGOS MUNGO, Gmel.

*The Common Indian Mungoose.*

(Synonymy in No. 3.)

4 ♂♂; 2 ♀♀. Keshod, Kathiawar.
2 ♂♂. Verawal, Kathiawar.
1 ♂; 1 ♀. Talala, Kathiawar.
2 ♀♀. Sasan, Kathiawar.
1 ♀. Bagdu, Kathiawar.
1 ♀. Baradia, Kathiawar.
2 ♀♀. Kudia, Kathiawar.
1 ♀. Rajkot, Kathiawar.
1 ♀. Vankaneer.
1 ♀. Juna Bowli.
1 ♂. Muli, Muli State, Kathiawar.

(*See* also Reports Nos. 1, 2, 3, 4, 5, 7, 8 and 9.)

Vernacular name:—NURLIA.

"Common everywhere, particularly in or near villages."—C. A. C.

CANIS PALLIPES, Sykes.

*The Indian Wolf.*

(Synonymy in No. 3.)

1 ♂. Moti Mojiti, Bajana, Kathiawar.

(*See* also Report No. 3.)

Vernacular name.—NOWR, NAR.

"Two were observed near Talala; is said to be common in the more open, remote parts of the State. The shepherds tell me the wolves are very bold, having little fear of man, and do much damage among the flocks during both day and night; at Moti Mojiti they frequently broke through a thick fencing of thorns to get at the sheep and goats. I sat just outside one of these sheep pens on several occasions when the moon served; about midnight two wolves appeared, and I fired at the foremost, which when wounded, howled exactly like a dog; thinking I had made a mistake, I waited to have a smoke before following up. The animal had both forelegs broken and made much noise in going away. I followed the sounds and saw him lie down in some short grass, but though the moon was nearly full, I was within ten yards before I could make out the wolf; he attempted to charge."—C. A. C.

CANIS INDICUS, Hodgs.

*The Common Indian Jackal.*

(Synonymy in No. 1.)

2 ♂♂. Junagadh, Kathiawar.
1 ♂. Keshod, Kathiawar.
1 ♀. Verawal, Kathiawar.
1 ♂; 1 ♀. Vankaneer, Kathiawar.

(*See* also Reports Nos. 1, 3, 4, 5, 6, 7 and 9.)

Vernacular name.—Sival.

"Common about cultivation; I did not meet with it at Sasan or Kudia."—C. A. C.

VULPES BENGALENSIS, Shaw.

*The Common Indian Fox.*

(Synonymy in No. 1.)

1 ♂. Bagdu, Kathiawar.
2 ♂♂; 1 ♀. Rajkot, Kathiawar.

(*See* also Reports Nos. 1, 3, 5 and 7.)

Vernacular name.—Lokri.

"I saw several foxes at Veraual, but could not find their 'bores,' and the lack of cover made it very difficult to stalk them. One fell twice to shots from my gun, but eventually escaped.

I have heard foxes calling at Bagdu and Junagadh, they are also common at Rajkot."—C. A. C.

FUNAMBULUS PENNANTI, Wrought.

*The Common 5-striped Squirrel.*

(Synonymy in No. 1.)

5 ♂♂; 5 ♀♀. Junagadh, Kathiawar.
1 ♂. Keshod, Kathiawar.
2 ♂♂; 1 ♀. Verawal, Kathiawar.
4 ♂♂. Talala.
9 ♀♀. Talala, Kathiawar.
3 ♀♀. Sasan, Kathiawar.
3 ♀♀. Kudia, Kathiawar.
7 ♂♂; 4 ♀♀. (2106 no skull). Rajkot, Kathiawar.
6 ♂♂; 2 ♀♀. Vankaneer, Kathiawar.
7 ♂♂; 5 ♀♀. Satapur, Dhrangadhra.
1 ♂. Moti Mojiti, Bajana.
1 ♂; 1 ♀. Sadla, Bajana.
1 ♂; 1 ♀. Sihor, Bhavnagar, Kathiawar.

(*See* also Reports Nos. 1, 3, 4, 5 and 7.)

Vernacular name:—Kilkuri.

"Common everywhere, difficult to obtain at Kudia.

While having my tea one evening I saw a squirrel come down to the place where I had been at work, and tow and wood were lying about, he seized a piece of tow about a foot long, when without hesitation he deftly rolled it into a tight ball and carried it up a tree, the rolling up of the ball was accomplished with precision and neatness, one end being held by the teeth while the rest was tucked up into the hollow of the neck.

At Rajkot they were very common about the bungalows and cactus hedges."—C. A. C.

The specimens from Satapur have a much yellower appearance, while those from Sihor are greyer.

DIPODILLUS NANUS, Blanf.

*The little Gerbil.*

1875. *Gerbillus nanus*, W. Blanf., A. M, N. H. (4), XVI., p. 312.
1891. *Gerbillus nanus*, Blanford, Mammalia No. 267, p. 399.

2 ♂♂; 1 ♀. Muli, Muli State, Kathiawar.

These specimens bear a strong resemblance to some specimens in the National Collection from near Aden; however they agree with the description of the type of *nanus* taken at Gwadar, Baluchistan, so probably the species extends from Aden to Kathiawar.

"These small Gerbils were dug out of the soft sand on the river bank. The adult female was found in a burrow of simple construction, a single and nearly straight run going to a depth of 2 feet and a second leading to the surface again, the whole being about 6 feet in length; one entrance was half closed, the other quite filled in with sand, but whether this was intentional or not I cannot say. Nos. 2660, 2661, 2662 were found in a burrow with 3 entrances, two of which were filled in with sand, the third left open. The runs in this burrow branched occasionally into blind ways and there were several small accumulations of fine chopped grass. These gerbils are wonderfully agile when on the surface, getting along in short and rapid bounds. Very prominent in life are the four white spots, one behind each ear and above each eye. These gerbils are exceedingly difficult to find, there being little or no indication of their existence." —C. A. C.

MERIONES HURRIANÆ, Jerd.

*The Indian Desert Gerbil.*

(Synonymy in No. 3.)

6 ♂♂; 10 ♀♀. Juna Bowli, Dhrangadhra.
4 ♂♂. Muli, Muli State.
2 ♂♂; 4 ♀♀. Moti Mojiti.
2 ♂♂; 1 ♀. Sadla, Bajana.

(*See* also Report No. 3.)

"As anticipated, *Meriones hurrinæ* is moderately abundant in Dhrangadhra, the distinctive burrows with small heaps of sand just outside the numerous entrances being met with in colonies at frequent intervals.

This is a most difficult rat to trap, for he refuses almost any bait and is very cautious about treading on concealed traps, but as he can be shot at any time during the day, it is not worthwhile spending time over traps; digging out can also be resorted to, though this is sometimes a long job, owing to the large area which is occupied by the numerous runs of a single burrow.

In the burrows I examined very little similarity in the plan was noticeable, except that nearly every run terminates with an opening on the surface; I found no nests but occasionally small collections of chopped grass which might have been for food. The runs are generally not more than a few inches to a foot below the surface. I watched some of these rats chasing each other near their burrows and the speed with which they get over the ground is remarkable.

In Muli it did not appear to be plentiful, their workings were to be found everywhere in the neighbourhood of the river, but the majority of the burrows were undoubtedly uninhabited, which in my experience is unusual. Very common in Bajana, always in sand and very light soil, frequently seen abroad in the early morning, rarely at midday."—C. A. C.

GRYPOMYS GLEADOWI, Murray.

*The sand-coloured Rat.*

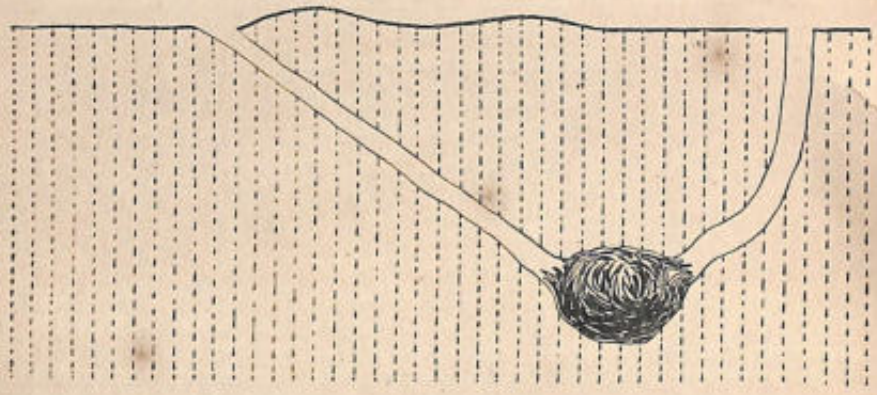
1885. *Mus gleadowi*, Murray, P. Z. S., p. 809.
1891. *Mus gleadowi*, Blanford, Mammalia No. 291, p. 420
30 ♂♂; 34 ♀♀. 3 in al. Rajkot, Kathiawar.

2 ♂ ♂ ; 1 ♀. Juna Bowli.
3 ♂ ; 3 ♀ ♀. Muli, Muli State.
1 ♂. Moti Mojiti.
1 ♀. Sadla. Bajana, Kathiawar.

There seems no doubt that this fine series is *Grypomys gleadowi*, the type locality of which is Karachee, Sind.

"The very large series I have obtained may give the impression that the country swarms with this species ; on the contrary I should only describe it as fairly plentiful, the reason that so many were obtained being that a burrow is rarely over two feet long and can be dug out in a few minutes.

*Grypomys gleadowi* is found on rather poor soil devoid of any cover except short grass, the seeds and blades of which must constitute the sole food of this rat. The burrows which are not in colonies are of most peculiar construction (see sketch) comprising two short runs leading to a



circular chamber in which a nest of grass is placed about one foot below the surface ; the run which appears to be generally used is about 18 inches long, and slopes gradually down to the nest ; the second run leaves the surface vertically, and with a slight curve towards the bottom, also enters the nest, this appears to be an emergency exit and is sometimes obscured from view above by a pad of grass placed there by the rats. There are no pathways in the grass and there is no deposit of earth near the burrow. At this season nearly all the females were breeding and were apart from the males. In one burrow I found a female No. 2313 with three almost newly-born young and also the previous brood of three, three-quarter grown ; when the mother bolted from the burrow, the new born young remained adhering to the mammæ ; these juveniles I preserved in spirit and it will be noticed that the fur on their backs is nearly black. From three to five young at a birth appears to be usual. Kept in confinement these rats are very active and become tame in a few days ; in a fortnight I allowed some to run about on the table and found I could handle them. They can scarcely be called plantigrade, for the usual mode of progression is on the toes with the body raised from the ground, the back well arched and the head rather high. So far as my observations went, they do not move in bounds as *Tatera indica* does ; when

sitting, it is usual for them to assume an almost upright position with the forefeet drawn up. The bare ground on which this species lives necessitates very keen sense of hearing ; hence the very large ears, but as these tend to make the rat conspicuous, Nature provides that the terminal third or even half of the ears can be folded down, the orifice remaining open Testes very large, measuring together 25 × 17 (measurements taken from No. 2167). At Muli they were found under the same conditions as in Rajkot and also in soft sand, when the latter, the burrows were longer and deeper and usually had only one entrance and a single straight run."—C. A. C.

TATERA INDICA, Hardw.

*The Indian Gerbil.*

(Synonymy in No. 1.)

2 ♂. Keshod, Kathiawar.
3 ♂♂ ; 1 ♀. Verawal, Kathiawar.
1 ♀. Talala, Kathiawar.
3 ♂♂ ; 3 ♀♀. Sasan, Kathiawar.
20 ♂♂ ; 17 ♀♀. Rajkot, Kathiawar.
6 ♂♂ ; 5 ♀♀. Vankaneer, Kathiawar.
5 ♂♂ ; 1 ♀. Juna Bowli.
3 ♂♂ ; 1 ♀. Satapur, Dhrangadhra.
3 ♂♂ ; 5 ♀♀. Moti Mojiti, Kathiawar.
5 ♂♂ ; 3 ♀♀. Sadla, Bajana.
1 ♂ ; 2 ♀♀. Sihor, Bhavnagar, Kathiawar.

(*See* also Reports Nos. 1, 2, 4, 5, 6, 7, 8 and 9.)

"I should say that in an ordinary year this would be a very common rat in Junagadh State, it is now scarce. In Bajana it is very common in hedges surrounding cultivation."—C. A. C.

VANDELEURIA OLERACEA, Benn.

*The Dekhan Tree-Mouse.*

(Synonymy in No. 2.)

1 ♀. Junagadh, Kathiawar.
1 ♀. Moti Mojiti, Bajana.

(*See* also Reports Nos. 2, 4, 5 and 7.)

"No. 2691 was caught in the thatch of a house."—C. A. C.

EPIMYS RUFESCENS, Gray.

*The Common Indian Rat.*

(Synonymy in No. 1.)

5 ♂♂ ; 8 ♀♀ (1646 no skull). Junagadh, Kathiawar.
3 ♂♂ ; 5 ♀♀. Keshod, Kathiawar.
5 ♀♀. Sasan, Kathiawar.
9 ♂♂ ; 10 ♀♀. Rajkot, Kathiawar.
1 ♂ ; 3 ♀♀. Vankaneer.
1 ♂. Moti, Mojiti, Bajana.
1 ♀. Satapur, Dhrangadhra.
1 ♀. Sadla, Bajana.

(*See* also Reports Nos. 1, 2, 3, 4, 5, 6, 7, 8 and 9.)

"Rather scarce now near Junagadh, common at Sasan where there appears to be a pale variety in the fields."—C. A. S.

VARIETY WITH WHITE UNDERPARTS.

1 ♂. Keshod, Kathiawar.
1 ♂ ; 1 ♀. Talala, Kathiawar.
18 ♂♂ ; 10 ♀♀. Sasan, Kathiawar.

(*See* also Reports Nos. 5, 6, 7 and 9.)

BANDICOTA MALABARICA, Shaw.

*The Malabar Bandicoot.*

(Synonymy in No 5.)

2 ♂♂ ; 7 ♀♀. Sasan, Kathiawar.

(*See* also Reports Nos. 5, 6, 7 and 9.)

Vernacular name:—GUS.

"Very plentiful in Sasan village; from reports it has temporarily disappeared from the neighbourhood of Junagadh."—C. A. C.

LEGGADA SADHU, Wrought.

*The ashy Spiny-Mouse.*

(Synonymy in No. 3.)

2 ♂♂ ; 13 ♀♀. Kudidela, Kathiawar.
2 ♂♂ ; 2 ♀♀. Vankaneer.
6 ♂♂. Juna Bowli.
12 ♂♂ ; 10 ♀♀. Satapur, Dhrangadhra.
1 ♀. 1 in al. Mulī, Muli State.
1 ♀. Moti Mojiti, Bajana.

(*See* also Report No. 3.)

All the specimens from Kathiawar have been put into the *L. sadhu* group; some, principally the large ones, are of rather a darker colour, but there seems no reason for not including them.

"Trapped sometimes with *Cremnomys*, but favouring ground with deeper soil, the foot of a stone wall is a favourite resort; I took one in a tree, three or four feet from the ground."—C. A. C.

LEGGADA CINDERELLA, Wrought.

*The smaller ashy Spiny-Mouse.*

(Synonymy in No. 3.)

5 ♂♂ ; 1 ♀. Kudia, Kathiawar.

(*See* also Report No. 3.)

MUS BOODUGA, Gray.

*The Southern Field Mouse.*

(Synonymy in No. 1.)

4 ♂♂ ; 4 ♀♀, 3 in al. Sasan, Kathiawar.

(*See* also Reports Nos. 1, 2, 4, 5, 6, 7, 8 and 9.)

"Taken on the same ground as the dark mice. Not particularly common at Sasan."—C. A. C.

MUS DUNNI, Wrought.

*The Northern Field Mouse.*

(Synonymy in No. 3.)

9 ♂♂; 19 ♀♀, 6 in al. Rajkot, Kathiawar.
3 ♂♂; 1 ♀. Vankaneer.
2 ♂♂; 4 ♀♀ (2559 skull only.) Juna Bowli.
3 ♂♂; 1 ♀. Muli, Muli State.
9 ♂♂; 1 ♀. Moti Mojiti, Bajana.
6 ♂♂; 3 ♀♀. Sadla, Bajana.
2 ♂♂; 1 ♀. Sihor, Bhavnagar, Kathiawar.

(*See* also Report No. 3.)

These specimens from the more open country in the N. E. have the drab colouration typical of *M. dunni*, while those from the forests at Sasan have the usual appearance of *M. booduga*; it would seem from this, that they are not Northern and Southern forms but open country and jungle varieties.

"At Rajkot many of these small mice were taken on similar ground as *Gryponys gleadowi*, but it was most noticeable that they invariably favoured sites with adjacent cover, such as small bushes, banks and overhanging pieces of rock; they appear to make shift with any crevice or ready made hole with a sufficiently small opening. In captivity they are at first fearfully wild and then quickly sulk and pine away. In Bajana they were in short burrows under hedges and bushes or tufts of grass in any kind of soil and even soft sand."—C. A. C.

MUS MANEI, Kel.

*The common Indian House Mouse.*

(Synonymy in No. 5.)

1 ♀. Junagadh, Kathiawar.
4 ♂♂; 2 ♀♀, 1 in al. Sasan, Kathiawar.
8 ♂♂; 7 ♀♀. Sasan, Kathiawar.
18 ♂♂; 22 ♀♀, 3 in al. Rajkot, Kathiawar.
2 ♂♂. Vankaneer.

(*See* also Reports Nos. 1, 3, 5, 6, 8 and 9.)

"Most of these mice were trapped under hedges surrounding cultivation in or near Sasan village, the chokras brought me a few and in some instances said they had caught them in their houses, but this I do not know for certain."

MILLARDIA MELTADA, Gray.

*The soft-furred Field Rat.*

(Synonymy in No. 1.)

1 ♂. Sasan Kathiawar.
4 ♂♂; 4 ♀♀. Rajkot, Kathiawar.
2 ♂♂; 6 ♀♀. Satapur, Dhrangadhra.
4 ♂♂; 2 ♀♀, 1 in al. Muli, Muli State.

(*See* also Reports Nos. 1, 3, 4, 5 and 7.)

Vernacular name (all rats):—UNDA.

"Except for the plague I cannot account for having trapped only one specimen in Junagadh. At Muli it was living in cracks in the ground, generally in cotton fields. At Satapur these rats were trapped among rocks and tumble-down walls, not near cultivation; they appear to be rare here, because I could only get the above few specimens, though setting sixty or eighty traps daily."—C.A.C.

CREMNOMYS CUTCHICUS, Wrought.

*The Cutch Rock Rat.*

(Synonymy in No. 3.)

19 ♂♂; 16 ♀♀; 2 in al. Kudia, Kathiawar.

(*See* also Reports Nos. 3, 8 and 9.)

"This rat is common at Kudia, where I found it always among rocks; it is evidently fond of climbing for I found little piles of droppings on the tops of large boulders; there were also small collections of droppings in hollows under the rocks. It is doubtless gregarious, for where one is caught it is safe to expect to find others. Its food consists of a good deal of grass seed; all my specimens were taken at an altitude of about 2,000 feet; during my first camp above Junagadh, I was trapping on somewhat similar ground at about 700 feet, but made no captures and saw no signs of the rat."—C.A.C.

GUNOMYS KOK, Gray.

*The Southern Mole-Rat.*

(Synonymy in No. 1.)

1 ♀. Junagadh, Kathiawar.
4 ♂♂; 7 ♀♀. Talala, Kathiawar.
2 ♂♂; 2 ♀♀. Sasan, Kathiawar.
18 ♂♂; 16 ♀♀. Rajkot, Kathiawar.
1 ♀. Moti Mojiti, Bajana.

(*See* also Reports Nos. 1, 4, 5, 7, 8 and 9.)

"From reports was undoubtedly common near Junagadh. Taken from a large jowari field, some in the open, others from under some wood stacks. In Bajana it was generally found in the beds of dried up tanks, rather difficult to trap. A wounded mungoose took refuge in a burrow occupied by a large female *Gunomys kok*; I went away for a spade, and later, after digging some distance, found the rat in a dying condition, it having already evicted the mungoose."—C.A.C.

GOLUNDA ELLIOTI, Grey.

*The Indian Bush Rat.*

(Synonymy in No. 1.)

1 ♂. Kudia, Kathiawar.
1 ♀. Rajkot, Kathiawar.
11 ♂♂. 6 ♀♀. Juna Bowli.
1 ♂; 2 ♀♀. Satapur, Dhrangadhra.
1 ♀. 1 in al. Muli, Muli State.
1 ♂. Moti Mojiti, Bajana.
1 ♀. Sadla, Bajana, Kathiawar.

(*See* also Reports Nos. 1, 2, 3, 4, 5, 6 and 7.)

"In other districts I had trapped, a fair number of this species on ground identical with that of the Sasan cultivation; I can confidently assert that this rat was not in Sasan. The single specimen taken at Kudia was secured on a grass covered bank, far from the cultivation. At Dhrangadhra it was more partial to the Kora Jar bushes, and in the early evening I observed it feeding on the leaves of this bush. The presence of *G. elliotí* may be detected by short pathways in the grass or under bushes, the pathways are generally confined to the shelter of bushes or hedges and cannot be mistaken for the well-worn straight tracks of *Tatera indica*, which may run under the hedges or across the open ground."—C. A. C.

HYSTRIX LEUCURA, Sykes.

*The Indian Porcupine.*

(Synonymy in No. 1.)

1 ♂. Junagadh, Kathiawar.
1 ♂. Talala, Kathiawar.
1 ♀. Keshod, Kathiawar.
1 ♂; 1 ♀. Baradia, Kathiawar.
1 ♂. Rajkot, Kathiawar.
1 ♂. Vankaneer, Kathiawar.

(*See* also Reports Nos. 1, 2 and 5.)

Vernacular name:—SEEDAI.

"Common in most parts of the State; I observed footprints at Kudia. At Verawal there is a porcupine's earth in a rocky hill, the foot of which is washed by the sea. I watched this earth by moonlight but the Porcupine failed to appear. I shot No. 1784 in teak jungle one hour before dark. The flesh of a young porcupine is remarkably fine eating, but during skinning operations on No. 1998, which appeared to be a very old individual, a very rank and rather pungent odour emanated from the flesh. The Whagris say the liver is bitter. I have noticed in young but full-grown animals that the sexual organs of the male are very poorly developed and in the female the mammary glands are invisible."—C. A. C.

LEPUS DAYANUS, Blanf.

*The Sind Hare.*

(Synonymy in No. 3.)

1 ♀. Junagadh, Kathiawar.
3 ♀♀. Keshod, Kathiawar.
1 ♀. Verawal, Kathiawar.
1 ♂. Talala, Kathiawar.
1 ♂. Sasan.
4 ♀♀. Baradia, Kathiawar.
6 ♂♂; 8 ♀♀. Rajkot, Kathiawar.
1 ♂; 3 ♀♀. Vankaneer.
2 ♂♂. Juna Bowli.
1 ♂; 1 ♀. Moti Mojiti, Bajana.
1 ♀. Sadla, Bajana.
3 ♂♂; 5 ♀♀. Sihor, Bhavnagar.

(*See* also Report No. 3.)

This series of hares presents considerable variation in size and in shade of coat, but probably this is due to the age of the animal and also to the newness of the coat, as the differences are not consistent; they are left as *dayanus*, which species they most resemble.

Vernacular name:—SASALA.

"Hares may be common near Junagadh, but I could not find them owing to the standing crops; I saw a few at Keshod and occasionally in the Gir; scarce at Verawal; common at Baradia; no sign of them at Kudia; very common in the more remote parts of Rajkot."—C. A. C.

GAZELLA BENNETTI, Sykes.

*The Indian Gazelle.*

(Synonymy in No. 1.)

1 ♂. Bagdu, Kathiawar.
1 ♀. Juna Bowli.

(*See* also Reports Nos. 1, 3 and 7.)

Vernacular name :—CHIKARA.

"Very common, particularly on the edge of the Gir where there is light cover."—C. A. C.

ANTILOPE CERVICAPRA, L.

*The Black Buck.*

(Synonymy in No. 1.)

1 ♂. Keshod, Kathiawar.
1 ♂. Bagdu, Kathiawar.

(*See* also Reports Nos. 1 and 5.)

Vernacular name :— KHALIA.

"Very common, not found in the Gir."—C. A. C.

SUS CRISTATUS, Wagn.

*The Indian Wild Boar.*

(Synonymy in No. 5.)

1 ♂. Sihor, Bhavnagar, Kathiawar.

(*See* also Reports Nos. 5 and 8.)

Vernacular name :—HUAR.

"Gir and Girna range, common."—C. A. C.

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## REPORT No. 11.

BY KATHLEEN. V. RYLEY.

*With Field Notes by the Collector G. C. Shortridge.*

COLLECTION... ... ... No. 11.
LOCALITY ... ... ... COORG.
DATE ... ... ... DECEMBER 16th 1912-FEBRUARY 1913.
COLLECTED BY ... ... MR. G. C. SHORTRIDGE.
EARLIER REPORTS .. .. No. 1, E. Khandesh, Vol. XXI, p. 392; No. 2, Berars, Vol. XXI, p. 820; No. 3, Cutch, Vol. XXI, p. 826; No. 4, Nimar, Vol. XXI, p. 844; No. 5, Dharwar, Vol. XXI, p. 1170; No. 6, Kanara, Vol. XXII, p. 29; No. 7, Central Provinces, Vol. XXII, p. 45; No. 8, Bellary, Vol. XXII, p. 58; No. 9, Mysore, Vol. XXII, p. 283; No. 10, Kathiawar, Vol. XXII, p.

This collection was made in Coorg, a small British Province in Southern India.

The following detailed description of the country and camps is given by Mr. Shortridge :—

"Coorg, which is the smallest province in India, is situated chiefly on the slopes and summits of the Western Ghats. Bounded on the north by South Kanara and the Hassan district of Mysore.

Young Bison Bull (probably a half-tame specimen), Mysore.

On the west, north-west, and south-west the boundary runs along the foot of the Ghats, some of the peaks of which rise to a height of from 5,000 to 6,000 feet, overlooking the low lands of South Kanara and Malabar. The Brahmagiri Hills constitute a formidable barrier between South Coorg and the wooded tracts of the Wynaad. On the north and east for a short distance the Cauvery and Hemavati rivers mark the boundary between Mysore and Coorg, but elsewhere (to the east) the country merges imperceptably into the general tableland of Mysore.

Coorg lies geographically between north latitude 11°-56′ and 12°-50′ and between east longitude 75°-22′ and 76°-12′.

Area 1,582 square miles, greatest length and breadth 60 by 40 miles.

Average rainfall 124 inches.

Population (1911) 174,976.

General elevation between 3,000 and 3,500 feet.

The Fort of Mercara stands about 3,800 feet above sea level and this elevation is maintained for a considerable distance towards the north. Eastwards the country slopes down to the bed of the Cauvery (which rises in North Coorg), the elevation at Fraserpet being some 1,100 feet below that of Mercara. On the west where the boundary extends to the foot of the Ghats the elevation sinks almost down to sea level.

Geological formation chiefly granite, syenite and mica schist.

Coorg proper is entirely covered with heavy forest, save here and there where there are coffee plantations, and rice or ragi patches. Extensive evergreen forests clothe the mountain ranges almost to their summits.

In the east and south-east there are long stretches of deciduous and bamboo jungle. Further north near Fraserpet where the Cauvery forms its eastern boundary the country becomes slightly more open and the jungle rather more scrubby.

In many places, especially where the jungle is deciduous, or has been partly cleared for coffee cultivation and then abandoned there are stretches of dense lantana undergrowth.

The two prominent zones may be determined as evergreen and deciduous forests. The former clothing the Ghats and the latter the eastern hill tracts.

The evergreen forests in the Ghat region are so dense and tangled with thorny undergrowth and creepers that they can be penetrated only by beaten paths. They contain among other valuable timbers:—The Poon (*Calophyllum elatum*), Ebony (*Diospyros ebenaster*), Ironwood (*Mesua ferrea*), Cedar (*Cedrela toona*) and Sampige (*Michelia champaca*). Favoured by the constantly moist atmosphere, the stems and branches of many of the trees are covered with orchids, mosses and other parasites. Festoons of wild pepper

and gigantic creepers which again support the more slender convolvuli, and other herbaceous vines stretch from tree to tree, while the soil in many places highly favours the growth of moisture loving plants such as the Indian arrowroot (*Curcuma longa*), Wild ginger (*Zingiber casumunar*) and the Cardamom. Wherever on their summits or windward sides the hills are denuded of forest they are clothed with dense coarse grass.

On the east is the drier bamboo zone. The character of this district is indicated by the prevalence of large clumps of bamboos, interspersed with 'Teak' (*Tectona grandis*), Honné (*Pterocarpus marsupium*), Biti (*Dalbergia latifolia*), Nandi (*Lagerstræmia microcarpa*), Matti (*Terminalia tomentosa*), Sandal (*Santalum album*) and other trees peculiar to the deciduous forests.

Coorg is best known as a coffee growing country, its other products being chiefly rice, pepper and cardamoms.

There are about 600 square miles of forest reserve; but owing to the fact that all Coorgs are allowed to carry firearms, and the want of a restriction in the number of yearly licences issued, the larger game is rapidly being shot out, more so perhaps than any other part of Southern India I have visited. Bison, Chital and Bear only exist in a few of the more remote parts of the province, most of which districts are well known and very much overshot by shikar parties; while a good Sambur head from Coorg has for many years been unknown.

These remarks are made at the special request of several Coorg residents who deplore the yearly increasing rarity of every kind of large game here and remark on the uselessness of attempts at protection on their part, when outside shikar parties, careless of the ultimate extermination they will cause, come here every year in numbers that are out of all proportion to the amount of game in the district.

In addition to the amount of help received, there was a great deal of very keen interest taken in the object of the survey,and a general desire that the Coorg collection should be a good and representative one. On this account it is satisfactory that with the exception of one or two stragglers and possibly a few bats, almost everything likely to occur in Coorg is represented, which helps to show how invaluable local assistance is to the work of the Survey.

Mr. F. Hannyngton, I. C. S., the Commissioner of Coorg, a very keen member of the Society, helped me in every possible way and accompanied me on many of my camps. Owing to the thoroughness of his assistance I was able to make a very wide tour through the province.

While such facilities as "permission to shoot in reserves," "free game license," "free residence in travellers' bungalows," and particularly "instructions to local native officials to assist while

travelling through their districts" tend to help the survey very considerably on account of the time and additional expense saved.

Mr. J. A. Graham, another member of the Society, assisted me in the best way possible by making a very large and complete collection from around Haleri estate. It is entirely owing to this collection of over 100 mammals from North Coorg that I was able to devote most of my time to the South. If there were more amateur collectors throughout India as enthusiastic, and with such a thorough grasp of systematic collecting, the distribution of Indian Mammals would be better known than it is.

In South Coorg I received invaluable assistance from Mr. H. Cuthell of Huvinakadu estate, and owing to his accurate local knowledge was able to add to the collection several species that I would not have got without his help.

The following are short descriptions of the actual camps visited :—

NORTH COORG.

1. *Mercara.*—Altitude 3,809 feet. Population 6,730. The chief town in Coorg, situated in a high valley, sheltered by the tops of hills. Patches of evergreen forest that have been largely cleared in the neighbourhood of the town, and again overgrown with lantana and other scrub. Stretches of rough grass country on the slopes of the hill tops. Very little collecting was done around the town itself, but owing to the hospitality of Mr. Hannyngton I was able to make Mercara my base camp.

2. *Jambur.*—Altitude 3,180 feet. A small village about eleven miles to the north-west of Mercara on the banks of a tributary of the Cauvery. Surrounding forests chiefly evergreen. Small patches of rice cultivation in the valleys.

3. *Haleri.*—Altitude 3,555 feet. A large coffee estate surrounded by evergreen forest a few miles to the north of Mercara. Hilly country. Nearly the whole of the large collection from this district was made by Mr. Graham.

SOUTH COORG.

4. *Wotekolli.*—A small village, altitude 2,000 feet. Very hilly country, evergreen forest. Large stretches of rough grass country on the summits and windward slopes of the surrounding hills.

5. *Makut*—Altitude 250 feet. 8 miles south of Wotekolli at the foot of the Ghats—on the borders of North Malabar. Forest chiefly evergreen with a belt of Teak to the south.

6. *Virarajendrapet* (*Virajpet*).—Altitude 3,000 feet. The second town in Coorg. Population 4,280. Situated in the most thickly populated part of the province. Extensive patches of cultivation. Surrounding forests—mixed evergreen and deciduous with patches of bamboo.

7. *Srimangala.*—Altitude 2,782 feet, small forest village situated on the eastern slopes of the Brahmagiri hills, which rise to a height of over 5,000 feet. I found some most interesting changes in the fauna to the east and west of this range which practically forms the boundary between the evergreen and deciduous forests in south Coorg. Surrounding jungle deciduous, very largely intermixed with bamboo.

8. *Huvinakadu Estate—Kutta.*—Altitude 2,843 feet. A coffee estate on the borders of the Wynaad about 8 miles to the south of Srimangala—hilly country surrounded chiefly by deciduous and bamboo jungle.

9. *Nagarhole.*—Altitude 2,600 feet. A small forest settlement in the extreme south of Coorg. In the middle of a large deciduous and bamboo jungle. Lantana undergrowth very thick in many places. Situated along the borders of the Wynaad and within a few miles of the Mysore boundary.

Country undulating, but less hilly than in most parts of Coorg.

During my stay in this camp Mr. H. Tiroman, I. F. S., conservator of Forests, was kind enough to lend me elephants as well as providing me with every local assistance. If looked after for a few years this district would become one of finest game spots in Southern India.

The following species were not obtained :—

*Simia silenus.*—This monkey occurs on the Ghats on the western borders of Coorg and in South Kanara. The boundary between North and South Kanara is the northern limit of its range, at which point it is probably only a straggler. Said to become numerous in South Malabar and Travancore.

*Pteropus giganteus.*—Seldom, if ever, found in heavy forest country (at least in Southern India). Hardly a resident of Coorg, although said to be occasionally seen in the more open country in the extreme north-east borders, becoming plentiful in the more open part of Southern Mysore.

Vernacular names :—BOWLU-HUKKI. BAWALI-NURRASI.

* *Hesperoptenus tickelli.*—A specimen of this species in spirit was obtained by Mr. Graham after I left Coorg but did not arrive with the main collection.

*Felis viverrina.*—Doubtfully recorded from Coorg. If occurring at all it is probably a rare straggler from the coast, being a dweller in flat swampy country, rarely, if ever, found at any altitude, chiefly frequenting coastal swamps and estuaries. Said to occur in the neighbourhood of Mangalore (South Kanara) also recorded from the coastal districts of North Kanara, although probably more plentiful

* Unfortunately this bat along with some others which Mr. Graham had kindly collected after Mr. Shortridge left ,was spoilt in the spirit in which they were being preserved—N. B. K.

further south. In Java, I killed a specimen that had killed a number of full grown imported chital in a park near Batavia; while in Southern India, it is said to occasionally kill goats and to be very destructive to poultry.

*Viverra civettina.*—Recorded from Coorg by Blanford but like *Felis viverrina* it is probably a rare straggler from the coast. I could get no information of it here, and it appears to be unknown locally. Said to occur on the coast as far north as the northern boundary of South Kanara, although probably more numerous from Malabar southwards.

*Elephas maximus.*—Elephants are at times fairly numerous in North and East Coorg, although many if not all of them wander backwards and forwards from Mysore and the Wynaad. They are not driven into "Keddahs" here but occasionally captured in pitfalls; these pits are eleven feet square and about the same in depth, and are filled in with dry grass to prevent the elephants from injuring themselves when they fall in.

Vernacular name:—"ANI."—G. C. S.

This collection, which is a particularly interesting and representative one, consists of 561 specimens, spread over 64 species in 45 genera. It is curious that this small province should produce the largest number of species obtained in any one collection since the survey was begun. As Mr. Shortridge mentions in his field notes, the mountain ranges of Coorg are evidently the dividing line for several species, as in the case of the *Presbytes*, *Ratufa* and *Leggada* where there are different species and sub-species within a few miles of each other; this is possibly due to the difference in altitude, and in the vegetation on the Eastern and Western slopes of the Brahmagiri hills. Besides two new species of mice and one new species and two new subspecies of squirrels, there are fourteen species which have been obtained for the first time in this survey, *viz.*, *Presbytis johni* and *Presbytis hypoleucus* (the specimens previously obtained from Dharwar, Kanara, etc., and provisionally put down as *P. hypoleucus*, will probably prove to be the Southern form of *entellus*. Another interesting result is that *Loris tardigradus* differs more than was expected from *Loris lydekkerianus*, a series of the latter came from Mysore and are larger throughout as well as being much greyer in colour. Two specimens of the fruit bat *Rousettus leschenaulti* were also obtained and were especially welcome, as this bat appears to be rather rare and local, and the National collection has only a few specimens and none of recent date. A good series of *Felis bengalensis* was procured for the first time and more are badly wanted from other localities. *Paradoxurus jerdoni* was obtained, also a fine series of otters, including the common otter and the clawless otter.

The mungoose group is well represented, besides the common mungoose, *Mungos fuscus* and the large handsome species *Mungos*

*vitticollis* were taken. *Martes gwatkinsi* was useful, as Bonhote separated this species from *M. flavigula* a few years ago, and this example exactly matches the solitary specimen in the British Museum Collection. *Melursus ursinus*, *Funambulus sublineatus* and a large series of *Platacanthomys lasiurus* are all new to the survey.

The collection also contains many representatives of the cat tribe and ungulates. It is a peculiar thing that in several cases the specimens from Coorg are larger than examples of the same species received from other parts, this is so among the Ratufas, *Mus booduga*, *Vandeleuria*, etc.

(Since the collection was sent home Mr. L. Newcome, Mercara, has sent in to the Society further skins of a panther, brown palm civet and porcupine from North Coorg—N.B.K.)

SIMIA SINICA, L.

*The Bonnet Monkey.*

(Synonymy in No. 5.)

3 ♂♂, 1 ♀. Haleri, N. Coorg.
1 ♂. Wotekolli, S. Coorg.

(*See* also Reports Nos. 5, 6, 8, and 9.)

A monkey of medium size (the male described weighing 13 lbs.) General colour greyish brown; paler on the under side; tail nearly as long as head and body and of rather a darker shade. Head and body about 21 inches, legs and arms the same colour as the body. Fur of moderate length, smooth and soft, rather darker on top of the head and arranged in two radiating flat partings; face practically without hair.

"More or less abundant throughout Coorg; sufficiently plentiful to be very destructive in coffee estates, where they destroy large quantities of the ripe berries."—G. C. S.

Vernacular names:—KAPI, KORDA.

PRESBYTIS JOHNI, Fischer.

*The Nilgiri Langur.*

1829. *Simia Johnii*, Fischer, Syn. Mam., p. 25.
1834. *Semnopithecus cucullatus*, Is Geof; Zool. Bël. Voy. p. 38, pl. 1.
1840. *Semnopithecus jubatus*, Wagner, Schrep, Saugeth, supp. 1 p. 305.
1844. *Semnopithecus cephalopterus*, (part) Blyth, J. A. S. B. XIII, p. 469.
1888. *Semnopithecus johni*, Blyth, Blanford, Mammalia No. 16.

1 ♂. Kutta, S. Coorg.
1 ♂. Srimangala, S. Coorg.

A monkey with a black body and limbs; hair on head and sides of face longer and of a light yellowish brown colour; there is no radiating parting on crown of head; face nearly bare with slight erect fringe above the eyes; base of tail and rump ashy grey. Head and body about 24 inches, tail rather longer. Weight of male about 21 lbs.

"In Coorg apparently confined to the southern slopes of the Brahmagiri hills on the Wynaad borders, where it occurs in the 'SHOLAS' or patches of jungle surrounded by grass country on the sides of these mountains. This is almost certainly the Northern limit of the range of this species. Langurs are sought after by some of the local jungle tribes, who besides eating them, use their skins for making into drums."—G.C.S.

Vernacular names:—KARI-MUSHYA.

PRESBYTIS HYPOLEUCUS, Blyth.

*The Malabar Langur.*

*Semnopithecus hypoleucus*, Blyth, Journ., As. Soc. Beng., Vol. X, 1841, p. 839; Vol. XII, 1843, pp. 170, 172; Vol. XII, 1844, pp. 470, 476; Vol. XVI, 1847, p. 733, pl. XXVI, fig. 1, and p. 1271; Anderson, Res. Zool. Exped., Yun-nan, 1878, p. 29; Blanford, Mamma'ia, No. 15, 1888.

♀ (skull only). S. Coorg.
2 ♂♂, 3 ♀♀. Wotekolli, S. Coorg.
3 ♂♂. Makut, S. Coorg.

Mr. Dollman has kindly examined this series and written the following notes on the subject:—

"The Malabar Langur is evidently most nearly allied to the *entellus* group. It is distinguished externally by its far darker colouration, the back, shoulders and hind quarters washed with a dark greyish chocolate tint and the entire limbs dark brownish black; the head, sides of face and ventral surface a rich yellowish buff. The skull is equally distinct, being considerably smaller with much smaller teeth.

As the existing descriptions of this little known Langur are for the most part, founded upon old and faded individuals, it has been thought fit to add the following account:—

Size and general proportions much as in the *entellus* group. Hair on body comparatively short, without the long silky hairs of the northern species. Hair on the head radiating in the same manner as in *entellus*, the hairs considerably shorter, and not extending to any marked degree on to the neck. Black supraorbital fringe less developed, hairs less numerous and shorter. General colour of back greyish chocolate brown, gradually merging into yellowish buff, the buff colour most prominent on the temples; in some individuals the buff colour on the head is almost hidden by a dirty greyish brown wash. Limbs dark brownish black throughout, the inner sides of the arms usually paler and tinted with buff. Hand and feet dark black. Flanks pale yellowish buff or cream, the colour darkening on the belly to a deeper tint, in some cases almost orange. Sides of face and beard deep orange-buff, this coloration being far more conspicuous in some individuals than in others. Tail similar in colour to limbs, gradually becoming paler towards the tip.

Skull smaller than that of *entellus*, with much smaller brain case and narrower zygomatic region. Teeth conspicuously small, especially the canines in the adult males. Cheek teeth set almost in straight lines, the two rows being nearly parallel; in *entellus* the tooth rows bulge outwards slightly.

Dimensions (measured in the flesh) of adult male and female respectively:—Head and body 650, 630 mm.; tail 840, 895; hindfoot 180, 160; ear 43, 36.

Weight of the same specimens 26 and 22 lbs. respectively.

Skull (dimensions of old male and female specimens)—

| | | |
|---|---|---|
| Greatest length .. .. .. .. | 113 | 110 mm. |
| Basilar length .. .. .. .. | 72·3 | 74·7 mm. |

* It has been suggested that these reports on the survey collections should be made rather more descriptive, as hitherto they have been too largely scientific to be of general interest; so for the benefit of those who have not Blanford's "Mammalia" or some such book of reference, a few lines describing the general appearance of each species will be given. It must be understood that this is not to be taken as a scientific description, but simply to give some idea of the colour, size and weight of the animal, to help those, who do not know them by name, to recognise the animals. The measurements are not given on an average but of a fairly typical specimen selected from the Coorg Collection.

| | | |
|---|---|---|
| Zygomatic breadth .. .. .. | 84·5 | 86 |
| Greatest width of brain case .. .. | 60·5 | 63 |
| Width (outside) across orbital region .. | 67·4 | 68 |
| Interorbal constriction .. .. .. | 11·8 | 11 |
| Palatilar length .. .. .. .. | 39·7 | 37 |
| Width of palate (inside $m^1$) .. .. | 21·5 | 22 |
| Length of upper tooth row (from front of first premolar to back of last molar) .. | 30 | 32·3 |

In an adult male in which the canine teeth are fully up, but not worn, the length from the front alveolar border to the tip of the canine is 18·6 mm.; in a skull of similar sex and condition of a specimen belonging to the *entellus* group the canine measures 24·5 mm. in length.

The original locality given by Blyth is Travancore; this series from Southern Coorg apparently represents the northern limit of the Malabar Langur."

These specimens having proved to be the true *P. hypoleucus*, those previously obtained in Dharwar, Kanara and Bellary must be relegated to the *entellus* group, probably they will prove to be *P. anchises*, the southern representative of *entellus*.

"Fairly plentiful on the slopes and at the foot of the Ghats around Wotekolli and Makut. This species is replaced by the next to the East of the Brahmagiri Hills, which appear to separate the two species at this point. I could get no information of any species of Langur existing in North Coorg".—G. C. S.

Vernacular name :—MUSHYA.

PRESBYTIS ENTELLUS ANCHISES, Blyth.

*The Southern Langur.*

(Synonymy in No. 1.)

2 ♂♂, 2 ♀♀. Nagarhole, S. Coorg.

(*See* also Reports Nos. 1, 2, 4, 7 and 10.)

A monkey with fine, smooth, silky hair of a pale creamy brown colour, paler on the flanks; limbs of a darker shade becoming almost black on the hands and feet; tail about the same colour as the limbs; hair on crown of head short and radiating from a point on the forehead. Head and body about 25 inches, tail considerably longer. Weight of a female 23 lbs.

For detailed description see "Notes on the Langurs" in the "Scientific Results."

"In Coorg this species seems to occur only on the East of the Brahmagiris. Plentiful around Nagarhole, a single troup was observed to the north of Srimangala. These specimens had conspicuous crests, similar to "*priamus*," which were not present in specimens from other localities. *P. priamus* is recorded by Blanford (probably incorrectly) from the Wynaad."—G.C.S.

LORIS TARDIGRADUS, L.

*The slender Loris.*

3 ♀♀. Virajpet, S. Coorg.
1 ♀. Kutta, S. Coorg

A small greyish brown lemur about 8 inches long with thick woolly fur; some, chiefly the younger ones, have a decidedly red brown colour; the eyes are large and round with a narrow white stripe which broadens out above the eyes. No tail visible, paler on the under side; limbs the same colour as body. Weight of the specimen described about 6 ozs.

I have given no synonymy in this case, as stated in a previous Report (No. 9) on the Mysore Loris, it is difficult to make any definite statement about the Slender Loris until some specimens are obtained from Ceylon and as some are expected shortly, the subject is being left until the Ceylon material arrives.

"Probably fairly plentiful in Coorg, although apparently rare on the Western side of India as far North as North Kanara. Not easy to find in thick jungle without the help of natives, owing to its sluggish and nocturnal habits and powers of concealment by day among the thick foliage of high trees.

Blanford records that this species has no tail which he gives as one of the distinguishing features between this genus and *Nycticebus*, but although short (averaging 7 mm. in length) and inconspicuous, a slender external tail is at all events occasionally present.

Natives in South Coorg distinguish two kinds of Loris, one of them having a distinct tail. I suggest from their descriptions that individuals with more noticeable tails, than those I examined, occasionally occur.

Shortly after I left Coorg, Mr. Graham obtained a female together with an apparently recently born young one (March 16th)."—G.C.S.

Vernacular name:—HUNIMUNNA, SINGALIKA, KARD MUNISHYA.

ROUSETTUS LESCHENAULTI, Desm.

*The fulvus Fruit-Bat.*

1820. *Pteropus leschenaulti*, Desmarest, Encycl. Mith. Mamm. 1, p. 11.
1825. „ *amplexicaudatus*, Temm, Mon. Mamm. 1, p. 200.
1835. „ *pyrivorus*, Hodgs. J.A.S.B. IV, no. 48, p. 700.
1843. *Cynopterus affinus*, Gray, List. Mamm. B.M., p. 39.
1870. *Eleutherura fuliginosa*, Gray, Cat. Monk. etc., p. 119.
1870. *Eleutherura marginata*, Gray. Cat. Monk. etc., p. 119.
1873. *Cynonycteris infuscata*, Peters, M.B. Akad, Berlin, p. 487.

1 ♂. Virajpet, S. Coorg.
1 ♂. Nagarhole, S. Coorg.

A dull brown fruit bat about 5 inches long; very short tail. The example taken weighed 3½ ozs.

"Apparently very much less plentiful than *Cynopterus*. Two specimens were shot while resting inside verandahs, on one occasion in company with a number of *Cynopterus sphinx*."—G.C.S.

CYNOPTERUS SPHINX, Vahl.

*The Southern short-nosed Fruit Bat.*

(Synonymy in No. 6.)

5 ♂♂, 6 ♀♀. Virajpet, S. Coorg.

(*See* also Reports Nos. 6 and 9.)

A fruit bat about 4 inches long of varying shades of brown, the shoulders having a brighter yellowish brown tint. Very short tail, less than ½ inch long.

"Very plentiful in Coorg. In the vicinity of houses, they have an unpleasant habit of resting inside verandahs throughout the night and dropping quantities of half eaten figs. They can be driven away by branches, which are hung up inside the verandahs, and which interfering with their flight keep them away. I never observed this habit among any of the small fruit bats that swarmed in Java."—G. C. S.

Vernacular names:—'ILI-NURRASI' (Flying rat), HARA-NURRASI.

MEGADERMA SPASMA TRIFOLIUM, Geoff.

*The Malay Vampire Bat.*

(Synonymy in No. 5.)

1 ♀. Haleri, N. Coorg.

(*See* also Reports Nos. 5 and 6.)

An ashy grey bat with large ears and no tail; a lighter shade of grey on the under side; fur fairly long; a nose leaf nearly twice as high as it is broad. Head and body about 3 inches long.

"A small colony was found in a mud temple on Haleri estate."—G.C.S.

RHINOLOPHUS BEDDOMEI, K. And.

*The Great Indian Horse-shoe Bat.*

(Synonymy in No. 6.)

1 ♂, 1 ♀ in al. Haleri, N. Coorg.

(*See* also Report No. 6.)

A brown bat speckled with grey; long fur; fairly large ears; a large complicated nose leaf and a tail only just extending beyond the membrane. Head and body about 3 inches long; ⅓ oz. in weight.

"Found in a hollow tree; as noted in the North Kanara Report, this species does not roost by day in colonies, but in pairs. I have noted at different times that a number of other species are not gregarious.—*Kerivoula*, *Harpyiocephalus* and *Coelops* always roost singly or in pairs."—G.C.S.

HIPPOSIDEROS FULVUS, Gray.

*The bicoloured leaf-nosed Bat.*

(Synonymy in No. 3.)

1 in al. Haleri, N. Coorg.

(*See* also Reports Nos. 3, 5, 6, 7, 8, 9 and 10.)

A small bat of a pale grey brown colour, fur white at the base and grey brown at the tips; large ears; small nose leaf; tail extending to end of membrane. Head and body not quite 2 inches long.

HIPPOSIDEROS DUKHUNENSIS, Sykes.

*Sykes' leaf-nosed Bat.*

(Synonymy in No. 5.)

1 ♂, 1 in al. Wotekolli, S. Coorg.

(*See* also Reports Nos. 5, 6, 8 and 9.)

A small bat which varies considerably in colour, ranging from yellow, red brown to grey brown; a complicated nose leaf; tail just extending beyond the membrane. Head and body a little over 2 inches long.

"Insectivorous bats were less plentiful in Coorg than in most places visited in Southern India. This may be on account of the altitude, as in the East Indies, I found that bats began to get scarce above an altitude of 3,000 feet."—G.C.S.

PIPISTRELLUS CEYLONICUS, Kel.

*Kelaart's Pipistrelle.*

(Synonymy in No. 1.)

1 ♂ Mercara, N. Coorg.
2 ♂♂, 8 ♀♀. Haleri, N. Coorg.
2 ♀. Wotekolli, S. Coorg.

4 ♂♂, 6 ♀♀. Srimangala, S. Coorg.
(*See* also Reports Nos. 1, 2, 3, 5, 6, 8, 9 and 10.)

A small brown bat; head and body a little more than 2 inches long, tail extending just beyond the membrane.

"Pipistrelles were the only bats observed to be really plentiful in Coorg. Frequently hiding by day in the roofs of houses."—G.C.S.

Vernacular name (all small bats) 'SUNDA-NURRASI' (Flying mouse.)

PIPISTRELLUS MINUS, Wrought.

*The Southern Dwarf Pipistrelle.*

(Synonymy in No. 1.)

8 ♂♂, 15 ♀♀, 12 in al. Srimangala, S. Coorg.
1 ♂ (imm.), 2 ♀♀. Kutta, S. Coorg.

(*See* also Reports Nos. 1, 2, 3, 5, 6, 7, 8, 9 and 10.)

A small dark brown bat, rather a lighter shade underneath; head and body slightly less than 2 inches in length; tail extending just beyond the membrane.

"Very plentiful around Srimangala, apparently more local than *P. ceylonicus*."—G.C.S.

SCOTOPHILUS WROUGHTONI, Thos.

*Wroughton's Bat.*

(Synonymy in No. 1.)

1. Haleri, N. Coorg.
(*See* also Reports Nos. 1, 5, 6, 7, 9 and 10.)

A cinnamon coloured bat, paler on the under side; tail extending slightly beyond the membrane. Head and body nearly 3 inches long.

"A swift and early flyer.—Not observed in any numbers in Coorg."—G.C.S.

TYLONYCTERIS PACHYPUS, Temm.

*The club-footed Bat.*

(Synonymy in No. 5.)

1 ♂ Srimangala, S. Coorg.
1 in al. Haleri, N. Coorg.
(*See* also Reports Nos. 5 and 6.)

A very small bat of a yellowish brown colour above and below; tail extending just beyond the membrane; head and body about 1½ inches long. It is easily distinguished by having suckers on its feet.

"I noticed in Java that this species invariably roosted inside the hollow stems of bamboos, and it was very apparent that the sucker like appendages of these bats enabled them to run up and down the smooth inner surfaces of bamboos with great ease. An early flyer."—G.C.S.

* PACHYURA PERROTTETI, Duvern.

*The Indian Pigmy Shrew.*

(Synonymy in No. 4.)

1 ♂, 1 in al. Haleri, N. Coorg.
1 ♂ Srimangala, S. Coorg.
(*See* also Reports Nos. 4 and 8.)

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*An additional specimen was lately received from Mr. Sprott from Haleri —N. B. K.

A very small glossey dark brown shrew. Head and body about 2 inches long, tail rather shorter.

The specimen in alcohol, no. 2617, is slightly larger than *perrotteti* and has a much longer tail, but for the present I am leaving it as *perrotteti* as it comes nearest to that species; when more material has been collected, the complicated subject of the shrews will be worked out.

"Possibly not uncommon. Mr. Graham tells me that they are well known owing to their habit of falling into tanks and wells; one specimen was found drowned in a well on Haleri estate."—G.C.S.

PACHYURA, sp.

*Shrews.*

2 ♂♂, 1 ♀, 11 in al. Haleri, N. Coorg.
8 ♂♂, 9 ♀♀. Virajpet, S. Coorg.
1 ♀. Nagarhole, S. Coorg.

(*See* also Reports Nos. 1, 3, 4, 5, 6, 7, 9 and 10.)

"Plentiful, particularly around houses".—G.C.S.

Vernacular name:—MUGILI.

FELIS TIGRIS, L.

*The Tiger.*

(Synonymy in No. 5.)

1 ♀. Haleri, N. Coorg.

(*See* also Reports Nos. 5 and 6.)

"Very much less numerous than the panther".—G.C.S.

Vernacular name:—HULI.

FELIS PARDUS, L.

*The Panther.*

(Synonymy in No. 5.)

1 ♂. Wotekolli, S. Coorg.

(*See* also Reports Nos. 5, 6 and 9.)

"Plentiful".—G.C.S.

Vernacular name:—"KIRRABA" "UDDIBBA."

FELIS AFFINIS, Gray.

*The Jungle Cat.*

(Synonymy in No. 1.)

1. Haleri, N. Coorg.

(*See* also Reports Nos. 1, 3, 4, 5, 6, 7 and 10.)

A cat varying in colour, chiefly of a brownish yellow grey; tail ringed blackish brown and grey; paws pale yellow, black underneath; ears tipped with black; underparts paler, with remains of stripes on legs and under side of flanks. Head and body about 25 inches, tail 9 inches.

"Not plentiful in Coorg. Often called the Tiger Cat to distinguish it from *Felis bengalensis* which is known as the Panther Cat.

At the Mysore Zoo (October 1912) a large cobra got into a cage containing a specimen of *Felis affinis*, the cobra was discovered the next day killed and partly eaten".—G.C.S.

Vernacular name:—'KEBBULI.'

FELIS BENGALENSIS, Kerr.

*The Leopard Cat.*

4 ♂♂. 1 ♀. Virajpet, S. Coorg.
2 (no skulls) Haleri, N. Croog.

The yellow brown wild cat, with dark brown or black longitudinal stripes and spots; underside white and spotted. Head and body about 21 inches long, tail about half that length, weight about 6¼ lbs.

This series, which is very uniform, will be most useful in working out the *F. bengalensis* group when more specimens from other parts of India have been received, nothing can really be attempted in the way of sorting out, or breaking up, this very difficult and complicated group until specimens have been obtained from Bengal; these are the first examples of this cat that have been collected during the survey, and the National Collection is very badly off for specimens, those which it does possess are mostly poor skins with very vague localities, therefore it is impossible to try to give any sort of synonymy at present as more material is greatly needed.

"Fairly plentiful in Coorg, apparently more so than *Felis affinis* which is the common wild cat in most parts of Southern India. Particularly numerous around villages, where they destroy large numbers of fowls. I have seen specimens of this cat from as far North as Castle Rock (North Kanara) where, however, they appear to be rare. In North Kanara and Dharwar districts the vernacular name "Wagati" is used indiscriminately, both for this species and *Felis rubiginosa*".—G. C. S.

Vernacular name:—BORKA.

FELIS (domestic).

1. Haleri, N. Coorg.

Probably a hybrid cat. Grey with lateral stripes like an ordinary tabby cat.

VIVERRICULA MALACCENSIS, Gmel.

*The Small Indian Civet.*

(Synonymy in No. 3.)

1 ♂. Wotekolli, S. Coorg.
1 ♂, 3 ♀♀. Virajpet, S. Coorg.
1 ♂. Kutta, S. Coorg.
3 ♀♀, 2 not sexed. Haleri, N. Coorg.

(*See* also Reports Nos. 3, 5, 7 and 10.)

A brownish grey civet with longitudinal black or brown stripes and rows of spots on its back and a stripe down each side of the neck, brown paws and a longish narrow head and pointed nose. Head and body about 22 inches, tail about 16 inches. Some specimens are lighter in colour and the stripes and spots indistinct, the tail is ringed, grey and brown.

"Very plentiful in Coorg. Blanford states that he has not heard of any Civet Cat being kept in India for the production of Civet"; but a number of this species are kept for that purpose at Kolar in Eastern Mysore. Civet is very largely produced from this species in Java, where it is used very considerably for flavouring the tobacco smoked by the natives.

Civets, Paradoxures and the Common Mongoose do not seem to be such persistent raiders of poultry yards as the small *felidae*; not on account of any shyness, as they all have the habit of collecting in large numbers around human habitations. If such were the case, it would hardly be possible to keep poultry at all in a district like Coorg, where these animals

exist in such quantities. They all, no doubt, kill fowls when opportunity offers but it is probable that they prefer preying on rats, lizards and other small animals that exist everywhere in such enormous numbers. They are all fond of carrion, and a dead animal will invariably attract them."—G.C.S.

Vernacular name :—PULUNQUOTAY PUNUGU.

PARADOXURUS NIGER, Desm.

*The Indian Toddy Cat.*

(Synonymy in No. 5.)

1 ♂. Haleri, N. Coorg.
1 ♀. Makut, S. Coorg.
1 ♂. (imm. skull only); 2 ♀ ♀. Haleri, N. Coorg.

(*See* also Reports Nos. 5, 7 and 8).

A Civet Cat with yellowish white under fur, some of the hairs having long, black tips; the limbs and end of the tail are black-brown; the shoulders and back of the neck are darker, and in some cases there are indistinct bands or rows of spots down the back. Head and body about 22 inches, tail about 18 inches.

"Known throughout India as the Toddy-Cat, which is said to be on account of its habit of climbing palms and drinking the Toddy that flows into jars put there by "Toddy drawers." The Paradoxure of Java is called the Coffee Cat, owing to its habit of collecting in numbers around coffee plantations for the purpose of feeding on the ripe berries. *Paradoxurus niger* has the same habit in Coorg: when the berries are eaten, only the pulp is digested, and the undigested beans are deposited in heaps as they have a habit of coming continually to one place, generally in open localities, such as paths or on tree stumps. When the regular coffee picking is over, these heaps are looked for and collected. The Jackal has exactly the same habit depositing the beans in similar heaps; but, although both animals being very plentiful, devour a large amount of coffee, a certain part is afterwards recovered, consequently they are not considered such serious pests as monkeys and birds (chiefly barbets). Even when existing away from coffee estates, Paradoxures appear to be largely frugivious and seemingly not very destructive to poultry. They have a well known habit of taking up their abode in the roofs of houses, where, although not very desirable, owing to the noise they make by running about overhead during the night, they doubtless destroy a large number of rats. This species is very readily tamed."—G.C.S.

Vernacular name :—KULLIBEKKU.

PARADOXURUS JERDONI, Blan.

*The brown Palm Civet.*

1885. *Paradoxurus jerdoni*, Blanford, P.Z.S., pp. 613, 802. No. 54. Mammalia.

3 ♂ ♂. Haleri, N. Coorg.
1 ♂. 2 ♀. Virajpet, S. Coorg.

A Civet Cat with deep brown on head, shoulders and limbs, but grizzled on back and sides; tail grizzled with terminal end brown, sometimes having a white tip. Fur radiating from a point on the shoulders. Head and body about 22 inches, tail about 20 inches. Weight of a female 5½ lbs.

"Fairly plentiful in Coorg, although not nearly so numerous as *P. niger*. The habits of the two paradoxures appear to be identical; they are found side by side in the same localities, especially around coffee estates, and are

not recognized as being distinct by the natives. I have not noticed if *jerdoni* has the same habit as *niger* of living in the roofs of houses. Both species are largely arboreal and may frequently be observed in trees on moonlight nights."—G. C. S.

MUNGOS MUNGO, Gmel.

*The common Indian Mungoose.*

(Synonymy in No. 1.)

2 ♀♀. Wotekolli, S. Coorg.
6 ♂♂, 7 ♀♀. Virajpet, S. Coorg.
1 ♀. Srinmangala, S. Coorg.
2 ♂♂; 3 ♀♀. Haleri, N. Coorg.

(*See* also Reports Nos. 1, 2, 3, 4, 5, 7, 8, 9 and 10.)

"Extremely plentiful in Coorg. Very often seen by day."—G. C. S.

Vernacular name:—KERA HOU-KERA.

MUNGOS VITTICOLLIS, Benn.

*The stripe-necked Mungoose.*

1835. *Herpestes vitticollis*, Bennett, P. Z. S., p. 67.
1839. *Mangusta vitticollis*, Elliot, Mad. Journ. L. S. X., p. 103.
1888. *Herpestes vitticollis*, Blanford, Mammalia No. 64.

1 ♂ 1 ♀. Wotekolli, S. Coorg.
1 ♂. Srimangala, S. Coorg.
1 ♂. Nagarhole, S. Coorg.
1 ♂ 2 ♀♀. Haleri, N. Coorg.

A large handsome mungoose, brown with yellow red speckles; head iron grey; lower part of the back and tail with long chestnut hairs; a black stripe on each side of the neck; limbs and end of the tail black. Head and body about 20 inches, tail 13 inches; weight about 7½ lbs.

"Not uncommon, although very much less plentiful and more local than *Mungos mungo*. Unlike most of the small South Indian Carnivora, *vitticollis* seems to be less plentiful in the neighbourhood of habitations, and is probably a typically forest form that has not learnt to become parasitic on village poultry and house rats. Like the common mongoose this species hunts a lot by day, one specimen having been shot while crossing a jungle track at midday.

Although recorded from North Kanara by Elliot, *vitticollis* is probably a rare straggler as far North as that district. In life the shape of the head differs from that of *mungo*, the snout having a slight upward curve, rather like that of a *Coati mundi*. This is very accurately shown in Blanford's sketch of *Mungos urva*, which is probably similar in appearance.

Sack-like depression beneath tail, very large and conspicuous in *vitticollis*, not so well developed in *fuscus*, and rudimentary in *mungo*."—G. C. S.

Vernacular names:—QUOKI-BALU, KATI-KERA.

MUNGOS FUSCUS, Waterh.

*The Nilgiri brown Mungoose.*

1838. *Herpestes fuscus*, Waterhouse, P. Z. S., p. 55.
1888. *Herpestes fuscus*, Blanford, Mammalia No. 62.

2 ♂♂ 1 ♀. Virajpet, S. Coorg.

A brown mungoose speckled black and yellow throughout; paws almost black. Head and body about 19 inches, tail about 12 inches, weight of a male 6 lbs.

"Apparently very much more local and less plentiful than *vitticollis*, Virajpet being the only locality in Coorg where I heard of it occurring. The specimens obtained were shot close to habitations."—G. C. S.

Vernacular name:—SENDALI-KERA.

CANIS INDICUS, Hodgs.

*The Jackal.*

(Synonymy in No. 1.)

1 ♂; 4 ♀♀. Virajpet, S. Coorg.
1 ♀. Srinamgala, S. Coorg.
1 ♂. Kutta, S. Coorg.
1 ♂, Juv.; 2 ♀♀ (no skull). Haleri, N. Coorg.

(*See* also Reports Nos. 1, 3, 4, 5, 6, 7, 9 and 10).

"Plentiful especially in the vicinity of villages. Like *Paradoxurus*, Jackals have the curious habit of devouring large quantities of ripe coffee berries. In addition to being a scavenger, when the opportunity offers, they are as great robbers of hen roosts as the English Fox".—G.C.S.

Vernacular names:—KURRAKA, KURRINARI, NARI, GULILAKKA, GULINARI, GULIKUNKA.

CYON DUKHUNENSIS, Sykes.

*The Indian Wild-dog.*

(Synonymy in No. 2.)

1 ♂ (skull only). Nagarhole, S. Coorg.
1 ♀. Chamrajnagar, S. Mysore. (Van Ingen)
3 (no skulls). Mercara, N. Coorg.

(*See* also Reports Nos. 2, 4 and 7).

A rich red-brown dog, with end of tail, black. Head and body 36 inches, tail 16 inches.

"Considered more or less numerous in those parts of Coorg where the larger game has not been entirely driven away, but on account of their wandering habits, their presence in any particular district can never be made certain of.

Generally gregarious.

Specimen 2571 was sent by Mr. Van Ingen, who obtained it in the extreme south of Mysore close to the Coorg border".—G. C. S.

Vernacular names:—KENNAI, CHENNAI.

MARTES GWATKINSI, Horsf.

*The Southern Indian Marten.*

1851. *Martes gwatkinsii*, Horsf. Cat. E. Ind. Coll., p. 99.
1888. *Martes flavigula*, Blanf. Mammalia, No. 77 (partim).
1 ♂. Virajpet, S. Coorg.

General colour dark-brown; head, tail and limbs almost black; white under chin; yellow bands on each side of neck extending to underside of neck and on to chest. Length of head and body 24 inches, tail 16 inches, weight 4½ lbs.

Bonhote (A.M.N.H., ser. 7, Vol. VII, 1901,) recognised *Martes gwatkinsi* as a distinct species from *M. flavigula*. Horsfeild's type was a specimen collected by Elliot in Madras, and it exactly agrees with the example from Coorg, so that *M. gwatkinsi* may be accepted as representing the South Indian species.

"Apparently rare in Coorg, the single specimen obtained was only recognized by a very few of the local natives. Said to be largely diurnal in habits, and although to a considerable extent arboreal, to hunt a great deal on the ground, occasionally in small parties".—G. C. S.

LUTRA LUTRA, L.

*The common Otter.*

1758. *Mustela lutra*, Linnæus, Syst. Nat. 1, 10th edn., p. 45.
1777. *Lutra vulgaris*, Erxl. Syst. Reg. An., p. 448.
1823. *Lutra nair*, F. Cuv. Dict. Sc. Nat. XXVII, p. 247.
1837. *Lutra indica*, Gray, Charlesworth's Mag. N. H. 1, p. 580.
1839. *Lutra tarayensis*, Hodgs. J.A.S.B., VIII, p. 319.
1888. *Lutra vulgaris*, Blanf. Mammalia, No. 92.

1 ♂, 4 ♀♀. Virajpet, S. Coorg.
1 ♂. Srimangala.
4 ♂♂ (2683, no skull); 6 ♀♀ (2684 no skull). Haleri, N. Coorg.

General colour brown, under fur woolly, white at the base and brown above; hairs of a lighter brown colour and longer. Under surface greyish brown, underside of neck especially light in colour. Head and body about 20 inches, tail about 10½ inches. Weight of a female 7 lbs.

"Very plentiful. Coorg is a celebrated Mahseer district, and a reward is offered for the destruction of otters by the local fishing association. It will be interesting to discover whether the estuary otter of the West Coast is this species or *macrodus*, possibly they both occur there. *Lutra lutra* would appear to be the common "hill otter" of Southern India".—G.C.S.

Vernacular names:—NIRNAI. NIRUNAI (Water-dog).

AONYX CINERA, Illig.

*The clawless Otter.*

1815. *Aonyx cinera*, Illiger, Abh. Ak. Berl. 1811, p. 99 (pub. 1815).
1824. *Lutra leptonyx*, Horsfeild, Res. Java.
1839. *Lutra indigitata*, Hodgson, J. A. S. B., VIII, p. 320.
1888. *Lutra leptonyx*, Blanford, Mammalia, No. 95.

1 ♂. Virajpet, S. Coorg.
1 ♂. Haleri, N. Coorg.

General colour dark brown (rather darker than the common otter), under fur woolly and paler at the base; underpart lighter, almost white under the chin and on sides of face. Differs from the common otter in only having rudimentary claws. Head and body 23 inches, tail 13 inches, weight of a male 9½ lbs.

Blanford originally adopted the name *leptonyx*, but in his 'Appendix and *Errata*' on p. 601 of the "Mammalia", he accepts *cinera* as representing this species.

"In Coorg, occurring in the same waters as *Lutra lutra*, but in fewer numbers. It is difficult to distinguish between the habits of animals which are externally so alike, but I have been informed that the clawless otter (known as the small otter) hunts in larger packs, although most otters, wherever plentiful, are gregarious. As far as it is at present known, this species in Southern India is a hill otter, but in Java and other parts of the East Indies, it is equally plentiful in estuaries and even along the sea coast. In Java I found this species breeding in the banks of paddy fields."—G. C. S.

MELURSUS URSINUS, Shaw.

*The Sloth Bear or Indian Bear.*

1791. *Bradypus ursinus*, Shaw, Nat. Misc. II, pl. 58.
1817. *Ursus labiatus*, Blainv. Bull. Soc. Philom. p. 74.
1855. *Ursus inornatus*, Pucheran, Rev. Mag. Zool. VII, p. 392.
1888. *Melursus ursinus*, Blanford, Mammalia, No. 100.
2594 (skull only) .. Nagarhole, S. Coorg.

"Occurring in the thinly populated parts of Coorg, particularly in the eastern districts close to the South Mysore borders where the jungle is deciduous. Said to frequently lie up by the day in dense lantana thickets, or in thick clumps of bamboos."—G. C. S.

Vernacular name :—KARADI.

PETAURISTA PHILIPPENSIS, Ell.

*The South Indian Flying Squirrel.*

(Synonymy in No. 6.)

7 ♂♂, 12 ♀♀. Haleri, N. Coorg.
1 ♀. Virajpet, S. Coorg.
1 ♂, 1 ♀. Kutta, S. Coorg.
2 ♂♂. Srimangala, S. Coorg.

(*See* also Report No. 6.)

General colour grizzled grey, under fur ashy grey with white tips; shoulders, limbs and flanks rusty red; underside dirty white; tail black except at commencement which is grey. Fur, very soft. Head and body about 18 inches, tail 20 inches, weight of a female 4 lbs.

"Plentiful, apparently more evenly distributed in Coorg than in North Kanara, where, although fairly plentiful, they were distinctly local."—G. C. S.

Vernacular names :—HARABEKKU PARUMBEKKU.

RATUFA INDICA SUPERANS, Ryl.

*The Coorg Giant Squirrel.*

1913. *Ratufa indica superans.*—Ryley. Journ. B. N. H. S., Vol. xxii, p. 436.
7 ♂♂, 3 ♀♀. Wotekolli, S. Coorg.
3 ♂♂, 1 ♀. Makut, S. Coorg.

General colour chestnut red; underside pale yellow which extends on to the front of the fore paws and around the sides of the head and face, becoming almost white on the top of the head; ears have tufts of chestnut hair; whiskers black; terminal end of tail yellow, the underside of tail is paler throughout. Head and body about 18 inches, tail 20 inches. Tail hairs fairly long and bushy.

"With one exception, which was intermediate, the whole series of 14 specimens from Wotekolli and Makut to the west of the Brahmagiri hills appear identical in colour with those from Dharwar and North Kanara, showing no traces of black. A second series from Nagarhole and Kutta to the east of the Brahmagiris, where the forests are entirely deciduous, differed in all having black tails. While a single specimen, No. 2572, sent by Mr. Van Ingen from Chamarajnagar (South Mysore), less than 30 miles to the east of Nagarhole, differs again in having the shoulders and hind quarters as well as the tail black. These three localities are all in the same latitude and the amount of black on individuals evidently increases here from west to east. The black-tailed forms from Nagarhole, etc., being intermediate between the two extremes; but it is remarkable to find such marked

variation in three districts so close together. The Brahmagiris appear to form an abrupt barrier between the two Coorg forms, though there is apparently nothing to prevent their meeting and inter-breeding around the foot of that range. Mr. Van Ingen informs me that the red squirrels from Eastern Mysore are similar to those from Southern Mysore. Specimens from South Malabar and Travancore are also said to be very strongly suffused with black.

Rare in North Coorg."—G.C.S.

Vernacular name :—KENJERI.

RATUFA INDICA BENGALENSIS, Blanf.

*The Central Indian Giant Squirrel.*

(Synonymy in No. 7.)

2 ♂♂. 3 ♀♀. Kutta, S. Coorg.
3 ♂♂ ; 2 ♀♀. Nagarhole, S. Coorg.

General colour deep chestnut red, yellow underside and pale markings on head and forelegs as in *R. indica superans*, but differing from that species in having a black tail with a yellow tip, underside of tail still with a narrow yellow stripe throughout. Head and body about 16 inches, tail 17 inches. Weight of a female 4½ lbs.

The synonymy of the above sub-species was given in Report No. 7, it was then applied to the Ratufas obtained in the Central Provinces, which, however, have now been made into a new subspecies *Ratufa indica centralis* (ante p. ) as the Coorg specimens agree more closely with the type of *Ratufa indica bengalensis*.

RATUFA INDICA CENTRALIS, Ryl.

*The black shouldered Giant Squirrel.*

1913. *Ratufa indica centralis*, Ryley. Journ., B. N. H. S., Vol. xxii, p. 436.

♂ 2572. Chamrajnagar, S. Mysore.

General colour chestnut red with pale markings as in *superans* and *bengalensis*, but differing from those species in having black on the shoulders, rump and hindquarters, the tail is also black with a very small pale yellow tip. This squirrel is also smaller, the head and body only measuring about 13½ inches ; tail 16 inches and weight about 2¾ lbs.

It is curious to find this one specimen agreeing so well with the large series from the Central Provinces, and not with the Ratufas obtained so near by in Coorg.

"The Southern and Eastern Mysore form."—G.C.S.

FUNAMBULUS WROUGHTONI, Ryley.

*The Coorg striped Squirrel.*

1913. Funambulus wroughtoni, Ryley. Journ. J.B.N.H.S., Vol. xxii, p. 437.

1 ♂. Jambur, N. Coorg.
5 ♂♂, 2 ♀♀. Haleri, N. Coorg.
5 ♂♂, 4 ♀♀. Wotekolli, S. Coorg.
1 ♂, 1 ♀. Makut, S. Coorg.
10 ♂♂, 2 ♀♀. Virajpet, S. Coorg.
3 ♂♂, 1 ♀. Srimangala, S. Coorg.

(*See* also Reports Nos. 5 and 6.)

Speckled brown, black and grey with three longitudinal light yellow stripes, the middle one being very narrow and shorter than the lateral

stripes; a red-brown head; grizzled tail, red on its underside; the back sometimes has a black patch and often a rusty-red appearance. Underside greyish white. Head and body about 7 inches, tail 6 inches.

"Only locally plentiful in Coorg, in some places being distinctly uncommon; I have noticed this in many parts of Southern India, both with *Funambulus tristriatus* and *palmarum*, and considered that they must die off locally from time to time from some epidemic. Bubonic plague has been suggested as the cause in some places. There appeared to be much variation in the markings and colouration of the striped squirrels from Coorg.

*Sciurus macrurus* is recorded by Blanford from Southern Mysore and should be looked for in the deciduous jungles near the Coorg-Mysore boundaries, although I received no information of its occurrence anywhere in Coorg".—G. C. S.

Vernacular names:—Sunni, Alalu, Aluqunsha.

FUNAMBULUS SUBLINEATUS, Waterh.

*The Dusky Striped Squirrel.*

1838. *Sciurus sublineatus*, Waterhouse, P.Z.S., p. 19.
1842. *Sciurus delesserti*, Gervais, Mag. Zool., pl. 31.
1851. *Sciurus trilineatus*, Blyth, J.A.S.B., XX, p. 163 (nom. nud).
1891. *Sciurus sublineatus*, Blanf., Mammalia No. 256.
2 ♂ ♂. Kutta, S. Coorg.

A small brown squirrel speckled with dull greenish grey, having four dark-brown longitudinal stripes separated by three pale ones: undersurface of a yellower shade: feet same colour as body; tail of a rather darker speckled colour. Length of head and body about 5 inches, tail rather less; weight of a male 1½ ounces.

"Apparently local and by no means plentiful in Coorg. Mr. Cuthell informs me that these squirrels occur in pairs in damp gullies in the thickest forest, particularly where the soil is favourable for the growth of wild ginger and cardamoms. Said to be extremely shy and difficult to discover among the creepers and tangled undergrowth that they frequent; hiding behind the trunks of trees and making off at the slightest sound."—G. C. S.

Vernacular name:—Gooda-Sunni.

PLATACANTHOMYS LASIURUS, Blyth.

*The Malabar Spiny Mouse.*

1859. *Platacanthomys lasiurus*, Blyth., J. A. S. B., XXVIII, p. 288.
1891. *Platacanthomys lasiurus*, Blanford, Mammalia No. 263.
24 ♂ ♂, 14 ♀ ♀, 4 in al. Virajpet, S. Coorg.
1 ♂. Near Mercara, N. Coorg.

General colour brown, underside dirty white. Fur on back mixed with flat stiff spines, underfur grey white at the base becoming brown, with the extreme tip of the spines white, tail dark-brown and bushy at the end; whiskers long and black. Head and body 5½ inches, tail 4 inches, weight of a female 2¾ ounces.

"Apparently very local, although extremely plentiful where it occurs. The specimens were chiefly obtained by the natives, who smoked them out of hollow trees around Virajpet: they discovered the trees these animals lived in with wonderful accuracy, and when smoked they came out of the hollow ends of dead branches. *Platacanthomys* is known to exist as far north as the Kadur District in Western Mysore.

Said to be fond of feeding on Cardamoms, and to occasionally get into

toddy pots. Mr. Baker found this species among clefts in rocks as well as in hollow trees; he observed that they were most abundant in elevated vales and ravines and that like *Gunomys* and *Tatera*, they hoarded up grain and roots.

Evidently entirely confined to the Ghat region. Blanford's sketch is good, except that the tail is too long and the feet too slender, while in life the ears are not usually carried in such an upright position. Eyes small, eyelids frequently of a dull pink. Snout and feet in some individuals bright pink, in others whitish.

A specimen kept alive for a short time resembled a dormouse in habits. It was very sluggish by day, and would feed freely on bananas and biscuits, allowing itself to be handled without showing any signs of fear and never attempting to escape. Although not savage, it would bite inquisitively at a finger or anything placed near it. During life the spines on the back are carried partly erect, but the tail does not appear to be subdistichous as described by Blanford. Tails frequently tipped with white".—G. C. S.

Vernacular name:—MULLILI.

TATERA INDICA, Hardw.

*The Indian Gerbil.*

(Synonymy in No. 1.)

1 ♂ Virajpet, S. Coorg.
1 ♀ Srimangala, S. Coorg.

(*See* also Reports Nos. 1, 2, 3, 4, 5, 6, 7, 8, 9 and 10.)

General colour varying from red-brown to fawn with sometimes a few black tips to the hairs; underfur grey. Tail with dark stripe above and below, having longer dark-brown hairs at the terminal end. Undersurface white. Head and body about 7 inches. Tail 8 inches.

"Apparently comparatively scarce in Coorg, only existing in the cultivated districts."—G. C. S.

VANDELEURIA OLERACEA, Benn.

*The Dekhan Tree Mouse.*

(Synonymy in No. 2.)

1 ♂; 3 ♀♀. Kutta, S. Coorg.

(*See* also Reports Nos. 2, 4, 5, 7 and 10.)

A yellow brown mouse, white on the underside. Whiskers black. tail very long, nearly 5 inches, head and body about 3½ inches.

"Probably not uncommon, especially in Bamboo jungle, but owing to its arboreal habits not easily trapped. It makes a rather conspicuous round nest, like that of a dormouse of dry bamboo leaves, in shrubs and trees, usually about 5 or 6 feet from the ground; but, although these nests are plentiful, they are rarely found occupied, and are probably only used by the female for bringing up her young. *Vandeleuria* recalls the African genus *Dendromys* in habits."—G. C. S.

EPIMYS BLANFORDI, Thos.

*The White-tailed Rat.*

(Synonymy in No. 2.)

1 ♂. Wotekolli, S. Coorg.
1 ♂. Nagarhole, S. Coorg.

(*See* also Reports Nos. 2, 6, 7 and 9.)

A brown rat, white below, with terminal half of the tail clothed with white hairs. Fur fairly long and very soft. Head and body about 7 inches, tail rather longer.

"Probably fairly plentiful in Coorg, especially in heavy deciduous forest."— G. C. S.

Vernacular name:—"MURA-ILI."

EPIMYS RUFESCENS, Gray.

*The Common Indian Rat.*

(Synonymy in No. 1.)

1 ♂ Jambur, N. Coorg.
2 ♂♂, 1 ♀. Wotekolli, S. Coorg.

VARIETY.—With white underparts.

2 ♂♂, 2 ♀♀. Jambur, N. Coorg.
4 ♂♂, 5 ♀♀. Haleri, N. Coorg.
6 ♂♂, 9 ♀♀. Wotekolli, S. Coorg.
1 ♂, 1 ♀. Makut, S. Coorg.
6 ♂♂. Virajpet, S. Coorg.
1 ♂. Nagarhole, S. Coorg.

(*See* also all previous Reports.)

Brown with more or less rufous or yellow tips to the hairs; very long bare tail. Usually grey below but there is a variety with white underparts. Head and body about 7 inches, tail about 9 inches.

"The variety with dark underparts undoubtedly becomes scarce in forest districts, particularly as one goes south. Nearly all of those from Coorg were the white-bellied variety. Although the two forms interbreed indiscriminately wherever they meet, there is no doubt that the white-bellied variety is an older and probably indigenous stock that is gradually disappearing in the more thickly populated districts in the course of interbreeding with the continually increasing numbers of dark-bellied imported stock."—G. C. S.

Vernacular names:—ILI, GOODILI, MUNI-ILI.

MUS MANEI, Kel.

*The Common Indian House-Mouse.*

(Synonymy in No. 5.)

1 ♀. Jambur, N. Coorg.
4 ♂♂ ; 2 ♀♀. Haleri, N. Coorg.
1 ♀. Virajpet, S. Coorg.

(*See* also all Reports Nos. 5, 6, 8, 9 and 10.)

The small brown house-mouse, rather lighter below. Head and body about 3½ inches and tail of the same length.

"Very abundant around houses."—G. C. S.

Vernacular name:—"SUNDA"

MUS BOODUGA, Gray.

*The Southern Field Mouse.*

(Synonymy in No. 1.)

1 ♂, 1 ♀. Heleri, N. Coorg.
1 ♀. Wotekolli, S. Coorg.

2473 (6 juv.) in al. Viratpet, S. Coorg.
4 ♂♂, 1 ♀. Srimangala, S. Coorg.
3 ♂♂. Nagarhole, S. Coorg.
1 ♂. Kutta, S. Coorg.

(*See* also Reports Nos. 1, 2, 4, 5, 6, 7, 8, 9 and 10.)

A small brown mouse of varying shades from red-brown to grey sandy-brown. Sometimes grey and sometimes white on the underside. Varying from 2½ to 3½ inches, tail about the same length.

"Although generally living in holes underground or among stones, I found a round grass nest almost the size of a cocoanut under a fallen log at Nagarhole containing young of this species."—G. C. S.

LEGGADA GRAHAMI, Ryl.

*The Coorg hill Spiny-Mouse.*

1913. *Leggada grahami*, Ryley. Journ. B. N. H. S. Vol. XXII, p. 434
10 ♂♂.
20 ♀♀,
1 in al. Wotekolli, S. Coorg.

A small dark brown mouse slightly speckled with buff; dirty white on underside. Fur mixed with spines. Head and body about 4½ inches, tail nearly 3 inches.

"This mouse was very plentiful among the long grass on the summits and slopes of the hills around Wotekolli at an altitude of from 2,000 feet upwards."—G. C. S.

LEGGADA HANNYNGTONI, Ryl.

*The Coorg lowland Spiny-Mouse.*

1913. *Leggada hannyngtoni*, Ryley. Journ. B. N. H. S., Vol. XXII p. 435
3 ♂♂, 2 ♀♀. Makut.

A small dark brown mouse, slightly flecked with yellow; pure white on undersurface. Head and body about 4½ inches, tail about 3 inches.

"This mouse, which differs from the preceding species chiefly in having a larger hind foot, was trapped in thick jungle at Makut, at the foot of the Ghats, altitude 250 feet."—G. C. S.

MILLARDIA MELTADA, Gray.

*The soft-furred Field Rat.*

(Synonymy in No. 1.)

2 ♂♂, 1 ♂. Kutta, S. Coorg.

(*See* also Reports Nos. 1, 3, 4, 5, 7 and 10.)

Dark-brown grey above; pale grey below. Fur very soft. Head and body about 5 inches, tail 4 inches.

"Trapped in Huvinakadu estate in a small patch of thick scrub surrounded by heavy deciduous forest, which stretches for many miles in every direction. If these specimens do not differ from *Millardia meltada* of the Bombay Deccan, that species has a remarkable distribution. In the Deccan I found *Millardia* strictly confined to the open black cotton plains, which were bare of any kind of trees or even shrubs, living in holes and sun-baked cracks in the ground and never extending beyond these areas, even into the adjoining red soil districts; while, since leaving the Deccan, I had not come across it anywhere."—G. C. S.

Vernacular name.—MIRIKI.

GUNOMYS KOK, Gray.

*The Southern Mole-Rat.*

(Synonymy in No. 1.)

1 ♀. Wotekolli, S. Coorg.
2 ♂♂; 1 ♀, 2 in al. Makut, S. Coorg.
1 ♂; 1 ♀. Virajpet, S. Coorg.
4 ♂♂; 4 ♀♀. Srimangala, S. Coorg.

(*See* also Reports Nos. 1, 4, 5, 7, 8, 9 and 10.)

Dark-grey brown slightly speckled with buff; paler on the underside. Tail practically bare; head and body 6½ inches, tail 5 inches, weight 5¾ ounces. Easily distinguished from *Epimys rufescens* by its much shorter tail.

"Plentiful both in thick jungle (deciduous and evergreen) and around cultivation. In rubber estates *Gunomys* is very destructive to the young trees. During the first few years of their growth rubber trees have tuberous roots, which these rats attack; numbers of half-grown trees are killed in this way, the trees wither and eventually fall. Owing to their subterranean habits mole rats are very difficult to exterminate."—G. C. S.

Vernacular name:—"TORDA."

BANDICOTA MALABARICA, Shaw.

*The Malabar Bandicoot.*

(Synonymy in No. 5.)

1 ♂, 3 ♀♀, (2650 no skull). Haleri, N. Coorg.
1 ♂, 4 ♀♀. Virajpet, S. Coorg.
1 ♂, Srimangala, S. Coorg.

(*See* also Reports Nos. 5, 6, 7, 9 and 10.)

A large grey rat with long black-brown hairs on the back; a rather lighter colour on the underside. Tail thick and bare. Head and body about 12 inches, tail almost as long; weight about 2¼ lbs.

"Plentiful. Never occurring at any distance from habitations. The presence of bandicoots in a district is very easily discovered on account of the large burrows they make around stables and outhouses."—G. C. S.

Vernacular name:—HEGGANA.

GOLUNDA ELLIOTI, Gray.

*The Indian Bush-Rat.*

(Synonymy in No. 1.)

2 ♂♂. Wotekolli, S. Coorg.
1 ♀. Virajpet, S. Coorg.
1 (no skull), Kuta, S. Coorg.

(*See* also Reports Nos. 1, 2, 3, 4, 5, 6 and 7.)

General colour greenish-brown with black and yellow speckles; rather lighter on the undersurface. Hair dark-grey at the base; tail dark above and pale on underside. Head and body 5 inches, tail 4 inches.

"Probably plentiful. *Golunda* is said to have been at times a great pest in Ceylon, where it is known as the Coffee rat. In Coorg, although occurring in Coffee plantations, where they without doubt feed on the ripe berries, they do not appear to be sufficiently numerous to do an appreciable amount of damage. The Indian Bush-Rat is diurnal and may often be seen or heard among lantana thickets or other undergrowth-making a rustling sound like a lizard as it moves about."—G. C. S.

Vernacular name:—KOOLA.

HYSTRIX LEUCURA, Sykes.

*The Indian Porcupine.*

(Synonymy in No. 1.)

1 ♂ (skull only). Makut, S. Coorg.

(*See* also Reports Nos. 1, 2, 5 and 10.)

Quils brownish black with white bands on them, quills of tail white; the dark-brown crest bristles are also sometimes tipped with white. Weight from 20-30 lbs.

"Fairly plentiful but not easy to find here in the thick hill forests that they frequent. Porcupines are very destructive to rubber plantations, and if they occur in a district where rubber is planted, unless the trees are wired in, they get eaten down in large quantities.

Many fallen quills were seen but they were all normal in colour".—G. C. S.

Vernacular name:—MULLHUNDHI.

LEPUS NIGRICOLLIS, Cuv.

*The Black-naped Hare.*

(Synonymy in No. 5.)

4 ♀♀ (1 imm) (2555 no skull), Virajpet, S. Coorg.
1 ♂. 5 ♀♀ Haleri, N. Coorg.

(*See* also Reports Nos. 5, 6, 8 and 9.)

General colour rich glossy rufescent brown interspersed with black, with a distinctive black patch on the back of the neck, grey on the rump and sides of the face, white on the undersurface; limbs rufous. Head and body about 20 inches, tail 3 inches.

"Plentiful both in forest and cultivated country".—G. C. S.

Vernacular names:—MOLA KHUNDILI.

BIBOS GAURUS, H. Sm.

*The Gaur.*

(Synonymy in No. 6.)

2 ♀♀, (skulls only) Nagarhole, S. Coorg.

(*See* also Report No. 6.)

"Only occurring in the remoter parts of Coorg. Very much overshot in the few localities here where they still exist."—G. C. S.

Vernacular name:—KATI.

ANTILOPE CERVICAPRA, L.

*The Black Buck.*

(Synonymy in No. 5.)

1 (no skull) albino. Chamrajnagar, S. Mysore (Van Ingen).

(*See* also Reports Nos. 1, 5 and 10.)

"The black buck probably never wanders inside the boundaries of Coorg, although together with the four-horned antilope it occurs in the more open parts of Southern Mysore.

The specimen, sent by Mr. VanIngen, is a fawn of what would have eventually become an albino. Albino black buck are bred in the Mysore

Zoo, where there is now a considerable herd; the young of which are invariably faintly marked as in the present specimen, only becoming pure white after the first year".—G. C. S.

Vernacular name:—HULI-KURRA.

MUNTIACUS VAGINALIS, Bodd.

*The Barking Deer.*

(Synonymy in No. 2.)

1 ♀. Kutta, S. Coorg.
1 ♂, 1 ♀. Nagarhole, S. Coorg.

(*See* also Reports Nos. 2, 6 and 7.)

A chestnut coloured deer, face and limbs brown, facial ribs, female without horns but having a little black tuft where they would be. Partly white below. Weight of Coorg female 41 lbs. Length of head and body 38 inches; height from shoulder to top of hoof 23 inches; height from withers to tip of hoof, 26 inches, girth behind shoulders 21 inches.

"Fairly plentiful in many parts of Coorg. In Blanford's "Mammalia" the weight of animals is frequently under-estimated, that of an adult Muntjac stag is given as 38 lbs. In the present specimens a doe weighed 41 lbs. while a stag weighed down a 50 lb. scale, so heavily that I estimated its weight at between 60 and 70 lbs."—G. C. S.

Vernacular names:—KAIRLI, KURRANGI, KARDKURRI.

RUSA UNICOLOR, Bechs.

*The Sambhar.*

(Synonymy in No. 5.)

1 ♀. Wotekolli, S. Coorg.
1 ♀. Makut, S. Coorg.
1 ♂. (skull only) Nagarhole, S. Coorg.

(*See* also Report No. 5.)

The largest Indian deer; uniform colour dark-brown, varying slightly in shade; hair coarse.

"Fairly plentiful in reserved forests, but as with the other large game in Coorg, getting shot out to such an extent that good heads are very seldom obtained."—G. C. S.

Vernacular name:—KUDDAWAY.

AXIS AXIS, Erxl.

*The Spotted Deer.*

(Synonymy in No. 6.)

1 ♂. Nagarhole, S. Coorg.

(*See* also Reports Nos. 6 and 7.)

"Local. Said to be fairly numerous in East Coorg, in deciduous jungle near the Mysore borders."—G. C. S.

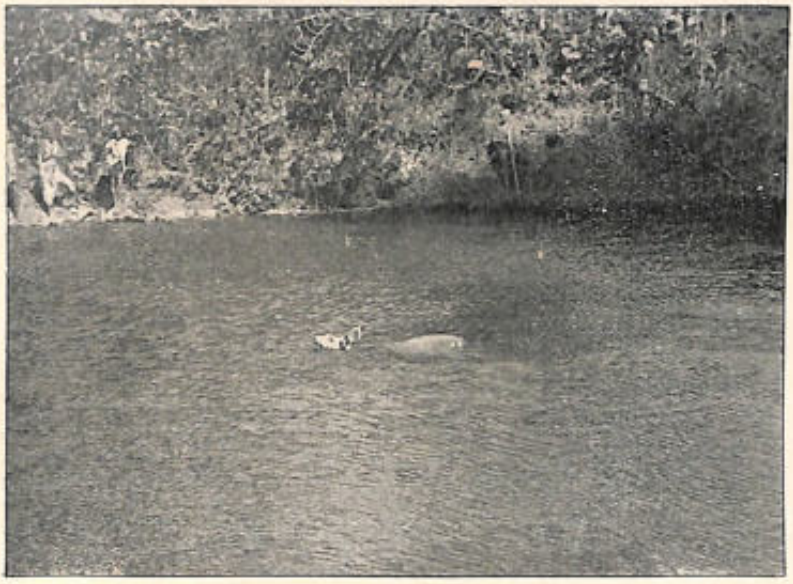
Vernacular name:—SARAGA.

TRAGULUS MEMINNA, Erxl.

*The Indian Chevrotain or Mouse Deer.*

(Synonymy in No. 6.)

1 ♀. Wotekolli, S. Coorg.



Doe Sambar swimming the Cauvery River, S. India.
(Photo by E. F. H. Wiele).

Head of Barking Deer.—S. India.
(Actual head before being skinned).
(Photo by E. F. H. Wiele).

1 ♂. Makut, S. Coorg.
2 ♂♂, 2 ♀♀, 1 in al. (juv.) Virajpet, S. Coorg.
1 ♀. Chamrajnagar, S. Mysore.
2 ♂♂ (juv.) Haleri, N. Coorg.

(*See* also Report No. 6.)

General colour, brown with greenish yellow speckles, pale yellow lateral stripes and spots, top of head rather darker; underside almost white, longitudinal stripes on undersurface of neck. A large female weighed 12 lbs. Length of head and body 23 inches, tail 1¾ inches.

"Plentiful, chiefly frequenting heavy jungle, where it is not easy to put up. Blanford gives the weight of an adult male as 6 lbs. Coorg specimens average from 8-10 lbs., large individuals occasionally weighing as much as 12 lbs., does as heavy, if not slightly heavier than bucks."—G. C. S.

Vernacular name :—KOORA-HUNDHI.

SUS CRISTATUS, Wagn.

*The Indian Wild Boar.*

(Synonymy in No. 5.)

2 ♀♀. Nagarhole, S. Coorg.
1 ♂, 1 ♀. Haleri, N. Coorg.

(*See* also Reports Nos. 5, 8 and 10.)

"Plentiful. The village pigs of Southern India are probably descended from wild stock, while the variations in skulls of wild pigs from various parts of India is very probably due to occasional interbreeding with domestic pigs which would also account for the young of village pigs being occasionally striped."—G. C. S.

Vernacular name :—KARD-HUNDHI.

MANIS CRASSICAUDATA, Geoff.

*The Indian Pangolin.*

(Synonymy in No. 3.)

2702 juv. Haleri, N. Coorg.

(*See* also Reports Nos. 3, 6, 8 and 9.)

Scales light-yellow brown throughout, undersurface bare.

"Well-known in Coorg, although, as in most localities, not numerous, and on account of its nocturnal and fossorial habits seldom seen."—G. C. S.

Vernacular names :—TIREGA, CHIPHUNDHI, CHIPBEKKU.

# SOME NEW SNAKES FROM THE ORIENTAL REGION.

By

F. Wall, C.M.Z.S., I.M.S.

*Oligodon evansi*, spec. nov.—In the year 1902 shortly after leaving Burma, Major (now Colonel) G. H. Evans sent me the detailed notes of a snake from Thandoung, Toungoo District (S. Shan States), which he was unable to identify. I wrote to him in reply that it was certainly a species of *Oligodon* or *Simotes* not known to science. When my collections were sent on to me, this specimen was not forthcoming, and Colonel Evans was never able to trace what became of it. I was much interested therefore after the lapse of 11 years to have a snake sent to me by the keeper of the Society's Museum, collected at Taounggyi (S. Shan States) which exactly tallies with Colonel Evans' description which I have kept by me, and have frequently referred to when new species of the genera *Oligodon* and *Simotes* have been announced.

I propose to call the species *Oligodon evansi*, which may be described thus:—*Length*—13½ inches, tail 1⅞ inches. *Rostral*—Touches 6 shields, the rostro-nasal, and rostro-internasal sutures subequal, greater than rostro-labial. *Internasals*.—Two, the suture between them ¾ that between the præfrontal fellows, ⅔ the internaso-præfrontal; *Præfrontals*—Two, suture between them ⅔ the præfronto-frontal; in contact with the internasal, postnasal, loreal, præocular, and supraocular. *Frontal*—Touches six shields, the sutures subequal. *Supraoculars*—Length ⅔ frontal, breadth ⅓ frontal. *Nasals*—Two, in contact with the 1st and 2nd supralabials. *Loreal*—One, longer than high, about ⅘ the length of the nasals. *Præocular*—One. *Postoculars*—Two. *Temporal*—One, in contact with the 5th supralabial only. *Supralabials*—Six, the third and fourth touching the eye, the fifth much the longest. *Infralabials*—Four,

Oligodon evansi. (× 1½)

fourth largest, third and fourth touching the posterior sublinguals. *Sublinguals*—Two pairs. *Ventrals*—131. *Anal*—Entire. *Subcaudals*—19, divided *Costals*—Two heads lengths behind the head 15, midbody 15, two heads lengths before the vent 15.

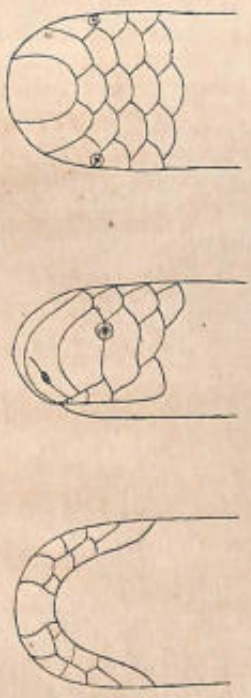
*Colour*—Deep olive-green dorsally, with black mottling forming indistinct cross-bars posteriorly. Some variegation formed by short linear gamboge edges to some scales. A broad, black, well defined saggitate mark on the nape. Head almost uniform dark olive, the labial sutures black on both lips. Belly yellow with elongate, transverse, black marks reaching to the middle line, often on alternate or on two successive ventrals.

The shortness of the tail is one very noticeable feature. Colonel Evans' specimen measured 18½ inches, the tail accounting for 1¾ inches. The ventrals numbered 140, and the subcaudals 24 (25 ?). A row of dark dorsal spots were present along each side. In other respects the two specimens completely agree.

*Typhlops venningi*, spec. nov.—Among other interesting snakes from Burma lately received from Captain F. E. W. Venning is a blind snake of the family *Typhlopidæ* which is new to science. I propose to associate the discoverer's name (*viz.* Mrs. Venning) with these specimens (two) which have been lodged in the British Museum.

*Habitat*—Pyawbwe, Upper Burma circa 700 feet.

*Description.—Rostral*—About half the width of the head above. *Prefrontal, frontal,* and *interparietal* subequal, rather larger than the body scales. *Supraocular*—About as broad as the preceding. *Anterior parietal*—Broader than the supraocular. *Nasals*—Not meeting behind rostral. Not completely divided, the suture above the nostril failing to meet the rostral. The suture below the nostril passes to the 2nd labial. *Præocular*—Touches



*Typhlops venningi* (× circa 8/1)

the 2nd and 3rd of the labial series. *Ocular* as large as the præocular, in contact with the 3rd and 4th labials. *Temporal*—One. *Labials*—Four *Scales* in 18 rows in the whole body length.

Eyes fairly distinct, beneath the præocular, and ocular shields. Nostril latero-inferior. Snout rounded. Tail ending in an obtuse cone. Length 7½ inches. Breadth about one fifty-sixth to one sixty-fourth the total length.

*Colour.*—Dark purplish-brown dorsally, lighter beneath. A white spot on the anal region, and at the tip of the tail.

*Distira cyanosoma*, spec. nov.—Among a small collection of snakes sent to me last year from the Philippine Islands, by Dr. Griffin was a marine specimen which I have made the type of a new species, incorporating it provisionally with the genus *Distira*. I have presented it to our National Museum at S. Kensington.

*Description.—Rostral*—Broader than high; in contact with 4 shields. *Nasals*—in contact with the fellow of the opposite side; suture from the nostril passes to the 2nd supralabial. *Præfrontals*—a pair; in contact with the 2nd supralabial. *Frontal*—Touches 6 shields, the fronto-parietal sutures rather the longest. *Parietals*—Entire. *Præocular*—One. *Postoculars*—Two. *Temporals.*—Two on the right side, three on the left; longer than high. *Supralabials*—Eight; the third and fourth touching the eye, sixth and seventh small, the eighth elongate. *Sublinguals*—Two pairs, subequal; the posterior quite separated by small scales. *Infralabials*—Four, the fourth largest; a cuneate scale wedged in between the third and fourth. *Costals*—Two heads lengths behind the head 33, midbody 37, two heads lengths before the anus 35, subimbricate, faintly tuberculate. *Ventrals*—213 ?, enlarged, entire, not quite twice the breadth of the last row.

*Colour.*—Uniformly bluish, deeper dorsally, paler costally, and ventrally.

It bears a pronounced superficial resemblance to *Enhydrina valakadyn*. (Boie).

THE COMMON BUTTERFLIES OF THE PLAINS OF INDIA.

Horace Knight, del. Heutschel-Colourtype.

# THE COMMON BUTTERFLIES OF THE PLAINS OF INDIA.

## Explanation of Plate L.

Figs. 72, 73 . . . Catopsilia crocale ♂.

„ 72 *a*, *b*, 73 *a*, *b*. „ „ ♀.

(72*b* is the var. catilla).

# THE COMMON BUTTERFLIES OF THE PLAINS OF INDIA.

## (INCLUDING THOSE MET WITH IN THE HILL STATIONS OF THE BOMBAY PRESIDENCY.)

BY

T. R. BELL, I.F.S.

(*Continued from page 344 of Volume XXII.*)

PART XV.

WITH PLATES K. & L.

### Genus CATOPSILIA.

Besides the three species mentioned below there is a fourth from China and Tenasserim extending to Australia, called *C. scylla* which can be distinguished by the forewing being white, the hindwing rich cadmium yellow.

The males have secondary sexual characters : on the forewing, on the underside of the dorsal margin near the base, a tuft or fringe of long hairs that is directed forwards. On the upperside of the hindwing : a small patch, mostly oval in shape, of specialized scales, called *androconia*, situated just above the subcostal vein.

**108. Catopsilia crocale** (Pl. L, figs. 72, 73, ♂ ♂ ; 72*a*, ♂ and 73*a*, ♂, ♀ ♀.) —Male, *upperside* : chalky white, sometimes with a more or less broad and clearly defined, basal, sulphur-yellow area on both fore and hindwings ; this sulphur-yellow colour is at times diffused over the whole surface of the wings, though generally it becomes paler towards the terminal margins. Fore wing : the whole, or sometimes only the apical half, of the costa narrowly black, this colour widened out irregularly at the apex , termen widely black at the apex, narrowing posteriorly. This border in some specimens almost reaches the tornus, in others terminates at vein 4 ; occasionally it is continued posteriorly by a series of black dots at the apices of the veins. Hind wing : generally uniform, unmarked ; some specimens bear minute, black dots at the apices of the veins. *Underside* : ground-colour very variable : white with a slight to strong ochraceous tinge, greenish white, or sulphur-yellow. Fore wing : typically without markings in some specimens with a patch of sulphur-yellow on either side of base of median nervure ; in the very yellow examples the tornal area is often widely greenish white ; in others (*C. catilla*, Cramer) it bears a spot, variable in size, on the discocellulars : this spot has a pearly centre and an outer reddish line. Again, many specimens have an irregular, angulated, narrow, reddish, discal line (the colour varies in intensity) that runs from the costa obliquely outwards to vein 7, and then obliquely inwards to vein 2, though this line is often absent in specimens that bear the discocellular spot ; apex and termen sometimes very narrowly reddish. Hind wing : typically uniform, without markings ; in var. *catilla* there is a single small spot at the end of the cell, similar to that on the fore wing, sometimes this spot is much larger with a narrow, outer, reddish ring, sometimes it is accompanied by a similar, reddish spot at base of interspace 5 ; when two spots are present they may be entirely separate, or their outer rings may coalesce ; again, some specimens have a highly irregular, discal, reddish line (often reduced to a series of minute spots) that extends from the costa to vein 1 ; finally, the majority of the specimens have a series of minute,

red, terminal dots at the apices of the veins. Female, *upperside*: ground-colour varies as in the male, but sometimes it is chalky white at the bases of the wings, with the terminal margins more or less broadly sulphur-yellow. Fore wing: always with a round, sometimes quadrate, black, discocellular spot variable in size; in some specimens the costa is black only towards the apex of the wing, in others broadly black throughout and opposite the apex of cell so widened out as to touch the discocellular spot. In lightly marked specimens in addition to the discocellular spot there is only an irregular, terminal, black band, dentate inwardly and widest at the apex of the wing; in others there is in addition a more or less diffuse, highly-curved, macular, postdiscal band that extends from the costa obliquely outwards down to vein 7, where it often touches the terminal, black band and thence is continued downwards and slightly inclined inwards to interspace 1, getting gradually fainter and paler posteriorly. Hind wing: a series of terminal, interspacial black spots that vary in size and, in the dark form, coalesce into a terminal black band. *Underside*: varies from white with a yellowish, sometimes ochraceous, tinge to deep chrome-yellow; markings as in the male but still more variable; in *catilla* the spot at the apex of the cell, in both fore and hind wings, is enlarged into a large, reddish blotch, that on the hind wing sometimes so much so as to occupy the apex of the cell, the basal two-thirds of interspaces 4, 5, 6 and the middle third of interspace 7; in some specimens it is continued posteriorly in a series of obscure lunules to interspace 1*a*. Antennæ red, obscurely dotted with black; palpi and head above, red; thorax clothed with long, yellow, sometimes greenish hairs; abdomen pale yellow; beneath: palpi and thorax pale to dark yellow; abdomen white. Expanse: 46-87 mm.

*Larva*.—Body cylindrical, of the same breadth from segment 5 to segment 12; anal end rather narrowed, roundly square at extremity. Head round from front view and thick through; the clypeus triangular; the surface of the whole head covered all over with fairly small, conical shiny-black tubercles, each tubercle carrying a short hair; colour green, slightly yellower than the body; clypeus also green, and tubercled; antennæ white, jaws tipped brown-red. The head is slightly broader than segment 2. Segments 3 and 4 slightly tumid along dorsoventral line. Surface of body rather deeply, transversely parallel-lined, 7 lines to each segment (there are always some one or two less in all these pierid larvæ on segments 2, 3, 4) as usual; the intervals between these lines have, each, a single row of conical tubercles, each surmounted by a tiny hair—these tubercles numerous and often touching each other or nearly so; there are no tubercles on the spiracular band or below it; ventrum clothed somewhat sparsely with fine, short, white hairs. Spiracles oval, slightly convex, white, situated in the white-band. Colour is a rather dark, bright-green with a dark, dorsal, pulsating line and a spiracular, broad, white line suffused with yellow on segments 2-5; belly shiny light green; the tubercles are green, frequently dark metallic blue, increasing in size towards the spiracular region where they often form a broad, supraspiracular band in some specimens; in the blue-tubercled individuals the head-tubercles are also blue. L: 41 mm.; B: 5 mm.

*Pupa*.—Is of the normal, smooth type with slight ventral wing-bulge and papilionid suspension. Head triangular seen from above, produced into a conical snout which is continued smoothly and evenly into the outlines of the head; this snout as long as segment 2 and slightly turned up; segment 2 rather long, the dorsal line ascending at an angle of 30° to longitudinal axis of pupa, convex transversely, the sides evenly continuous with sides of head; thorax with the dorsal anterior slope, slightly more

inclined to pupal axis and twice as long as the posterior slope, which latter is also more steeply inclined in the opposite sense : the dorsal line is carinated slightly ; lateral outline of thorax gradually widening to shoulders, then the pupa quite parallel-sided to end of wings except for a very slight constriction where the body-loop passes ; there is also a slight lateral constriction between segments 2 and 3; the dorsal line of abdomen is nearly straight from thorax to cremaster; the lateral lines converging gradually to same end; the ventral line from tip of head-snout gradually diverges in a straight line from longitudinal axis of pupa, then curves back in a parabolic curve, whose apex is opposite segment 5/6, to meet the ventral, abdominal, straight line in an obtuse angle at the hinder margin of segment 8. The cremaster is a truncated triangle as broad at base as it is long, much hollowed out ventrally, with low, dorsal, parallel, extensor-ridges. The transverse section of abdomen is circular throughout. The surface is finely transversely aciculate-striate. Spiracles of segment 2 narrow, lightish; others oval, yellow, of ordinary size, situated below the yellow abdominal line. Colour is green, occasionally glaucous green ; tip of snout, edge of cremaster, and supraspiracular line along abdomen, yellow; a thin, black line round the eye. L.: 28 mm.; B: 7 mm. at segment 7 ; L. of snout: 2 mm ; H. at apex of wing-bulge : 7·6 mm.; H. at apex of thorax: 7·55 mm.

*Habits.*—The egg is rather slight, of the ordinary type, white when first laid, turning yellow ; always laid singly on the upperside of a leaf or on a bud or shoot. The larva always lives on the upperside of the leaf, lying along and over the midrib, making a bed of silk ; it generally lies with its head towards the point of the leaf ; sits sometimes with the front legs bunched and held in the air ; eats often and much ; grows, therefore, accordingly. The pupa is formed after wandering for a short distance, the larva becoming quite translucent-looking just before fixing itself up. The tail-pad is copious and the fixture therefore strong ; the loop in which the pupa hangs is rather long ; a favourite position for a pupa is to fix the tail to a leaf-stalk and the body-loop to the underside of the leaf on the midrib. The larvæ are quite active creatures in their way but are not easily dislodged from their beds on the leaves ; they will, however, occasionally fall when disturbed, always however keeping at anchor in the shape of the usual silk thread to climb back by. They are very muscular and can jump well ; this they do by settling themselves with the belly flat against a support, raising part of the body slightly and then bringing it down suddenly ; one was observed once to clear a basin of water in which it was confined on a bunch of the foodplant placed in a bottle in the middle. The jump was quite a considerable one, quite 8 inches or more. This particular individual had tried to get down the bottle several times—it was about to pupate—but was prevented from getting away by the water. This fact argues a certain thinking power in this particular caterpillar ; most will walk straight into water and get drowned. The larvæ exude a green, rather strong-smelling liquid from the mouth as a method of defence against enemies when attacked violently and the possession of this odour may be the reason why

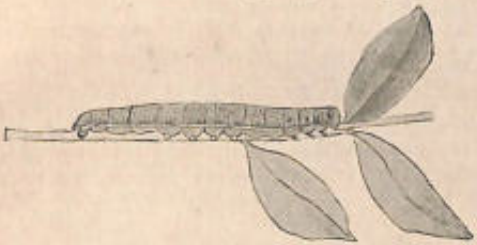
they are less liable to parasitic attack than many others of the family. The pupæ can move the abdomen from side to side from the junctions of segments 8 and 9, and 9 and 10; they do this slowly when disturbed and produce a dull, knocking noise thereby. It might alarm insect enemies. The imago is a powerful flier, much on the wing during sunny weather, active and fast, rising high into the air and capable of covering long distances in continued effort. It flies very straight in powerful, long, up and down curves, keeping its wings well over the back for quite a space sometimes on the downward grade; it is fond of flowers on which it generally rests, while feeding, with its wings closed; it chooses the undersides of leaves when reposing and likes wooded places. The habit of migrating has been alluded to in the general remarks upon the family; that of coming to wet places in nallas and on roads also exists; clouds of insects may be put up from such spots in years when they are plentiful. *C. crocale* is one of the commonest butterflies everywhere in India except in the absolutely desert tracts; in the heavy-rainfall parts, where the vegetation is exuberant, the individuals are exceedingly numerous in certain years, whether at sea-level or on the tops of the highest hills. The food plants are all belonging to the family *Leguminosæ*; larvæ have been bred on most species of *Cassia* with a leaf large enough to support their weight: *fistula*, *siamea*, *tora*; upon *Bauhinia racemosa* also and *Butea frondosa*; the favorite however is *Cassia siamea* for the form *crocale*, *C. fistula* for *catilla*. These two forms are so close together and grade so completely into each other in both sexes that it is impossible to separate them absolutely. The distribution is nearly throughout British India except in desert tracts; through Siam to China and the Malayan Subregion to Australia.

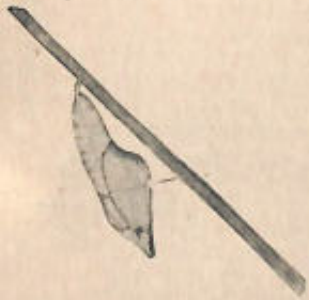
**109. Catopsilia pyranthe** (Pl. J, figs. 64 ♂, 64*a* ♀.)—Male, *upperside*: chalky white, tinted in some specimens with green. Fore wing: with or without a discocellular, black spot that varies in size; costa and termen sometimes without a black margin; occasionally the costa has its apical third narrowly black, broadened slightly at the apex with black spots between the anterior veins; or again, the costa may be narrowly black, the apex very broadly so and this colour continued down the termen, but narrowed posteriorly. Hind wing: sometimes immaculate but generally with narrow, terminal, black spots at the apices of the veins, these often reduced to mere dots or again so broadened as to coalesce into a terminal, black border. *Underside*: ground-colour similar, suffused over the anterior half of the fore and over the whole of the hind wing with a greenish tint that varies to an ochraceous yellow and, except in the very palest specimens, is evenly irrorated over the greenish or ochraceous-tinted areas with transverse, short, reddish-brown strigæ; both fore and hind wings with, generally, an obscure, discocellular, reddish-brown spot or indication thereof. Female, *upperside*: as in the male but sometimes with a suffusion of pale greenish-yellow on the terminal third or fourth only of both fore and hind wings, rarely of that tint throughout. Fore wing: always with a discocellular, black spot that varies very much in size; costa somewhat narrowly black with the basel half pinkish, in other specimens narrowly

black throughout, the black broadened at the apex and continued along the anterior half of the termen in a series of inwardly-pointed, black spots; or again, the costa may be more broadly black, that colour widened considerably at the apex and continued broadly down the termen to vein 3, then suddenly narrowed to a slender line at the tornus; in most specimens there is an anterior, postdiscal, short, black, macular band; in the dark forms this coalesces with the black on the apex and termen. Hind wing: sometimes immaculate, sometimes with a series of terminal spots at the apices of the veins; sometimes with a narrow, dusky-black, terminal band broadest near the apex, narrowed posteriorly to a slender line at the tornus. In very dark specimens there is, in addition, an ill-defined, short, anterior, postdiscal, macular, black band. *Underside:* as in the male, with similar variations; but in addition, in most specimens, the discocellular spots are well-defined with an outer red ring that encircles a silvery spot; on the hind wing one or two similar spots on each side of the discocellulars; generally also both wings are crossed by a transverse, postdiscal line of minute, red spots which, on the fore wing is confined to the anterior portion but, on the hind wing, is nearly complete. In both sexes: antennæ reddish, head and thorax anteriorly brown, thorax clothed posteriorly with long, white hairs, abdomen white; beneath: palpi, thorax and abdomen white. Expanse: 52-66mm.

*Egg.*—Spindle-shaped, narrowly truncated at top; 12 longitudinal ridges which, however, do not show at top as teeth although they all reach the edge; interspaces finely and paralleledly striated. Colour white when laid, yellow later. H: 1·5mm.; B: 0·5mm.

*Larva* (v. marginal figure).—Body cylindrical, of the same breadth from segment 5 to segment 12; anal end square at extremity, overreaching anal claspers. Head round from the front view, hardly broader than segment 2 at its front margin, with a slightly depressed dorsal line down face to the apex of the triangular clypeus; surface covered with minute, conical, black tubercles, each bearing a short hair; colour green, surface of body with the usual parallel, impressed, transverse lines, 7 to each segment, the interval between each two set with a single row of small, black, conical tubercles, each surmounted by a short, black hair; these tubercles increase in size as they approach the spiracular white band generally and form a black, supraspiracular band above it; the sides of ventrum covered with smaller conical, black tubercles. The larva is very similar to that of *crocale* except that there are tubercles on the ventrum. Colour of body darkish grass-green; head of a lighter green and belly of a green which is between the two. L: 37. 5mm.; B: 4mm.





*Pupa* (v. marginal figure).—Is the counterpart of that of *crocale*. Head produced into a short, perfectly straight beak or snout, short and pyramidal in shape. Surface of body finely transversely aciculate-striate. Spiracles linearoval of ordinary size, brown-yellow in colour. Colour darkish green, lighter on ventrum; a yellow, dorsal line on thorax; a

similarly yellow, supraspiracular line from end to end. L: 22·5 mm.; B: nearly 6mm. at segment 7.

*Habits.*—The habits are the same as for *crocale* except that the butterfly is not quite such a powerful flier and keeps nearer to the ground as a rule. The commonest foodplant of its larva is *Cassia tora* perhaps, a semi-herbaceous species; it feeds also upon other leguminous plants. In the Deccan the chief species is *Cassia auriculata*. Its habitat is throughout India; Assam; Burma; Tenasserim; extending to China, and as far as Australia. It does not ascend the Himalayas above 7,000 feet.

**110. Catopsilia florella.**—The male closely resembles some male specimens of *C. pyranthe* that have the black markings on the fore wing reduced and narrow. The female, however, shows a greater difference.

The late Mr. de Nicéville considered the two forms identical but whether this is so or not can only be tested by careful breeding experiments. After examining a long series of specimens from Africa, India and the Malayan Subregion, none of which can be referred to *C. crocale* or *C. scylla*, the only two other forms that occur within British India, Colonel Bingham says, he found that he was able to separate them into two groups; the specimens in one group agreed absolutely with *C. florella* in the Banksian collection in the British Museum; the others differed. The two, he says, if there are two distinct forms, cannot be considered geographical races as in many localities their range is conterminous; nor are they seasonal varieties one of the other as they have repeatedly been taken together on the same day at the same spot. He says it is of course possible that *C. florella* is a dimorph of *C. pyranthe*, but clear evidence of this is lacking. He gives the chief points of difference between the two forms in parallel columns as :—

| *C. florella.* | *C. pyranthe.* |
|---|---|
| Male and female, *underside*: the ground-colour white, in female often tinged outwardly with pale primrose-yellow. | Male and female, *upperside*: ground-colour white, tinged with greenish, sometimes in female tinged outwardly with greenish-yellow. |
| Male, *upperside*: markings on fore wing brownish red, rarely dusky black; on termen always more or less macular, the spots sometimes connected slenderly along extreme margin, the markings not narrowed posteriorly. Hind wing generally with a very slender, terminal, yellowish-pink line. | Male, *upperside*: markings on fore wing always black; on termen not macular but formed into a continuous, black band always sensibly narrowed posteriorly. Hind wing with no terminal line, or if present black, sometimes macular, generally ill-defined and diffuse. |
| Female, *upperside*: markings as in male, the terminal, macular band on fore wing not broader. | Female, *upperside*: markings always much broader than in the male; terminal black band sometimes very broad down to vein 3, then suddenly contracted and narrowed to tornal angle. |

The differences, Colonel Bingham says, as enumerated, are slight, but they are constant, and give to the two insects a facies markedly different one from the other. Expanse: 52-74 mm.

*Larva.*—"Ground-colour pea-green, a black, interrupted, but very distinct lateral stripe and, below it, a broader stripe of an orange-yellow colour; the larva is rough but not hairy, the whole of the back and head covered with minute, black spots. L. when full grown about 37·5 mm." (*Nurse.*)

*Pupa*.—"Pattern and colouring very like that of the larva; but the green apparently more uniform and (except on the wing-cases), inclining to glaucous; yellow lateral stripe paler; acute cephalic projection tipped with reddish brown; attached to various bushes, grasses, &c." (*Trimen.*)

*Habits*.—The above is all copied from Colonel Bingham. The probabilities are against this form being a good species. It is said to occur in the N.-W. Himalayas, it certainly occurs in Sind; it is chronicled from Dharmsala; the Punjab; Sikhim; Bengal; Nilgiris; Western India; Mysore; Assam; Burma; Ceylon; it occurs to the West through a great part of Africa to Sierra Leone in the West, to Nyassaland in the East and in Aden; Socotra; Persia and Afghanistan; also further East, in China and Siam.

Genus Terias.

**111. Terias venata** (Pl. K, figs. 70, 70*a*, *b*, *c*.).—*Wet-season brood*.—Male, *upperside*: gamboge-yellow. Fore wing: aspical third black, this colour extending along the costa in a gradually narrowing line to the base; the inner margin of the black area irregular, oblique and sinuate from the middle of costa to vein 4, thence continued outwards along that vein for a short distance and vertically downwards to vein 2, thence obliquely outwards to tornal angle; the portion of the area between veins 2 and 4 of even width, slightly produced angularly inwards at veins 2 and 3; basal two-thirds of the wing irrorated with black scales, most dense at extreme base; a single, linear, black speck on the discocellulars. Hind wing: terminal margin with an even, black band and a dusting of black scales from base to tornal angle, parallel with, but not extended to, the dorsum, nor spreading to the disc; a small patch of salmon-coloured scales at base of interspace 7 (generally hidden by the dorsal margin of fore wing). Cilia of both fore and hind wings pale yellow. *Underside*: ground-colour similar but somewhat duller, both fore and hind wings evenly but sparingly dusted with black scales which do not extend to the cell, disc or dorsal margin of the forewing; the last paler yellow with a patch of salmon-coloured scales below the median vein in interspace 2 (likewise hidden ordinarily from view); a linear speck on the discocellulars of the fore wing and a minute dot in interspace 7 of the hind wing black; the disc of the hind wing transversely crossed by two parallel, very obscure, short, blackish, lunular bands; all the veins of both fore and hind wings with minute, black dots at their apices. Antennæ, head, thorax and abdomen dusky black; the antennæ with a line of white dots beneath, the palpi, thorax and abdomen there whitish. Female, similar, except of course, the sex-marks are absent. *Upperside*: the dusting of black scales more dense; the black area on the fore wing and the terminal, black band on the hind wing broader; the former, however, narrowed generally abruptly below the middle of interspace 1 and continued thence to the tornal angle as a mere black line; the latter very broad anteriorly and attenuated rapidly towards the tornus. *Underside*: as in the male. Antennæ, head, thorax and abdomen similar to those in the male.

*Dry-season brood*.—Ground-colour in both sexes clearer, brighter and more free of the irreration of black scales. *Upperside*: the terminal, black band on hind wing narrower, of even width in the male, obsolescent posteriorly in the female. *Underside*: similar but paler than in wet-season specimens. Expanse: 36-42 mm.

*Habits*.—There is no record of the breeding of this insect. It is not by any means rare where it occurs in the Bombay Presidency:

this is generally in the drier parts and not in the hilly regions of heavy rainfall. It is common round Belgaum, in Dharwar, Bijapur, Sholapur and Poona in grass lands. It always keeps close to the ground and hardly ever flies far without settling which it does on the underside of leaves or on a bit of dead grass, a twig, &c., always with the wings closed over the back. It is a weak flier like others of the genus—none of them are strong—and flutters rather than flies; like the rest also it is fond of flowers which the male seeks amongst the grass: generally on the very surface of the ground.

**112. Terias læta** (Pl. K, figs. 69 ♂, 69*a* ♀).—Male and female, fore wing: much more pointed at apex than in *T. venata*; termen sharply cut and straight. Seasonal dimorphism in this form shows more definitely in the markings of the under than in those of the upperside. The form differs from *T. venata* as follows:—

Male and female, *upperside*: a richer, brighter yellow. Fore wing: basal half of costal margin broadly irrorated with black scales; apical, black area as in *T. venata*, but stopping abruptly at vein 2; the tornus, except for a very fine, black, anteciliary line, yellow. Hind wing: almost uniform, the terminal black band, generally conspicuous in *venata*, reduced to a black, subapical patch, and, posteriorly, to a series of black spots in the wet-season specimens that are entirely absent in specimens taken in the dry season.

*Underside. Wet-season brood.*—Fore wing: dorsal margin broadly pale, whitish yellow above; the base, discocellular cell-area and disc of the wing rich yellow; costa narrowly edged pink; costal margin and apex broadly rusty brownish; a single black speck at the apex of cell. Hind wing: buff-yellow overlaid with a more or less dense irroration of rusty brownish-red scales; a minute dot at base of interspace 7 with a minute ring beyond; a series of four dark spots transversely cross the wing at middle of cell followed by a transverse, dark bar from apex of wing to vein 1. This bar is interrupted in interspace 2 and is succeeded by a much shorter, similar bar in interspaces 2 and 3. Cilia of fore and hind wings pink. *Intermediate form* as in the wet-season form but the rusty brownish-red tint replaced by a pale fleshy buff, often with a mealy appearance.

*Dry-season brood.*—Ground-colour of both fore and hind wings pale yellow. Fore wing: apex very broadly and the basal half of the costal margin above the costal nervure irrorated with fleshy-pink and brownish scales. Hind wing: its whole surface densely shaded with similarly coloured scales; longitudinally the wing is crossed by two, somewhat diffuse, straight, ferruginous-brown bars, the upper one the longer; above these bars are a few brown, somewhat obscure specks and dots on the upper basal half of the wing. Antennæ mealy yellow, with scattered dusky scales; head with pinkish pubescence; thorax and abdomen black, with scattered yellow hairs and scales; beneath: palpi, thorax and abdomen pale yellowish white. Expanse: 36-48mm.

*Habits.*—This species had not been bred either, it seems. It is very common throughout the Bombay Presidency in every place without exception; in the cold weather and later on it gets up under one's feet in scrub-jungle and grassy lands as well as along the borders of paths and roads in the forest regions wherever there is grass and fairly clear ground. It never flies high nor long and settles again nearly immediately when disturbed, though, in the mornings and

## THE COMMON BUTTERFLIES OF THE PLAINS OF INDIA.

### Explanation of Plate K.

Fig. 69 . . . . . Terias læta ♂.

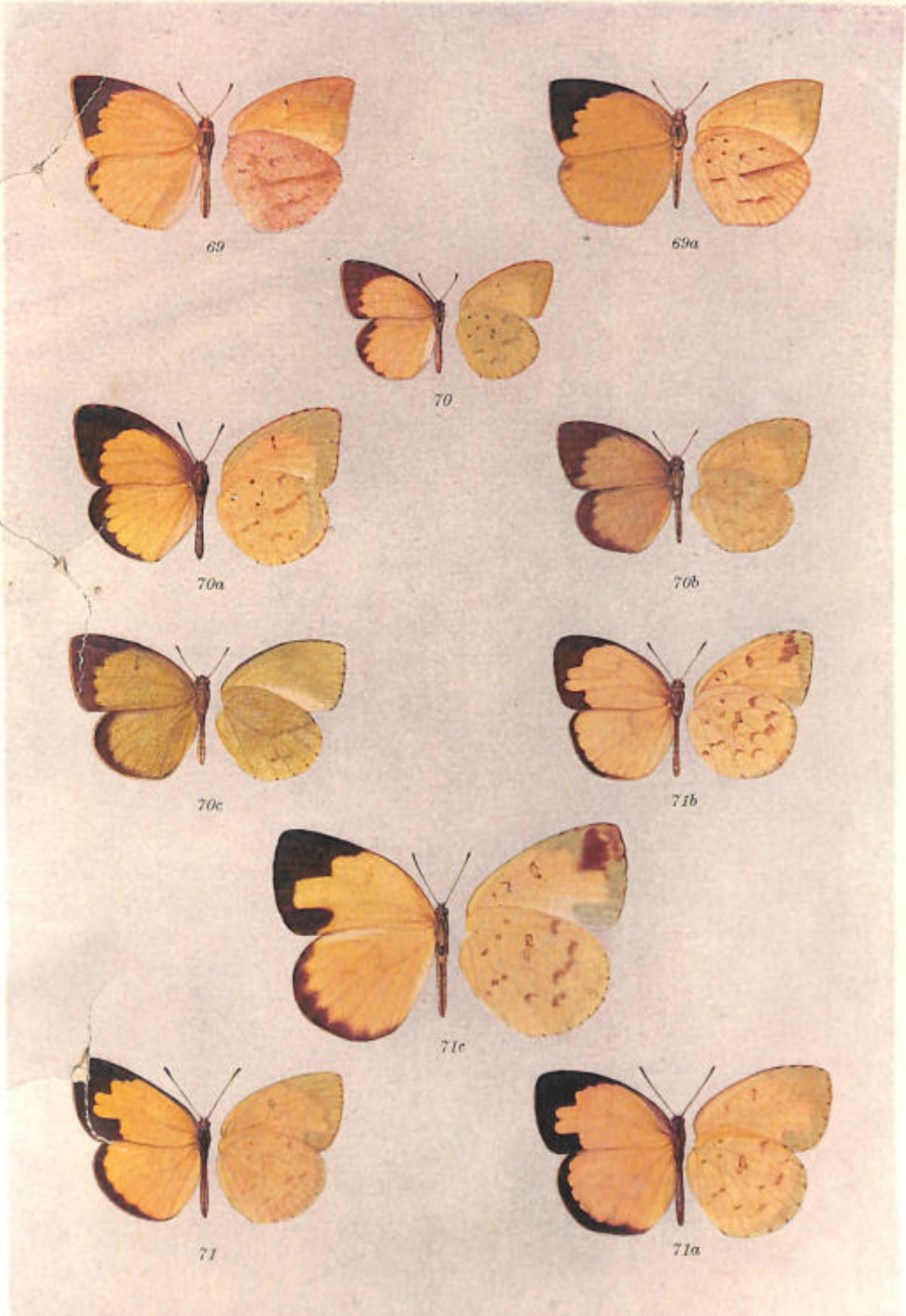
Figs. 69 *a*, *b* & *c*. . . „ „ ♀.

„ 70, 70*a*. . . . Terias ventata ♂.

„ 70 *b* & *c* . . . „ „ ♀.

„ 71, 71 *a*, *b* . . Terias hecabe ♂.

Fig. 71*c* . . . . . „ „ ♀.




THE COMMON BUTTERFLIES OF THE PLAINS OF INDIA.

Horace Knight, del. Heutschel-Colourtype.

afternoons, it may be found feeding at flowers growing close to the ground when it takes frequent flights in course of its quest; it is rather weak on the wing, but flies well when at it; that is, it does not flutter; it keeps to rather thick places, grass or weeds being favourites, and is fond of sitting on dead grass-stems and blades closing its wings over its back immediately it settles, the pinkish yellowish colour of the undersides of which blend very well with the withered surroundings; it is not easy to see if not disturbed. It has been noticed in Kanara, a district where the monsoons are very heavy, that *læta* only appears when these cease, about the month of October; the little insect is quite common from November to June wherever there is grass and the shade overhead is not too dense, but after the first rains commence hardly one is to be seen. Unfortunately nobody has gone into the question at all and so the reason for this is still a mystery; but the fact is curious and the explanation might possibly be that *venata* and *læta* are one and the same species, the latter the cold-weather (dry-season) form with distinctly marked underside and accentuated points to the fore wings; it is known that the cold weather produces these particular results in members of other families as, in the *Satyrinæ*, shown in *Melanitis*; in the *Nymphalinæ*, in *Junonia* (*almana—asterie*) and *Kallima*; and others. *Venata* has not been particularly noticed as occurring in Kanara in any numbers, while, as remarked, *læta* is abundant; but this does not go for much as the different species of *Terias* are everywhere abundant, nobody bothers very much about them and *libythea* is, cursorily, sufficiently like *venata* for the latter to be passed over when not specially sought out. The matter is under investigation and it is hoped will be settled in the near future. The result will be published. *Læta* is found in the Himalayas from the borders of Afghanistan to Bhutan; in the Punjab; Western India: Ahmednagar, Karachi, Poona, Bombay, Khandesh; Southern India: the Nilgiris and Anamalai Hills; in Assam, Burma and Tenasserim.

There is one thing that rather goes against the probability of *læta* and *venata* being different forms of the same insect and that is the absence (according to the books) of the former from Ceylon and Ganjam on the East Coast of India; the latter, too, is not recorded from Tenasserim, where the former occurs. Of course it is possible that *læta* may occur in Ceylon but it seems very improbable as the island has been well worked by lepidopterists.

**113. Terias libythea.**—The form does not seem subject to seasonal dimorphism or polymorphism in so great a degree as some of the others belonging to the genus *Terias*.

Male, *upperside*: gamboge-yellow. Fore wing: the apical third black; the inner margin of the black area, more or less regularly concave, extends from the apex of the basal third of the costa and curves round to a point on the dorsum just before the tornal angle base of wing irrorated with black

scales. Hind wing: a black, terminal band that is broader anteriorly; basal area dusted with black scales. In specimens of the wet-season broods the black-marked areas on both fore and hind wings are broader than in dry-season specimens. Sometimes, in the latter, the terminal band is broken into a series of linear spots posteriorly. *Underside*: ground-colour similar. Fore wing: costa narrowly edged with pink; two well-marked, discocellular, and some obscure, preapical, black specks. Hind wing: a small spot at base followed by three transversely-placed spots and an elongated, delicate loop-like discocellular spot black; above and below the discocellular spot are small black-scaled, diffuse spots and beyond the cell, on the disc, are short, transverse, diffuse, bands of black scales placed *en echelon*. The apices of the veins in both fore and hind wings with black spots; cilia salmon-pink. Antennæ, head, thorax and abdomen dusky black; the thorax with some yellow hairs; beneath: the palpi, thorax and abdomen whitish-yellow; legs pink. Female, similar, but the terminal band on the upperside proportionately broader in both wet and dry-season broods. Expanse: 32-44mm.

*Larva*.—The body is subcylindrical, narrowing more to anal end than to head; thickest possibly about segments 4, 5; anal end sloping somewhat and finishing off square, slightly tumid at extremity. The head rather small, round, very slightly bilobed, the vertices of lobes broadly rounded, slightly narrower than middle of segment 2; surface covered somewhat densely with semiappressed, stiff, longish, black hairs; colour green like the body. Surface of body lined transversely with fine, parallel lines, about 7 to each segment; the intervals between each two with a single row of erect, black, short bristles from spiracular line to spiracular line, each bristle arising from a cylindrical, white tubercle; the belly is also similarly haired though not so densely. Spiracles oval, white, of ordinary size, placed on the white band. Colour is grass green with a darker green, dorsal line and a white, spiracular band, tinged with yellow, from segment 2 to segment 12. L: 19 mm.; B: 2·6mm.; B. of head: 1·8mm.

*Pupa*.—The pupa is of the type of that of *Catopsilia*: the wing-bulge not very prominent. The head is slightly narrower than segment 2 at middle, but, at their common margin, they are of equal width; it is produced out in front from between the eyes into a short, conical beak, the top side of which is in the same pl ne as the top of the head which is again parallel to the longitudinal axis of the pupa, the ventral line gradually diverges from that axis and is continued by the ventral line of the pupa formed by the juncture of the costal margins of wings as far as opposite segment 7 where it curves round and back, in a short, straight line to abdomen at the hinder margin of segment 8; eyes hardly prominent; segment 2 broadening backwards; thorax only slightly humped, short; abdomen circular in transverse section, straight along dorsal line; the pupal lateral outlines are parallel from shoulders to end of dorsal margin of wings; cremaster is square at end, flat dorsally and slightly thickened at the extreme posterior corners. Surface quite smooth and shiny. Spiracles are oval, white, of ordinary size and situated in the white, spiracular band. Colour green with a white, spiracular band on abdomen, a subdorsal and lateral brownish spot on each segment, a large spot in front of spiracle of segment 7, a group of 7 lateral spots in front of spiracle of segment 2; snout pink and wrinkled. L: 16mm.; B: 2·7mm. at shoulders; H: 4mm. at wing-bulge; nearly 3mm. at thorax.

*Habits*.—The eggs are laid singly, generally on the uppersides of the leaves, often on the young folded leaf-buds. The larvæ lie on the uppersides of the leaves and the leaflets are often

closed nearly over them; at least it so happens with the sensitive *Cassia* upon which, only, the species has been bred. The pupa is formed in the same way as those of the other *Terias* species; there is nothing distinctive about its ways. The plant upon which the larva feeds or was found feeding grows generally in damp, even swampy lands and the butterfly is most commonly found about such places; it is very plentiful in the dry weather in the hot rocky beds of rivers in Kanara where the willow-like *Homoia* grows; underneath the shade of this the foodplant is sometimes found growing. The insect keeps much to the bushes, close to the ground though, on the whole, it is found more on the wing than *læta*; it is found in parties like this latter sitting low down amongst undergrowth in localities that suit its taste; and many of them get up at a time when disturbed. The flight is rather weak; not often sustained and of the usual type. The insects are fond of flowers but only go to such as are low down near the ground or actually lying on it: vetches, &c. The foodplant is *Cassia kleinii*, a rather small, semiscandent annual found in damp places; it has yellow flowers with some red markings on them, the leaves are composed of many small leaflets which the larva eats, leaving the midribs intact; the plant is somewhat sensitive and the leaves always close at night. The butterfly is distributed over the Himalayas from Kangra and Simla to Bhutan; Punjab; Bengal; Ganjam; Western India: Poona; Belgaum, Kanara; Southern India the Nilgiris and Anamalai Hills; Ceylon; Assam; Burma; the Nicobars.

**114. Terias hecabe** (Pl. K, figs. 71, 71*a*, *b*, *c*.). *Wet-season brood.*—Male *upperside*: yellow, variable in tint from sulphur to rich lemon-yellow according to locality with a light or heavy rainfall. Fore wing: apex and termen deep black, this colour continued narrowly along the costal margin to base of wing, near which it often becomes diffuse; the inner margin of the black area from the costa to vein 4 very oblique and irregular, excavate on the inner side between veins 2 and 4, this excavation outwardly rounded between the veins and inwardly slightly toothed on vein 3; below vein 2 the black area is suddenly dilated into a square which occupies the whole of the tornal angle; the inner margin of this dilatation is variable, in the typical form it is slightly concave. Hind wing: terminal margin with a narrow, black band attenuated anteriorly and posteriorly; dorsal margin broadly paler than the ground-colour. *Underside*: yellow, generally a slightly paler shade than that of the upperside, with the following reddish-brown markings:—Fore wing: two small spots or specks in basal half of cell and a reniform spot or ring on the discocellulars. Hind wing: a slightly curved, subbasal series of three small spots, an irregular, slender ring or spot on the discocellulars followed by a highly irregular, curved, transverse, discal series of spots or specks, some or all of which are sometimes obsolescent. On both fore and hind wings the veins that attain the costal and terminal margins end in minute, reddish-brown specks. Antennæ greyish yellow, the club black; head, thorax and abdomen yellow, shaded with fuscous scales; beneath: the palpi, thorax and abdomen yellowish white. The sex-mark seen from above appears as a thickening of

the basal half of the median vein of fore wing. Female very similar, the sex mark of course absent; the black areas on both fore and hind wing slightly broader with the inner edge of the black, terminal band on the hind wing often diffuse. *Underside*: ground-colour and markings as in the male Antennæ, head, thorax and abdomen also similar.

*Dry-season brood.*—Male and female, *upperside*: ground-colour and markings much as in wet-season specimens, the emargination on the inner side of the black area and the tornal dilatation on the fore wing similar; on the hind wing, in the great majority of individuals, the black, terminal band is also similar, in a few it is narrower and diffuse inwardly in both sexes. *Underside*: ground-colour similar to wet-season, but, in many specimens with an irroration of black scales over the yellow parts of the wing; the reddish-brown marking on both wings also similar, but the spots are larger, darker, more clearly defined and, therefore, more conspicuous. In addition, on the fore wing, there is a preapical, very prominent, transverse, elongate spot or short bar of reddish-brown extended downwards from the costa. This spot is irregular in shape and of variable width but does not seem ever to spread outwards to the actual edge of the termen. In a few specimens there is also a small, reddish-brown spot in interspace 1, near the tornus. Expanse: 40-55mm.

Colonel Bingham says:—Like all wide-ranging forms, *T. hecabe* varies enormously and consequently has received a lot of names. The descriptions above of the imago from specimens picked to match the figure given in Edwards's "Gleanings of Natural History," which, according to Professor Aurivillius ("Recensio Critica Lepidopterorum Musei Ludovicæ Ulricæ," 1882, p. 60), represents the typical form of "*Papilio hecabe*," Linné.

Taking the varieties seriatim we have *T. suava*, Boisduval, *T. hecaboides*, Mènètriès, *T. nicobarensis*, Felder, and *T. kana*, Moore, all of which differ so slightly from typical *hecabe* as to require no separate description. The difference is chiefly one of the width or heaviness of the black markings on the upperside. *T. simulata*, Moore, and *T. contubernalis*, Moore, are the dry-season forms of these.

He says further that *merguiana*, Moore, *excavata*, Moore, *fraterna*, Moore, are the same, *i.e.*, varieties also very slightly different from the type; *purreea*, Moore, *patruelis*, Moore, *fimbriata*, Wallace, *narcissus*, Butler, *irregularis*, Moore, *asphodelus*, Butler, *simplex*, Butler, and *apicalis*, Moore, only differ in the width of the black terminal border of the fore-wing and the shape of its inner edge.

In Kanara a pure white specimen of *hecabe* was once bred with the usual black bordering and other marks; several individuals had the yellow on the uppersides of the wings more or less obscured by dark brownish suffusion.

*Egg.*—Spindle-spaped, bluntly pointed at top, flattened at the base on which it rests; the surface with many longitudinal ribes which are, however, so fine even under the lens that they appear more like striæ; there are also many extremely fine, transverse striæ. Colour white when laid, quickly becoming yellow, somewhat shiny. L: 1·25mm.; B: nearly 0·5mm.

*Larva.*—Body cylindrical or nearly so, narrowing very slightly in segment 2 and again from segment 10 to anal end; the anal flap is sloping longly semicircular, somewhat tumid. The head is more or less round, the clypeus rather large, triangular, slightly depressed and somewhat shiny; the surface is minutely rough and dull, set not very closely with short, thickened, tubercular spines which are truncated at ends, those on the vertex having dark extremities, these hairs or spines brown in colour, a few whitish, some with globular drops of transparent liquid on their ends; colour light green reticulated with darker green, antennæ green, labrum green, jaws with dark brown tips. Surface of body lined as usual transversely

and parallelledly with some 7 impressed lines on each segment (less on segments 2, 3, 4), the intervals between each two lines having a row of little conical, white tubercles, each one bearing a cylindrical, short hair on top of it, some of these hairs carrying a globular drop of clear liquid at the extremity; there are about 12-20 of these tubercles in a row from spiracular line to spiracular line; the surface is, besides, finely shagreened-looking under the lens; some finer hairs on segment 2, longer, as also on ventrum, brown; the extremity of anal flap with some small, brown tubercles dorsally. The body tubercles may sometimes be green instead of white. Spiracles are small, oval, very slightly convex, situated in the white spiracular band and white like it. Colour of larva dark green, mostly glaucous on sides with a spiracular, white narrow band the whole length from head to end of anal flap. L: 22mm.; B: 3mm.

*Pupa*.—The pupa is like that of *T. libythea*. The head-point is conical and not long, rather sharply pointed; its axis is in continuation with the longitudinal axis of pupa; segment 2 is slightly shortest in dorsal line, the front and hinder margin approaching each other at that place: looked at from above it is semielliptical in shape more or less, narrower very slightly at hinder margin than segment 3 (thorax); the thorax is only very slightly convex in dorsal line and is rounded behind; the shoulders are hardly prominent, the pupa is parallel-sided thence to the hinder margin of segment 7, then narrows gradually to segment 12, thence more suddenly to base of cremaster; this cremaster is rather longer than broad, strong, trapeze-shaped with its sides in even continuation with the body outlines, the nearly square extremity set with short suspensory hooklets as well as the adjacent ventral surface; the wing-bulge is a parabolic curve, the longer side, from snout to just opposite segment 7 (this line gradually diverging from longitudinal axis of pupa) being twice the shorter; this short side drops from the apex of the curve suddenly to the hinder margin of segment 8. Surface of pupa is slightly shiny and nearly smooth—very finely irregular—aciculate under lens. Spiracles of segment 2 hardly noticeable; the rest small, oval and white (especially white in the dark specimens). Colour of pupa is generally green with a rather dark violet-grey, dorsal line; the dorsal margin of wing also violet-grey continued along abdomen above spiracles; a faint, white, spiracular line; the line of suture of wings near abdominal end dark. Some pupæ are much marked with smoky-grey all over, especially on the surfaces of wings. The snout annularly rugose, yellow, as well as the lateral edges of cremaster in green pupæ; in dark pupæ both these latter are dark. L: 17mm.; B: 3·5mm.; H. at wing-bulge: 5 mm.

*Habits*.—The eggs are laid singly on young shoots and leaves; the larva lives at first on a shoot or anywhere about a leaf, even sometimes on the underside; later on takes to the midrib on the upperside of a leaf in the normal manner, spinning a bed of silk to lie upon. The pupa is suspended in the ordinary way: as for *libythea* the body-string being long enough for perfectly free motion; it is generally formed upon the foodplant, often high up and always on the underside of a midrib or twig. This is the commonest of all the species of Indian *Terias*; it is found everywhere and is equally plentiful at all seasons of the year. It is a stronger flier than any of the others, keeps on the wing continuously for quite a long time and has the normal style of flight; goes freely to flowers; often rises quite high up in to the air; frequents

damp places in nalla beds and on roads in the hot months of the year in large numbers and is equally abundant in the shady extensive forests of the hills and in the open hot plains. The larva feeds upon *Leguminosæ* : *Cassia*, *Wagatea*, *Acacia*, *Sesbania*, *Cæsalpinia*, *Albizzia*, &c. From the variety of the foodplants existing there is little wonder that the range is extensive and that the butterflies vary as they do in colour, markings and size. The distribution is ; throughout British India, eastwards to Siam and China ; south far into the Malayan Subregion ; to the west into parts of the Ethiopian Region.

**115. Terias sylhetana.**—The type specimen was of the *dry-season brood* and can be described briefly as follows :—Male, *upperside* : rich citron-yellow. Fore wing : markings very similar to those in *T. hecabe*, variety *patruelis*, Moore. Hind wing : ground-colour uniform ; a very narrow, black, terminal line. In the type this is continuous, in other specimens broken and interrupted, and in some large specimens intermediate between the dry and wet-season forms, variable in width but distinctly broader than in the type. *Underside* : the ground-colour very slightly paler ; markings much as in the dry-season form of *hecabe*, but in the fore wing there is *always* an additional minute, reddish-brown dot in the extreme base of the cell and in all typical specimens the apical reddish-brown patch is much larger and spreads diffusely outwards to the termen.

*Wet-season brood*.—Male and female, *upperside* : citron-yellow. Fore wing : markings very similar to those of *T. hecabe*, variety *merguiana*, Moore, but the black area broader, especially the dilated, posterior, tornal portion which, though squarer, has its inner edge slightly sloped outwards as in *merguiana*. The width of the black area is, however, very variable as are also the size and shape of the dilated, posterior portion that occupies the tornal angle. Hind wing : a black band along the terminal margin, this band variable in width and generally attenuated anteriorly and posteriorly. *Underside* : ground-colour similar to those in wet-season specimens of *hecabe*, but *always* with an additional reddish-brown spot or dot at the extreme base of cell of fore wing. Antennæ, head, thorax and abdomen and, in the male, the sex-mark, as in *hecabe*. Expanse : 41-53mm.

*Terias sylhetana* is a variable insect, nearly as variable as *hecabe* ; dry-season specimens can be distinguished from the corresponding forms of *hecabe* by the much larger, outwardly diffuse, reddish-brown, apical patch on the underside of the fore wing ; but the only constant difference distinguishing the wet-season forms (also the dry-season ones) is the presence of the extra spot in the cell of *sylhetana* on the underside of the fore wing.

*Larva*.—Very similar to that of *T. hecabe*, but is always found in companies of many individuals. Head round from front view, flattened somewhat on face, with a slight, depressed, thin line down centre ; surface covered with minute, black tubercles bearing each a rather long, white seta ; colour black ; clypeus very light yellow with similarly coloured jaws. Segment 2 somewhat broader than head ; anal end longly semicircular, somewhat square at extremity, dorsally slightly sloped. Surface of body transversely lined as in *hecabe*, each interspace between the lines with a row of small, black, longly conical tubercles which are more pronounced laterally as a rule ; many of the dorsal tubercles often have a transparent, longly pear-shaped, blue top to them (the dried liquid-globule ?) ; the main tubercles of each segment with a longer, black seta often surmounted by a globular, blue drop of liquid ; abdomen with small, setiferous, black tubercles. Spiracles large, roundly oval, light yellowish brown in colour.

Colour of body when full grown is a bluish, dark green dorsally, with a whitish yellow-green, often somewhat indistinct, spiracular line ; belly yellow-green ; when not quite fully grown the colour is greenish yellow all over. L : 26mm. ; B : up to 3mm. nearly ; the length may also be slightly greater.

*Pupa.*—In shape indistinguishable from that of *hecabe* except by the colour which is here dark yellowish green-brown with the top of beak yellow; the beak is sharply pointed and often slightly turned up at end. Some of the pupæ are much greener than others. They are nearly invariably found strung up in companies one behind the other along the under-side of a twig or midrib of a leaf ; they are of the same size as those of *hecabe*.

*Habits.*—The eggs are laid on the top of a leaf or on a young shoot to the number of 20 or 30, in clusters. The larvæ are gregarious right through their existence ; they are much subject to attack by hymenopterous parasites. When about to pupate they do not wander far and, as indicated already above, they hang themselves up in rows, one behind the other, along the undersides of twigs and leafribs, in which position the pupæ are generally found ; the suspension being the same as for *hecabe*. The butterflies are perhaps the most active of all the *Terias* genus and may often be seen flying high up in the air round trees—perhaps because their commonest foodplant is one of the largest creepers in India which often grows over the highest trees. This plant is *Wagatea spicata*, a climber with a stem covered with sharp-pointed, thick-based, strong thorns, shiny, small, hard-looking leaflets and long spikes of orange and red flowers which form striking objects in the jungle-landscape of the Bombay Western Ghats. It is belonging to the *Leguminosæ*. The larvæ have also been found on some species of *Cassia* and upon *Poinciana regia*, the Gold-Mohur Tree. The butterfly exists in Sikhim, Central and Southern India ; Assam ; Burma ; Tenasserim ; the Andamans ; extending into the Malayan Subregion.

The genus *Terias* is Ethiopian and Indo-Malayan ; there are 9 species recognized as occurring in British India : those described above, *T. moorei* from the Nicobars ; *T. andersoni* from the South Andamans and Tenasserim and *T. sari* from South India in the Nilgiri Hills, Ceylon, Burma, Tenasserim, extending far into the Malayan Subregion, both distinguished from all others by the male having, like *hecabe*, a sex-mark only on the fore wing but, unlike any other species, by both sexes having only a single reddish-brown mark in the cell of fore wing on the underside ; and *T. harina* from Sikhim, Assam, Burma, Tenasserim, Andamans, extending into the Malayan Subregion, a species without any male secondary sexual characters, with the underside quite unmarked and the upperside of hind wing without any terminal black edging : it is a very clear, pure, pale primrose-yellow in colour.

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*(To be continued.)*

# THE BIRDS OF GORAKHPUR.

BY

A. E. Osmaston, I.F.S.

During two-and-a-half years in the Gorakhpur District I spent most of my spare time studying birds and for three-and-a-half years Mr. Hope Simpson, I.C.S., has collected specimens from all over the district. The list of birds we have now obtained seems to be very fairly representative of the district, and though no list drawn up in such a short time could possibly hope to be complete, yet it is thought to be sufficiently so to be of interest. Some of the birds obtained moreover are rare and in other cases it has been possible to make short notes on the breeding or habits of the birds which appeared worth recording.

Except in a very few instances of quite common or well-known birds they were always shot to make sure of their identification and when on leave last year I took the opportunity of comparing some doubtful skins with those in the British Museum; so it is hoped that no bird has been wrongly recorded. I should also add that several skins were kindly identified for me by Mr. N. B. Kinnear of our Society.

Mr. Hope Simpson had seldom the leisure to skin the specimens he obtained and so several birds he shot, and in whose correct identification there appeared a possibility for doubt, have been excluded from this list. As examples of the above I may mention *Æthopyga horsfieldi*, *Sturnus minor* and *Calandrella tibetana*. The great slaty Woodpecker (*Hemilophus palverulentus*) was shot by Mr. Hope Simpson about 10 miles over the Nepal border in the forest below the Nepal hills, but I have never seen it in the Gorakhpur forests and I do not think it is found south of the border line.

As my work confined me almost entirely to the forest areas of the north of the district my observations of birds are similarly restricted, but Mr. Hope Simpson in his touring over all parts of the district has been able to fill up the gaps which would otherwise have existed in treating of the Gorakhpur District as a whole.

The Gorakhpur District lies in the extreme north-east of the United Provinces, being bounded on the north by Nepal and on the east by Bengal. It is entirely a plains district, the Nepal boundary lying some five to ten miles from the base of the hills. The north of the District is in reality Tarai though it has lost much of its tarai characteristics owing to the great extent of cultivation and better drainage which has taken place within the last sixty years. The south of the District is very heavily populated and the avifauna is poor except along the banks of rivers such as the Rapti and Gogra or in "tals."

The heavy rainfall and level character of the land has produced a damp climate and numerous swampy depressions or "tals" which are very favourable to waders, ducks, and water birds generally. It is consequently not surprising to find that out of a total of 263 birds recorded below 68 belong to this class.

In the following list the numbers refer to those given in Oates' and Blanford's Fauna.

CORVIDÆ.

*Corvus macrorhynchus* (4).—The Jungle Crow.
Common. Eggs taken on 11th March 1910 and 17th March 1910.
*Corvus splendens* (7).—The Indian House-Crow.
Common. Eggs taken on 6th June 1911.
*Dendrocitta rufa* (16).—The Indian Tree-pie.
Common. Eggs taken on 12th June 1909. On one occasion I watched this bird pounce on a lizard which it caught and ate.
*Parus atriceps* (31).—The Indian Grey Tit.
Common. Eggs taken on 28th April 1909 and 21st April 1911. The devotion of these birds to their nesting site was well shown in one of the above nests. When I discovered it the bird was sitting on two eggs. Thinking the mother was a young one I took out two eggs from under her, the only two in the nest. She then escaped out of the hole. I did not replace the eggs but revisited the nest after two days when I found it again neatly tidied and containing two fresh eggs.

CRATEROPODIDÆ.

*Argya earlii* (104).—The striated Babbler.
Common in thick scrub and long grass in the north of the district. Shot 13th January 1911.
*Argya caudata* (105).—The common Babbler. I do not remember ever seeing this bird in the tracts of sal jungle but elsewhere it is generally distributed.
*Argya malcolmi* (107).—The large Grey Babbler. Mr. Hope Simpson shot a specimen on 1st February 1910, but it appears to be uncommon.
*Crateropus canorus* (110).—The Jungle Babbler.
Common.
*Timelia pileata* (134).—The Red-capped Babbler. I only once saw this bird, in high swampy grass near the Nepal border. This was on 19th July 1909 when I shot it. Mr. Simpson however has seen it in large numbers though I think it is restricted to the north of the district.
*Pyctorhis sinensis* (139).—The yellow-eyed Babbler. Not very common.
*Zosterops palpebrosa* (226).—The Indian White-eye.
Common.
*Ægithina tiphia* (243).—The Common Iora.
Fairly common. Eggs taken on 9th June 1909 and 26th June 1910. In Oates and Blanford it is stated that in winter the male loses all or most of the black on the upper parts except on the tail and wings and becomes yellowish green. This "winter" plumage is however the only plumage I have seen these birds wearing though I have shot males on various dates in May and June when the birds are breeding and should have donned their summer plumage, if ever. All these males were purely green above except one shot on 24th June 1910 which possessed two feathers on its back tinged with black, thus resembling *A. viridissima*. This seems to

suggest that the "winter" plumage may in certain localities be retained throughout the year.

*Chloropsis aurifrons* (247).—The Gold-fronted Chloropsis. Not uncommon in well-wooded parts.

*Molpastes bengalensis* (282).—The Bengal Red-vented Bulbul. Common.

*Otocompsa emeria* (288).—The Bengal Red-whiskered Bulbul. Common.

SITTIDÆ.

*Sitta castaneiventris* (321).—The chestnut-bellied Nuthatch. Not very common, but well distributed.

DICRURIDÆ.

*Dicrurus annectens* (326).—The crow-billed Drongo.

Fairly common in dense forest. Eggs taken on 10th June 1909, 14th June 1909 and 28th June 1911. In Oates and Blanford the habits of this Drongo are described as similar to those of *D. ater*. My observations however in Gorakhpur showed little similarity beyond such general family resemblance as would be bound to exist between two such closely allied species. I found *D. annectens* inhabiting only the densest forest, where it seldom perched on the tops of trees as in the case of *D. cærulescens* which occurs in the same forest, but remained amongst the undergrowth or lower portions of the crowns of trees. It was thoroughly at home in dense sal coppice five to fifteen feet in height. Unlike *D. ater* I found it shy though not in any marked degree. Its notes are peculiarly clear and loud. The nests I found were usually 15 to 30 feet from the ground and placed in a terminal fork of a slender bough generally near the top of some whippy young tree. They were composed of grasses, roots and fibres bound together with cobweb, and in all the nests I found, one of the chief constituents was the dead deciduous branchlets of *Phyllanthus emblica*. At the time these drop from the tree they have a delicate curve and the points of detachment of the leaves form rough protuberances which are admirably adapted for fixing the twig where it is placed in the construction and in keeping the whole strong and flexible. I have also noticed these deciduous branchlets form an important factor in the nest construction of *D. ater*, *D. cærulescens*, *D. longicaudatus* (in the Garhwal District) and *Dissemurus paradiseus*.

One day when watching a pair of these birds building the bird continually dropped the fibrous threads with which it was binding the commencement of its nest to a fork, but every time the thread dropped the bird swooped down and caught it in mid air before it reached the ground.

The irides of this bird are described in Oates and Blanford as brown, but I found them to be a deep lake.

*Dicrurus ater* (327).—The Black Drongo. Common.

*Dicrurus cærulescens* (330).—The White-bellied Drongo.

Common. Eggs taken on 5th May 1909 and 20th April 1910. These Drongos appear to like rather an open forest best and they are very partial in Gorakhpur to a form of forest in which there is a dense coppice overtopped by scattered sal trees. They remain for the most part in the crowns of these trees and select as their special outlooks the tallest amongst them. The nests I found were mostly at a considerable elevation near the top of the crown of some lofty tree; one nest however was only twelve feet from the ground.

*Dissemurus paradiseus* (340).—The larger Racket-tailed Drongo.
Not very common. Eggs taken on 14th June 1909. This Drongo inhabits similar dense forest to *D. annectens*.

SYLVIIDÆ

*Acrocephalus stentoreus* ( 363 ).—The Indian Great Reed-Warbler.
Common in suitable localities. Eggs taken on 10th July 1909 and 26th July 1909.
*Acrocephalus dumetorum* (366).—Blyth's Reed-Warbler.
Shot by Mr. Hope Simpson on 26th November 1912, who records it as a great skulker.
*Orthotomus sutorius* (374).—The Indian Tailor-bird.
Common.
*Cisticola cursitans* ( 381 ).—The Rufous Fantail-Warbler.
Very common in suitable localities. This bird can be at once recognised by the way it utters a short sharp note (just like the click of a fly shuttle in a silk loom ) whilst flying, each note corresponding with the position of the bird when at the lowest point of one of the dips in its flight. The flight being made up of a series of nearly vertical rises and falls.
*Franklinia gracilis* ( 382 ).—Franklin's Wren-Warbler.
Common. Eggs taken 23rd June 1910.
*Megalurus palustris* ( 389 ).—The Striated Marsh-Warbler.
A single specimen shot on 22nd May 1911 in the north of the district.
*Chætornis locustelloides* ( 392 ).—The Bristled Grass-Warbler.
Not uncommon in dense patches of grass surrounded by forest. The bird becomes most conspicuous at the beginning of the rains.
*Phylloscopus affinis* ( 405 ).—Tickell's Willow-Warbler.
Mr. Hope Simpson has shot several specimens, one on 27th January 1910, and the bird is probably fairly common in suitable places.
*Phylloscopus tytleri* ( 406 ).—Tytler's Willow-Warbler .
An uncommon bird, of which a specimen was shot by Mr. Hope Simpson on 18th February 1910.
*Phylloscopus tristis* ( 407 ).—The Brown Willow-Warbler.
This is not a common bird. It sometimes frequents patches of "jhao" (*Tamarix dioica*) along the banks of rivers. Shot 27th January 1910 and 8th January 1911.
*Phylloscopus humii* (418).—Hume's Willow-Warbler.
Shot by Mr. Hope Simpson at Pharenda on 10th December 1912.
*Prinia lepida* (462).—The Streaked Wren-Warbler.
Mr. Hope Simpson has shot several specimens of this Warbler which is probably not uncommon. One was shot on 2nd February 1910.
*Prinia socialis* (464).—The Ashy Wren-Warbler.
Only fairly common in jungle tracts, elsewhere scarce.
*Prinia sylvatica* (465).—The Jungle Wren-Warbler. Fairly common.
*Prinia inornata* (466).—The Indian Wren-Warbler.
Common. Eggs taken in July and August.

LANIIDÆ.

*Lanius lahtora* (469).—The Indian Grey Shrike.
Generally distributed and very common in suitable localities, as for instance, long narrow stretches of scrub jungle on the higher lands bordering wet nallahs.
*Lanius vittatus* ( 473 ).—The Bay-backed Shrike.
Not uncommon in certain localities.
*Lanius nigriceps* (475).—The Black-headed Shrike.

Not very common.

*Lanius erythronotus* (476).—The Rufous-backed Shrike.
Common.

*Lanius tephronotus* (477).—The Grey-backed Shrike.
Shot on 14th November 1910.

*Lanius isabellinus* (479).—The Pale-brown Shrike.
A rare bird, shot on 21st January 1911.

*Lanius cristatus* (481).—The Brown Shrike.
Shot on 27th January 1911. This bird is fairly common.

*Tephrodornis pondicerianus* (488).—The common Wood-Shrike.
Common.

*Pericrocotus brevirostris* (495).—The Short-billed Minivet.
Mr. Hope Simpson shot a specimen on 29th January 1910 and says it is not uncommon in cultivated parts and is to be seen travelling from mango grove to mango grove in small flocks of six or eight.

*Pericrocotus peregrinus* (500).—The Small Minivet.
Common.

*Graculus macii* (510).—The Large Cuckoo-Shrike.
Fairly common. These birds become very noisy during the breeding season. The cock bird at this time mounts some height into the air and descends on quivering wings whilst uttering his call. When sitting still and uttering their call they invariably raise first one wing and then the other alternately in unison with the notes of their call. They never raise both wings simultaneously.

### Oriolidæ.

*Oriolus kundoo* (518).—The Indian Oriole.
Common.

*Oriolus melanocephalus* (521).—The Indian Black-headed Oriole.
Fairly common.

### Sturnidæ.

*Sturnus menzbieri* (532).—The Common Indian Starling.
Occurring sometimes in large flocks during the winter months.

*Temenuchus pagodarum* (544).—The Black-headed Myna.
Fairly common.

*Æridotheres tristis* (549).—The Common Myna.
Very common.

*Acridotheres ginginianus* (551).—The Bank Myna.
Fairly common but local. Eggs taken 16th May 1910.

*Æthiopsar fuscus* (552).—The Jungle Myna.
A very uncommon bird.

*Sturnopastor contra* (555).—The Pied Myna.
Common. Eggs taken on 6th June 1911.

### Muscicapidæ.

*Cyornis tickelli* (576).—Tickells' Blue Flycatcher.
Fairly common in dense forest. Eggs taken on 18th June 1911, 21st June 1911 and 25th June 1911.

This is a wary bird and not easily observed. When walking quietly through the forest the bird will usually on first noticing one come up close within a few yards as if to inspect the intruder and will as a rule give vent to a short song ending abruptly which sounds like a defiant challenge. Having thus delivered himself he disappears and is not easily approached again. I found many old as well as new nests and every one of them was

placed in a similar position, namely, within one of the numerous recesses formed when a species of fig like *Ficus religiosa or Ficus bengalensis* grows upon another tree and encircles it in a network of anastomosing roots. The nest is usually placed from 3 to 7 feet from the ground.

*Culicicapa ceylonensis* (592).—The Grey-headed Flycatcher.

Visits the district during the winter months and is then common in certain localities in the north.

*Terpsiphone paradisi* (598).—The Indian Paradise Flycatcher.

Fairly common. Eggs taken on 26th March 1910. It does not appear to be a permanent resident in Gorakhpur, but from what I observed it arrives about the second week in April.

*Hypothymis azurea* (601).—The Indian Black-naped Flycatcher.

This is not nearly so common a species as *Cyornis tickelli* though frequenting similar dense forest.

*Rhipidura albifrontata* (604).—The White-browed Fantail Flycatcher.

Fairly common.

### Turdidæ.

*Pratincola caprata* (608).—The Common Pied Bush-Chat.

Fairly common.

*Pratincola maura* (610).—The Indian Bush-Chat.

Fairly common.

*Ruticilla rufiventris* (644).—The Indian Redstart.

This bird is not common in most parts of the district, it appears however to be very common in certain localities, as for instance, amongst the babul growth along the embankment leading to Chatai Bridge. Shot 15th April 1911.

*Cyanecula succica* (647).—The Indian Blue-throat.

A bird of exceedingly retiring disposition, on account of which it appears rare but is probably not so rare as it seems.

*Thamnobia cambaiensis* (661).—The Brown-backed Indian Robin.

Not very common.

*Copsychus saularis* (663).—The Magpie-Robin.

Common.

*Cittocincla macrura* (664).—The Shama.

Rather rare.

*Merula atrigularis* (677).—The Black-throated Ouzel.

This winter visitor appears in small flocks which are I think confined to the north of the district.

*Oreocincla dauma* (698).—The Small-billed Mountain-Thrush.

An uncommon bird. Whether it is migratory or not, I am not sure, but I shot a specimen as late as 30th March 1911. The bird is partial to shady remote streams flowing through dense forest.

### Ploceidæ.

*Ploceus baya* (720).—The Baya.

Fairly common. Eggs taken on 4th August 1909 and 30th June 1911.

*Munia atricapilla* (726).—The Chestnut-bellied Munia.

Does not seem to be common.

*Uroloncha malabarica* (734).—The White-throated Munia.

Very common. Eggs taken 15th January 1911.

*Carpodacus erythrinus* (761).—The Common Rose-Finch.

Mr. Hope Simpson obtained several specimens of this bird. One was shot on 24th January 1910.

*Gymnorhis flavicollis* (775).—The Yellow-throated Sparrow.

Fairly common.

*Passer domesticus* (776).—The House Sparrow.

*Emberiza aureola* (797).—The Yellow-breasted Bunting.

A specimen was obtained by Mr. Hope Simpson near Lachmipur on 16th January 1911.

*Melophus melanicterus* (803).—The Crested Bunting.

Not at all a common bird. Shot 2nd February 1910.

### Hirundinidæ.

*Cotile riparia* (808).—The Sand-Martin.

Mr. Hope Simpson found this bird common in December 1911 on Bakhira Tal and again in November 1912 on Chatai Tal, though Oates describes it as rare in India.

*Cotile sinensis* (809).—The Indian Sand-Martin.

Fairly common.

*Hirundo rustica* (813).—The Swallow.

Shot 28th January 1911.

*Hirundo nepalensis* (822).—Hodgson's Striated Swallow.

Shot in November 1912 at Karmipatti where Mr. Hope Simpson found it not uncommon.

*Hirundo erythropygia* (823).—Sykes's Striated Swallow.

Not very common.

### Motacillidæ.

*Motacilla alba* (826).—The White Wagtail.

Very common during the winter months.

*Motacilla leucopsis* (827).—The White-faced Wagtail.

Shot 30th January 1910.

*Motacilla personata* (829).—The Masked Wagtail.

Common during the winter months.

*Motacilla maderaspatensis* (831).—The Large Pied Wagtail.

Shot 17th June 1911.

*Motacilla melanope* (832).—The Grey Wagtail.

*Motacilla borealis* (833).—The Grey-headed Wagtail.

*Motacilla beema* (835).—The Indian Blue-headed Wagtail.

*Motacilla citreola* (837).—The Yellow-headed Wagtail.

*Anthus trivialis* (840).—The Tree-Pipit.

A specimen was obtained by Mr. Hope Simpson on 29th January 1910 on the Nepal border.

*Anthus maculatus* (841).—The Indian Tree-Pipit.

A fairly common winter visitor.

*Anthus rufulus* (847).—The Indian Pipit.

Fairly common.

### Alaudidæ.

*Melanocorypha bimaculata* (859).—The Eastern Calandra Lark.

Shot 30th January 1910.

*Alauda gulgula* (861).—The Indian Sky-Lark.

*Alaudula raytal* (866).—The Ganges Sand-Lark.

Fairly common on the banks of the Gandak.

*Mirafra assamica* (870).—The Bengal Bush-Lark.

This is a fairly common bird in suitable localities, such as railway embankments. Eggs taken 1st July 1910.

*Mirafra erythroptera* (871).—The Red-winged Bush-Lark.

*Galerita cristata* (874).—The Crested-Lark.

A common bird.

*Pyrrulanda grisea* (879).—The Ashy-crowned Finch-Lark.
A common bird.

NECTARINIIDÆ.

*Arachnechthra asiatica* (895).—The Purple Sun-bird.
Fairly common.

DICÆIDÆ.

*Dicæum olivaceum* (917).—The Plain-coloured Flower-pecker.
On 17th April 1910 I found a nest of this species containing a clutch of three eggs. The nest was about 20 feet from the ground suspended at the end of a leafy bough of a mango tree.

*Dicæum erythrorhynchus* (919).—Tickell's Flower-pecker.

*Piprisoma squalidum* (921).—The Thick-billed Flower-pecker.
A fairly common forest bird often associated in small flocks with *D. olivaceum*.

PITTIDÆ.

*Pitta brachyura* (933).—The Indian Pitta.
Fairly common from April onwards. In 1909 I first heard this bird on 29th April, and in 1910 on 6th May. I took eggs on 12th June 1909, 22nd June 1910 and 23rd June 1910. One of these nests was fully thirty feet from the ground and placed on the top of a horizontal bough.

PICIDÆ.

*Liopicus mahrattensis* (972).—The Yellow-fronted Pied Woodpecker.
Not very common.

*Iyngipicus hardwickii* (976).—The Indian Pigmy Woodpecker.
Rather scarce.

*Micropternus phæoceps* (983).—The Northern Rufous Woodpecker.
A rare bird. The few occasions on which I have seen it, it was in the midst of dense forest. Once I watched it feeding on a mass of flying ants collected on a rotten tree trunk.

*Brachypternus aurantius* (986).—The Golden-backed Woodpecker.
Fairly common everywhere. Eggs taken on 28th April 1909 and 29th April 1910.

CAPITONIDÆ.

*Thereiceryx zeylonicus* (1008).—The Common Indian Green Barbet.
Common. A pair in my compound brought up a brood in April 1910 and again a second brood in July.

*Xantholæma hæmatocephala* (1019).—The Crimson-breasted Barbet.
Common.

CORACIADÆ.

*Coracias indica* (1022).—The Indian Roller.
Common everywhere.

MEROPIDÆ.

*Merops viridis* (1026).—The Common Indian Bee-eater.
Very common. Eggs taken on 6th May 1909 and 18th April 1911.

*Merops philippinus* (1027).—The Blue-tailed Bee-eater.

Fairly common, but nearly always found in the vicinity of water. Eggs taken on 21st May 1909 and 18th April 1911.

*Melittophagus swinhoii* (1030).—The Chestnut-headed Bee-eater.

A rather rare bird. I found a nest with young ones in a river bank on 3rd May 1911. This Bee-eater seems to prefer the vicinity of large streams flowing through forest. I have never seen it away from forest or near cultivation.

ALCEDINIDÆ.

*Ceryle varia* (1033).—The Indian Pied Kingfisher.

Very common.

*Alcedo ispida* (1035).—The Common Kingfisher.

Fairly common.

*Pelargopsis gurial* (1043).—The Brown-headed Stork-billed Kingfisher.

This is a very noisy and not uncommon bird in well-wooded parts. Its notes are very loud and harsh.

*Halcyon smyrnensis* (1044).—The White-breasted Kingfisher.

Very common. Eggs taken on 13th May 1909 and 2nd May 1911. In one nest I found an ejected pellet composed of the chitinous remains of winged insects which no doubt largely constitute their food.

BUCEROTIDÆ.

*Anthracoceros albirostris* (1053).—The Indo-Burmese Pied Hornbill.

Not uncommon in well-wooded areas, and Mr. Hope Simpson says they are exceedingly common across the Nepal border. On 28th May 1909 I cut out a nest of this bird which contained two unfledged young ones and the mother. The slit, from which the mother's beak protruded about an inch and a half, was about 4 inches long by 1 inch wide, the original hole of about five inches diameter having been narrowed to this size by the application of plaster. The plaster in this nest as well as in a former one was filled with fig seeds like carroways in a seed cake and from its consistency appears to me more likely to be disgorged half-digested food than droppings, to which in my opinion it bears no resemblance. From the moment I appeared at the entrance the mother kept up an incessant and deafening screaming and made vicious snaps at whatever came within her reach. I finally drew her out of the hole and set her free but she nearly fell to the ground being only just able to fly a little. This was probably partly owing to weakness, but also to the fact that a large number of her tail and wing feathers had dropped out in the hole, and the remainder were badly damaged. She did not attempt to fly again but by using her bill like a parrot she managed to reach the top of a tree close by. The dirt at the bottom of the hole was mixed up with large quantities of *Melanoxylon* seeds, the fruits of which tree they are evidently very fond of.

These hornbills seem to bear special hatred towards hawks as on two occasions I have watched them pursuing large hawks with great persistence. The hawk in one instance was *Spizætus limnætus* and it had some prey in its claws which might have been a young hornbill, but in any case the old ones were giving him a very hot time.

*Lophoceros birostris* (1062).—The Common Grey Hornbill.

Fairly common.

UPUPIDÆ.

*Upupa indica* (1067).—The Indian Hoopœ.

Fairly common.

CAPRIMULGIDÆ.

*Caprimulgus mahrattensis* (1089).—Sykes's Nightjar.
Shot 11th June 1910.
*Caprimulgus monticola* (1090).—Franklin's Nightjar.
Shot 9th June 1910.
*Caprimulgus asiaticus* (1091).—The Common Indian Nightjar.
Fairly common locally.
*Caprimulgus europæus* (1092).—The European Nightjar.
A solitary male bird was shot by Mr. Hope Simpson on 13th January 1911.
*Caprimulgus macrurus* (1093).—Horsfield's Nightjar.
Common.

CUCULIDÆ.

*Cuculus micropterus* (1107).—The Indian Cuckoo.
Not very common.
*Hierococcyx varius* (1109).—The Common Hawk-Cuckoo.
Common.
*Cacomantis passerinus* (1112).—The Indian Plaintive Cuckoo.
An uncommon cuckoo.
*Coccystes jacobinus* (1118).—The Pied Crested Cuckoo.
Common all over the district.
*Eudynamis honorata* (1120).—The Indian Koel.
A common cuckoo. I took two eggs out of a nest of *Corvus splendens* on 6th June 1911.

*Rhopodytes tristis* (1123).—The Large Green-billed Malkoha.
A rather rare bird.
*Taccocua leschenaulti* (1129).—The Sirkeer Cuckoo.
Fairly common.
*Centropus sinensis* (1130)—The Common Crow-Pheasant.
Fairly common. Eggs taken on 4th July 1910, 5th July 1910 and 21st June 1911.
*Centropus bengalensis* (1133).—The Lesser Concal.
Not uncommon, but restricted to stretches of high grass surrounded by forest. Eggs taken on 8th June 1911.

PSITTACIDÆ.

*Palæornis nepalensis* (1135).—The Large Indian Paroquet.
Common in the north of the district. Eggs taken on 9th March 1910 and 17th March 1910. I frequently found several pairs nesting in the same tree, their favourite tree being *Bombax malabaricum*.
*Palæornis torquatus* (1138).—The Rose-winged Paroquet.
Very common. Eggs taken on 25th February 1910, 11th March 1910 and 13th March 1910. Two of the nests from which I obtained the above eggs were cut into a day or two before I actually took the eggs but in neither case did the birds forsake in spite of my cutting round the entrance hole.
*Palæornis cyanocephalus* (1139).—The Western Blossom-headed Paroquet.
A fairly common bird.

STRIGIDÆ.

*Asio accipitrinus* (1157).—The Short-eared Owl.
A specimen was obtained by Mr. Hope Simpson on 20th November 1911 whilst snipe shooting.

*Syrnium ocellatum* (1161).—The Mottled Wood-Owl.
This bird chiefly inhabits large mango groves and where such are to be found the bird is not uncommon.
*Ketupa zeylonensis* (1164).—The Brown Fish-Owl.
Fairly common along the banks of forest streams.
*Scops giu* (1173).—The Scops Owl.
This is a not uncommon owl in dense forest. On 20th April 1911 I was walking through the forest when I noticed an owl fly out of a hole close by. I promptly shot it. I then looked into the hole from which it had flown and saw another owl sitting inside. She was sitting on three eggs which I removed from beneath her and then took out the bird herself and carried her home. The bird I shot first was a male of this species in ordinary grey plumage, but the interesting part is that the female I captured sitting on her eggs was of the dark chestnut variety, all her upper plumage being a beautiful rich chestnut. I kept her in captivity for a month or more, but she eventually died. She was very fond of grasshoppers and other insects. The eggs, which were hard set, were rather curious since they were all heavily and evenly spotted with dark redish-brown spots. These spots were very quickly removed by water. I have noticed almost exactly similar spots on a clutch of eggs of *Halcyon smyrnensis*.
*Scops bakkamæna* (1178).—The Collared Scops Owl.
Not a very common owl.
*Athene brama* (1180).—The Spotted Owlet.
Common. On one occasion I came across one of these owls being mobbed by a couple of crows in broad day-light. The owl was on the ground and the crows kept on opposite sides of it, so that whilst one drew its attention by a feint, the other closed in and pecked at the bird from behind. The owl kept his mouth wide open to frighten his tormentors and made more or less of a fight, but seeing it was getting worsted I approached, when the crows drew to one side and the owl flew off. One of the crows then swooped at the owl in flight like a hawk and took out a lot of feathers but the owl succeeded in reaching some thick trees where I left it safely hidden.
*Glaucidium radiatum* (1184).—The Jungle Owlet.
A common owl.

### Pandionidæ.

*Pandion haliætus* (1189).—The Osprey.
Two pairs were found living on Bakhira Tal on the border between Basti and Gorakhpur in the winter of 1911.

### Valturidæ.

*Otogyps calvus* (1191).—The Black Vulture.
Not a very common vulture.
*Gyps tenuirostris* (1195).—The Himalayan Long-billed Vulture.
Not very common.
*Pseudogyps bengalensis* (1196).—The Indian White-backed Vulture.
Very common, and I found large numbers of nests in the north of the district containing young ones in February 1910.
*Neophron ginginianus* (1197).—The Smaller White Scavenger Vulture.
Common.

### Falconidæ.

*Aquila hastata* (1206).—The Small Indian Spotted Eagle.
Not, I think, very common.
*Spizaëtus limnaëtus* (1212).—The Changeable Hawk Eagle.

Not uncommon. On 30th April 1909 I found a single young one in a nest. I took it two weeks later and tried to rear it but it died. On 9th June I found another nest with a single young one. This bird I took and kept for about a year. It was not a well-dispositioned hawk for hawking, being of too sullen and stolid a character. The only unwounded bird or animal it ever caught was a hare which it killed in its tremendous grip instantaneously. The following year I obtained one egg from the same nest on 9th March 1910. Both these nests were placed near the top of exceptionally tall trees with dense forest on one side and an open grassy forest glade on the other. The nest was about 2½ feet in diameter.

*Spizaëtus nepalensis* (1213).—Hodgson's Hawk-Eagle. A rarer bird than the last species. In Oates and Blanford this bird is described as a winter visitor to the plains but in Gorakhpur it is certainly resident and breeds there. On 31st March 1910, I found a nest fairly high up in a sal tree which contained one egg. I shot the bird and there is no doubt as to its identification. The nest was lined with green leaves. On 23rd April 1911 a man brought me one of these birds which a month previously he had picked up after an exceptionally heavy hail storm. A hail stone had hit the bird on the head blinding one eye completely. This bird was probably a year old as the lower plumage was white with large black drops. I was told the hail storm referred to above did considerable execution amongst water birds on some large open pieces of water in the forest.

*Spilornis cheela* (1217).—The Crested Serpent Eagle.

A fairly common eagle. Eggs taken 31st March 1910.

*Butastur teesa* (1220).—The White-eyed Buzzard-Eagle.

A common bird. Eggs taken 16th May 1910 and 24th March 1910.

*Haliaëtus leucoryphus* (1223).—Pallas's Fishing Eagle.

A pair of birds frequents nearly every lake of any size. Eggs taken 27th January 1910.

*Polioaëtus ichthyaëtus* (1226).—The Large Grey-headed Fishing Eagle.

Fairly common wherever water exists.

*Haliastur indus* (1228).—The Brahminy Kite.

Common. Eggs taken on 30th March 1910.

*Milvus govinda* (1229).—The Common Pariah Kite.

Common. Eggs taken 3rd March 1910 and 11th March 1910.

*Elanus cæruleus* (1232).—The Black-winged Kite.

Not a very common bird, especially in the north.

*Circus macrurus* (1233).—The Pale Harrier.

Not uncommon.

*Circus melanoleucus* (1236).—The Pied Harrier.

A rather rare bird.

*Circus æruginosus* (1237).—The Marsh Harrier.

Not uncommon.

*Buteo ferox* (1239).—The Long-legged Buzzard.

*Buteo desertorum* (1242).—The Common Buzzard.

*Astur badius* (1244).—The Shikra.

Common. Eggs taken on 1st May 1909, 28th April 1910 and 20th April 1911.

*Accipiter nisus* (1247).—The Sparrow-Hawk.

A young bird of this species was shot by Mr. Hope Simpson on 7th January 1912 in the act of boldly attempting to take a wounded snipe which a coolie was retrieving.

*Pernis cristatus* (1249).—The Crested Honey-Buzzard.

A not uncommon bird. Eggs taken on 4th June 1911.

*Tinnunculus alaudarius* (1265).—The Kestril.

Common.

COLUMBIDÆ.

*Crocopus phœnicopterus* (1271).—The Bengal Green Pigeon.
Common. Eggs taken on 4th April 1910 and 24th April 1910.
*Chalcophaps indica* (1291).—The Bronze-winged Dove.
Not common. It is usually found in the damper portions of the forest where cane brakes grow, such as occur in the north of the district. Eggs taken on 14th June 1909.
*Columba intermedia* (1292).—The Indian Blue Rock-Pigeon.
Large flocks frequent certain chosen localities.
*Columba eversmanni* (1295).—The Eastern Stock-Pigeon.
One was shot on 27th January 1910 out of a large flock feeding on an open rice plain.
*Turtur orientalis* (1304).—The Rufous Turtle-Dove.
A specimen was obtained by Mr. Hope Simpson on 3rd November 1911.
*Turtur ferrago* (1305).—The Indian Turtle-Dove.
Sometimes occurs in large flocks.
*Turtur suratensis* (1307).—The Spotted Dove.
*Turtur risorius* (1310).—The Indian Ring-Dove.
Common.

PHASIANIDÆ.

*Pavo cristatus* (1324).—The Common Pea-fowl.
Common in the north of the district. In Oates and Blanford it is stated that these birds bred for the most part in the rainy season. This I think scarcely applies to Gorakhpur where I have found eggs between 17th April and 9th May.
*Gallus ferrugineus* (1328).—The Red Jungle-fowl.
The distribution of this bird is curious since it is entirely absent from all the Gorakhpur forests excepting a strip running down from Nepal on the west bank of the Gandak, and here the bird is fairly plentiful for at least 20 miles south of the Nepal border. West of this strip of forest is cultivation for a few miles and then forest again which runs up to within 5 or 6 miles of the Nepal country and yet jungle fowl are not found there. This is particularly curious when it is remembered that within comparatively recent times the whole of the north of the district was under forest in continuation of the Nepal forests.
*Coturnix communis* (1355).—The Common Quail.
Plentiful in favourable years.
*Coturnix coromandelica* (1356).—The Rain Quail.
Not uncommon.
*Francolinus vulgaris* (1372).—The Black Partridge.
Rather scarce in most parts.
*Francolinus pondicerianus* (1375).—The Grey Partridge.
Nowhere plentiful.
*Francolinus gularis* (1376).—The Swamp Partridge.
This bird is, I believe, restricted to the north-east corner of the district where it is scarce.

TURNICIDÆ.

*Turnix tanki* (1384).—The Indian Button-Quail.
Not common.

RALLIDÆ.

*Porzana pusilla* (1393).—The Eastern Baillon's Crake.
A rather uncommon bird. One I shot on 17th January 1910 in a sma jheel had its gizzard full of several kinds of seed but no traces of animal *lif*

*Amaurornis phœnicurus* (1401).—The White-breasted Water-hen.
A fairly common bird in suitable places, and it does not appear very particular as to choice requiring very little water and sometimes being found in sugarcane fields with no permanent water near.

*Gallinula chloropus* (1402).—The Moorhen.
This bird is, I think, not common as I have never noticed it, but Mr. Hope Simpson found it a common bird on a jheel at Gopalpur where several birds were shot.

*Gallicrex cinerea* (1403).—The Water-Cock.
Uncommon, except in a few localities in the extreme north of the district.

*Porphyrio poliocephalus* (1404).—The Purple Moor-hen.
Fairly common on most of the larger jheels.

*Fulica atra* (1405).—The Coot.
Very common on all large jheels. I do not think it remains to breed.

GRUIDÆ.

*Grus antigone* (1409).—The Sarus.
Fairly common. On the Gandak river in January 1911 I twice saw a large flock of these birds flying over-head. On the first occasion there were 20 birds and they were flying in a V shape, 15 birds forming one arm of the V and 5 the other. On the second occasion there were 24 birds and they were spread out in a long diagonal line.

OTIDÆ.

*Sypheotis aurita* (1416).—The Lesser Florican.
I have only observed this bird during the early months of the rains and I think it probably only visits the district at this season and then only in very small numbers.

ŒDICNEMIDÆ.

*Œdicnemus scolopax* (1418).—The Stone-Curlew.
Fairly common in suitable places.

*Esacus recurvirostris* (1419).—The Great Stone-Plover.
A not uncommon bird along the banks of the Gandak.

GLAREOLIDÆ.

*Cursorius coromandelicus* (1422).—The Indian Courser.
Not uncommon.

*Glareola lactea* (1427).—The Swallow-Plover.
This bird does not appear to be at all common, but was observed by Mr. Hope Simpson on the Ghogra and on Bakhira Tal where it was apparently picking insects off the water in the dusk of the evening.

PARRIDÆ.

*Metopidius indicus* (1428).—The Bronze-winged Jacana.
Fairly common on suitable jheels. I took eggs on 30th July 1909 and 3rd August 1909. The birds frequently disclose the position of their eggs by jumping up into the air near them, screaming and fluttering their wings.

*Hydrophasianus chirurgus* (1429).—The Pheasant-tailed Jacana.
Not quite such a common bird as the preceding species. Eggs taken 3rd August 1909.

CHARADRIIDÆ.

*Sarcogrammus indicus* (1431).—The Red-wattled Lapwing
Common.

*Sarciophorus malabaricus* (1433).—The Yellow-wattled Lapwing.
Fairly common.
*Hoplopterus ventralis* (1435).—The Indian Spur-winged Plover.
A rather scarce bird.
*Vanellus vulgaris* (1436).—The Lapwing or Peewit.
Shot at Senduria by Mr. Hope Simpson on 2nd December 1912.
*Ægialitis alexandrina* (1446).—The Kentish Plover.
Very common along the Gandak river in January.
*Ægialitis dubia* (1447).—The Little Ringed Plover.
Common along the Gandak river.
*Himantopus candidus* (1451).—The Black-winged Stilt.
Flocks of these birds are not uncommon.
*Numenius arquata* (1454).—The Curlew.
Not common, though a large number were seen in Bheura Tal in the extreme south of the district close to the Gogra.
*Totanus hypoleucus* (1460).—The Common Sandpiper.
Very common.
*Totanus glareola* (1461).—The Wood Sandpiper.
*Totanus ochropus* (1462).—The Green Sandpiper.
Common. Mr. Hope Simpson notes that it has a smell just like that of a mouse.
*Totanus calidris* (1464).—The Redshank.
Common on some of the large jheels.
*Totanus glottis* (1466).—The Greenshank.
*Tringa minuta* (1471).—The Little Stint.
Common.
*Tringa temminckii* (1474).—Temminck's Stint.
Common.
*Gallinago cœlestis* (1484).—The Fantail Snipe.
Common.
*Gallinago stenura* (1485).—The Pintail Snipe.
Common.
*Gallinago gallinula* ( 1487 ).—The Jack Snipe.
Not so common as the two preceding species.
*Rostratula capensis* (1488).—The Painted Snipe.
Not uncommon.

### Laridæ.

*Larus ridibundus* (1490).—The Laughing Gull.
Two pairs were seen on a "tal" on 10th January 1911 and one of the birds was shot.
*Larus affinis* (1494).—The Dark-backed Herring Gull.
This bird was shot on the Gandak river on 24th January 1911. The identification is not certain, but it was either this species or *L. cachinnans*.
*Hydrochelidon hybrida* (1496).—The Whiskered Tern.
*Sterna seena* (1503).—The Indian River-Tern.
Common.
*Sterna melanogaster* (1504).—The Black-bellied Tern.
Common.

### Pelecanidæ.

*Pelecanus philippensis* (1523).—The Spotted-billed Pelican.
This bird appears to visit the district in small numbers during the rains only.

PHALACROCORACIDÆ.

*Phalacrocorax carbo* (1526).—The Large Cormorant.
Common.
*Phalacrocorax javanicus* (1528).—The Little Cormorant.
Common.
*Plotus melanogaster* (1529).—The Indian Darter.
Fairly common. Eggs taken 16th July 1909.

IBIDIDÆ.

*Ibis melanocephala* (1541).—The White Ibis.
Scarce.
*Inocotis papillosus* (1542).—The Black Ibis.
Not uncommon in suitable places.

PLATALEIDÆ.

*Platalea leucorodia* (1545).—The Spoonbill.
I have never shot this bird, but on one occasion I saw a small flock of what I am sure were spoonbills. This was in the north-east of the district near the Nepal border.

CICONIIDÆ.

*Dissura episcopus* (1548).—The White-necked Stork.
Fairly common. Eggs taken on 1st July 1910.
*Xenorhynchus asiaticus* (1549).—The Black-necked Stork.
A rare bird in this district.
*Leptoptilus javanicus* (1551).—The Smaller Adjutant.
In a "tal" near Nichlaul in the north of the district I saw about 30 of these birds together at one time, otherwise it is not a common bird. One bird I shot had just swallowed two water snakes, each 1½ feet long.
*Anastomus oscitans* (1553).—The Open-bill.
Not very common. On 16th July 1909 I visited a rookery of these birds in the north of the district in the midst of a fairly large patch of forest. This site was annually resorted to by the birds for breeding purposes. The place was in the middle of a large area of high "retwa" grass, thorny rose bushes, and stunted trees of *Eujenia jambolana* and *Barringtonia acutangula*, at this time of year under two or three feet of water. The birds had built their nests over an area of about six acres and within this space nearly every tree contained nests so that I estimated there were about 500 nests altogether. The nests were usually about 25 feet from the ground and were just a rough mass of sticks lined with a few green leaves or small branches with green leaves attached. The birds took little notice of me and one pair actually proceeded to place a leafy branch on its nest only five feet above my head as I sat on the elephant.
*Plotus melanogaster* was also breeding here, but in more limited numbers. There were perhaps some 30 nests of this species which were chiefly placed in some trees apart from the open-bills' nests though a few were placed in the same trees with those of the latter. After I had fired off my gun the openbills quickly returned and settled all round again, but the snake birds were much more wary and kept circling round high up in the air for half an hour or so before they dared approach the colony again. The snake birds seem very fair flyers and when at a great height come shooting down with half-closed wings like an arrow. They always fly with their necks bent.

ARDEIDÆ.

*Ardea manillensis* (1554).—The Eastern Purple Heron.
Fairly common in suitable places.
*Ardea cinerea* (1555).—The Common Heron.
Fairly common. I found large numbers living on the open sand banks of the Gandak river in December 1910.
*Herodias alba* (1559).—The Large Egret.
*Bubulcus coromandus* (1562).—The Cattle Egret.
Not very common.
*Ardeola grayi* (1565).—The Pond Heron.
Very common. Eggs taken 6th June 1911.
*Ardetta sinensis* (1571).—The Yellow Bittern.
Not uncommon where suitable places are to be found, but these are not numerous. Eggs taken during July of 1909 and 1910.
*Ardetta cinnamomea* (1572).—The Chestnut Bittern.
I found several of these birds in a "tal" in the north of the district on 17th June 1911.
*Botaurus stellaris* (1574).—The Bittern.
Generally an uncommon bird though occasionally met with in fair numbers in suitable places.

ANATIDÆ.

*Anser indicus* (1583).—The Barred-headed Goose.
Occurs in large flocks on the Gandak and some of the larger jheels.
*Sarcidiornis melanonotus* (1584).—The Nukta.
A rare duck in this district.
*Casarca rutila* (1588).—The Brahminy Duck.
Very common, especially along the larger rivers.
*Dendrocycna javanica* (1589).—The Whistling Teal.
Not very common.
*Nettopus coromandelianus* (1591).—The Cotton Teal.
Fairly common.
*Anas boscas* (1592).—The mallard.
Not seen in any large numbers.
*Anas pœcilorhyncha* (1593).—The Spotted-billed Duck.
A rather uncommon duck.
*Chaulelasmus streperus* (1595).—The Gadwall.
A common duck occurring in very large flocks.
*Nettium formosum* (1596).—The Clucking Teal.
A single male bird was obtained alive by Mr. Hope Simpson on 18th March 1911. It had been netted by the natives.
*Nettium crecca* (1597).—The Common Teal.
Very common.
*Mareca penelope* (1599).—The Wigeon.
Mr. Hope Simpson found this duck plentiful on Bakhira Tal in December 1911, but it is not usually met with.
*Dafila acuta* (1600).—The Pintail.
A common duck.
*Querquedula circia* (1601).—The Garganey Teal.
Common.
*Spatula clypeata* (1602).—The Shoveller.
Not very common.
*Netta rufina* (1604).—The Red-crested Pochard.
Very common and occurring in immense flocks.
*Nyroca ferina* (1605).—The Pochard.

This duck is generally seen in small parties or singly with other species of duck.

*Nyroca ferruginea* (1606).—The White-eyed Duck.

Very common and inhabits every variety of pond and jheel.

*Nyroca fuligula* (1609).—The Tufted Duck.

This is an uncommon duck. I think it prefers pieces of water with plenty of covering and weeds and those which are secluded amongst forest, though Mr. Hope Simpson also found them in considerable numbers in December 1911 on Bakhira Tal which is quite open except for rushes in one part.

*Clangula glaucion* (1610).—The Golden-eye.

A pair of these birds were shot by Mr. Hope Simpson on Bakhira Tal on 22nd December 1911.

PODICIPEDIDÆ.

*Podicipes cristatus* (1615).—The Great Crested Grebe.

Not uncommon in some of the large jheels.

*Podicipes albipennis* (1617).—The Indian Little Grebe.

Fairly common.

# A POPULAR TREATISE ON THE COMMON INDIAN SNAKES.

## Illustrated by Coloured Plates and Diagrams.

By

Major F. Wall, I.M.S., C.M.Z.S.

*Part XX continued (with Plates A. and B. and Diagram.)*

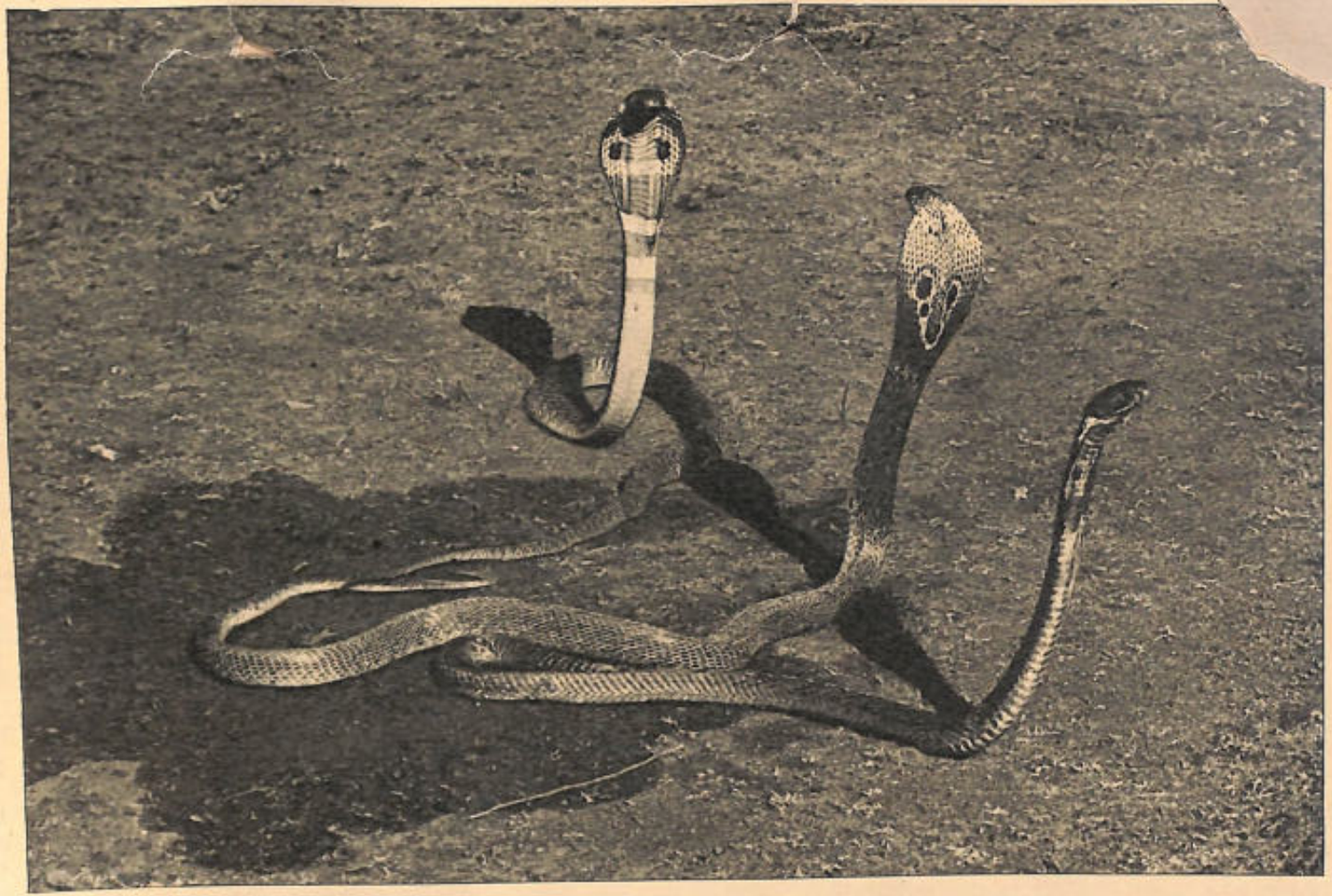
(*Continued from page 259 of this Volume.*)

*The Sexes.*—I can discover no difference in the lepidosis of the sexes, nor in the relative lengths of the tails. There is no constant difference either in the ranges of ventrals, and subcaudals. The male clasper is narrow and long and surmounted with very small claw-like tentacles. It is not bifid. Females appear to be more numerous than males in Bangalore, as Dr. Nicholson found 410 of the former against 308 of the latter in 718 cobras sexed by him. In Cannanore, however, I got 8 ♂ ♂ to a single ♀. In Chitral out of 18 sexed 11 were ♀ ♀ and 7 ♂ ♂. In Fyzabad I collected 18 ♂ ♂ to 15 ♀ ♀.

*Breeding.*—The mating season extends over several months of the year. Flower in Siam had a gravid female with eggs fit for discharge judging from their measurements in the month of January. Nicholson had several gravid females with eggs about an inch long in February at Bangalore, and I had one in a similar condition at Cannanore in the same month. Mr. E. E. Green also had a gravid female in Ceylon in the same month. Colonel Dawson had captive cobras in Trivandrum, which were observed "in copula" in January. Mr. H. Hampton wrote to me of a pair he had in captivity at Mogok, Ruby Mines, Burma, that were observed coupled at the end of March. Evans and I obtained gravid females in Rangoon in July and August, one specimen in July showing but little enlargement of the ovarian follicles. Mr. Foulkes told me some years ago of a pair reported coupled in June at Rajamundry.

The act of mating has been witnessed by Colonel Dawson and Mr. H. Hampton to whom I am indebted for the following details. In Trivandrum the pair remained coupled from 11 a. m. uiuti 4-20 p.m. on the 17th of January. In Mr. Hampton's vivarnl coitus lasted intermittently for three days. He observed that thm pair nodded their heads continually, and their bodies quiverede They did not take the slightest notice of anybody in front of their cage. They did not expand their hoods, neither did they wrap themselves around one another. Each turned the vent upwards and sideways to effect engagement.

*Period of gestation.*—The cobra is known to be oviparous, and the period of gestation is accurately known in Colonel Dawson's case.



COBRAS (*Naia tripudians*).

*Photograph from life by Major F. D. S. Fayrer, I.M.S.*

Sixty-two days after coitus, *i.e.*, on the 20th of March, eight eggs were deposited, the first at 8 a.m., six more almost immediately, and then after the lapse of half an hour the last. In Mr. Hampton's case the mating was observed towards the end of March, and eggs were not deposited until the middle of August, nearly 5 months.

*Season of Egg-laying.*—The usual month for the deposition of eggs is May. All the eight cobras that have laid eggs at Parel Laboratory did so in that month. Nicholson, too, says that about Bangalore they are laid in May and early June. Mr. Phipson remarked that eggs are laid in the rains, and Fayrer, too, says that his snakemen told him that about Bengal they laid eggs in the rains. Two eggs sent to me from our Society's collection were deposited in June. Wall (A. J.) mentions eggs laid in July, and Hampton's eggs were laid in the middle of August at Mogok.

*Size of Eggs.*—The eggs are elongate, white, ovals with soft shells, and similar poles. The two sent me from our Society measure 49 × 28 mm. (a shade under 2 inches in length). The almost mature eggs extracted from the maternal abdomen by Flower measured 53 × 34 mm. Eggs sent me from Parel vary much, and are much smaller, and it occurs to me they may have been infertile. Two of these measured 41 × 20 mm., one 38 × 19, one 32 × 20, and a fifth 29 × 15 mm.

*Number of Eggs.*—From over a dozen records, I find that the usual number of eggs laid is 12 to 22. I find one record of 8, and the only record of over 22 is Mr. Hampton's. In this case 45 eggs were deposited, 36 seemingly good, and 9 apparently infertile.

*Incubation.*—Fayrer says on the evidence of his snakemen that the cobra incubates her eggs, and that they frequently dug out mother, and brood. This is in accordance with the habits of other snakes and receives direct confirmation from Colonel Dawson, who told me that at first his dam coiled herself among her eggs. The period of incubation has been ascertained at Parel. Eggs laid on the 12th May hatched out on the 20th of July, *i.e.*, in 69 days. The period that elapses then between coition, and the advent of the young is rather over 4 months.

*Hatchlings.*—Mr. Phipson reported young measuring only 7½ inches as they emerged from the eggs in our Society's rooms. All the other testimony at my command agrees in assigning to the hatchling a length of 10 to 11 inches. Assistant Surgeon Robertson told me the young he saw just hatched measured 11 inches. I measured one of those that hatched at Parel, which was bottled at once, and found it was 10½ inches long. Nicholson remarks that at birth they are less than one foot. Now Colonel Bannerman extracted an embryo from an egg 43 days after deposition, and found it taped 7 inches. Another that was removed from an egg by me measured 9 inches; but it is not specified at what

lapse of time after deposition. It is curious from these two last specimens to account for Phipson's hatchlings only measuring 7½ inches. I have had young cobras brought to me measuring 10½ inches in June at Cannanore and 11⅛, 12½ and 12¾ inches at Fyzabad in July. Nicholson remarked that out of 1,000 cobras brought to him in May to August 1873, 230 were young of the season measuring from 12 to 16 inches, and of 1,220 in the year 50 were from eggs deposited. It seems to be a common belief that young cobras newly hatched are not poisonous. This is certainly a mistake, as Mr. Phipson reported that the young cobras that hatched out some years ago in our Society's rooms killed a small Malay python (*Python reticulatus*) which was placed in their cage, a few days after they were born. They attacked it at once, biting it viciously across the back.

*Growth.*—Phipson referring to the hatchlings that were 7½ inches when they emerged from the egg, says they grew an inch and a half in about two months, but as these specimens appeared to have died of inanition, having refused all food, one may be certain this underestimates the normal growth. Similarly, I have had specimens submitted to me from Parel which did not develop as cobras usually do in a state of nature. Four of these born on the 18th July 1910 were consigned to spirit on the 2nd of November. I measured these, and found them 11 9/16, 12, 12, and 12⅝ inches. A fifth specimen born on the 20th July 1910 died on the 7th December, and I find it is 12¾ inches long.

Nicholson's observation shows that young measuring less than a foot at birth attain a length of from 2½ to 3 feet by the end of their first year of life. This rate of growth is out of all proportion to that noted by me in connection with other snakes, and I expected to find some error in his conclusions. My own notes, however, confirm Nicholson's statements. I find that young averaging 12 inches in July, average 2 feet 6 inches by the next July. At the end of their second year they average 3 feet 8 inches, at the end of the third 4 feet 2 inches, and at the end of the fourth 4 feet 10 inches. The growth, it will be seen, is especially rapid during the first year, and progressively diminishes in subsequent years. In other snakes I find it the rule that the young proximately double their length in the first year.

*Sloughing.*—Fayrer* mentions a cobra that cast its skin on October 17th, and again on November the 10th, and December the 7th. Another in his possession desquamated on the 15th of October and on the 6th of November. In Trivandrum† a captive cobra shed its skin on November 10th, 1902, and on February 19th, April 8th and July 28th in 1903. I have been told by snakemen that ecdysis

* Loc. cit, pp. 144 and 143. † *The Field*, 16th April 1904.

occurs about once a month, and Vincent Richards gives about the same period between successive moults from his observations.. It will be seen from the above that there is no regularity in this function, which may occur at intervals ranging between three weeks, and three months. I am informed by snakemen that specimens in captivity sicken during this period, and that they are afraid to give them food or drink as it upsets them. They certainly appear very dull, and non-captive specimens are most likely to meet with their death, if they venture out of their holes at this time, the disc before the eye becoming so opaque that the creature is virtually blind for some time.

*Foes.*—In a former Journal* I published a list of the enemies of snakes in their natural haunts, any of which I take it may include the cobra in their dietary. Among mammals, the Mongoose has been conceded a special place as a destroyer of cobras. Personally I always had the greatest difficulty to get my captive Mongooses, and I have had three or four to face my captive cobras, much less attack them. Mr. Stevens in Assam told me he once witnessed an encounter between a Mongoose and a cobra. The snake managed to evade the carnivore, in the tall grass and was killed by Mr. Stevens. An interesting incident was reported to me by Mr. Reid showing that some animals have an instinctive dread of the cobra, or perhaps snakes in general. A herd of buffaloes that were standing, feeding out of a row of "nands," suddenly became very excited, and broke loose, stamping and snorting, and to all appearances were terrified. On investigation a cobra was found close by which was killed, one old cow when she saw it rushed upon its body, and trampled it. This by the way is the method by which deer and pigs are reported to attack and destroy snakes. Gunther says the jungle fowl kills young cobras, and this seems probable, as domestic fowls are known to kill and eat them; an event of this kind happened before the eyes of the late Mr. P. W. MacKinnon in Mussoorie, his fowl killing, and then swallowing the snake with no ill-effects. Both Evans and Craddock have reported instances of the cobra being victimised by the king cobra (*N. bungarus*) in this Journal.† Mr. Gleadow once wrote to me that he saw a large monitor lizard (*Varanus*, spec.) running off with a live snake, 3 or 4 feet long, in his jaws, which when released was shot, and proved to be a cobra.

*Parasites.*—Among entozoa, a very common parasite is the tick. *Aponomma gervaisi.*—When adult it is about the size of a split lentil, flat, and of a dark plumbeous colour. I have picked as many as a dozen off one snake. A less common parasite I have not been able to get identified, but it is so like the English harvest bug (*Trombidium holosericeum*) in size, and appearance besides being of the same scarlet hue, that I suspect it is a mite of the *Trombidium* genus.

* Vol. XVI, p. 375. † Vol. XIV, pp. 143 and 416.

I have made no special observations on entozoa, but it is pretty certain that both nematodes, and cestodes, similar to those in other snakes, inhabit the alimentary canal.

A parasite known by the name of *Hæmogregorina najæ* is known to inhabit the blood.

*The fangs.*—In Chamber's Encylopædia the article on the cobra says that its fang is not canaliculate, but grooved. Mr. Boulenger too in his catalogue refers to the fangs as being grooved and they are shown with a deficiency in the anterior wall in the figures in Fayrer's and other works. This is most certainly not correct. The fact that there is an indistinct line on the anterior face of the fang does not affect the question of its being canaliculate. The line referred to is a seam which marks the spot where the circumflexed walls of the canal meet and blend. There is a considerable opening at the base of this seam and a much smaller one near its point, where the poison finds exit. It is not generally known that it was this beautifully specialised instrument in the jaws of a poisonous snake, that led a medical man to design the surgical instrument used so freely in these days in the form of the hypodermic needle.

The cobra's fang is relatively small compared with viperine fangs, and is a much more solid and stronger weapon. The length of my largest cobra fang is 7 mm. and was taken from a large adult. The length of the fangs in a fifteen inch *Echis* * in my collection is 5 mm., and those in a 3 feet 4 inch viper (*Lachesis anamallensis*) are 13 mm. My largest hamadryad (*N. bungarus*) measuring 11 feet 5 inches had fangs 10 mm. in length.

There are usually two fully operative fangs fixed in each maxilla, but these are shed singly at intervals, and from Fayrer's experiments 18 days was the shortest period that elapsed between drawing them, and the fixation of a new one.

*The poison gland.*†—This organ, which is really a salivary gland, and the analogue of the parotid gland in mammals including man, consists of a body and a neck. The body is much the shape and size of an almond, and consists of (1) a thick fibrous capsule or jacket, (2) the glandular or poison secreting substance proper, and (3) a duct running centrally in the long axis of the gland. The capsule gives off numerous fibrous septa which pass into the glandular substance and divides the gland into numerous chambers or pockets (the poison lakes of Bobeau). Each pocket is lined with

* This was prepared from the snake that fatally bit an European, whose case was published in this Journal (Vol. XIX, p. 226.)

† I am indebted to Dr. Pearson, the Director of the Colombo Museum, for permission to incorporate the plate herein produced, which appeared in Spolia Zeylanica, Vol. IX, Part XXXIII, and illustrated the interesting description of the gland that accompanied it from the pen of Dr. Bobeau. My remarks on the gland are largely drawn from this source.

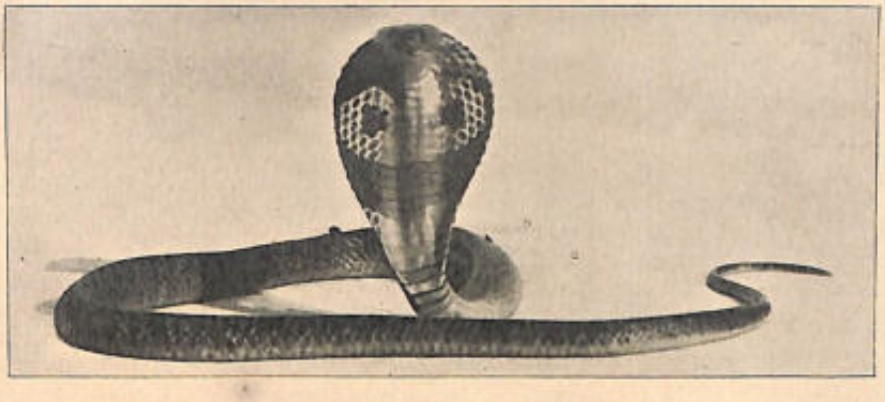
poison—secreting cells, and carries in its walls blood vessels which convey the blood upon which the poison cells depend for their activity. After a period of activity, the pockets which converge forwards and inwards towards the axis of the gland, become distended with poison, and this is poured into the central duct. At the posterior pole the gland ends in a downward projecting lobe. The fibrous capsule dips into the gland just in front of this lobe to

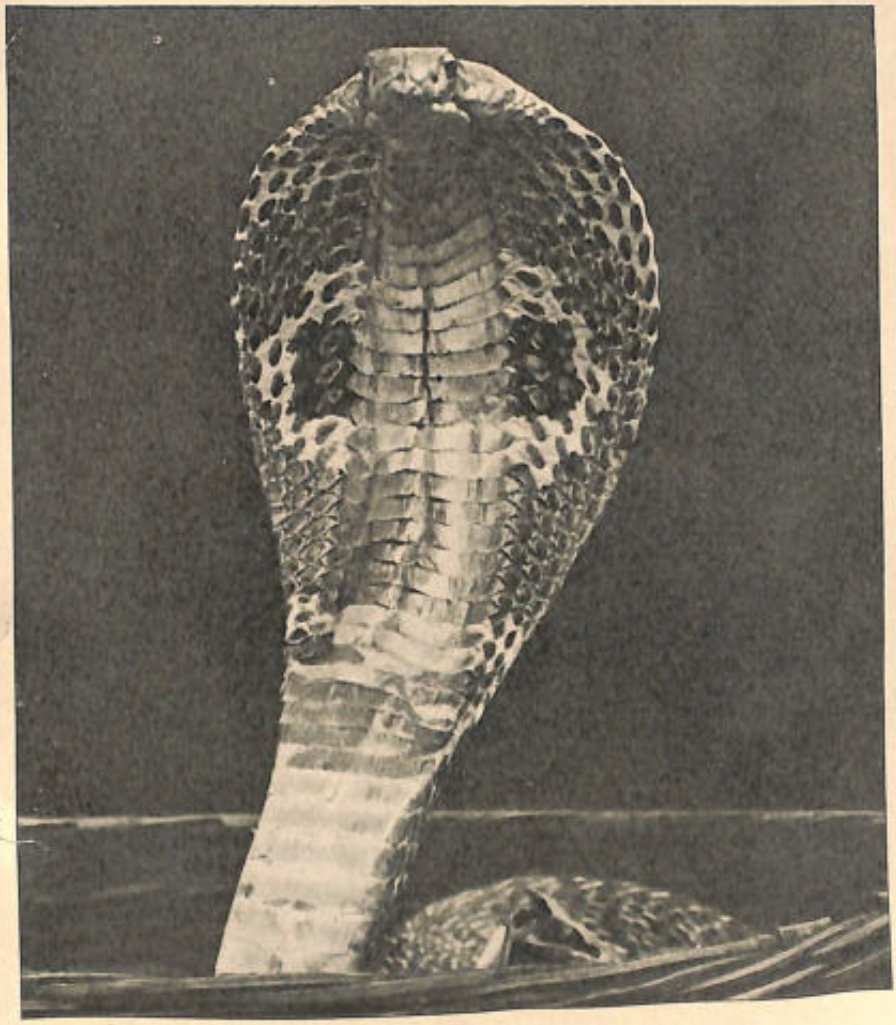
form a furrow for the attachment of an important muscle, the masseter. This muscle originates from the postfrontal bone, and the ridges on the parietal, and is somewhat fan-shaped. Its fibres converge, and pass first backwards over the superior and internal surfaces of the gland, then downwards behind its posterior pole, and finally forwards to be attached to the furrow, or dimple in front of the lobe. The muscle, in fact, embraces a large part of the gland surface, and in contraction squeezes it much in the same way as the hand operates on a bicycle horn, the result being that poison is driven forwards into the duct to pour finally into the mouth. The neck of the gland consists of a sheath which is the direct continuation of the capsule surrounding the body, but is much thinner. Centrally is the poison duct, and intermediate between the sheath and the duct a series of mucous glands. These are placed at right angles to the axis of the duct, and discharge their mucous into that channel where it mingles with the poison proper. In section the gland appears to the naked eye much like a sponge.

Our plate shows a vertical section in the length of the gland, the diameter in this direction being more than twice that in a transverse direction. In other words, the gland is markedly compressed. The constricted portion or neck is the most anterior part. The little lobe situated at the posterior pole, and directed downwards is well shown.

*Physical characters of cobra poison.*—Cobra venom when freshly secreted, is a clear, amber-coloured, very viscid fluid with a specific gravity of 1050. It resembles olive oil in appearance and consistency and soon solidifies into an amorphous, brittle mass, fissuring in all directions, and losing from 60 to 75 per cent. of its weight in the process of drying.

Major Glen Liston has very kindly weighed me a drop of fresh cobra venom in the balance at Parel Laboratory, and find it weighs proximately 35 mgms. Allowing a loss of 68 per cent. in drying, the residue of one drop would weigh 11 mgms. It is somewhat remarkable that a drop of olive oil to which I have compared cobra venom in appearance and consistency only weighs 6 mgms. in the same balance at Parel. When dry the poison retains its transparency and resembles gum or amber. In the dry state it keeps well, and preserves its virulent character according to Vincent Richards for at least 15 years. The same authority shows that though there has been some difference of opinon among authorities, poison is acid when fresh, and this, in spite of the fact that the normal reaction of the cobra's mouth is alkaline. Lamb has confirmed these observations. After the lapse of some hours the venom becomes neutral. Dr. Nicholson says it is slightly bitter to the taste and causes a feeling of frothy soapiness in the





COBRAS (*Naia tripudians*).
*Photographs from life by Major F. D. S. Fayrer I.M.S.*

mouth, at the same time stimulating the flow of saliva. The same authority remarks that the dried particles have a pungent action upon the nostrils. Lamb describes the taste as very bitter and astringent.

*Quantity of poison secreted.*—This, of course, varies with the size of the cobra, but even in specimens of similar length other factors affect the yield. Lamb says: "it is an observation of common occurrence in this laboratory (Parel), that a cobra newly caught will yield from 20 to 30 large drops of poison, while after he has been a captive for some time this quantity will have diminished to from 6 to 10 drops and in time to *nil.*" Dr. Nicholson observed that the yield was more abundant in wet weather. Under the influence of anger poison is secreted unduly copiously. Doubtless age, health, and individual vitality also influence the quantity secreted.

The venom in its fluid state is found to vary a good deal in concentration, a cobra's yield is therefore calculated by the amount of solid residue left after drying. Cunningham's average for 9 cobras was 254 mgms. Lamb's for 14 cobras 231, and Rogers's for 2 cobras 249 mgms. Lamb found that by provoking cobras, so as to make them bite viciously, the yield collected in glasses was considerably augmented, as compared with that collected by simple pressure over the glands, and amounted to an average of 373 mgms. for 3 cobras. Cunningham obtained from one cobra the enormous quantity of 726 mgms. The amount of solid, it will be seen, ranges between 200 and 726 mgms. in healthy adult cobras.

*Toxicity of cobra poison.*—Lamb has shown that even the dried product varies in its degree of toxicity, as he found the minimal lethal dose for rats was ·07 mgms. with one sample and ·04 with another.

*Lethal dose of cobra poison in man.*—It is a well established fact that cobra venom may be swallowed in large quantities without producing any baneful results. Elliot gave a dog 10 drops—a dose sufficient to kill 10 dogs, if injected into the tissues—without producing any ill-effect. On another occasion he gave 20 drops to a goat with the same result. Fraser by graduated doses internally succeeded in giving a cat 1,000 times the lethal dose by injection beneath the skin. Calmette repeated the experiment, giving 1,000 times the lethal subcutaneous dose to a cat internally, without producing symptoms of poisoning. It is the access of the venom into the blood stream that constitutes its extreme danger to all animals. The lethal dose of the poison so introduced has been accurately ascertained for many animals by experiment, but in man must remain to some extent conjectural. Various estimates have been made, based on experiments on the lower animals. Fraser's estimate is 31 mgms. whilst Calmette made it about 10 mgms. Lamb,

however, finding that ·25 mgms. is proximately the minimal lethal dose per kilogram weight in monkeys, and postulating an equal degree of susceptibility in man, concludes that the dose for a man weighing 10 stone would be about 15 to 17·5 mgms. If we take Lamb's estimate of the lethal dose for man, which is probably nearest the mark and strike an average for the 25 cobras experimented with by Cunningham, Lamb and Rogers, the average yield of which amounts to 240 mgms., we may state that an average cobra contains poison enough in its glands to kill 15 men. An exceptional cobra may even contain sufficient poison to kill 45 men!

*Rapidity of absorption of cobra poison.*—Blake found that a poison injected into the jugular vein, reached the pulmonary circulation of a dog in from 4 to 6 seconds, and the cardiac circulation in 7 seconds. A poison injected into the same vein was distributed throughout the circulation in 9 seconds. It is this extreme rapidity of transmission in the blood stream that accounts for the fatal issue in experiments where a poisoned member is amputated or wound excised almost immediately after being bitten. Russell* caused a cobra after biting a dog twice, to inflict a wound in the leg of a pigeon, and amputated the member one minute later, but the bird died in two hours. On dissecting up the limb the extravasation peculiar to the local action of snake poison was observed half an inch above the punctures and almost reached the point of amputation.

Fayrer (Expt. 3 of Series 16) caused a cobra to bite a dog in a fold of skin in the groin. The wound was entirely excised "at once," but death took place in 6 minutes. In another experiment (No. 13 of Series 15), the same authority repeated the same performance, the part being "immediately" excised within 2 seconds. The animal died 2 hours and 35 minutes later. It appears probable that the initial absorption of the poison is far more speedy in the first few seconds (or minutes) than subsequently. (?)

When one considers all these facts, the extremely small quantity that constitutes a lethal dose in man, the number of lethal doses of venom available in a normal cobra, and the rapidity of absorption into the blood, it is extremely remarkable tha any bitten subject can escape receiving his death warrant however trivial the injuries sustained. In spite of this it is a well established fact that a certain number of bitten subjects, in which poison too has been indubitably injected do recover, and without treatment. Of course it is obvious in these cases that the dose absorbed was a sublethal one.

*Uncertainty in the effects of cobra bite.*—It seems to me very remarkable how variable are the results of a cobra bite as testified by experi-

* Loc. cit. p. 73. Expt. XXVIII.

ment in the lower animals. Elliot* reports on the authority of Surg.-Major Browning, I.M.S., that on one occasion "a healthy cobra bit a dog in two places with no results ; another bite from the same cobra on the same animal resulted in death." Fayrer† records a parallel case. "A Mongoose and a full-sized cobra were put into a large wire cage at 1 p. m. The snake struck at the Mongoose, and they grappled with each other frequently, and apparently the Mongoose must have been bitten, as the snake held on to it about the neck and head. The next day at noon both were well." There had been two cobras with this Mongoose during the night "both equally fierce striking each other, and the Mongoose, but the latter was not poisoned. He was scratched by the cobra rather severely on the head." But on being bitten in the thigh by the same cobra when both were taken out of the cage "the Mongoose succumbed to the poison and died very rapidly." Again Dr. Davy reports a case where "a cobra, 5 feet long, bit a hen, fixing its fangs in the skin covering the lower point of the left pictoral muscle, and keeping its hold about two or three seconds." The hen died after eight hours. Compare with this Fayrer's‡ fowl that was bitten "by a large cobra in the thigh, fell into convulsions immediately and died in 50 seconds." The literature on the cobra is full of similar conflicting results following its bite; it is obvious that if such occur in lower animals during experiment, they will occur also in the human subjects bitten by accident. Speaking of this uncertainty, Fayrer§ says "snakes frequently strike, and even wound without poisoning."

There is abundant evidence to show that snakes like the cobra, which are known to be capable of delivering a mortal wound, frequently fail to do so, though they may inject poison in considerable quantity. Vincent Richard** says "a man or an animal may be very seriously poisoned by a rattle snake, or indeed by any snake, and yet recover under subjection to various or even no treatment." Weir Mitchell†† cites an experiment with a dog which he says "has especial value as showing how exceedingly grave may be the signs of poisoning, and yet how rapidly and complete may be the rally and escape." At one stage the dog was lying on the floor, scarcely breathing, and nearly pulseless." I could multiply instances "*ad libitum*." So far as the human subject is concerned there are many cases of cobra bite recorded, where no ill-effects were produced, or symptoms of varying severity, not ending in

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* Trans. Brit. Med., Assoc., S. Ind. Br., 1895, page 7.
† Thanatophidia, p. 69.
‡ *Ibid.* p. 80.
§ *Ibid.* p. 64.
** Landmarks of Snake lit, p. 71.
†† EssayonSnake Poison, p. 172.

death, though no treatment was attempted. Dr. Davy* after remarking that the effects of cobra bite "vary a good deal according to circumstances not easy to calculate," says: "I have seen several men who have recovered from the bite of the hooded snake, and I have heard of two or three only to whom it has proved fatal." Russell† mentions a cooly woman whom he saw 10 hours after being bitten by a cobra. P aralysis had advanced so far as to seriously affect her throat, and he had difficulty in getting her to swallow a Tanjore pill. She recovered completely. He mentions another case of a drunken Irishman‡ who declared he was proof against any snake owing to his nationality, and put a cobra into his shirt before an assembled throng. The snake bit him severely in the breast, and he suffered not only great pain locally, but serious constitutional effects, nevertheless he recovered. Dr. Nicholson§ records a case where two snakemen under the influence of drink got bitten by one of their cobras. As some time had elapsed when he saw them he coloured some water pink with his dentifrice which he gave them to allay their fears. Both recovered, though one had a swollen hand next day as a result of the accident. Calmette¶ records another very interesting case where a man was profoundly under the influence of cobra poisoning following a bite, but who persistently refused antivenene which was to hand, took his chance, and recovered completely.

These cases are most instructive, and serve to point two lessons. One is that however serious the symptoms arising from a cobra bite, there is always hope. The other lesson is that nobody is qualified to assume that any given treatment adopted in a certain case has been responsible for its favourable issue. There can be no doubt that the failure to realise this latter truth, has been responsible for the host of reputed antidotes, which have been vaunted from time to time since the days of Celsus, all of which have proved futile when subjected to scientific experiment. It is difficult to say what percentage of cases of cobra bite would not prove mortal. Dr. Davy, speaking of Ceylon cobras, says that recovery follows the bite as often as death. In the article on Snake Poisons in Allbutt's system of medicine, Lamb and Martin say, "the mortality in persons bitten by the larger snakes of India and South America would not, from the scanty records available, appear to be more than 30 per cent."

*Symptoms of cobra toxæmia.*—These may be divided into local and constitutional.

*Local.*—The first, and perhaps invariable symptom, is pain,

* An Account of the Interior of Ceylon, 1821.
† *Ibid.* p. 78.
‡ *Ibid* p. 88.
§ *Ibid.* p. 160.
¶ Snakes, Snake Venoms, etc.

which is of a stinging or burning character, out of all proportion to the mechanical injuries sustained. It comes on immediately, and persists, perhaps lasting for hours. If pain is experienced only to the degree excited by ordinary pricks or scratches, and is but transient, there is a justifiable presumption that poison has not been introduced. Coincident with the pain, and almost as speedy in its appearance is swelling which gradually increases until perhaps the whole limb is puffy. The third invariable sign that venom has gained access to the wounds is the oozing of a blood stained serum. If on the other hand the punctures are sealed with clot as in ordinary wounds shortly after injury, there is every probability, if not actual certainty, that poison has failed to find entry into the tissues. The fourth cardinal sign is one which cannot be detected until the tissues in the site of the wound have been cut into, though it may be inferred if rapidly ensuing swelling has occurred, accompanied with the other signs. The tissues assume a very characteristic appearance, the parts become purplish centrally, the colour fading to scarlet, and then pinkish, and a thin serum exudes. In one case, Wall (A.J.) found this purplish effusion, which is characteristic of the action of snake venom, within 30 seconds of the injection of the poison. When present, it is absolute proof of the absorption of venom; if absent, it is probably equally good proof of the failure of the poison to have reached the tissues.

How intensely irritant the venom is locally is apparent from the rapidity of the symptoms noted above, added to which is the fact that in many cases where the bitten subject recovers, the tissues involved actually mortify, and are thrown off as a slough. Occasionally one sees natives with withered limbs stated to be due to the effects of a snake bite.

The constitutional effects, are a gradual, but rapidly advancing paralysis, due to the action of the poison on the brain and cord. Sooner or later the bitten subject complains of weakness in the legs, and is prompted to recline rather than walk or sit. This weakness creeps up the trunk, and affects the muscles of the neck, so that the head droops, the muscles of the tongue, lips and throat, so that speech becomes difficult, the lips fall away from the teeth, and allow the saliva to dribble, and swallowing becomes difficult or impossible. The eyelids too droop giving a sleepy expression to the face. While these paralyses are waxing, the respiratory function becomes affected, breathing becomes difficult, then laborious and finally death from respiratory failure ends the scene. Among other toxic symptoms may be mentioned, nausea, or actual vomiting, and not infrequently hæmorrhages from various orifices, as a result of the action of the poison on the blood altering its composition, reducing its coagulability, and dissolving the red blood cells.

An easy aid to remember the essential action of the poison is supplied in the word COBRA. CO. stands for COrd and BRA for BRAin, implying that it is the central nervous system that is in the main affected. Again COBR stands for Coagulation Of Blood Reduced, and the final A gives the mode of death, *viz.*, by Asphyxia.

Cases of cobra toxæmia are very seldom well reported even by the medical profession, a great deal being often left to the imagination. I will give one example that was excellently recorded by Dr. Hilson as follows : " On a night in June, at about half-past 12 o'clock, Dabu, a Hindu punkah cooly, was bitten on the shoulder by a cobra, whilst sleeping. On inspecting the wound, there were found over the prominence of the right deltoid muscle, and about three-quarters of an inch apart, two large drops of a clear serous-like fluid tinged with blood, which had apparently oozed from two small punctures, so minute that they could not be perceived by the naked eye. A burning pain was complained of in the neighbourhood of the bite, which rapidly increased in intensity, and extended so as to affect a circular portion of the integument of the size of an ordinary saucer ; and judging from the description given of it, it was very similar in character to that produced by the sting of a scorpion.

" At 12-45 a.m., or about a quarter of an hour after being bitten, he complained of a pain in his shoulder shooting toward his throat and chest, and said he was beginning to feel intoxicated ; but there was nothing in his appearance at this time to indicate that he was in any way under the influence of the poison. On the contrary, he was quite calm and collected, and answered all questions indifferently, at the same time that he was fully alive to the danger of his condition. The pupils were not dilated, and they contracted when exposed to the light of a candle ; his pulse was normal, and there was no embarrassment of the respiration. About five minutes after, he began to lose control over the muscles of his legs, and staggered when left unsupported. At about 1 o'clock, the paralysis of the legs having increased, the lower jaw began to fall and frothy and viscid saliva to ooze from the mouth. He also spoke indistinctly, like a man under the influence of liquor. At 1-10 a.m. he began to moan, and shake his head frequently from side to side. The pulse was now somewhat accelerated but was beating regularly. The respirations were also increased in frequency. He was unable to answer questions, but appeared to be quite conscious. His arms did not seem to be paralysed. He continued to moan and shake his head from side to side, as if trying to get rid of viscid mucous in his throat. The respirations were laboured, but not stertorous. The breathing gradually became slower, and finally ceased at 1-44 a.m. while the heart continued to beat for one minute longer. "

*Rapidity of death in the human subject.*—The interval that elapses

between a cobra bite and the death thereby occasioned varies considerably. The shortest interval that I have any record of is half an hour. Fayrer* reports one case that died in this short interval, the bitten subject being an adult man. *The Pioneer* of the 27th of April 1908, reported a European lady, Mrs. Cockely, succumbing to the bite of a cobra in half an hour. The wound was inflicted on the top of her toe, and the snake was killed there and then by her husband. More often the interval that elapses amounts to hours, from about two to six hours being perhaps usual. A woman mentioned by Fayrer died after 8 hours, and other cases have been reported exceeding 24 hours.

*Treatment of cobra bite.*---From the voluminous literature on experimental work, with the object of testing various reputed antidotes to cobra or other snake venoms, and of testing the value of mechanical contrivances for checking the absorption of these poisons, one cannot escape the conviction that there is only one known remedy, *viz.*, antivenene. Fayrer's work alone is convincing enough and he spared no pains and gave every possible method a fair trial. Drugs of all sorts, those vaunted by professional snakemen, as well as those from the British Pharmacopiæa were administered by the mouth, by injection into the tissues at the site of the wound, and introduced into the veins, with no benefit. The actual cautery, strong corrosive liquids locally, and the introduction of oxidising agents such as permanganate of potash, which are known to neutralise and destroy the poisonous properties of cobra venom in a vessel were employed at the seat of the wound without avail. Ligature, excision and amputation were all tried, and proved futile, and the so called "snake stones" were as useless as everything else.

Fayrer's experiments have been repeated, and supplemented by numerous conscientious workers in this field, and abundantly confirmed. The resuscitated "remedy," permanganate of potash, has lately been the subject of an exhaustive investigation at the hands of Colonel Bannerman at Parel and has proved to be completely unsuccessful. The conditions of an accidental bite were imitated as far as possible, and I had the privilege of witnessing some of the experiments. A syringe charged with the lethal dose of poison was fitted on to a Russell's viper's fang. A puncture in the dog's skin was made with a knife point, the fang introduced, and the poison injected. Within a couple of seconds or so, the puncture was cut down upon and permanganate crystals well rubbed in. There was no doubt of the thoroughness of the attempt to bring the salt into relationship with the poison, but it signally failed to avert death. I saw the previous day's dead subject also dissected, and the typical effects of the poison were seen to have been diffused as high up as

* Loc. cit. p. 53.

the thigh, though the envenomed puncture had been made in the foot. These experiments merely confirmed those made by Vincent Richards, who performed no less than 100 operations in the early eighties of last century, and those of Fayrer reported in 1882.

After reading, and studying a copious literature on experimental work, there seems only one conclusion to be drawn, and that is, that no method of procedure, whether prophylactic, symptomatic, or so-called antidotal, will avert the fatal issue in cobra bite, where the dose injected is supralethal, except the injection of antivenene. One might, I think, discard the consideration of treatment altogether in cobra bite cases where antivenene has not been injected, and arrive at a faithful estimate of the percentage of fatalities.

*Antivenene.*—The first steps towards the discovery of this antidote appears to have originated with Sewall in 1886, who proved that an animal could acquire a tolerance for snake poison, till a dose in excess of the ordinarily fatal one carried no ill-effects. Kaufmann in 1889, Kanthack in 1891, Phisalix and Bertrand in 1893, Calmette in 1894, and Fraser in 1895 confirmed Sewall's results, and Fraser succeeded to the extent of conferring on rabbits a toleration to 50 times the usual minimal lethal dose. Calmette, and Phisalix and Bertrand in 1894 and Fraser in 1895 proved that the serum of an immunised animal possessed antidotal properties and Fraser called the product antivenene. In Kasauli where antivenene is prepared for issue in India, the horse is immunised, and when accomplished to a high degree, the animal is bled and the serum separated.

One cc of the serum as issued is capable of neutralising 1 mgm. of cobra venom, and the dose recommended for injection into the veins by Lamb and Martin is at least 100 cc.*

Antivenene has been experimented with on the lower animals, into which a known quantity of cobra venom in excess of the minimal lethal dose has been injected, and the animals have been saved from an otherwise inevitable death.

It is extremely disappointing however to find on studying the statistics of snakebite fatalities published yearly in the Reports of the Sanitary Commissioner, Government of India, that the mortality in cases of ophitoxæmia cases has been scarcely reduced since the introduction of this remedy. The figures available are all the more discouraging because the circumstances under which the cases have been treated have been peculiarly favourable, the cases having occurred in the British or Native Army, or in Jails where medical assistance is available at all times, and within a few minutes, and antivenene always to hand. The three conditions laid down for successful treatment are—(1) the injection should be made as soon

* Loc. cit.

as possible after the bite; (2) it should be made intravenously; and (3) not less than 100 cc. should be injected. At least ten times this amount would be necessary to protect the bitten subject, if injected into the tissues, and there is no comparison to the speed of absorption in this compared to the intravenous method.

The antivenene now issued is reckoned to retain its virtue for a period of two years at least, after which it should be rejected as of dubious efficacy.

It will be seen from the figures to which I have access that the percentage of deaths from snake bite cases, all species included, for six years previous to the issue of antivenene was 8·71, and for eight years since the issue of this antidote, the percentage is 7·36 (*vide* table appended):—

BEFORE ISSUE OF ANTIVENENE.

| Year. | British Army. | | Native Army. | | Jails. | | Total. | |
|---|---|---|---|---|---|---|---|---|
| | Cases. | Deaths. | Cases. | Deaths. | Cases. | Deaths. | Cases. | Deaths. |
| 1896 .. .. | 2 | 2 | 13 | 1 | 15 | .. | 30 | 3 |
| 1897 .. .. | 1 | .. | 15 | 3 | 37 | 1 | 53 | 4 |
| 1898 .. .. | 1 | .. | 8 | 1 | 21 | .. | 30 | 1 |
| 1899 .. .. | 2 | .. | 11 | 4 | 20 | .. | 33 | 4 |
| 1900 .. .. | 1 | .. | 12 | 1 | 14 | 1 | 27 | 2 |
| 1901 .. .. | 2 | .. | 9 | .. | 11 | 3 | 22 | 3 |
| Total .. | 9 | 2 | 68 | 10 | 118 | 5 | 195 | 17 |

AFTER ISSUE OF ANTIVENENE.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1902 .. .. | 2 | .. | 9 | .. | 13 | 1 | 24 | 1 |
| 1903 .. .. | .. | .. | 15 | 2 | 21 | .. | 36 | 2 |
| 1904* .. .. | 2 | 1 | 11 | .. | 25 | 1 | 38 | 2 |
| 1905 .. .. | .. | .. | 10 | 2 | 19 | .. | 29 | 2 |
| 1906 .. .. | .. | .. | 9 | 3 | 17 | .. | 26 | 3 |
| 1907 .. .. | .. | .. | 17 | .. | 30 | 2 | 47 | 2 |
| 1908 .. .. | *2 | 2 | 12 | 4 | 31 | 2 | 45 | 8 |
| 1909 .. .. | 3 | .. | 13 | .. | 24 | 1 | 40 | 1 |
| Total .. | 9 | 3 | 96 | 11 | 180 | 7 | 285 | 21 |

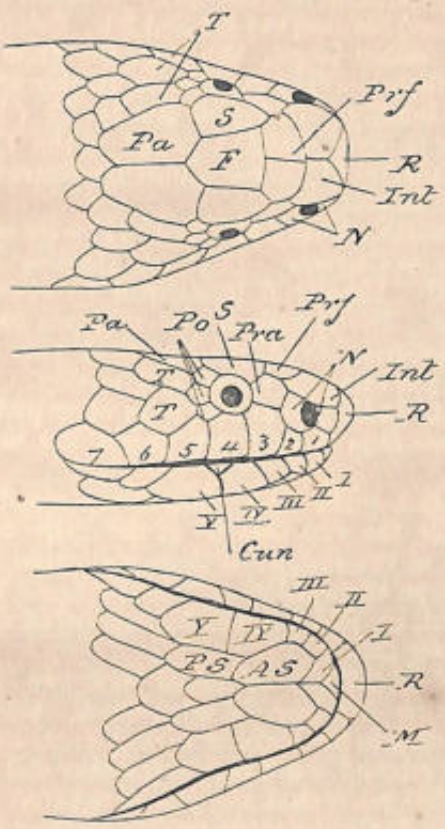
* Polyvalent Antivenene issued.

Although cobra venom does not directly depress the heart, other influences are very likely to affect that organ in cases of cobra poisoning. Pain, fright, and cold are all powerful depressants to cardiac activity, and may seriously endanger life. It is most essential therefore in treating cobra poisoning to look for any tendency to faintness, and treat this vigorously. Antivenene of unquestionable activity, administered intravenously in adequate doses cannot be expected to save a patient who is suffering from cardiac weakness due to non-toxic causes. A feeble or rapid pulse, with cold body surface, specially noticeable in the extremities, and a subnormal temperature are though silent, vociferous appeals from an inarticulate subject for vigorous stimulation of the heart. The non-professional attendant can do much in such cases. He can subdue if not actually relieve pain by hot fomentations. He can apply friction with powdered ginger or mustard to various parts of the body in turn, whilst the rest of the body is covered up with blankets, and can pursue this course until eight or a dozen hot water bottles can be filled, when they should be wrapped in flannel garments or blankets, and applied all round the patient. He can give hot stimulating drinks, such as coffee, bovril, etc., if the patient can swallow. These should be given in small quantities (half a coffee-cupful or so) every ten minutes. Alcohol should not be given. He can further seek to gain the patient's confidence, allay his fears, and reassure him as to his fate. Possibly the neglect of attention to syncope has been responsible for the disappointing results of antivenene as shown in the table above.

*Freaks.*—Albinism is a very rare freak in reptiles, and the only albined cobra I have heard of is the one mentioned by Tennent* in his book on Ceylon. Melanism, on the other hand, is a common condition in snakes, and, as already mentioned, I regard the black cobras usually classified under variety *cæca* as melanotic specimens of variety *typica*. Double-headed snakes are rareties, but a fair number have been collected in various Institutions. The Indian Museum owns a double-headed cobra (an example of anterior dichotomy) presented by the Nawab of Dacca.

*Lepidosis.*—*Rostral*—Touches 6 shields; the rostro-internasal sutures much the largest. *Internasals*—Two; in contact with præoculars; the suture between them less than that between the præfrontal fellows, much less than the internaso-præfrontals. *Præfrontals.*—Two; in contact with the internasals, præoculars, and supraoculars; the suture between them greater than the præfronto-frontal. *Frontal.*—Touches 6 shields; the fronto-supraocular sutures about twice the fronto-parietals. *Supraocular*—Longer than, but about as broad as the frontal. *Nasals*—Two; in contact with

* Vol. 1. p. 192.




*Naja tripudians* (× ⅓)

| | | | |
|---|---|---|---|
| A. S. | ...Anterior Sublinguals. | Pra. | ...Præoculars. |
| Cun. | ...Cuneate. | Prf. | ...Præfrontals. |
| F. | ...Frontal. | P. S. | ...Posterior Sublinguals. |
| Int. | ...Internasal. | R. | ...Rostral. |
| M. | ...Mental. | S. | ...Supraocular. |
| N. | ...Nasal. | T. | ...Temporals. |
| Pa. | ...Parietals. | 1-7. | ...Supralabials |
| Po. | ...Postoculars. | I-V. | ...Infralabials. |

the 1st, 2nd and 3rd supralabials. *Præocular.*—One. *Postoculars*—Three usually (rarely two). *Temporals*—Two; the lower touching the 5th and 6th supralabials. *Supralabials*—Seven; the 3rd and 4th touching the eye. *Infralabials*—Five; the 4th and 5th subequal

touching the posterior sublinguals. A small cuneate scale (rarely two, rarely none) between the 4th and 5th. *Sublinguals.*—Two pairs; the anterior rather larger, the posterior quite separated by a single scale. *Costals*—Very variable in number according to the variety and the locality. In *Typica* usually 23 ( less commonly 25 ) in midbody in South India; 21 or 23 in the Central Provinces; 23 (less commonly 21) in the United Provinces; 21 in the Punjab and Western Himalayas.

In *fasciatia* usually 23 (rarely 21) west of Calcutta; 21 (rarely 19) east of Calcutta. In variety *sputatrix* 19 or 21. In variety *oxiana* 21. Usually 6 (sometimes 8) rows are absorbed before the vent. The vertebral row subequal to adjacent scales, or rather narrower, no keels. No apical pits. *Ventrals* variable in number according to variety and locality. In *typica* from Ceylon and South India 170 to 193, from other parts of India 176 to 200. In *fasciata* from Assam and Burma 179 to 194. In *oxiana* 195 to 213.

*Anomalies.*—The head shields are wonderfully constant, and except for the rare absence of the little cuneate shield, and the presence of two instead of three posticulars I do not think I have ever seen an abnormality. Two specimens killed by Mr. Bernard Cooke had, he told me, the 3rd supralabial divided into an upper and a lower part.

*Dentition.*—*Maxilla* furnished with two operative canaliculate fangs. One of these is often loose, not yet having become anchylosed into the bone, or having functioned is about to be shed. A single grooved tooth in the posterior end of the jaw is usually present, but when shed may not be replaced for some days. *Palatine.*—6 to 8 subequal teeth grooved on their inner faces. *Pterygoid.*—In varieties *Typica* and *Fasciata* 11 to 15 grooved on their inner faces, and diminishing in size posteriorly. In *oxiana* 20 to 22. *Mandibular*, 13 to 15, grooved on their outer faces, reducing in size behind.

Our coloured plate (page 243) shows three varieties of the cobra, (1) *typica*, the binocellate or spectacled cobra of Europeans, and the "gokurrah" of natives: (2) *cæca*, the blind cobra with no hood marks; and (3) *fasciata*, the monocellate cobra of Europeans, and the "keautiah" of natives in Bengal. Mr. Gerhardt is to be congratulated on the excellence of these pictures which are most life-like.

Plates A and B are reproduced from Major Fayrer's most successful photographs. The upper figure in Plate B shows the hood expanded, and a very moderate degree of erection of the body. Contrast with this the three specimens in figure A, all of which are seen erected to their full extent.

# PLANTS OF THE PUNJAB.

## A BRIEF DESCRIPTIVE KEY TO THE FLORA OF THE PUNJAB NORTH-WEST FRONTIER PROVINCE AND KASHMIR.

BY

Colonel C. J. BAMBER, F.L.S.,

*Indian Medical Service.*

PART XII.

*(Continued from page 143 of Volume XXII.)*

HERBS, ERECT, WITH ALTERNATE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

**Convolvulus Aitchisoni,**
CONVOLVULACEÆ.
F. B. I. iv. 218.
Jhelum, Salt Range (Aitchison).
Sakesar.

small to medium size, white woolly root-stock, woody, perennial, annual stems 1-4 in., leaves clustered, linear, radical 1½ in., linear or oblong densely hairy on both sides; flowers 1 in., pinkish white, in clusters, bracts ⅔ in., narrowly lanceolate, calyx deeply 5-lobed, lobes linear, hairy ½ in., corolla wide-mouthed, 5-plaits hairy without, stamens 5, within the corolla, stigmas 2, thread-like, nearly equal to the style, capsule round, 4-seeded.

**Convolvulus microphyllus,**
CONVOLVULACEÆ.
F. B. I. iv. 218.
Bhera, Sargodha.
Baluchistan (C. B. Clarke).

like the last species, but larger, flowers pinkish yellow, smaller and axillary.

**Convolvulus pluricaulis, var. macra,**
CONVOLVULACEÆ.
F. B. I. iv. 218.
The Plains to 3,000 ft.
Rawalpindi.
Delhi.

very like the last species, but corolla larger, ⅔-¾ in.

HERBS, ERECT, WITH ALTERNATE EXSTIPUTATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

**Convolvulus glomeratus,**
CONVOLVULACEÆ.
F. B. I. iv. 219.
The Plains of the Western Punjab and N.-W. F. Province.
Baluchistan (C. B. Clarke).

medium size to large, root-stock biennial or perennial, spreading, leaves ½-1½ in., oblong, nearly sessile, sparingly hairy; flowers ½ in., in heads on stalks ½-¾ in., with leaflike bracts ½-1 in., or heads sessile on short axillary branches, calyx-lobes 5, ⅛ in. long, lanceolate, hairy, short-pointed, corolla tubular, mouth narrow funnel-shaped, for other characters see *Convolvulus Aitchisoni* above.

**Evolvulus alsinoides,**
CONVOLVULACEÆ.
F. B. I. iv. 220.
The Plains to 6,000 ft.
Valleys below Simla.
Syri (Collet).
Kalka.
Baluchistan (Boissier).

small, perennial, spreading, sometimes prostrate, silky hairy more or less, white, yellow or rusty, annual branches many; leaves ¼-1 in., rarely 1½ by ⅛ in. linear or oblong, sessile or nearly so; flowers ¼-⅜ in., blue or white, 1-3 together sessile or on minor stalks ⅛ in. long clustrered on a main stalk ½-1½ in., bracts linear, hairy, calyx-lobes 5, ⅛-¼ in., lanceolate, hairy, corolla funnel-shaped, tube very short, barely 5-lobed, folding at the angles, stamens 5 attached near the bottom of the corolla-tube, styles 2 branching into 2 linear stigmas; capsule ⅛-⅙ in., round, 4-valved, seeds 4, smooth.

**Breweria latifolia,**

see Shrubs, Erect, Alternate, Exstipulate, Simple, Petals United.

**Solanum coagulans,**

see Herbs, Erect, Alternate, Exstipulate, Lobed.

**Solanum xanthocarpum,**

see Herbs, Erect, Alternate, Exstipulate, Lobed.

**Solanum gracilipes,**
SOLANACEÆ.
F. B. I. iv. 237.
The Plains.
Baluchistan (Boissier).

medium size, perennial, velvety with minute star-shaped hairs, stem prickly prickles short, conical, partly curved back; leaves 1½ in. diam., ovate or circular with a wavy edge often nearly heart-shaped, not prickly; flowers ⅜-in. sessile on short axillary one-to three-flowered main stalks or on nearly terminal minor stalks one to three together on very short lateral branches, calyx lobes 5, ¼ in., linear, in fruit ½ in., corolla tube short, deeply lobed, lobes 5, folded in bud, wheel-shaped, stamens 5, in corolla throat, tops meeting in a cone; berry ¼ in., round, smooth, larger than the calyx-lobes, seeds ⅛ in. diam., many discoid, smooth.

**Physalis minima,**
SOLANACEÆ.
F. B. I. iv. 238.
The Plains to 7,000 ft.
Simla (Collett).

medium size, annual, velvety, often spreading; leaves 2 by 1½ in., ovate, angular, short-pointed, stalk 1 in., flowers ½ in. diam., yellow or blue, single on axillary stalks, calyx 5-lobed, ⅛-⅓ in., lobes lanceolate in fruit, calyx ½-1 in., ovoid or round, 5-10 ribbed, loosely enclosing the fruit, corolla broadly bell-shaped, almost 5-lobed, folding at the angles, stamens 5, berry ½ in. diam., round green, seeds 1/12 in. diam., very many, discoid, surface netted.

HERBS, ERECT WITH ALTERNATE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

**Physalis peruviana, Cape gooseberry,** *Tepari.*
SOLANACEÆ.
F. B. I. iv. 238.
The Plains to 5,000 ft.

like the last species, but more hairy, stouter, fruit-calyx larger, corolla yellow with five large purple spots at the base within, fruit yellow when ripe. This plant is indigenous and cultivated in Tropical America, cultivated widely in India for its sweet acidulated berries.

**Capsicum frutescens, Chilli,** *Lal mirch.*
SOLANACEÆ.
F. B. I. iv. 239.
The Plains to 5,000 ft.
Kashmir.
Baluchistan (Hughes-Buller).

medium size, annual, smooth or nearly so, stem woody, much branched, bushy; leaves 2-4 by ½-1 in., lanceolate margin entire or slightly wavy prolonged into the stalk, stalk ¼-½ in., flowers ½ in. across, white on solitary axillary stalks or 2-3 together, calyx bell-shaped, minutely 5-toothed, ridges running into teeth, corolla wheel-shaped, 5-angled, stamens 5, anthers fringed with black, style short, stigma round; berry 2-3 in., yellowish red, tapering, long, skin loose, seeds many discoid. This plant is not indigenous, it is probably indigenous in America; it is widely cultivated for its pungent fruit, which is used as a condiment.

**Capsicum minimum, Bird's-eye-Chilli,**
SOLANACEÆ.
F. B. I. iv. 239.
The Plains.

like the last, but smaller, flower stalks mostly 2-3 together, berry red, 1½ by ½ in., or smaller, nearly erect. This plant is only found cultivated and is used as a condiment.

**Capsicum grossum,**
SOLANACEÆ.
F. B. I. iv. 239.
The Plains.

like the last, but the flower stalks are solitary, nodding in fruit, berry 3 by 2 in. or smaller, red. This plant is only found cultivated and is used as a condiment.

**Withania somnifera,**
SOLANACEÆ.
F. B. I. iv. 239.
The Plains.
Lahore.
Salt Range.
Baluchistan (Stocks).

medium size to large, greyish-green, branches round; leaves 2-4 in., ovate, thinly woolly, hardly pointed, stalks ¼-½ in; flowers ¼-½ in., greenish yellow axillary sessile or shortly stalked, solitary or clustered, calyx ¼ in. in flower, ½ in. in fruit, bell-shaped, 5-6-toothed, in fruit papery, swollen, enclosing the berry, corolla bell-shaped, lobes 3-6 short, stamens 5-6, on the base of the corolla, stigma shortly 2-fid; berry ¼-½ in. diam., round, seeds many, discoid.

**Withania coagulans,**
see Shrubs, Alternate, Exstipulate, Simple.

**Datura stramonium,**
**Datura fastuosa,**
**Physochlaina procalta,**
see Herbs, Erect, Alternate, Exstipulate, Lobed.

SOLANACEÆ.
F. B. I. iv. 244.
North Kashmir
12—15,500 ft.

large, nearly smooth, branches clustered towards the top; leaves 4-6 by 3 in., ovate-oblong, wavy margins, stalk 1-4 in.; flowers ¾-1¼ in., stalked in a terminal flat-topped sticky velvety cluster 2-8 in. diam., calyx ¼ in., bell-shaped, lobes 5, ¼ in., lanceolate, short, in fruit 1¼ by ¾ in., streaked corolla 1¼ by ½ in., tubular funnel-shaped, lobes 5,

HERBS, ERECT WITH ALTERNATE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

short, overlapping in bud, stamens 5, attached at the middle of the tube protruding, style thread-like, stigma barely 2-lobed, protruding; capsule ½ in. diam., 2-celled, seeds $\frac{1}{12}$ in., very many, net-veined flattened.

**Hyoscyamus niger, Henbane**
SOLANACEÆ.
F. B. I. iv. 244.
Himalaya, 8-11,000 ft.
Narkanda (Collett).
Quetta.

medium size to large, sticky, hairy with an unpleasant heavy odour, stem thick; leaves, radical leaves 6-8 in., entire or coarsely sinnate-toothed or lobed, spreading, oblong-ovate, stem-leaves smaller, sessile, ovate, lobed, changing into bracts above; flowers 1-1¼ in. diam., dark, yellowish-green, veined with purple, sessile on one-sided spikes, rolled back at first, then straight, calyx ¾ in., tube ovoid lobes, funnel-shaped, 5-toothed, corolla funnel-shaped, lobes 5 spreading unequal, broad, short, stamens 5, protruding style thread-like, longer than the stamens, stigma nearly round, capsule ½ in. diam., enclosed in the swollen tube of the enlarged calyx, lower part papery, upper hard, opening along the line between the two parts; seeds $\frac{1}{12}$ in. very many.

**Hyoscyamus pusillus,**
SOLANACEÆ.
F. B. I. iv. 245.
Kashmir.
Ladak, 10,000 ft.
Baluchistan (Stocks).

very like the last, but lower leaves smaller, often lobed, stem leaves stalked often lobed, calyx streaked smoothish, teeth lanceolate, corolla ½-¾ in. yellow, not net-veined.

**Hyoscyamus muticus,**
SOLANACEÆ.
F. B. I. iv. 245.
N. W. F. Province.
Baluchistan (Stocks).

like *Hyoscyamus niger*, but leaves larger, somewhat woolly, stem leaves stalked entire or toothed, calyx streaked, velvety, teeth triangular, not sharp-pointed in fruit, corolla 1-1½ in. dark yellow or nearly white.

**Nicotiana tabacum, Tobacco,**
*Tumaku.*
SOLANACEÆ.
F. B. I. iv. 245.
The Plains to 2,000 ft.

medium size to large, annual, velvety, sticky leaves 4-10 by 2-5 in., oblong, base wedge-shaped; flowers pink, 1½ in. long, in terminal or nearly terminal loose branching racemes, calyx ovoid, teeth 5, triangular lanceolate, corolla-linear-funnel shaped, lobes 5, stamens 5, in the lower part of corolla-tube, thread-like, style thread-like, stigma 2-fid; capsule ¾ in., seeds numerous, small, hardly flattened. This plant is a native of America widely cultivated, sometimes found as an escape near villages.

**Nicotiana rustica,**
SOLANACEÆ.
F. B. I. iv. 245.
The Western Plains.
N. W. F. Province.
Baluchistan (Lace).

very like the last species, but the leaves are ovate with a blunt or heart-shaped base, flowers yellowish in a close flowered branching racemes, calyx teeth triangular with a blunt point, corolla bell-shaped, cylindric, berry ½ in. This plant is a native of Mexico, and only found here as a cultivated plant.

HERBS, ERECT WITH ALTERNATE EXSTIPUTATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

**Verbascum Thapsus,** see Herbs, Erect, Unbranched, Alternate, Exstipulate, Simple.

**Cyanotis cristata,** see Prostrate Herbs, Alternate, Exstipulate, Simple.

**Cyanotis barbata,** see Prostrate Herbs, Alternate, Exstipulate, Simple.

**Cyanotis axillaris,** see Prostrate Herbs, Alternate, Exstipulate, Simple.

STAMENS TWO.

**Anticharis linearis,** SCROPHULARIACEÆ. F. B. I. iv. 250. The Plains. Baluchistan (Boissier).

small, annual, slender, velvety, sticky ; leaves 1-1½ by $\frac{1}{16}$—$\frac{1}{10}$ in. linear, short-pointed ; flowers ½ in. long, pink, axillary, solitary, on thread-like stalks, much longer than the calyx, calyx 5-lobed, lobes narrow, half as long as the capsule, corolla ½ in. long, tube dilating into the throat, lobes 5, flat nearly equal, velvety, stamens 2, perfect, anthers curved, placed cross-ways, style thread-like, stigma blunt or notched ; capsule ¼-½ in., oblong-ovoid long-pointed, seeds many, minute, streaked.

**Veronica anagallis,** see Herbs, Erect, Opposite, Exstipulate, Simple.

**Veronica verna,** see Herbs, Erect, Opposite, Exstipulate, Simple.

**Veronica serpyllifolia,** see Herbs, Erect, Opposite, Exstipulate, Simple.

COROLLA TWO-LIPPED, STAMENS FOUR.

**Linaria minor,** *Toad flax.* SCROPHULARIACEÆ. F. B. I. iv. 252. The Plains.

small to medium size, annual, glandular velvety, branches ascending ; leaves ½-1 in. oblong or ovate with a broad tip, narrowed into the stalk ; flowers small, pale purple with yellow on the lower lip on slender stalks arranged on stouter main stalks, as long as the leaves, bractless, sepals 5, linear, enlarging after flowering, nearly equal to the corolla, corolla two-lipped, tube spurred in front, upper lip erect, 2-lobed, lower spreading 3-lobed, throat nearly closed by the yellow palate, stamens 4, in unequal pairs, within the corolla tube, style thread-like, stigma minute ; capsule pouched, 2-celled, seeds many, oblong, ribbed.

**Antirrhinum Orontium,** see Herbs, Erect, Opposite, Exstipulate, Simple.

**Striga lutea,** see Herbs, Erect, Opposite, Exstipulate, Simple.

**Striga euphrasioides,** see Herbs, Erect, Opposite, Exstipulate, Simple.

HERBS, ERECT WITH ALTERNATE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS NONE.

FLOWERS IN TERMINAL CHAFFY SPIKES.

**Celosia argentea,**
AMARANTACEÆ.
F. B. I. iv. 714.
The Plains to 4,000 ft.
Valleys below Simla (Collett).
Dharampur.

medium size to large, annual, smooth, stem stout or slender; leaves 1-6, linear or lanceolate, stalked or sessile, flowers ½-½ in., white or pinkish, glistening in long-stalked, simple or branched, cylindric, oblong or ovoid spikes, 1-8 by ¾-1 in., looking like the flowering top of a grass, sepals 5, thin, shining, lanceolate, short-pointed, longer than the bracts, petals none, stamens 5, united below into a tube, style long, tip 2-lobed, fruit dry, ovoid, enclosed in the sepals, short pointed, seeds few. This plant is found in fields or near cultivation.

**Celosia cristata, Cocks comb,**
AMARANTACEÆ.
F. B. I. iv. 715.
The Plains.

like the last species, but leaves broader and longer, flowers much smaller, ½-¼ in., pink, red or yellow, spikes often branched with flattened united stalks. This plant is cultivated or found as an escape.

**Digera arvensis,**

see Herbs, Prostrate, Alternate, Exstipulate. Simple.

**Amarantus spinosus,**
AMARANTACEÆ.
F. B. I. iv. 718.
The Plains, to 6,000 ft.
Choa Saidan Shah (Donie).
Sainj.
Valleys below Simla.

medium size to large, annual, green, sometimes red, stem hard, spines ⅜ in. and less, straight, leaves 1½-4 by ¾-2 in. ovate or oblong, blunt, long-stalked, base wedged-shape, 5 spines in each leaf-axil; flowers ⅛ in. long, male and female separate in axillary clusters and in long dense or loose-flowered spikes, bracket one bristle-like and bracteoles 2 at the base of each flower, longer than the sepals, sepals of males long-pointed, of females blunt with a short point, stamens 5, stigmas 2, fruit wrinkled, nearly as long as the sepals, dividing by a circular fissure below the top, top thickened, and divided into 2 or 3, seeds ½₀ in. diam., black, shining, border blunt, not thickened. A weed of cultivation.

**Amarantus paniculatus,** *Bathu.*
AMARANTACEÆ.
F. B. I. iv. 718.
The Plains to 9,000 ft.
Valleys below and Hills above Simla.

large, annual, stout, stem streaked, smooth or very slightly downy; leaves 2-6 by 1-3 in., oblong with the ends rounded or ovate-lanceolate, short-pointed or finely long-pointed; flowers like the last species, but red or yellow in ovate branched racemes, roughly scurfy with spreading recurved bracts, bracts needle-like, very much longer than the long-pointed sepals, seeds ⅟₁₀ in. diam., yellowish-white or densely black with a narrow thin border. This plant is widely cultivated as a rainy season crop.

HERBS, ERECT WITH ALTERNATE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS NONE.

FLOWERS IN TERMINAL CHAFFY SPIKES.

**Amarantus candatus, Love-Lies bleeding,** *Bathu.* AMARANTACEÆ. F. B. I. iv. 719. The Plains to 9,000 ft. Baluchistan (Boissier).

very like the last species, but the spikes are long tail-like and drooping bracts shorter and sepals ovate oblong. This plant is less commonly cultivated.

**Amarantus gangeticus,** AMARANTACEÆ. F. B. I. iv. 719. The Plains to 9,000 ft.

like *Amarantus paniculatus*, but the leaves are often pink or red, bracts and sepals with long bristle-like points, sepals 3, stamens 3, seeds larger, very black with a sharp border. This plant is cultivated and only found on cultivated ground.

**Amarantus viridis,** AMARANTACEÆ. F. B. I. iv. 720. The Plains. Baluchistan (Boissier).

like the last species, but green, bracts shorter than the 2 or 3 sepals, stamens 2 or 3, seeds smaller with a sharp border. This plant is only found in waste places.

**Amarantus polygamus,** see Prostrate Herbs, Alternate, Exstipulate, Simple.

**Amarantus Blitum,** see Prostrate Herbs, Alternate, Exstipulate, Simple.

**Amarantus tennifolius,** see Prostrate Herbs, Alternate, Exstipulate, Simple.

**Ærua javanica.** see Shrubs, Erect, Alternate, Exstipulate, Simple.

**Ærua lanata,** AMARANTACEÆ. F. B. I. iv. 728. The Plains to 2,500 ft. Kahuta, Rawalpindi (Douie). Baluchistan (Stocks).

small to medium size, stock woody, much branched, woolly, sometimes prostrate; leaves ½-1 in. ovate or orbicular, stalked, woolly or smooth; flowers minute, woolly not glistening in spikes, ½-½ in., crowded, forming nearly round clusters, all axillary, sessile, sepals 4-5, short, blunt, all or inner only, woolly, stamens 4-5, united below with interposed linear staminodes into a cup.

**Chenopodium album,** see Herbs, Erect, Alternate, Exstipulate, Simple, Toothed.

**triplex crassifolia,** CHENOPODIACEÆ. F. B. I. v. 5. The Plains to 8,000 ft. Lahore. Baluchistan (Hughes-Buller).

medium size, annual, stem and branches whitish; leaves 1-1½ in., oblong or ovate, tip-pointed or blunt, base wedged, shaped or forked, stalked, not thick; flowers one sexual, male and female on the same plant, male without bracts, sepal, 3-5, oblong, blunt, stamens 3-5, in clusters on slender leafless, long terminal interrupted spikes, female with 2 bracts, sepals none, stigmas 2, fruit enclosed by the much enlarged leaflike bracts, each with a

HERBS, ERECT WITH ALTERNATE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS NONE.

convex, smooth, thick, white, disk at its base, female in small axillary clusters on the lower part of the branches.

**Axyris amaranthoides,**
CHENOPODIACEÆ.
F. B. I. v. 8.
Himalaya, 8-13,000 ft.
Lahoul.

small, annual, with star-shaped hairs or smooth, stem stout or slender, branched from the base; leaves ½-1½ in., ovate or oblong, blunt or short-pointed, stalk short or slender, when dry, pale yellowish or reddish brown; flowers minute without bracts, male and female on the same plant, male in terminal clusters with 3-5 thin transparent sepals and 2-5 slender stamens, female axillary, solitary or mixed with the males, with 3-4 unequal thin sepals, fruit membranous, held by the sepals, flattened or spherical, tip shortly winged or crested, stigmas hairlike, very long.

**Kochia indica,**
CHENOPODIACEÆ.
F. B. I. v. 11.
The Plains.

small, annual, softly hairy, branched from the base, branchlets long widely separating; leaves small, oblong with rounded ends or linear-oblong, short-pointed, sessile; flowers minute, male and female, sometimes separate, bractless, sepals 5 curved in, in fruit closing over leathery with 5 free or united horizontal ovate, blunt, thick wings, forming a broad triangular calyx, stamens 5, anthers large, protruding, style slender, stigmas 2-3, thread-like, seed orbicular.

**Halocharis sulphurea,**
CHENOPODIACEÆ.
F. B. I. v. 19.
The Plains of N. W. F. Province.
Baluchistan (Aitchison).

small, annual hairy with long, bristles; leaves ½-1 in. long, linear, blunt-tipped, almost angled, sessile in clusters at the end of branches, floral, leaves equal to the hairy lanceolate bracteoles; flowers ⅛ in. diam., in headlike clusters, forming long spikes at the end of short branches, sepals 5, lanceolate, thin, transparent, outer softly hairy, stamens 5, on a fleshy disc, anthers linear connected by a long sessile yellow appendage, much longer and broader than the anther, capsule enclosed by the sepals ovoid, flattened, stigmas 2, slender, seed flattened.

**Phytolacca acinosa,**
*Lubar, rinsag, saruaga.*
PHYTOLACCACEÆ.
F. B. I. v. 21.
Himalaya, 4-9,000 ft.
Hazara.
Kashmir.

large, stout, fleshy, nearly smooth; leaves 6-10 by 2½-4 in., broadly lanceolate, long-pointed, narrowed into a short stalk; flowers ⅛ in. diam., green on stalks ¼ in. long in leaf opposed cylindrical racemes 2-6 in. long, bracts linear-lanceolate, thin, sepals 4, broadly oblong, blunt, stamens, 8-10, united below, anthers soon falling off, fruit of 8-10 carpels, dark purple, fleshy, crowded in an erect stout raceme 4-8 in. long, one seed in each carpel, black, kidney-shaped, shining. This plant was introduced from China, is cultivated and found as an escape; the leaves are cooked and eaten, but is otherwise poisonous.

HERBS, ERECT WITH ALTERNATE EXSTIPULATE SIMPLE LEAVES

LEAF MARGINS ENTIRE.

PETALS NONE.

**Thymelæa arvensis,**
THYMELÆCEÆ.
F. B. I. v. 194.
The Plains below Jammu.
Kashmir.
Ramu, 6,000 ft.

small to medium size, annual, very slender, smooth, straight, branches few leafy erect; leaves $\frac{1}{6}$-$\frac{1}{2}$ in., linear-lanceolate long-pointed, nearly erect, sessile: flowers $\frac{1}{12}$ in., sessile in all the leaf-axils, forming long leafy very slender spikes; bracts small, calyx urn-shaped or tubular, 4-lobed, lobes erect, blunt, ovate, very short, stamens 8 in 2-series, anthers nearly sessile; fruit $\frac{1}{10}$-$\frac{1}{8}$ in. long, ovoid, dry, narrowed upwards.

**Wikstræmia canescens,**

see Shrubs, Alternate, Exstipulate, Simple

**Diarthron vesiculosum,**
THYMELÆCEÆ.
F. B. I. v. 196.
N. W. F. Province.
Peshawar (Vicary).
Baluchistan (Boissier).

small, annual, slender, much branched, leafy; leaves $\frac{1}{6}$-$\frac{2}{3}$ in., linear, nerveless, somewhat waxy bluish green, sessile, blunt or almost pointed; flowers minute, on very short stalks in slender racemes, $\frac{1}{4}$ in. long, lengthening to 1 in. in fruit, calyx $\frac{1}{8}$ in. long, urn-shaped or tube very slender, closing over the fruit, bladder-like when the fruit does not ripen, lobes 4, spreading, stamens 8, in two series; anthers almost sessile, lower smaller than the upper; fruit $\frac{1}{12}$ $\frac{1}{10}$ in. long, dry, narrowly ovoid.

**Euphorbia Wallichii,**
EUPHORBIACEÆ.
F. B. I. v. 258.
Himalaya 6-12,000 ft.
Kashmir.
Chamba.
Jammu.

medium size to large, stock perennial, stems annual, velvety above, branched or not, juice milky; leaves 3-5 in., linear or oblong, with rounded ends or ovate with a broad pointed tip, sessile, thin, nerves many, spreading, floral leaves, $1\frac{1}{2}$ in. diam., clustered at the end of stem or branches, 3-4 large, rounded or oblong, ovate, short-pointed; flowers $\frac{1}{4}$ in. diam., in compound umbels, rays and flower stalks, few short, male and female organs in one cup-shaped 4-5 lobed calyx, lobes almost concealed by 5 horizontal kidney-shaped glands placed in their angles, glands smooth, rounded, fleshy, margins woolly; stamens many; anthers globular surrounding, a stalked orbicular 3-lobed capsule hanging down on one side, styles 3 united to the middle, dividing into two; capsule $\frac{1}{2}$ in. diam., consisting of 3 woody one-seeded cells; seeds $\frac{1}{8}$ in. smooth, grey-blue.

**Euphorbia pilosa,**
*Hairy Spurge,*
EUPHORBIACEÆ.
F. B. I. v. 260.
Himalaya, 4-8,000 ft.
Simla (Collett).
Murree.

very like the last species, but smaller bracts yellow-green, flowers smaller, glands yellow, styles long, capsule $\frac{1}{4}$ in. diam., covered, more or less with small, often minutely, hairy tubercles, seeds smooth.

HERBS, ERECT WITH ALTERNATE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS NONE

**Euphorbia dracunculoides,** *Kangi.*
EUPHORBIACEÆ.
F. B. I. v 262.
The Plains to 3,000 ft.
Baluchistan (Hughes-Buller).

medium size, annual, smooth stems many, leafy much branched, branches spreading ; leaves 1-1½ in., linear-lanceolate, nearly short-pointed, base generally pointed, rarely rounded or almost heart-shaped, floral leaves 2 broader at the base, shorter, flowers solitary, top-shaped, hairy within, lobes ovate bristly, glands curved, styles short, free, capsules ¼-½ in. diam., smooth, seeds patchy ; in other respects like the last species. Oil expressed from the seeds, has been found superior to linseed oil.

**Euphorbia Maddeni,**
EUPHORBIACEÆ.
F. B. I. v. 263.
Himalaya, 5-9,000 ft.
Mashobra.
Mahasu (Collett).
Murree.

small to medium size ; stem leaves 2 by ⅜ in. ovate with a broad tip narrowed into the stalk floral opposite, flowers solitary in the axils of branches or of the leaves of the branches or sometimes in umbels, lobes 4 or 5, glands yellow, curved, with long horns, styles nearly free, seeds smooth, in other respects like the last species.

**Euphorbia falcata,**
EUPHORBIACEÆ.
F. B. I. v. 263.
Rawalpindi (Aitchison).
Gilgit (Giles).
Baluchistan (Boissier).

small, stems and branches stiff, pale ; leaves ¼ in. or less, sessile, oblong with a broad tip, very long-pointed ; flowers minute, top-shaped, lobes fringed, glands very minute, capsule 1-10 in., thin, ovoid, cells keeled, seeds transversely furrowed. for other characters see the last species.

**Euphorbia prolifera,**
EUPHORBIACEÆ
F. B. I. v. 264.
The Plains to 6,000 ft.
Valleys below Simla (Collett).
Kashmir.

small, perennial, rootstock thick, woolly ; leaves ⅛ by ¼-½ in., very narrow linear or linear-oblong, blunt or short-pointed, base rounded or short-pointed, nerves 3 ; flowers ⅛ in. diam., shortly bell-shaped, lobes triangular, fringed, glands stalked, kidney-shaped or horned, or oblong, entire or toothed, bracteoles many, styles stout, rolled round, deeply divided, capsule ¼-¼ in. diam., broad, smooth, long-stalked, rather depressed, seeds mottled or not ; for other characters see the last species.

**Asparagus filicinus,** see Leafless Plants, Herbs.
**Asparagus gracilis,** see Leafless Plants, Herbs.
**Asparagus capitatus,** see Leafless Plants, Herbs.
**Asparagus adscendens,** see Leafless Plants, Herbs.
**Juncus bufonius,** see Herbs, Unbranched, Alternate, Exstipulate, Simple.

LEAF MARGINS TOOTHED.

PETALS UNUNITED

**Arabis glabra,** see Herbs, Erect, Unbranched, Alternate, Exstipulate, Simple.

HERBS, ERECT WITH ALTERNATE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNUNITED.

**Arabis auriculata,** see Herbs, Erect, Unbranched, Alternate, Exstipulate, Simple.

**Arabis alpina,** see Herbs, Erect, Unbranched, Alternate, Exstipulate, Simple.

**Arabis amplexicaulis,** see Herbs, Erect, Unbranched, Alternate, Exstipulate, Simple.

**Arabis tibetica,** see Herbs, Erect, Alternate, Exstipulte, Lobed.

**Arabis nuda,** see Herbs, Erect, Unbranched, Alternate, Exstipulate, Simple.

**Draba muralis,** see Herbs, Erect, Unbranched, Alternate, Exstipulate, Simple.

**Malcolmia africana,**
*Pathra, chinaka.*
CRUCIFERÆ.
F. B. I. i. 146.
The Plains to 13,000 ft.
Kashmir.
Rawalpindi.
Mianwali, District.
Baluchistan (Griffith).

small to medium size, annual, stout, leafy rough with stiff forked and simple hairs, branches many, long, somewhat spreading; leaves 1-6 in., oblong or lanceolate, toothed stalked; flowers many, small, purple in loose racemes near the end of branches, sepals 4, free erect, equal at the base, persistent, petals 4, placed crosswise, oblong-ovate with broad tip, twice the length of the sepals, stamens 6, the 4 inner longer and sometimes united in pairs, stigma conical, short, tapering into a sharp point; capsule 2-3 in. long, narrow straight, rough. This plant supplies good fodder, and in the spring forms bright patches of purple.

**Malcolmia toruiosa,**
CRUCIFERÆ.
F. B. I. i. 146.
N. W. F. Province.
Peshawar (Stewart).
Baluchistan (Boissier).

like the last species, but less stout, leaves 1-3 in., sometimes pinnatifid; flowers white, capsule ¾-1 in. usually curved or twisted with contractions.

**Malcolmia strigosa,** see Prostrate Herbs, Alternate, Exstipulate, Simple.

**Sisymbrium mollissimum,** see Herbs, Erect, Alternate, Exstipulate, Simple.

**Sisymbrium himalaicum,**
CRUCIFERÆ.
F. B. I. i. 147.
Himalaya 10-12,000 ft.

small, biennial or perennial, stiff, much branched, hairs simple or star-shaped; leaves 1-2 in., lanceolate-ovate with a broad tip, waved and toothed, radical leaves stalked, stem leaves clasping the stem with a forked base; flowers small, purple or white on slender erect stalks in bracteate racemes, sepals 4, short, equal at the base, petals 4, crosswise, stalks long, blade broad, stamens 6, all free, style short, slender; capsule 1-1½ in. long cylindrical, straight, spreading, smooth or velvety, stalk short, with a leaf-like bract at the base, seeds many in one series, not margined.

**Sisymbrium foliosum,**
CRUCIFERÆ.
F. B. I. i. 148.
Kashmir, 5-7,000 ft. (Thomson).

like the last species, but less hairy, radical leaves broadly toothed, shortly stalked, narrowed into the stalk, stem leaves larger; flowers without bracts; pods slender, curved, smooth, much flattened.

HERBS, ERECT WITH ALTERNATE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNUNITED.

**Sisymbrium Thalianum, Thale cress,**
CRUCIFERÆ.
F. B I. i. 148.
The Plains to 10,000 ft.
Simla (Collett).
Kashmir.

small, annual, branched, hairs simple and forked; leaves 1-3 in., toothed or entire, radical ovate with broad tip, stalked, stem leaves few, sessile; flowers small, white stalked in slender long racemes; capsules ⅛-1 in. long, linear, smooth, flattened, style short; seeds very small, flattened; for other characters see the last species.

**Sisymbrium rupestre,**
CRUCIFERÆ.
F. B. I. i. 148.
Kimalaya, 8-14,000 ft.
Hashmir.

small to medium size, annual, branched, greyish hairs simple or forked; leaves ½-1 in., radical linear-oblong, waved and toothed, shortly stalked, stem leaves sometimes heart-shaped at the base, sessile, toothed or entire; flowers small, white or purple, shortly stalked in few flowered bracteate racemes, sepals velvety, capsules 1½-1⅔ in. erect or spreading, slender, flattened; for other characters see the last species.

**Sisymbrium alliaria, Hedge Garlic,**
CRUCIFERÆ.
F. B. I. i. 151.
Himalay, 6-10,000 ft.
Simla.
Matiana (Collett).
Kashmir.

medium-size, annual or biennial, branches few, smooth or slightly hairy below; leaves 2-3 in. long, stalked, radical kidney-shaped, coarsely toothed, stem leaves heart-shaped, toothed; flowers ½ in. diam., white in loose racemes, pods 1½-2 in., stout, smooth, nearly cylindrical erect; seeds oblong, streaked and dotted; for other characters see the last species.

**Erysimum repandum,**
CRUCIFERÆ.
F. B. I. i. 153.
Kashmir 5-7,000 ft.
Baluchistan (Lace).

small to medium size, annual, widely branched, grey hairs with close pressed forked haired; leaves lanceolate, toothed with somewhat rounded notches, or entire; flowers ¼-½ in. diam., yellow, rarely purple, bractless, racemed, sepals 4, erect, petals 4, placed crosswise, long-stalled, stamens 6, 4 inner longer, capsule 1½-2 in. long, linear-nearly square, horizontal, nearly sessile; stalk stout; seeds in one row.

**Erysimum hieracifolium,**

see Herbs, Unbranched, Alternate, Exstipulate, Simple.

**Erysimum odoratum,**

see Herbs, Unbranched, Alternate, Exstipulate, Simple.

**Brassica juncea,**

see Herbs, Erect, Alternate, Exstipulate, Lobed.

**Diplotanis Griffithii,**

see Herbs, Erect, Alternate, Exstipulate, Lobed.

**Moricandia tortuosa,**

see Herbs, Erect, Alternate, Exstipulate, Simple, Entire.

**Lepidium Draba,**

see Herbs, Erect, Alternate, Exstipulate, Lobed.

**Thlaspi arvense, Penny cress, Mithridate Mustard,**
CRUCIFERÆ.
F. B. I. i. 162.
Himalaya, 1-10,000 ft.
Simla (Collett).

small to medium size, annual, smooth, branched or not; leaves 1-4 in., oblong-ovate with broad tip, radical stalked, soon withering, stem leaves oblong-lanceolate, stem clasping, forked at the base; flowers small, white or pale pink, racemed; sepals 4, erect, base equal; petals 4, equal, long-stalked; stamens 6, 4 inner longer, capsule ⅓-¾ in. diam.,

HERBS, ERECT WITH ALTERNATE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNUNITED.

circular, flattened, winged, seeds 5-6 in each cell grooved.

**Thalaspi cardiocarpum,**
CRUCIFERÆ.
F. B. I. i. 162.
Kashmir, 5-9,000 ft.

like the last species, but less robust, leaves broadly oblong, somewhat toothed, pod broadly notched at the tip; seeds 4-5 in each cell, smooth.

**Thlaspi alpestre, Alpine Pennycress,**
CRUCIFERÆ.
F. B. I. i. 162.
Himalaya, 7-12,000 ft.
Simla.
Mahasu.
Narkanda (Collett).
Matiana.
Kashmir.

like the last species, but perennial, tufted; radical leaves nearly circular, stem, leaves oblong, stem clasping, bases small, rounded; flowers rather large, always white, capsules triangular heart-shaped, not deeply, but broadly notched, seeds 4-8 in each cell.

**Neslia paniculata,**

see Herbs, Erect, Alternate, Exstipulate, Simple, Entire.

**Physorhyncus brahvicus,**

see Shrubs, Alternate, Exstipulate, Simple.

**Goldbachia lævigata,**
CRUCIFERÆ.
F. B. I. i. 166.
The Plains.
Kashmir, 5,000 ft.
Baluchistan (Boissier).

small to medium size, annual, branched, smooth with a bluish waxy tinge; leaves 4-5 in., radical many, ovate-oblong, toothed, with rounded notches, stem leaves lanceolate, base shortly forked, stem clasping; flowers small pale pink, in long bractless racemes, sepals 4, erect, equal at the base, petals 4, stamens 6, 4 inner longer; capsule ⅔ in. long, hanging down; curved, 4-angled 2-3 celled, like a string of beads, tapering above into a broad flattened beak; one oblong seed in each cell.

**Chorispora tenella,**

see Herbs, Erect, Alternate, Exstipulate, Simple, Entire.

**Impatiens Balsamina, Balsam or Touch-me-not,**
*Gulmendi, tilphar.*
GERANIACEÆ.
F. B. I. i. 453.
The Plains to 5,000 ft.
Valleys below Simla (Collett).

small to medium size, annual, succulent, velvety; stems usually hollow, joints more or less swollen; leaves 1½-2½ in., narrowly lanceolate, stalked, narrowed to the base, deeply toothed, stalk glandular; flowers ½ in. long without the spur, pink or nearly white, solitary on axillary, usually clustered stalks; sepals 3, two upper small, flat, usually green, the lower forming the lip, much larger, petal-like, more or less tubular, produced at the base in a hallow spur, ½ in. long, curved, slender, cylindric; petals 3, upper broad, somewhat concave, tipped with a small green point, two lower smaller forming wings, deeply 2-lobed; stamens 5, clasping the ovary; anthers round the 5-toothed sessile stigma; capsule ½-½ in., oblong, narrowed at both rounded ends, densely felted or woolly bursting open when ripe, touched or not, by 5-valves, which curl up and jerk away the many small

HERBS, ERECT WITH ALTERNATE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNUNITED.

rounded seeds. This plant is much cultivated for its beauty. It is emetic and purgative in its action.

**Impatiens racemosa,** see Herbs, Erect, Alternate, Stipulate Simple, Toothed.

**Impatiens brachycentra,** see Herbs, Erect, Alternate, Stipulate, Simple, Toothed.

**Sedum Rhodiola,** see Herbs, Erect, Alternate, Exstipulate, Simple, Entire.

**Sedum heterodontum,**
CRASSULACEÆ.
F. B. I. ii. 417.
Himalaya, 8-14,000 ft.
Kashmir.

small to medium size, perennial rootstock with a crown of scales, stems annual leafy; leaves 1-1½ in. long, ovate deeply toothed overlapping, base broad sessile, heart-shaped or forked, margin white; flowers small, pink in terminal compound clusters, calyx 4-5 lobed, lobes narrow oblong, petals 4-5, much longer than the calyx lobes, stamens 10-8, long, protruding, styles short 4-5; follicles 4-5, seeds many, oblong with rounded ends.

**Sedum tibeticum,** see Herbs, Erect, Alternate, Exstipulate, Simple, Entire.

**Sedum asiaticum,**
CRASSULACEÆ.
F. B. I. ii. 419.
Himalaya, 11-16,000 ft.
Maral Kund, The Chor (Collett).

like Sedum heterodontum, but smaller, leaves smaller, narrow, toothed, flowers yellow.

**Sedum linearifolium,** see Herbs, Erect, Alternate, Exstipulate, Simple, Entire.

**Œnothera rosea,**
ONAGRACEÆ.
F. B. I. i. 582.
Himalaya, 2-7,000 ft.
Simla.
Dharampur.
The Salt Range.

small, annual, stem reddish, velvety; leaves 1-2 in., ovate, narrowed at both ends, prominently veined, sometimes lobed; flowers ¼-½ in. diam., pink, solitary, in the axils of leafy racemes; calyx tube 4-angled, club-shaped, produced above the ovary, lobes 4, soon falling off; petals 4, pink with darker veins, circular; stamens 8, equal or alternate ones shorter, style thread-like; capsule ½-¾ in. long, club-shaped, 4-angled, 4-celled, splitting from the top into 4 valves; seeds many, small, tipped with a tuft of long white hairs. A weed of cultivation from Peru, lately established.

**Epilobium angustifolium,** see Herbs, Erect, Opposite, Exstipulate, Entire.

**Epilobium hirsutum, Great Willow herb, Codlins and cream,**
ONAGRACEÆ.
F. B. I. ii. 583.
Himalaya, 5-7,000 ft.
Kotgarh.
Sutlej and Giri Valleys in wet places (Collett).

large, annual, densely covered with white hairs; leaves 1-3 by ¼-½ in., lanceolate, stem-leaves usually opposite sessile, stem-clasping, teeth small sharp; flowers ½ in. long, pink-purple axillary in long or short leafy racemes at the end of stem and branches; calyx-tube linear, 4-angled, lobes 4 short-pointed, soon falling off; petals 4, erect, or spreading notched; stamens 8, alternate ones longer stigmas 4, distinct, erect at first, recurved after

HERBS, ERECT WITH ALTERNATE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNUNITED.

wards; capsule 1½-3½ in., and seeds like those of the Oenothera.

**Epilobium parviflorum, Hoary Eppilobe,**
ONAGRACEÆ.
F. B. I. ii. 584.
Himalaya, 5-7,000 ft.
Simla, Sutlej Valley (Collett).

like the last species, but smaller; flowers a little smaller; leaves not stem-clasping; stigmas ultimately spreading, not recurved.

**Epilobium roseum,**

see Herbs, Erect, Opposite, Exstipulate, Simple, Toothed.

FLOWERS, MINUTE, IN HEADS.

FLOWERS ALL TUBULAR.

**Vernonia cinerea,**
*Sahaderi.*
COMPOSITÆ.
F. B. I. iii. 233.
The Plains to 8,000 ft.
Simla (Collett).
Dharampur.
Baluchistan (Hughes-Buller).

small to medium size, annual, grey velvety, stem grooved; leaves ½-3 in., ovate or lanceolate, hairy blunt or short-pointed, teeth few, coarse, thin, nearly sessile; flowers minute, pinkish-purple in many heads ¼ in. diam., forming rounded or open and flat-topped clusters, main stalks slender bracteate, bracts round heads linear-lanceolate, silky outside, inner longer than outer; calyx hairs (pappus) long, white; corolla tubes slender, equal 5-lobed; anther bases blunt; style arms long, hairy, achenes $\frac{1}{12}$ in., smooth, tipped with the white or dirty-white pappus hairs, ¼ in. long.

**Vernonia anthelmintica,**
*Bakchi, Kalaziri.*
COMPOSITÆ.
F. B. I. iii. 236.
The Plains to 5,000 ft.
Valleys below Simla (Collett).
Dharampur.
Synj.

large, annual, stout, glandular, velvety near the top, leafy and much branched; leaves 3-5 in., ovate-lanceolate, coarse-toothed, long-pointed, narrowed into a short stalk, rough; heads ½-¾ in. diam., barely clustered, stalks long, dilated above, bracts of heads with broad purplish tips, hairy, inner shorter than outer; pappus hairs tawny; corollas unequal; achenes ⅛ in., ribbed; for other characters see the last species. This plant is found near villages, planted or as an escape; the seeds are used in skin diseases, and to drive away fleas and as a vermifuge.

**Vernonia cinerascens, Solidago virga aurea,**

see Shrubs, Alternate, Exstipulate, Simple.

see Herbs, Unbranched, Alternate, Exstipulate, Simple.

**Conyza japonica,**
COMPOSITÆ.
F. B. I. iii. 258.
The Plains to 7,000 ft.
Simla (Collett).

small, annual, silky or woolly, stem often unbranched; leaves 1-3 in. (radical often longer,) ovate with a broad tip prolonged into the short stalk, or lanceolate, coarsely sharp-toothed or round-toothed; upper leaves, half stem-clasping.

HERBS, ERECT WITH ALTERNATE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNUNITED.

FLOWERS, MINUTE, IN HEADS.

FLOWERS ALL TUBULAR.

oblong, or ovate oblong, often entire; flowers all tubular, yellow in globose; heads ⅛ in diam. arranged in terminal flat-topped clusters, bracts of heads narrowly lanceolate, short-pointed with transparent edges; pappus ¼ in.; reddish; corollas 5-toothed; anther-bases blunt, entire, style-arms flattened; achenes ¼ in., nearly smooth, margined.

**Conyza viscidula,**
COMPOSITÆ.
F. B. I. iii. 258.
Himalaya 1-7,000 ft.
Mashobra (Collett).

medium size to large, sticky with glands, much branched above; leaves 2-4 in., lanceolate, narrowed at both ends, nearly sessile, sticky on both sides, sharply toothed, sometimes entire; heads in loose clusters, bracts of heads long-pointed, pappus ⅛-¼ in., for other characters see the last species.

**Blumea amplectens,**
COMPOSITÆ.
F. B. I. iii. 260.
The Plains.
Rawalpindi (Douie).
Rohtak.
Gurgaon.

small, annual, bushy, softly hairy; leaves ½-1½ in. long, oblong or ovate with a broad tip, blunt or short-pointed, half-stem clasping; flowers minute, yellow in solitary long-stalked; heads ⅛-¼ in. diam., bracts of heads very slender, inner hair-pointed, base of head (receptacle) flat, naked; calyx hair, (pappus) scanty, reddish; corollas tubular filiforms 2-3 toothed inner slender, 5-toothed: anther bases, forked, tails small, slender; style arms short: achenes oblong. A common weed.

**Blumea Wightiana,**
COMPOSITÆ.
F. B. I. iii. 261.
The Plains to 4,000 ft.
Valleys below Simla (Collett).

small to medium size, silky or woolly, often sticky with glandular hairs; leaves 1½-2 by ¾-1 in.; lower ovate, stalked or nearly sessile, upper smaller, linear or lanceolate, sessile; flowers minute, purple or a few yellow, in numerous heads, ⅛ in. diam., forming stalked terminal or axillary clusters; bracts of heads few, short, inner many, narrow long-pointed, slightly longer than the flowers; achenes minute, angled, slightly hairy; for other characters see the last species.

**Blumea lacera,**
*Kakronda, jungli muli.*
COMPOSITÆ.
F. B. I. iii. 263.
The Plains to 2,000 ft.

very like the last species, but smell of turpentine, flowers yellow, achenes smooth, not hairy. The root is used as a febrifuge and an astringent in Indian medicine.

**Blumea hieracifolia,**
COMPOSITÆ.
F. B. I. iii. 263.
The Plains to 2,000 ft.

like the last species, but often unbranched or with a stout stem; heads ⅛-¼ in. diam. in tuft-like or spike-like long branching racemes.

HERBS, ERECT WITH ALTERNATE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

FLOWERS, MINUTE, IN HEADS.

FLOWERS ALL TUBULAR.

**Laggera flava,**
COMPOSITÆ.
F. B. I. iii. 270.
The Plains to 3,000 ft.

small to medium size, annual, slender or slightly velvety; stem cylindrical, branched at the top or not, grooved; leaves 1-3 in. long, lower stalked, upper ovate lanceolate or with a broad tip, half stem-clasping, not prolonged down the stem, sharply toothed; flowers minute, bright yellow all tubular, on few heads ¼ in. diam., on slender branches of loose clusters, bracts of heads outer ovate short-pointed, inner lanceolate, long pointed all smooth or with scattered bristles on the margins; corollas, inner tubular, 5-toothed, outer thread-like, minutely toothed; anther-basis 2-lobed or forked; style arms as in Blumea above; pappus white; achenes very minute, smooth.

**Laggera alata,**
COMPOSITÆ.
F. B. I. iii. 271.
Himalaya, 1-6,000 ft.
Simla.
Sutlej and Giri.
Valleys (Collett).

medium size to large, perennial, much branched velvety or felted, sometimes glandular; stem with broad entire wings; leaves 1-4 in. long, narrowly oblong, short-pointed, rough above, woolly beneath; sessile, prolonged down the stem; flowers minute, purplish in main heads ½ in. diam., in axillary racemes, on winged branches often forming a large terminal leafy cluster, drooping in fruit; bracts of the head many, narrow, stiff, short-pointed, outer shorter, green, often recurved, inner as long as the flowers; pappus white; corollas as in the last species; achenes small, hairy.

**Laggera pterodonta,**
COMPOSITÆ.
F. B. I. iii. 271.
Himalaya.
East of Sutlej, 4,000 ft.

like the last species, but more slender; smooth wings of stem toothed or lobed; leaves often lobed, heads ⅔ in. diam., on slender stalks at the end of the branches; bracts smooth, stiff.

**Laggera aurita,**
COMPOSITÆ.
F. B. I. iii. 271.
The Plains.

like the last species, but hairy, sticky, glandular; stem not winged; leaves very little prolonged down the stem, often lobed, heads ¼-½ in. diam., in small lateral or terminal clusters; flowers pink, bracts soft, slender, silky. This plant smells of turpentine.

**Sphæranthus indicus,**
*Mundi, gorakmundi.*
COMPOSITÆ.
F. B. I. iii. 275.
The Plains to 5,000 ft. in dry rice fields.

medium size, annual, glandular softly hairy, aromatic, branches with toothed wings; leaves 1-2 in. long, oblong-ovate with a broad tip, narrowed to the toothed base, prolonged down the branches, blunt or short-pointed, toothed, teeth often bristle-pointed, glandular-hairy on both surfaces; flowers pink or purple in globose terminal solitary compound bracteate heads ½ in. diam., consisting of

HERBS, ERECT WITH ALTERNATE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

FLOWERS, MINUTE, IN HEADS.

FLOWERS ALL TUBULAR.

very small crowded heads, each with 12 flowers bracts of small heads linear, hairy at the tip, as long as the flowers; pappus none; outer corollas 10-12, 4-5-toothed, inner 2-3, slender, straight 2-3-toothed, style-arms thread-like or united; achenes oblong, stalked, smooth. This plant is used to make a bitter tonic and a vermifuge in Indian medicine.

**Phagnalon niveum,** see Herbs, Erect, Alternate, Exstipulate, Simple, Entire.

**Pulicaria crispa,** see Herbs, Erect, Alternate, Exstipulate, Simple Toothed, Flowers in heads, outer ligulate.

**Carpesium cernum,**
COMPOSITÆ.
F. B. I. iii. 300.
Himalaya, 6-800 ft.
Simla, Mahasu, (Collett.)

medium size to large, annual, velvety to shortly hairy; leaves 2-5 by ¾-1½ in., lanceolate to ovate, nearly sessile to long-winged stalks, sharply pointed, toothed; flowers minute, yellow in terminal solitary nodding heads ½-1 in. diam. with large leafy bracts at the base or on long naked stiff stalks; bracts of heads many, outer green, more or less leaf-like, inner shorter, dry broad, oblong, blunt, margin white; pappus none; corolla of outer flowers 3-toothed, of inner, slightly larger, 5-toothed; anther bases forked; tails slender; style-arms linear, blunt, converging at first; achenes long-ribbed, not hairy, tip beaked, glandular.

**Carpesium trachelifolium,**
COMPOSITÆ.
F. B. I. iii. 301.
Himalaya, 4-6,000 ft.
Valleys below Simla (Collett).
The Glen, Simla.

like the last species, but more slender, more hairy; leaves smaller, long stalked, sometimes lobulate-toothed with rounded notches, heads never larger than ¼ in. diam., solitary or in clusters at the end of long axillary stalks.

**Carpesium abrotanoides,** see Herbs, Erect, Alternate, Exstipulate, Simple Entire.

**Adenocaulon bicolor,**
COMPOSITÆ.
F. B. I. iii. 302.
Himalaya, 6-9,000 ft.
Narkanda (Collett).

medium size to large, perennial; stem and branches covered with grey cottony hairs; leaves 2-4 in. diam., circular, toothed and angled with rounded margins, smooth above, white-felted beneath, upper smaller, sessile, lower long-stalked, more or less winged, wing often toothed; flowers small, white or pale yellow in heads ¼ in. diam., in loose branching racemes; branches slender, sticky from glands towards the ends; bracts of heads, 5, green, spreading, bent back in fruit; flowers about

HERBS, ERECT WITH ALTERNATE, EXSTIPULATE, SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

FLOWERS, MINUTE, IN HEADS.

FLOWERS ALL TUBULAR.

10, 4-5-lobed, outer only fertile, pappus none, anther-bases entire or minutely 2-toothed, style-arms short, broad; achenes long, club-shaped, covered with stalked glands.

**Artemisia Dracunculus,**

see Herbs, Erect, Alternate, Exstipulate, Lobed.

**Gynura angulosa,**
COMPOSITÆ.
F. B. I. iii. 334.
Himalaya, 4-7,000 ft.
Valleys below Simla (Collett).
Above Bhajjal, below Chor.

large, annual, smooth, thick, succulent, stem deeply grooved and angled, as thick as the thumb below, much branched; leaves 6-12 in. long, basal sometimes 24 in., lanceolate or oblong, irregularly toothed, long-pointed, sessile, base contracted, simple or forked, upper oblong, sessile with broad-forked bases; flowers orange-yellow in large heads ½-¾ in long in terminal bracteate flat-topped clusters; bracts of heads in one series, 10-12, equal, margins thin, floor of head flat, naked; pappus hairs white, slender; corollas 5-toothed; anther-bases entire or nearly forked; style-arms slender, long; achenes narrow, many-ribbed.

**Senecio Levingii,**

see Herbs, Erect, Alternate, Exstipulate, Lobed.

**Senecio chenopodifolius,**

see Herbs, Erect, Alternate, Exstipulate, Lobed.

**Cousinia auriculata,**

see Herbs, Erect, Alternate, Exstipulate, Lobed.

**Artemisia amygdalina,**
COMPOSITÆ.
F. B. I. iii. 325.
Kashmir,
Pir Panjal (Jacquemont, Stewart).

medium size, perennial, stem stout, smooth, deeply grooved and many ribbed; leaves 4-6 by ½-1¼ in., lanceolate, long-pointed with sharp incurved gland-tipped teeth, gray hairy beneath, stalk very short with minute bristle-like appendages; flowers in few-flowered ovoid heads ⅛ in., nearly all on one side of dense short axillary racemes, bracts of heads oblong, blunt, thin, smooth, outer with a green disk, floor of head naked, pappus none, inner corollas 5-toothed, outer 2-3-toothed, anther-bases blunt, entire; achenes very minute, faintly striped, oblong or ovoid with a broad top.

**Saussurea candicans,**

see Herbs, Erect, Alternate, Exstipulate, Lobed.

**Saussurea albescens,**

see Herbs, Erect, Alternate, Exstipulate, Lobed.

**Saussurea Jacea,**

see Herbs, Erect, Alternate, Exstipulate, Simple, Entire.

**Saussurea Lappa,**

see Herbs, Unbranched, Alternate, Exstipulate, Lobed.

**Jurinea ceratocarpa,**

see Herbs, Unbranched, Alternate, Exstipulate, Simple.

**Jurinea modesta,**

see Herbs, Erect, Alternate, Exstipulate, Simple, Entire.

HERBS, ERECT WITH ALTERNATE, EXSTIPULATE, SIMPLE LEAVES

LEAF MARGINS TOOTHED.

PETALS UNITED.

* FLOWERS, MINUTE, IN HEADS.

FLOWERS ALL TUBULAR.

**erratula pallida,**

see Herbs, Unbranched, Alternate, Exstipulate Simple.

**Tricholepis furcata,**
COMPOSITÆ.
F. B. I. iii. 380.
Himalaya, 5-10,000 ft.
Kashmir.

large, perennial, smooth, or nearly so, branched from the base, branches long ending in a long stalked head; leaves 2-6 by 1½-2½ in., oblong with rounded ends or lanceolate, short or long pointed, shortly toothed, surface covered with raised points, shortly stalked; flowers ¾-1 in. long, yellow in nodding heads 1½ in. diam., bracts of heads needle or thread-like from lanceolate base, turned back, hairy, tips black, pappus hairs scaly 1 in. long, united, bristles on floor of head shorter than the achenes, corollas 5-lobed, anther bases nearly entire, hardly forked, style-arms slender; achenes ⅛ in., narrowly oblong, ribbed, smooth, flattened.

**Tricholepis elongata,**
COMPOSITÆ.
F. B. I. iii. 380.
Himalaya, 4-8,000 ft.
Simla (Collett).

like the last species, but sparingly branched; leaves smaller often lobed, heads nearly erect, corollas ½-⅝ in., bristles of the floor of the head longer than the achenes, pappus hairs ¼ in. pale brown, shining, achenes acutely 5-angled, pale.

**Tricholepis Stewartii,**
COMPOSITÆ.
F. B. I. iii. 380.
Jhelum Valley (Stewart).

like the last species, but leaves smaller, lanceolate, long-pointed, quite smooth, heads 1 in. diam., shortly stalked, pappus ¾ in. stiff.

**Tricholepis tibetica,**

see Herbs, Erect, Alternate, Exstipulate, Lobed.

**Volutarella divaricata,**

see Herbs, Erect, Alternate, Exstipulate, Lobed.

**Carthamus tinctorius, Safflower,**
*Kasumbh.*
COMPOSITÆ.
F. B. I. iii. 386.
The Plains to 2,000 ft.

medium size, annual, smooth or velvety, thistle-like; leaves 1½-3 by ½-1¼ in., lanceolate, stiff, toothed and spinous or entire, sessile; flowers small, orange-red, in terminal heads ½-1 in., diam., bracts of heads many spinous, erect, outer leaf-like, spinous or not, inner ovate-oblong, short-pointed, floor of head flat, densely bristly, pappus none, corollas all tubular, deeply 5-toothed, slender, anther-bases forked, tails short fringed; achenes ovoid with top broad, 4-angled, smooth, with 4 bosses at the top. This plant is found as an escape, widely cultivated as a winter crop; the flowers provide rouge, a beautiful pink dye and oil is obtained from the seeds.

HERBS, ERECT WITH ALTERNATE, EXSTIPULATE, SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

FLOWERS, MINUTE, IN HEADS.

FLOWERS ALL TUBULAR.

**Carthamus oxyacantha,** *Kantiari, poli.*
COMPOSITÆ.
F. B. I. iii. 386.
The Plains.
West of the Ravi.
Gujar Khan (Doule).
Rawalpindi.
Baluchistan (Lace).

medium size, annual, stem and branches white; leaves oblong or oblong-lanceolate, lower shortly spinous-toothed, upper half stem-clasping, very spinous; flowers orange-yellow, outer bracts of head longer than the flowers, white below the contracted portion, green above it, with yellow spines; for other characters see the last species. This plant may be the wild form of the last species. An illuminating oil is expressed from the seeds.

**Carthamus lanatus,** see Herbs, Erect, Alternate, Exstipulate, Lobed

INNER FLOWERS TUBULAR, OUTER LIGULATE.

**Myriactis nepalensis,**
COMPOSITÆ.
F. B. I. iii. 247.
Himalaya 4-10,000 ft.
Simla (Collet).
Kashmir.

medium size to large, annual, velvety or roughly hairy, much branched; leaves 1-3 in., lanceolate, shortly stalked, stalks winged; flowers minute, outer white, inner yellow in heads $\frac{1}{2}$-$\frac{3}{4}$ in. diam., in clusters on diverging stalks, bracts of heads in 3-4 series, short-pointed, narrow, margins thin, afterwards reflexed, floor of heads convex, broad, naked, pappus none, corollas inner 4-5 toothed, outer entire, short, anther-bases entire, style-arms narrow, flattened, lanceolate; achenes flat, smooth, margined.

**Myriactis Wallichii,**
COMPOSITÆ.
F. B. I. iii. 247.
Himalaya, 4-10,000 ft.
Simla (Collett).

very like the last species, but more slender, less hairy, heads smaller on slender stalks.

**Rynchospermum verticillatum,** see Herbs, Erect, Alternate, Exstipulate, Simple, Entire.

**Aster amellus,** see Herbs, Erect, Alternate, Exstipulate, Simple Entire.

**Aster Pseudamellus,** see Herbs, Erect, Alternate, Exstipulate, Simple, Entire.

**Aster molliusculus,** see Herbs, Erect, Alternate, Exstipulate, Simple, Entire.

**Aster Thomsoni,**
COMPOSITÆ.
F. B. I. iii. 252.
Himalaya, 7-10,000 ft.
Simla (Collett).
Kashmir.

medium size to large, annual, hairy, branches bending at the joints; leaves 2-4 by 1-2$\frac{1}{2}$ in., broadly ovate, long-pointed, nearly sessile, base narrowed, half stem-clasping, coarsely sharply toothed; flowers, inner yellow, outer lilac or purple in long-stalked solitary heads, 1$\frac{1}{2}$-2$\frac{1}{2}$ in. diam.,

HERBS, ERECT WITH ALTERNATE, EXSTIPULATE, SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

FLOWERS, MINUTE, IN HEADS.

INNER FLOWERS TUBULAR, OUTER LIGULATE.

bracts of heads green, linear-lanceolate, long pointed, pappus hairs single, much shorter than the corollas and achenes, reddish, corollas inner 5-toothed, outer 20-30, $\frac{1}{2}$-$\frac{3}{4}$ in. long, entire or minutely toothed, anther-bases blunt, entire, style-arms flattened; achenes $\frac{1}{8}$-$\frac{1}{6}$ in., flattened, hairy.

**Aster asperulus,**
COMPOSITÆ.
F. B. I. iii. 252.
Himalaya.
East of the Ravi 4-9,000 ft.
Simla (Collett).

very like the last species, but the stem is nearly smooth, leaf-stalks winged, pappus as along as the corollas.

**Brachyactis menthodora,**
COMPOSITÆ.
F. B. I. iii. 253.
Sind Valley.
Kashmir 12,000 ft. (Clarke).

medium size, root perennial, stem annual glandular, velvety, odour of mint, stiff, branches short, erect; leaves 1-2 in., oblong-lanceolate, ovate, sharply toothed, lower long-stalked, upper sessile, half stem-clasping, prolonged down the stem; flowers, outer bluish, inner yellow in heads $\frac{1}{2}$-$\frac{3}{4}$ in. towards the top of the stem, or the ends of the branches, bracts of the heads green, few in 2-3 series, linear, velvety, $\frac{1}{2}$ as long as the flowers, 1-2 outer often much larger and leafy, floor of head not pitted, corollas, inner 5-toothed, outer minutely ligulate, pappus $\frac{1}{2}$ in., reddish, anther-bases blunt, not divided, style-arms narrow, flattened, tips narrowly lanceolate, achenes $\frac{1}{15}$ in., quite flat, nearly smooth, margins thickened.

**Erigeron linifolius,**
**Flea bane,**
COMPOSITÆ.
F. B. I. iii. 254.
The Plains to 7,000 ft.
Simla (Collett).

medium size to large, annual, more or less hairy, much branched; leaves $1\frac{1}{2}$-4 in., linear, often entire, sessile, crowded; flowers minute, inner yellow, outer pale purple or white in heads $\frac{1}{4}$ in. diam., on many slender stalks forming a leafy flat-topped branching raceme, bracts of heads in few series, floor of head naked, flat or slightly convex pappus often double, the outer of a few hairs or bristles, corollas inner tubular 5-toothed, outer in several rows, ligulate, ligules short or long, entire or minutely toothed, anther bases blunt, entire, style-arms flattened, tips lanceolate, long or short; achenes flattened, beaked. A garden escape.

**Erigoron canadensis,**

see Herbs, Erect, Alternate, Exstipulate, Simple, Entire.

HERBS, ERECT WITH ALTERNATE, EXSTIPULATE, SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

FLOWERS, MINUTE, IN HEADS.

INNER FLOWERS TUBULAR, OUTER LIGULATE.

**Erigeron asteroides,**
COMPOSITÆ.
F. B. I. iii. 254.
The Plains to 4,000 ft.

medium size, annual, velvety or hairy, with sticky glands; leaves 1-2 in., oblong or ovate with a broad tip, stalked, often lobulate, stem leaves $\frac{1}{2}$-1 in. half stem clasping; flowers in heads $\frac{1}{4}$-$\frac{1}{2}$ in. diam., stalked solitary or nearly clustered, ligules very narrow, blue rather longer than the reddish or dirty-white pappus, bracts of the heads very narrow with hair points, much shorter than the pappus, achenes $\frac{1}{20}$ in. nearly smooth—; for other characters see the last described species.

**Erigeron bellidioides,**
COMPOSITÆ.
F. B. I. iii. 256.
Himalaya, 5-10,000 ft.
Kashmir.

like the last species, but perennial, slender sparingly branched, smooth, radical leaves lanceolate, stem leaves sessile but not half stem-clasping, heads $\frac{1}{4}$ in. diam., long-stalked, few, ligules 3 times as long as the red pappus hairs, achenes slightly silky.

**Erigeron multiradiatus,**

see Herbs, Erect, Alternate, Exstipulate Simple, Entire.

**Conyza Japonica,**

see Herbs, Unbranched, Alternate, Exstipulate, Simple.

**Conyza stricta,**
COMPOSITÆ.
F. B. I. iii. 258.
Himalaya 1-6,000 ft.
Simla (Collett).
Hazara.
Kashmir.

medium size, grey velvety or rough, leafy much branched; leaves $\frac{1}{2}$-2 in., narrowly linear to ovate with a broad tip prolonged into a short stalk, often entire or rarely pinnately lobed; flowers in heads $\frac{1}{4}$ in. diam., long-stalked in flat-topped clusters, bracts of heads narrowly—lanceolate, pappus in., reddish, corollas yellow, outer minutely ligulate inner 5-toothed, anther-bases blunt, entire, style-arms flattened; achenes $\frac{1}{20}$ in., flattened.

**Inula racemosa,**
COMPOSITÆ.
F. B. I. iii. 292.
Himalaya 5-10,000 ft.
Kashmir.
Spiti.

medium size to large, rough, stem stout, grooved; leaves felted beneath, round-toothed, radical 8-18 by 5-8 in., oblong-lanceolate, narrowed into a stalk as long as the blade, upper oblong, half stem-clasping; flowers, all yellow, in many large heads, $1\frac{1}{2}$-2 in. diam., in racemes, bracts of heads, inner linear short-pointed, outer broad, green with triangular turned-back points, outermost usually leafy, pappus hairs $\frac{1}{4}$ in., reddish, corollas inner long 5-toothed, outer with ligules $\frac{1}{4}$ in. slender, 3-toothed, anther-bases forked, tails simple or branched, style-arms linear, broader above, blunt; achenes $\frac{1}{8}$ in., smooth, slender.

HERBS, ERECT WITH ALTERNATE, EXSTIPULATE, SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

FLOWERS, MINUTE, IN HEADS.

INNER FLOWERS TUBULAR, OUTER LIGULATE.

**Inula Royleana,**
COMPOSITÆ.
F. B. I. iii. 292.
Himalaya, 7-11,000 ft.
Kashmir.

like the last species, but smaller stem velvety or hairy and glandular; leaves 6-10 by 4-6 in., minutely toothed, radical ovate or oblong with a long winged stalk, stem leaves lobed, base forked, heads 3-4 in. diam., solitary on a stout erect woolly stalk, inner bracts of head slender, long-pointed, pappus hairs paler.

**Inula acuminata,**

see Herbs, Erect, Unbranched, Alternate, Exstipulate, Simple.

**Vicoa auriculata,**

see Herbs, Erect, Alternate, Exstipulate, Simple, Entire.

**Vicoa vestita,**
COMPOSITÆ.
F. B. I. iii. 297.
The Plains to 4,000 ft.
Sutlej Valley (Collett).
Dharampur.
Kangra Valley.
Lahore.

small to medium size, annual, softly hairy or woolly; leaves 1-2 in., linear-oblong or oblong, base broadly bluntly forked, half stem-clasping; flowers bright yellow, in heads ¾-1 in. diam. long stalked, bracts of heads rough with projecting processes, tips thread-like, recurved, corollas inner 5-toothed, outer with long narrow-spreading, 2-3-toothed ligules, pappus hairs few, anther-bases forked, tails slender, style-arms flattened, broader upwards; achenes small, hardly ribbed, tip rounded.

**ulicaria vulgaris,**

see Herbs, Erect, Alternate, Exstipulate, Simple, Entire.

**Pulicaria dysenterica,**

see Herbs, Erect, Alternate, Exstipulate, Simple, Entire.

**Pulicaria angustifolia,**

see Herbs, Erect, Alternate, Exstipulate, Simple, Entire.

**Pulicaria crispa,**
*Burkna, bui, gidi.*
COMPOSITÆ.
F. B. I. iii. 299.
The Plains.

medium size, perennial, shrubby below, very leafy, branches and leaves beneath densely cottony; leaves ½-1½ in. linear-oblong, margins turned in and toothed, sessile, lower half stem-clasping; flowers yellow in heads ½-¾ in. solitary, bracts of heads slender, bristle-like, pappus in two rows, outer of short jagged teeth, inner of white bearded hairs, 3 times as long as the achenes, corollas, inner tubular 5-toothed, outer minute or none, anther-bases forked, tails hair-like, style-arms linear, blunt, achenes smoothish.

**Guizotia abyssinica,**

see Herbs, Erect. Opposite, Exstipulate, Simple, Toothed.

HERBS, ERECT, WITH ALTERNATE EXSTIPULATE, SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

FLOWERS, MINUTE, IN HEADS.

INNER FLOWERS TUBULAR, OUTER LIGULATE.

**Dronicum Roylei,**
*Darunaj-akrabi.*
COMPOSITÆ.
F. B. I. iii. 332.
Himalaya, 10,000 ft.
Kashmir.

medium size to large, perennial, somewhat hairy or woolly ; leaves 4-5 in. long, broadly ovate, toothed with rounded notches, radical long-stalked, upper half stem-clasping, leaf-stalks, 4-6 in. flowers yellow in long slender stalked heads 1-2 in. diam., with a top-shaped swelling on the stalk, just below the head, floor of head naked, bracts of head in two series, green, ½-⅔ in. long, with fine long points, pappus of inner flowers short, reddish, pappus of outer flowers none, corollas, outer, 1,— series, ligules long, entire, or 2-3-toothed, inner tubular, 5-toothed ; anther-bases entire or nearly forked, style-arms linear; achenes top-shaped and oblong, deeply grooved, all smooth or outer slightly hairy. This plant is used in Indian medicine as an aromatic tonic.

**Senecio amplexicaulis,**
COMPOSITÆ.
F. B. I. iii. 348.
Himalaya, 9-13,000 ft.
The Chor (Collett).

large, perennial, stem hollow, thick as the thumb below, nearly smooth ; leaves 12 in. diam. or less, circular-kidney-shaped, base forked or not, lower leaf-stalks simple or partly winged, upper with a broad stem-sheathing wing ; flowers yellow in many-flowered heads, 1-2 in. diam., nodding in large flat-topped clusters, becoming racemose in fruit, branches of cluster velvety, bracts of heads ¼-⅓ in., about 8 united below, smooth, oblong, short-pointed, floor of head flat, naked, pappus hairs many reddish, corollas, inner 5-toothed, slender, outer 5-6, very long, anther-bases blunt, style-arms recurved ; achenes 1-5 in., 5-10-ribbed, smooth.

**Senecio Thomsoni**
COMPOSITÆ.
F. B. I. iii. 348.
Kashmir, 7-10,000 ft.

like the last species, but more slender, smooth below, smooth or cottony above, leaves not more than 10 in. diam., leaf stalk of floral leaves slender not winged, axils of clusters with long linear bracts, heads 5-6 flowered, bracteoles linear or thread-like, ligules 1-2 very long, achenes ¼ in. long.

**Senecio Ligularia,**
COMPOSITÆ.
F. B. I. iii. 349.
Himalaya, 9-12,000 ft.
Kashmir.

very like Senecio amplexicaulis above, but the flower-heads form an unbranched drooping terminal raceme, bracteles none, bracts at the base of the main stalks small large and leafy, bracts of heads ununited, ligules 8-10, ½-¾ in., achenes ⅛ in., narrow, longer than the reddish pappus.

HERBS, ERECT, WITH ALTERNATE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

FLOWERS, MINUTE, IN HEADS.

INNER FLOWERS TUBULAR, OUTER LIGULATE.

**Senecio Jacquemontianus** *Poshkar.*
COMPOSITÆ.
F. B. I. iii. 350.
Himalaya, 10-13,000 ft.
Kashmir (Falconer).

like the last species, but larger; leaves broadly ovate heart-shaped or nearly forked at the base, stalk of lower leaves stout winged, of upper leaves sheathing, bracteoles under the heads few, thread-like, stalks of clusters with oblong leafy bracts at the base, bracts of the heads oblong, short-pointed bases almost united, ligules many, long and broad; achenes deeply grooved, pappus very short, unequal, united at the base.

**Senecio alatus,**

see Herbs, Erect, Unbranched, Alternate, Exstipulate, Simple, Toothed.

**Senecio Kunthianus,**
COMPOSITÆ.
F. B. I. iii. 354.
Himalaya, 10-14,000 ft.
The Chor (Collett).
Kashmir.

medium size, stem stout, leafy, often glandular red when dry, often unbranched; leaves 1½-3 by ½-1 in., ovate-lanceolate, smooth above, white-felted beneath, coarsely toothed, shortly stalked, heads ⅓ in. long, many-flowered bracteate in broad terminal flat-topped clusters, bracts of heads 5-8, narrow short-pointed, ligules 5-7, short, pappus hairs white, many, as long as the tubular flowers; achenes ⅛ in., velvety; for other characters see the last described species.

**Senecio rufinervis,**
COMPOSITÆ.
F. B. I. iii. 355.
Himalaya.
East of the Sutlej, 6-8,000 ft.
Simla, Mahasu in forest (Collett).

large, shrub-like, branches, leaves beneath and clusters covered with flat lying white cottony wool; leaves 5-9 by 1-3½ in., oblong-ovate, short-or long-pointed, sharply toothed, stalked, base rounded, narrow or heart-shaped, nerves after flowering covered beneath with reddish-felt, heads ⅓ in., 8-10-flowered, many bracteolate in loose branched racemes forming flat-topped clusters, bracts of heads 5-8 oblong, short-pointed, very much shorter than the flowers, ligules, 4-5, short; achenes $\frac{1}{15}$ in., smooth; for other characters see the last species.

**Calendula officinalis,**

see Herbs, Erect, Alternate, Exstipulate, Simple, Entire.

**Calendula arvensis,**

see Herbs, Erect, Alternate, Exstipulate, Simple, Entire.

FLOWERS ALL LIGULATE.

**Rhagdiolus Hedypnois,**

see Herbs, Erect, Alternate, Exstipulate, Lobed.

HERBS, ERECT, WITH ALTERNATE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

FLOWERS, MINUTE, IN HEADS.

FLOWERS ALL LIGULATE.

**Picris hieracioides,**
**Hawkweed Picris,**
COMPOSITÆ.
F. B. I. iii. 393.
Himalaya, 6-8,000 ft.
Murree.

medium size to large, juice milky, branches clustered at the top, coarse, hairy, hairs straight or hooked; leaves 2-5 in., narrowly lanceolate, radical toothed with rounded notches, stalked, stem leaves smaller, half stem-clasping, usually entire; flowers yellow in many terminal long-stalked clustered heads $\frac{1}{2}$-$\frac{3}{4}$ in. long on bracteate stalks, bracts of heads narrow, black, hairy, inner equal, in one series, outer many, short, spreading, floor of head flat, naked, pappus $\frac{1}{2}$ in. long, plentiful, white feathery, in one series with a few short hairs at the base, corollas long, spreading, 5-toothed, anther-bases forked, style-arms slender; achenes $\frac{1}{8}$ in. narrowed at both ends, ribbed, slightly curved, shortly beaked, transversely wrinkled.

**Crepis fœtida,** see Herbs, Erect, Alternate, Exstipulate, Lobed.

**Crepis sibirica,** see Herbs, Unbranched, Alternate, Exstipulate, Simple.

**Crepis blattaroides,** see Herbs, Unbranched, Alternate, Exstipulate, Simple.

**Crepis japonica,** see Herbs, Erect, Alternate, Exstipulate, Lobed.

**Crepis acaulis,** see Herbs, Unbranched, Alternate, Exstipulate, Simple.

**Pterotheca Falconeri,** see Herbs, Unbranched, Alternate, Exstipulate, Simple.

**Hieracium vulgatum,**
**Hawkweed,**
COMPOSITÆ.
F. B. I. iii. 399.
Himalaya, 6-10,000 ft.
Simla, Mahasu (Collett).
Kashmir.

medium size to large, perennial, juice milky, hairy, hairs straight or star-shaped; leaves 3-5 in., broadly lanceolate, smooth above, hairy below, coarsely toothed, radical many, persistent, long-stalked, stem leaves, lower stalked, upper sessile; flowers yellow in many black, glandular, hairy, stalked heads $\frac{1}{2}$-$\frac{3}{4}$ in. long; bracts of heads many, black-hairy, narrow, short-pointed, inner nearly equal, outer smaller, floor of head flat, bristly, pappus plentiful, tawny, rough, rigid, bristly, ligules long spreading, 5-toothed, anther-bases not forked, style arms slender; achenes $\frac{1}{15}$ in., black, ribbed, not beaked.

**Nieracium crocatum,** see Herbs Erect, Unbranched, Alternate, Exstipulate, Simple.

HERBS, ERECT, WITH ALTERNATE, EXSTIPULATE, SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

FLOWERS, MINUTE, IN HEADS.

FLOWERS ALL LIGULATE.

**Hieracium prenanthoides,** COMPOSITÆ. F. B. I. iii. 400. Northern Kashmir 8-10,000 ft.

medium size to large, perennial, hairy or smooth' stem leafy branched, glandular above; leaves 1-3 in., rather thin, with scattered bristles, radical none, stem leaves oblong or ovate or linear-oblong, minutely toothed or entire, waxy bluish green beneath, upper-most leaves heart-shaped; flowers in heads 1 in. diam. forming branched leafy racemes in flat-topped clusters, bracts of heads velvety, achenes nearly $\frac{1}{8}$ in., ribed, red-brown; for other characters see the last described species.

**Hieracium umbellatum,** COMPOSITÆ. F. B. I. iii. 400. Himalaya, 5-10,000 ft. Matiana in woods (Collett). Kashmir.

like the last species, but stem leaves sessile, linear or linear-oblong, heads usually many in irregular umbels, stalks velvety, bracts of heads many, black, downy, outer with recurved tips.

**Hieracium virosum,**

see Herbs, Unbranched, Alternate, Exstipulate Simple.

**Lactuca rapunculoides,**
**Lactuca Lessertiana,**
**Lactuca sagittarioides,**
**Lactuca polycephala,**
**Prenanthes Brunoniana,**
**Pridium tingitanum,**

see Herbs, Erect, Alternate, Exstipulate, Lobed.

**Souchus maritimus,**

see Herbs, Unbranched, Alternate, Exstipulate, Simple.

see Herbs, Erect, Alternate, Exstipulate, Lobed.

FLOWERS NOT IN HEADS.

**Cephalostigma hirsutum,** CAMPANULACEÆ. F. B. I. iii. 428. Himalaya, 2-5,000 ft. Simla, common on banks (Collett). Kashmir.

small, much branched, roughly hairy, stem stiff; leaves $\frac{1}{2}$-1 by $\frac{1}{4}$-$\frac{1}{2}$ in., broadly lanceolate, round-toothed, margin wavy and crisped, nearly sessile; flowers $\frac{1}{8}$ in., blue, in small, branching racemes, upper bracts very small; flower stalks $\frac{1}{4}$-$\frac{1}{2}$ in., calyx sparsely hairy, 5-toothed, teeth $\frac{1}{10}$ in. linear-lanceolate, corolla deeply 5-lobed, lobes linear-lanceolate, spreading, stamens 5, stigma 3-lobed; capsule $\frac{1}{10}$ in. round, 3-valved seed, many three-angled.

**Wahlenbergia gracilis,** CAMPANULACEÆ. The Plains to 7,000 ft. Simla, Boileaugunge in fields (Collett).

small to medium size, perennial, smooth or hairy, sometimes nearly prostrate, branched or not; leaves $\frac{1}{2}$-2$\frac{1}{2}$ by $\frac{1}{12}$-$\frac{1}{2}$ in., sometimes opposite, linear to narrowly oblong, more or less toothed; flowers $\frac{1}{8}$-$\frac{3}{4}$ in., pale blue, long-stalked, solitary, or in

HERBS, ERECT, WITH ALTERNATE EXSTIPULATE SIMPE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

branching racemes, upper bracts small, linear calyx above the ovary, 5-toothed, smooth, teeth $\frac{1}{16}$-$\frac{1}{8}$ in., linear, base triangular, corolla, bell-shaped, divided into 5 broad oblong lobes, stamens 5, stigma 3-lobed; capsule $\frac{1}{4}$ in., tapering into the stalk, seeds many, small, oblong, with rounded ends, flattened, smooth.

**Bhyteuma Thomsoni,**

see Herbs, Unbranched, Alternate, Exstipulate, Simple.

**Campanula latifolia, Blue bell of Scotland,**
CAMPANULACEÆ.
F. B. I. iii. 439.
Himalaya, 8-11,000 ft.
Hattu (Collett).
Kashmir.

medium size to large, smooth, stout, furrowed, leaves $2\frac{1}{2}$-5 by 2-3 in., broadly lanceolate or ovate; upper nearly sessile, roughly velvety beneath; flowers 1-$1\frac{1}{2}$ in., dark purple in racemes, lower ones long-stalked, calyx ovoid or globose, calyx-teeth five, $\frac{1}{2}$-$\frac{3}{4}$ in., lanceolate, corolla bell-shaped, lobes 5, short-pointed, stamens 5, dilated at the bases stigma 3-5 lobed; capsule $\frac{1}{2}$ by $\frac{1}{3}$ in. smooth, seed-$\frac{1}{12}$ in., many.

**Campanula canescens,**
CAMPANULACEÆ.
F. B. I. iii. 439.
The Plains to 5,000 ft.
Mahdopur.

small to medium size, annual, hairy, slender; leaves 1 by $\frac{1}{4}$-$\frac{1}{3}$ in., oblong or lanceolate, round-toothed; flowers many clustered in branching racemes, often dimorphic, *i.e.*, one flower complete, another without corolla or stamens, calyx teeth 0 in., in the perfect flowers, $\frac{1}{12}$ in. in imperfect ores, linear-lanceolate, corolla $\frac{1}{4}$ by $\frac{1}{8}$ in., widely bell-shaped, shortly lobed, greyish-purple; capsule 0-$\frac{1}{4}$ in. diam., in imperfect flowers $\frac{1}{16}$ in. producing perfect seeds, seeds very minute, oblong with rounded ends, hardly flattened; for other characters see the last species.

**Campanula colorata,**
CAMPANULACEÆ.
F. B. I. iii. 440.
The Plains to 10,000 ft.
Simla (Collett).
Kashmir.

small to medium size, stem cylindrical, hairy, much branched or zigzag; leaves 1 by $\frac{1}{4}$-$\frac{1}{2}$ in., lanceolate, often narrowed into the blade, toothed, with slightly rounded notches, softly sparsely hairy on both surfaces; flowers $\frac{1}{4}$ by $\frac{1}{8}$ in., purple or greyish purple in clusters or branching racemes; for other characters see the last species.

# A LIST OF BUTTERFLIES COLLECTED BY CAPTAIN F. M. BAILEY IN WESTERN CHINA, SOUTH-EASTERN TIBET AND THE MISHMI HILLS, 1911.

By

Richard South.

(*Continued from Vol. XXII, p. 345.*)

Sub-Family.—Pierinæ.

125. Delias belladonna.

*Papilio belladonna*, Fabr., Ent. Syst. iii, p. 180 (1793).
*Delias sanaca* var *subnubila*, Leech, Butt. China, Japan and Corea, p. 421, pl. xxxvii, figs. 7 ♂, 8 ♀ (1893).
Four male specimens and one female, the males referable to the form. *subnubila*, Leech.
Drowa Gompa (10,000 ft.), June 21; Chikung (8,300 ft.), July 3; Tsa Chung (7,000 ft.), July 4 ♀.

126. Delias aglaia.

*Papilo aglaia*, Linn., Syst. Nat. x, p. 465 (1758).
*Delias aglaia*, Moore, Lep. Ind. vi, p. 169, figs. 1-1*d* (1905); Bingham, Faun. Brit. Ind., Butt. ii, p. 145 (1907).
Two male specimens.
Ta Shian Liang (15,000 ft.), July 31; Digaru River (12,000 ft.), August 3.

127. Delias thysbe.

*Papilio thysbe*, Cramer, Pap. Exot. iii, pl. 233, fig. c (1782).
*Thyca pyramus*, Wallace, Trans. Ent. Soc., 1867, p. 347.
*Delias thysbe*, Moore, Lep. Ind. vi, p. 171, pl. 532, fig. 1-1*c*. (1905); Bingham, Faun. Brit. Ind., Butt. ii, p. 146 (1907).
One male specimen.
Ding Manon (2,000 ft.), July 27.

128. Prioneris thestylis.

*Pieris thestylis*, Doubleday, Gray's Zool. Misc., p. 76 (1842).
*Prioneris thestylis*, Moore, Lep. Ind. vi, p. 187, pls. 538, 539 (1905); Bingham, Faun. Brit. Ind., Butt. ii, p. 151 (1907).
Two male specimens.
Tulang (7,000 ft.), July 16; Habong River (1,900 ft.), August 2.

129. Hyposcritia indra.

*Pieris indra*, Moore, Cat. Lep. E. I. C. i, p. 74 (1857).
*Hyposcritia indra*, Moore, Lep. Ind. vi, p. 226, pl. 549, figs. 1-1*b* (1905).
*Appias indra*, Bingham, Faun. Brit. Ind., Butt. ii, p. 205 (1907).
One female specimen.
Khupa (2,500 ft.), July 25.

130. Huphina nadina.

*Pieris nadina*, Lucas, Rev. Mag. Zool., 1852, p. 333.
*Huphina nadina*, Moore, Lep. Ind. vi, p. 214, pl. 545, figs. 2-2*e* (1905); Bingham, Faun. Brit. Ind., Butt. ii, p. 188 (1907).
Three specimens.
Tila (3,000 ft.), July 23 (1 ♂, 1 ♀); Ta Shian Liang (1,500 ft.), July 31.

131. HUPHINA HIRTA.

*Pieris hirta*, Moore, Proc. Zool. Soc. Lond., 1865, p. 490, pl. 31, fig. 17, ♂.
*Huphina coronis*, Moore, Lep. Ind., vi p. 207 (1905).
*Huphina nerissa*, Bingham, Faun. Brit. Ind., Butt. ii, p. 183 (1907).
A male specimen.
Pangam (2,500 ft.), July 29.

132. TACHYRIS HIPPO.

*Papilio hippo*, Cramer, Pap. Exot. iii, pl. 195, figs. B, C (1782).
*Appias hippo*, Bingham, Fauna Brit., Ind., Butt. ii, p. 203 (1907)
A male specimen of the typical form.
Salamgam (4,000 ft.), July 29.

133. HEBOMOIA GLAUCIPPE.

*Papilio glaucippe*, Linn, Syst. Ent. i, 2, p. 762 (1767).
*Hebomoia glaucippe*, Moore, Lep. Ind. vii, p. 123, pl. 591, figs. 1-1*c* (1909;) Bingham, Faun. Brit. Ind. Butt. ii, p. 274 (1907).
One male specimen.
Habong River (17,000 ft.), Aug. 2.

134. APORIA AGATHON.

*Pieris agathon*, Gray, Zool. Misc., p. 33 (1832).
*Metaporia agathon*, Moore, Lep. Ind. vi, p. 156, pl. 526, figs. 2-2*b* (1905).
*Aporia agathon*, Bingham, Faun. Brit. Ind., Butt. ii, p. 163 (1907).
Two male specimens.
Tsa Chung (7,000 ft.), July 4.

135. APORIA BAILEYI, sp. n.

♂. Forewings black, costal area powdered with white except on the costa itself; a large white patch in the discoidal cell, its outer extremity bluntly pointed; a white patch filling up the basal two-thirds of the first interspace; median nervure white; a postmedial series of five white spots, the fourth smallest and the fifth largest, all more or less oval; white spots between veins on termen, except towards apex. Hindwings black; a white patch in the discoidal cell and one along costal area; a series of five white spots beyond the cell, the fourth very small; terminal white spots as on forewings. Underside of forewings similar to above, but the terminal white marks extend inwards edging black spear-points from the postmedial white spots. The underside of the hindwings yellowish white, basal spot orange; venation broadly black, hastate marks between veins also black the points extending to termen.

Expanse 76-78 millim.

Closely allied to *A harrietæ*, de Nicéville,* from Bhutan (J. B. N. H. 1892).

Four male specimens.

Menkong (1,000 ft.), June 16; Di Chu, (9,000 ft.), July 9.

136. APORIA DUBERNADI.

*Pieris dubernadi*, Oberthür. Etud. d'Entom. ix, p. 13, pl. i, fig. 6 (1884).
*Aporia dubernadi*, Leech, Butt. China, Japan and Corea, p. 467, pl. xxxvi, fig. 8 ♀ (1893).

Twelve specimens including both sexes. Some specimens are referable to *chumbiensis*, Moore, others are intermediate between that form and the type.

* Journ. Bomb. Nat. His. Soc. vii, p. 341, pl. I, figs. 3 ♂, 4 ♀ (1892).

Liu Yang (7,000 ft.), May 9; Liang ho kao (10,300 ft.), May 15; Kia la (14,000 ft.), June 10; Tsema la (15,500 ft.), June 17; Zhasha la (15,000 ft.), June 20; Shiuden Gompa (13,500 ft.), June 29.

### 137. Aporia davidis.

*Pieris davidis*, Oberthur, Etud. d'Entom. ii, p. 18, pl. i, fig. 5 ♂ (1876); Leech, Entom. xxiv, suppl. p. 57, ♀ (1891).
*Aporia davidis*, Leech, Butt. China, Japan and Corea, p. 468, pl. xxxvi, fig. 1 ♀ (1893).

Eleven male specimens and one female, the latter, which agrees with the female type, from Tsema la. In one male (Kia la) the subterminal marking is almost entirely absent.

Liu Yang (7,000 ft.), May 9th; Liang ho kao (10,300 ft.), May 15; Batang (12,000 ft.). June 2; between Kia la and yer ka lo (12,000 ft.), June 6; E. of Kia la (14,000 ft.), June 10; Ridong (12,000 ft.), and Tsema la (15,500 ft.), June 17; Gon se (12,500 ft.), June 18.

### 138. Aporia martineti.

*Pieris martineti*, Oberthür, Etud. d'Entom. ix, p. 12, pl. i, fig. 5 ♂ (1881).
*Aporia martineti*, Leech, Butt. China, Japan and Corea, p. 470 (1893).

Three male specimens.

Kia la (12,000 feet), June 10; Shiuden Gompa (13,500 ft.), June 27; Pugu (15,000 ft.), June 30.

### 139. Aporia hippia.

*Pieris hippia*, Bremer, Bull. Acad. Pet. iii, p. 464 (1861.)
*Aporia hippia*, Leech, Butt., China, Japan and Corea, p. 471 (1893.)
*Aporia thibetana*, Gr.-Gr., Hor. Ent. Ross. xxvii, p. 127.

Four specimens agreeing with specimens labelled Var. *thibetana* in the British Museum.

Between Kia la and yer ka lo, Ching (12,000 ft.), June 6; La Gong (10,000 ft.), June 11; Menkong (10,000 ft.), June 16 (2 specimens).

### 140. Aporia venata.

*Pieris davidis* var. *venata*, Leech. Entom, xxiv., Suppl. p. 58 (June 1891); Butt. China, p. 469, pl. xxxvi. fig. 3 (1893.)
*Pieris davidina*, Oberthür, Etud. d'Entom. xv, p. 8, pl. iii, fig. 20 (July 1891).

Thirteen male specimens and one female.

Liu Yang (7,000 ft.), May 9; Liang ho kao (10,300 ft.), May 15; Ta chien lu (8,400 ft.), May 17; Nyachuka (10,000 ft.), May 25; Ridong (13,000 ft.), June 17; Gon se (12,500 ft.), June 18; Sanga Chu Dzong (11,000 ft.), July 1.

### 141. Aporia bieti.

*Pieris bieti*, Oberthür, Etud. d'Entom. ix, p. 12, pl. i, figs. 7 ♂, 8 ♀ (1884).
*Aporia hippia*, Leech, Butt. China, Japan and Corea, p. 471 (1893).
*Aporia sulphurea*, Oberthür, Leech, l. c., 472, pl. xxxvi, fig. 2.

Two male specimens and one female, (Sanga Chu Dzong), the latter is referable to ab. *sulphurea*, Oberth.

Drowa Gompa (10,000 ft.), June 21; Sanga Chu Dzong (12,000 ft.), June 30 and July 1.

142. APORIA PROCRIS.

*Aporia procris*, Leech, Entom. xxiii, p. 191 (1890); Butt. China, Japan and Corea, p. 469, pl. xxxiii, fig. 10 ♂ (1893).
*Pieris halisca*, Oberthür, Etud. d'Entom. xv, p. 7, pl. iii, fig. 23 (1891).
Eight male specimens and one female.
North of Tondu la (9,000 ft.), June 14; Kia la (2,000 ft.), June 10, ♀.
*Ab extrema*, nov.
Differs from the typical form in having all the veins and markings strongly black, the markings on terminal area of the forewings more or less confluent forming a broad border; a black spot at end of the cell. Sometimes very large.
Six male specimens.
Nya Chuka (10,000 ft.), May 25; N. of Tondu la (9,000 ft.), June 14; Menkong (10,000 ft.), June 16.

143. APORIA GOUTELLEI.

*Pieris goutellei*, Oberthür, Etud. d'Entom. xi, p. 15, pl. ii, fig. 11 (1886).
*Metaporia goutellei*, Leech, Butt. China, Japan and Corea, p. 465 (1893).
Two male specimens.
Ridong (13,000 ft.), June 17.

144. APORIA DELAVAYI.

*Pieris delavayi*, Oberthür, Etud. d'Entom. xiii, p. 37, pl. ix, fig. 97 (1890).
*Metaporia delavayi*, Leech, Butt. China, Japan and Corea, p. 466 (1893).
Six male specimens.
Drowa Gompa (10,000 ft.), June 21 and 22; Sanga Chu Dzong (12,000 ft.), June 30; Chikung (9,000 ft.), July 3.

145. MESAPIA PELORIA.

*Pieris peloria*, Hewitson, Exot. Butt. i, pl. ii, figs. 15, 16 (1853).
*Mesapia peloria*, Leech, Butt. China, Japan and Corea, p. 659 (1894).
Eleven specimens, only one of which is of the female sex.
Shiuden Gompa (13,500 ft.), June 21 (♀); Pugo (14,900 ft.), June 27.

146. BALTIA BUTLERI.

*Synchloe butleri*, Moore, Proc. Zool. Soc. Lond., 1882, p. 256, pl. xi, figs. 6, 6*a*.
*Baltia butleri*, Moore, Lep. Ind. vi, p. 145, pl. 522, figs. 3-3*b* (1904); Bingham, Faun. Brit. Ind., Butt. ii, p. 159 (1907).
Three male specimens.
Rama la (15,000 ft.), May 26; Jo la (16,000 ft.), June 30.

147. LEUCOCHLOE DAPLIDICE.

*Papilio daplidice*, Linn., Syst. Nat. i, 2, p. 760 (1767).
*Synchloe daplidice*, Leech, Butt. China, Japan and Corea, p. 458 (1893).
*Leucochloe daplidice*, Röber. Seitz, Gr. Pal. p. 49 (1907).
One female specimen.
Liang ho kou, 15th May.

148. PIERIS CANIDIA.

*Papilio canidia*, Sparman, Amœn. Acad. vii, p. 504 (1768).
*Pieris canidia*, Leech, Butt. China, Japan and Corea, p. 455 (1893).
Several specimens in both sexes.
Chin pan shi (2,000 ft.), April 13; Chin jih ho (2,000 ft.), April 21; Lu ku pa (3,000 ft.), May 5.

149. PIERIS CRUCIVORA.

*Pieris brassicæ* v. *crucivora*, Boisduval, Sp. Gen., p. 522 (1836).
*Pieris rapæ* var. *crucivora*, Leech, Butt. China, Japan and Corea, p. 457 (1893).
Four specimens.
Mangpa (11,500 ft.), May 21; Batang (9,000 ft.), June 6; Chikung (8,200 ft.), July 4.

150. COLIAS STOLICZKANA.

*Colias stoliczkana*, Moore, Ann. and Mag. Nat. Hist., 1878, p. 229; Bingham, Fauna Brit. India, Butt. ii, p. 242 (1907).
*Eurymus stoliczkana*, Moore, Lep. Ind. vii, p. 166, pl. 605, figs. 3, 3*b* (1909).
Two male specimens.
Pugo (14,900 ft.), June 27; Shiuden Gompa (13,500 ft.), June 29.

151. COLIAS HYALE POLIOGRAPHUS.

*Colias poliographus*, Motschulsky, Etud. d'Entom. ix, p. 29 (1860).
*Colias hyale*, Leech, Butt. China, Japan and Corea, p. 432 (1893).
Two male and two female specimens.
Kuan Chao Tzu (Szechuen), 1,500 ft., April 18; Gera (10,000 ft.), June 7; La Gong (10,000 ft.), June 11.

152. COLIAS MONTIUM.

*Colias montium*, Oberthür, Etud. d'Entom. xi, p. 16, pl. ii, fig. 41, (1886); Leech, Butt. China, Japan and Corea, p. 436, pl. xxxiv, fig. 15 ♀ (1893).
Three male and five female specimens.
Rama la (11,000 ft.), May 21; Nenda (12,700 ft.), May 31; Pugo (14,900 ft.), June 27.

153. COLIAS NASTES.

*Colias nastes*, Boisduval, Icones., 8 pl., figs. 4 and 5 (1832).
*Colias cocandica*, Ersch, Fedtsch., p. 6, pl. 1, fig. 3 ♀ (1874).
*Colias nebulosa*, Oberthür, Etud. d'Entom. xix, p. 8, pl. 8, fig. 65 (1894).
*Colias nastes*, Bingham, Faun. Brit. Ind., Butt. ii, p. 238 (1907).
Four male specimens of a form between *cocandica* and *nebulosa*.
Pugo (14,900 ft.), June 27.

154. COLIAS EOGENE.

*Colias eogene*, Feld., Reise Nov., p. 196, pl. 27, fig 7 ♂ (1865).
*Colias wanda*, Gr. Gr., Hor. Ent. Soc. Ross. xxvii, p. 383 (1893).
One specimen.
Jo la (16,000 ft.), June 30.

155. COLIAS FIELDII.

*Colias fieldii*, Ménétriès, Cat Mus. Pet. i, p. 79, pl. i, fig. 5 (1855); Leech, Butt. China, Japan and Corea, p. 438, pl. xxxv, figs. 6 ♂, 7 ♀ (1893).
A number of specimens. A male, the only example from Kuan Chao Tzu, is of small size and has rather narrow black border.
Kuan Chao Tzu (Sze Chuan) (1,500 ft.), April 18; between Kia la and Yer ka la (12,000 ft.), June 10; Menkong (10,000 ft.), June 16; Ridong (12,000 ft.), June 18; Drowa Gompa (10,000 ft.), June 22; Sanga Chu Dzong (12,000 ft.), June 25; Pugo (4,900 ft.), June 27; Minzong (3,500 ft.), July 20.

156. TERIAS ANEMONE.

*Terias anemone*, Felder, Wein. Ent. Mon. vi, p. 23 (1862).
*Terias mariesii*, Butler, Trans. Ent. Soc. Lond. 1880, p. 198, pl. vii, figs. 1-7.

*Terias hecabe*, Leech, Butt. China, Japan and Corea, p. 428 (1893).
*Terias hybrida*, Butler, Trans. Ent. Soc. Lond., 1880, p. 199.

Four specimens, the one from Trana is aberrant and seems to be referable to *hybrida*, Butl.

Trana (7,100 ft.), June 15; Minzong (3,500 ft.), July 20; Khupa (2,500 ft.), July 25; Salamgam (3,000 ft.), July 28.

157. TERIAS HECABE.

*Terias hecabe*, Linn., Syst. Nat. i, 2, p. 763 (1767).
*Terias æsiopa*, Mènètriès, Cat. Mus. Pet. i, p. 85, pl. 2, fig. 3 (1855).

Several specimens. One from Khupa approaches the form *æsiopa*, and a specimen from Ding Mann has the black of outer border of forewings continued along the dorsum for two-thirds its length, black border of the hindwings is very broad on the tornal half.

Khupa (2,500 ft.), July 25; Ding Mann (2,000 ft.), July 27; Tashianliang (1,500 ft.), July 31; Dze River (1,500 ft.), Aug. 1.

158. DERCAS DOUBLEDAYI.

*Lercas doubledayi*, Moore, Lep. Ind. vii, p. 31, pl. 562, figs. 1-1*c* (1906).
*Dercas verhuellii*, Doubleday, Gen. Diurn. Lep. i, p. 71 (1847); Bingham, Faun. Brit. Ind., Butt. ii, p. 226 (1907).

One male specimen.

Tila (3,000 ft.), July 22.

159. DERCAS LYCORIAS.

*Rhodocera lycorias*, Doubleday, Gray's Zool. Misc., p. 77 (1842).
*Dercas brindaba*, Swinhoe, Ann. and Mag. Nat. Hist., 1899, p. 107.
*Gonepteryx wallichii*, Doubleday, Proc. Ent. Soc. Lond. v, p. xlvii (1848);
*Dercas wallichii*, Leech, Butt. China, Japan and Corea, p. 445, pl. xxxv, fig. 3 ♂ (1893); Bingham, Faun. Brit. Ind., Butt. ii, p. 227 (1907).

Three specimens.

Dabla (8,000 ft.), July 4; Rima (6,500 ft.), July 5; Kahao (5,000 ft.), July 15.

160. GONEPTERYX ASPASIA.

*Gonepteryx aspasia*, Mènèt., Schrenck's, Reis. p. 17, pl. i, fig. 6 ♂; Leech, Butt. China, Japan and Corea, p. 442 (1893); Bingham, Faun. Brit. Ind., Butt.

Several specimens.

Liu Yang (7,000 ft.), May 9; Ta-chien-lu (8,400 ft.), May 17; Nyachuka (10,000 ft.), May 24; Num Chou (12,500 ft.), June 9; Kia la (12,000 ft.), June 10; Giada (9,500 ft.), July 2; Chikung (8,300 ft.), July 3.

161. GONEPTERYX NEPALENSIS.

*Gonepteryx nepalensis*, Doubleday, Gen. Diurn. Lep. i, p. 71 (1847).
*Colias nepalensis*, Moore, Lep. Ind. vii, p. 24, pl. 559, figs. 2-2*g* (1906).
*Gonepteryx rhamni*, Bingham, Faun. Brit. Ind., Butt. ii, p. 229 (1907).

One male specimen.

Gera (10,000 ft.), June 7.

162. IXIAS PYRENE.

*Papilio pyrene*, Linn., Mus. Ulr., p. 24 (1764).
*Ixias pyrene*, Moore, Lep. Ind. vii, p. 99, pl. 579, figs. 1-1*d* (1909); Bingham, Faun. Brit. Ind., Butt. ii, p. 193, pl. xviii (1907).

One male specimen.

Dze River (15,000 ft.), August 1.

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*Pieris brassicæ* v. *crucivora*, Boisduval, Sp. Gen., p. 522 (1836).
*Pieris rapæ* var. *crucivora*, Leech, Butt. China, Japan and Corea, p. 457 (1893).

Four specimens.

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*Eurymus stoliczkana*, Moore, Lep. Ind. vii, p. 166, pl. 605, figs. 3, 3b (1909).

Two male specimens.

Pugo (14,900 ft.), June 27; Shiuden Gompa (13,500 ft.), June 29.

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Three male and five female specimens.

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*Rhodocera lycorias*, Doubleday, Gray's Zool. Misc., p. 77 (1842).
*Dercas brindaba*, Swinhoe, Ann. and Mag. Nat. Hist., 1899, p. 107.
*Gonepteryx wallichii*, Doubleday, Proc. Ent. Soc. Lond. v, p. xlvii (1848); *Dercas wallichii*, Leech, Butt. China, Japan and Corea, p. 445, pl. xxxv, fig. 3 ♂ (1893); Bingham, Faun. Brit. Ind., Butt. ii, p. 227 (1907).
Three specimens.
Dabla (8,000 ft.), July 4; Rima (6,500 ft.), July 5; Kahao (5,000 ft.), July 15.

160. GONEPTERYX ASPASIA.

*Gonepteryx aspasia*, Mènèt., Schrencks, Reis, p. 17, pl. i, fig. 6 ♂; Leech, Butt. China, Japan and Corea, p. 442 (1893); Bingham, Faun. Brit. Ind., Butt.
Several specimens.
Liu Yang (7,000 ft.), May 9; Ta-chien-lu (8,400 ft.), May 17; Nyachuka (10,000 ft.), May 24; Nun Chou (12,500 ft.), June 9; Kia la (12,000 ft.), June 10; Giada (9,500 ft.), July 2; Chikung (8,300 ft.), July 3.

161. GONEPTERYX NEPALENSIS.

*Gonepteryx nepalensis*, Doubleday, Gen. Diurn. Lep. i, p. 71 (1847).
*Colias nepalensis*, Moore, Lep. Ind. vii, p. 24, pl. 559, figs. 2-2*g* (1906).
*Gonepteryx rhamni*, Bingham, Faun. Brit. Ind., Butt. ii, p. 229 (1907).
One male specimen.
Gera (10,000 ft.), June 7.

162. IXIAS PYRENE.

*Papilio pyrene*, Linn., Mus. Ulr., p. 24 (1764).
*Ixias pyrene*, Moore, Lep. Ind. vii, p. 99, pl. 579, figs. 1-1*d* (1909); Bingham, Faun. Brit. Ind., Butt. ii, p. 193, pl. xviii (1907).
One male specimen.
Dze River (15,000 ft.), August 1.

163. Leucophasia amurensis.

*Leucophasia amurensis*, Ménétriés, Schr. Reis. ii, p. 15, pl. i, figs. 4-5 (1859); Leech, Butt. China, Japan and Corea, p. 482 (1893.)

Three specimens.

Oroshi (10,000 ft.), May 23; Nyachuka (9,000 ft.), May 25; Gera (9,000 ft.), June 7.

164. Euchloe bieti.

*Anthocharis bieti*, Oberthür, Etud. d'Entom. ix, p. 14, pl. i., fig. 1 ♀ (1884); xi, p. 16, pl. vi., fig. 39 ♂ (1886); Leech, Butt. China, Japan and Corea, p. 478 (1893).

Four male specimens and one female.

Shiuden Gompa (13,500 ft.), June 29.

165. Euchloe cardamines.

*Papilio cardamines*, Linn., Syst. Nat. i, 2, p. 761 (1767).

*Anthocharis cardamines* var. *thibetana*, Oberthür, Etud. d'Entom. xi, p. 16 (1886).

*Anthocharis cardamines*, Leech, Butt. China, Japan and Corea, p. 476 (1893).

One male specimen.

Wu chia Chang (Sze Chuan), (2,000 ft.), April 14.

166. Euchloe scolymus.

*Anthocharis scolymus*, Butler, Journ. Linn. Soc. Zool. ix, p. 52 (186, Leech, Butt. China, Japan and Corea, p. 479 (1893).

Two male specimens agreeing in size with typical Japanese examples. The specimens from Western China in the B. M. collection are rather below the average size.

Chin Pan Shi (Sze Chuan), (2,000 ft.), April 13.

Family—RIODINIDÆ.

Sub-family.—Nemeobiinæ.

167. Zemeros flegyas.

*Papilio flegyas*, Cramer, Pap. Exot. iii, pl. cclxxx, figs. E, F (1780.)

*Zemeros flegyas*, Doubleday, Hewitson Gen. Diurn. Lep. ii, p. 419, pl. xxix, fig. 5 (1851): Leech, Butt. China, Japan and Corea, p. 290 (1893.)

A male specimen.

Salamgam (2,000 ft.), July 28.

168. Dodona eugenes.

*Dodona eugenes*, Bates, Journ. Linn. Soc. Zool. ix, p. 371 (1867); Leech, Butt. China, Japan and Corea, p. 292 (1893).

One male specimen.

Latrong (10,000 ft.), June 13.

169. Dodona sinica.

*Dodona durga* var. *sinica*, Leech, Butt. China, Japan and Corea, p. 291 pl. xxviii, fig. 3 (1893).

One male specimen.

Liu Yang (7,000 ft.), May 9.

170. Dodona egeon.

*Taxila egeon*, Westwood, Gen. Diurn. Lep. ii, p. 422, pl. 69, fig. 2 (1851).
*Dodona egeon*, Moore, Lep. Ind. v, p. 69, pl. 396, figs. 2-2*c* (1901).
One female specimen.
Panye (2,000 ft.), July 26.

171. Stiboges nymphidia.

*Stiboges nymphidia*, Butler, Proc. Zool. Soc., Lond., 1876, p. 309, pl. xxii. fig. 1 ♀; Leech, Butt. China, Japan and Corea, p. 295 (1893).
One female specimen.
Ding Manon (2,000 ft.), July 27.

172. Abisara fylla.

*Abisara fylla*, Doubleday, List Lep. Brit. Mus. pt. 2, p. 2 (1847); Leech, Butt. China, Japan and Corea, p. 296 (1893).
*Sospita fylla*, Moore, Lep. Ind. v, p. 78, pl. 399, figs. 1-1*c* (1901.)
Two specimens.
Tulang (3,500 ft.), July 18 (♀); Salamgam (3,000 ft.), July 28.

Family.—LYCÆNIDÆ.

173. Lycæna lanty.

*Lycæna lanty*, Oberthür, Etud. d'Entom. xi, p. 21, pl. vii, fig. 53 (1886); Leech, Butt. China, Japan and Corea, p. 310 (1893).
Eight male specimens and five females.
Nenda (12,000 ft.), May 31; Pongtramo (12,000 ft.), June 2; Pugo (14,900 ft), June 27; Shiuden Gompa (13,500 ft.), June 29. Tsa Chung (7,000 ft.), July 4 (Small ♀).

174. Lycæna pheretes.

*Papilio pheretes*, Hübner, Eur. Schmett. i, p. 45 (1865).
*Lycæna pheretes*, Bingham, Fauna Brit. Ind., Butt. ii, p 352 (1907).
*Plebeius pheretes*, Moore, Lep. Ind. viii, p. 21 (1910).
Four male specimens agreeing with those from Western China in the British Museum and one female.
The female (Di Chu) agrees fairly well with W. China specimens of the same sex, but is rather larger, and the fringes are white. On the underside all the spots are large and white, those of outer series on forewings are faintly coloured with greyish; the medial third of hindwings is tinged with ochreous.
Tsong la (13,500 ft.), June 19; Zhasha-la (14,000) ft., June 20; Drowa Gompa (10,000 ft.), June 21; Pugo (14,900 ft.), June 27; Di Chu (9,000 ft.), July 12.

175. Lycæna dis.

*Lycæna dis*, Grum-Grshimailo, Hor. Ent. Ross. xxv, p. 453 (1891).
Two female specimens.
Compared with the type of *dis*, which is in the British Museum, the white discoidal spots on upperside are rather larger. On the underside the forewings are suffused with whitish, and all the wings are bordered with white, the border of hindwings very broad.
Poda (15,000 ft.), June 30.

176. Lycæna ariana.

*Polyommatus ariana*, Moore, Proc. Zool. Soc., Lond., 1865, p. 504, pl. 31, fig. 2; Lep. Ind., p. 26, pl. 646, fig. 2 (1910).

*Lycæna stolizkana*, Felder., Reise Norara Lep. ii, p. 283. pl. 35, figs. 10, 11 (1865); Bingham, Fauna. Brit. Ind., Butt; ii, p. 341 (1907).
Several specimens, including both sexes.
Sanga Chu Dzong (12,000 ft.), June 26.

177. LYCÆNOPSIS ARGIOLUS.

*Papilio argiolus*, Linn., Syst. Nat. x, p. 483 (1758).
*Cyaniris argiolus*, Leech, Butt. China, Japan and Corea, p. 320 (1893).
*Cyaniris sikkima*, Moore, Proc. Zool. Soc., Lond., 1863, p. 524, pl. 48, fig. 11 E.
*Lycænopsis albocoerulescens*, Chapman, Proc. Zool. Soc., Lond., 1909, p. 446.
*Lycænopsis sikkima*, Moore, Lep. Ind. vii, p. 214, pl. 622, fig. 2 (1910).
Sixteen male specimens and 2 females. Nine of the males are more or less typical, two (Chikung) are referable to *albocoerulescens* and five (also Chikung) to *sikkima*.
Ta Pen Ba (5,000 ft.), May 8; Liu Yang (7,000 ft.), May 11; Batang (9,000 ft.), June 6 (♀); Lonpo (8,000 ft.), June 15 (♀); Menkong (10,000 ft.), June 16; Chikung (8,500 ft.), July 3.

178. LYCÆNOPSIS DILECTUS.

*Polyommatus dilectus*, Moore, Proc. Zool. Soc., Lond., 1879, p. 139.
*Cyaniris dilectus*, Leech, Butt. China, Japan and Corea, p. 319, pl. xxxi fig. 10 ♂ (1893).
Seven specimens.
Chikung (8,500 ft.), July 3; Mango (4,000 ft.), July 16; Minzong (3,500 ft), July 19.

179. LYCÆNOPSIS LIMBATA.

*Polyommatus limbatus*, Moore, Proc. Zool. Soc., Lond., 1879, p. 139.
*Lycænopsis limbata*, Moore, Lep. Ind. vii, p. 218, pl. 623, fig. 3 (1910).
*Cyaniris limbata*, Bingham, Faun. Brit. Ind., Butt. ii, p. 329 (1907).
*Cyaniris placida*, de Nicéville, J. A. S. B., 1883, p. 68, pl. i, fig. 8; Bingham, Faun. Brit. Ind., Butt. ii, p. 326 (1907).
*Lycænopsis placida*, Moore, Lep. Ind. vii, p. 229. pl. 624, figs. 2-2c (1910).
Eight specimens referable to *placida*.
Mango (4,000 ft.), July 16; Tulang (4,000 ft.), July 17.

180. LYCÆNOPSIS PUSPA.

*Polyommatus puspa*, Horsfield, Cat. Lep. E. I. C., p. 67 (1828).
*Cyaniris puspa*, Bingham, Faun. Brit. Ind. ii, p. 323 (1907).
*Lycænopsis puspa*, Moore, Lep. Ind. vii, p. 208, pl. 620, figs. 2-2c (1910).
Two specimens.
Muku (3,400 ft.), July 21; Tashianliang (1,500 ft.), July 31.

181. BOTHRINA CHENNELLII.

*Cyaniris chennellii*, de Nicéville, J. A. S. B., 1883, p. 72, pl. i, fig. 10; Bingham, Fauna Brit. Ind., Butt. ii, p. 327 (1907).
*Bothrinia chennellii*, Moore, Lep. Ind. vii, p. 270, pl. 638, figs. 2-2b (1910).
One male specimen.
Tondu la (9,000 ft.), June 14.

182. CASTALIUS ELNA.

*Lycæna elna*, Ex., Butt. v. (Lycæna,) pl. 1, fig. 8 (1876).
*Castalius elna*, Bingham, Faun., Brit. Ind., Butt. ii, p. 430 (1907); Moore, Lep. Ind. vii, p. 246, pl. 632, figs. 2-2c (1910).
One male specimen.
Habong River (1,700 ft.), August 2.

183. ZIZERA MAHA.

*Lycæna maha*, Kollar, Hugel's Kashmir, iv, pl. 2, p. 422 (1848).
*Lycæna argia*, Ménétriés, Cat. Mus. Petr. ii, p. 125, pl. x, fig. 7 (1857).
*Lycæna marginata*, Poujade, Ann. Soc. Ent. Fr., 1885, p. cli.
*Zizera maha*, Leech, Butt. China, Japan and Corea, p. 325 (1893).
Twelve specimens. Some approach *argia*, Ménétriés, in form; others agree with *marginata*, Poujade.
Kao Pen Tsai, (Szechuan) (1,500 ft.), April 19; Lu Pan Chiao (Szechuan), (1,700 ft.), April 20; Lu Ku Pa (Szechuan), (3,000 ft.), May 2; Minzong, M. (3,500 ft.), July 19; Salamgam (3,000 ft.), July 28.

184. EVERES ION.

*Lycæna ion*, Leech, Entom. xxiv, Suppl., p. 58 (June 1891); Butt., China, p. 331, pl. xxxi, fig. 4 ♂ (1893).
Eight specimens.
Drowa Gompa (10,000 ft.), June 21; Sanga Chu Dzong (4,000 ft.), June 23; Chikung (9,000 ft.), July 3; Kahao (9,300 ft.), July 15.

185. EVERES ARGIADES.

*Papilio argiades*, Pallas, Reise i. p. 472 (1771).
*Lycæna hillotia*, Ménétriés, Cat. Mus. Petr. ii, p. 124, pl. x, fig. 6 (1857).
*Everes argiades*, Leech, Butt. China, Japan and Corea, p. 328 (1893).
Five male specimens and two females. Two males (Chin Pan Shi) are referable to *hellotia*.
Chin Pan Shi (Szechuan) 2,000 ft., April 13; Kahao (5,200 ft.), July 7.

186. EVERES XUTHUS.

*Everes xuthus*, Leech, Butt. China, Japan and Corea, p. 330, pl. xxxi, fig. 7 ♂ (1893).
Four male specimens.
Ta Pen Ba (5,000), May 8; Minzong (3,500 ft.), July 19.

187. LAMPIDES BOETICA.

*Papilio boeticus*, Linn., Syst. Nat. xii, p. 789 (1767).
*Polyommatus boeticus*, Leech, Butt. China, Japan and Corea, p. 337 (1893).
Several specimens.
Ni Tou Yi (Szechuan) (5,000 ft.), May 4; Sanga Chu Dzong (11,000 ft.), July 1; Dong (4,500 ft.), July 15; Tinai (4,200 ft.), July 16.

188. NACADUBA ARDATES.

*Lycæna ardates*, Moore, Proc. Zool. Soc., Lond., 1874, p. 574, pl. 67, fig. 1.
*Nacaduba ardates*, Bingham, Faun. Brit. Ind., Butt. ii, p. 39 (1907).
*Nacaduba nora*, Moore, Lep. Ind. viii, p. 82, pl. 659, fig. 1-1*b* (1910).
Five specimens.
Pangam (2,500 ft.), July 24; Tashianliang (2,000 ft.), July 29; Dze River (1,500 ft.), August 1; Habong River (1,700 ft.), August 2.

189. CHRYSOPHANUS STANDFUSSI SUBBRUNNEA, var. nov.

*Polyommatus standfussi*, Grum-Grshimailo, Hor. Ross., 1891, p. 450.
*Chrysophanus standfussi*, Leech, Butt. China, Japan and Corea, p. 404, pl. xxx, fig. 19 ♂ (1893).
Two specimens. These differ from typical lines in having the underside of the wings brownish instead of grey.
Sanga Chu Dzong (12,000 ft.), June 25; Poda (5,000 ft.), June 30.

190. Chrysophanus li.

*Chrysophanus li*, Oberthür, Etud. d'Entom. xi, p. 19, pl. v, figs. 34 ♂, 38 ♀ (1886); Leech, Butt. China, Japan and Corea, p. 402 (1893).

Several specimens. In one female (Tsong-en) the fulvous colour is almost absent, except a narrow postmedian band.

Lêng Chu (Szechuan), 4,500 ft., May 7; Ta Pen Ba (5,000 ft.), May 8; Liu Yang (7,000 ft.), May 9; Tsongên (11,000 ft.), June 9.

191. Chrysophanus tseng.

*Chrysophanus tseng*, Oberthür, Etud. d'Entom. xi, p. 19, pl. v, fig. 35 (1886); Leech, Butt. China, Japan and Corea, p. 403, pl. xxx, fig. 7 ♀ (1893).

One male specimen.

Leng Chu (4,500ft.), May 7.

192 Chrysophanus pang.

*Chrysophanus pang*, Oberthür, Etud. d'Entom. xi, p. 19, pl. v. fig. 36 (1886); Leech, Butt. China, Japan and Corea, p. 403 (1893).

Seven male specimens and two females.

Ta Chien Lu (8,400 ft.) and Boi La To (12,000 ft.), May 17; Rong Sa La (14,000 ft.), June 1; Jara La Ka (15,000 ft.), June 2; between Kia La and Yer Ka Lo (14,000 ft.), June 10; Sanga Chu Dzong (12,000 ft.), June 25; Poda (15,000), June 30.

193. Ilerda epicles.

*Polyommatus epicles*, Godart, Enc. Méth. ix, p. 646 (1822).

*Ilerda epicles*, Leech, Butt. China, Japan and Corea, p. 408, pl. xxx, fig. 6 ♂ (1893).

Twelve specimens, all males.

Tulang (4,000 ft.), July 17.

194. Ilerda androcles.

*Ilerda androcles*, Hewitson, Gen. Diur. Lep. ii, pl. 75, fig. 2 (1852).

*Heliophorus androcles*, Moore, Lep. Ind. viii, p. 107, pl. 664, figs. 3—3c, (1910).

Two male specimens.

Chikung (8500 ft.), July 3, (7500 ft.), July 4.

195. Aphnæus syama mishmisensis, var. nov.

♂. Forewings purplish blue, with greenish reflection in certain lights; two black spots in the cell, costal area clouded with blackish; terminal border black, divided by an obscure pale transverse line, the inner portion of the border not extending to dorsum. Hindwings of same colour as the forewings, blackish on costal and dorsal areas; termen narrowly edged with black; tornal patch orange, enclosing two silvery marked black spots. Underside creamy white with silvery lined black markings on all wings arranged pretty much as in *Z. zibrina*, Moore; the terminal border of the forewings black, transversely intersected by a thin, interrupted, pale line.

♀. Fuliginous, without trace of purplish blue; black markings of the underside showing through.

Expanse 38—41 millim. ♂; 40 millim. ♀.

Eight male specimens and one female.

Kahao (5,300 ft.), July 7.

In the British Museum there are four specimens (1 ♂, 3 ♀♀) of an unnamed *Aphnæus*, from Western China, these seem to be of the same form as that here described.

196. APHNÆUS SYAMA.

*Amblypodia syama*, Horsfield, Cat. Lep. E. I. C., p. 107 (1829).
*Aphnæus syama*, Leech, Butt. China, Japan and Corea, p. 410 (1893); Swinhoe, Lep. Ind. ix, p. 167 (1911).
Three male specimens and a female, all rather abraded.
Rima (6,000 ft.), July 5; Kahao (5,200 ft.), July 13.

197. HYPOLYCÆNA ERYLUS.

*Polyommatus erylus*, Godt., Enc. Méth. ix, p. 633 (1823).
*Hypolycæna erylus*, Moore, Lep. Ind. ix, p. 93, pl. 723, figs. 1-1*b*. (1911).
Two male specimens.
Digaru River (1,200 ft.), August 3, (1,100 ft.), August 6.

198. STRYMON ÆNOME.

*Thecla ænome*, Leech, Butt. China, Japan and Corea, p. 366, pl. xxix, figs. 6 ♂, 9 ♀ (1893).
Seven specimens.
Lompo (8,000 ft.), June 15.

199. ZINASPA TODARA NEGLECTA, var. nov.

*Zinaspa ditorda*, de Nicéville; Leech, Butt. China, Japan and Corea, p. 346 (1893).
*Zinaspa todara*, Moore, Lep. Ind. ix, p. 14, pl. 720, figs. 2-2*b* (1911).
In this form the purple colour of the male is of darker and duller tint than in either typical *todara* or *distorta*. In the female the purple does not extend beyond the basal half of the forewings, whereas in *todara* this colour spreads over the basal two-thirds, and in *distorta* the purplish or bluish colour extends across quite three-fourths of the forewings.
Expanse 36 millim.
Two male specimens and one female.
Lêng Chu (4,500 ft.), May 7.
There were nine specimens from Western China in the Leech collection, now in the British Museum. These were referred to *distorta* but they are identical with the form here described as *neglecta*.

200. RAPALA CATENA, sp. n.

♂. Purple inclining to bluish on the discal area of each wing, a small orange mark surmounted by a cluster of bluish scales in tornal lobe of hindwings. Underside grey; each wing with two white lines at the outer extremity of cell, and two wavy white lines forming chain-like postmedial bands, the band on hindwings bent inwards at middle and angled before dorsum.
Expanse 40 millim.
One male specimen captured at Rima (5,500 ft.), July 7th, 1911.
Allied to *R. repercussa*, Leech, from Western China.

201. RAPALA SCHISTACEA.

*Deudorix schistacea*, Moore, Proc. Zool. Soc., Lond., 1879, p. 140.
*Rapala schistacea*, Moore, Lep. Ind. ix, p. 58, pl. 718, figs. 2-2*b*. (1911).
One male specimen.
Kahao (5,300 ft.), July.

202. RAPALA NISSA.

*Thecla nissa*, Kollar, Hügel's Kashmir, i, pt. 2, p. 42, pl. iv, figs. 3, 4 (1848
*Rapala subpurpurea*, Leech, Entom. xxiii. p. 42 (1890).

*Rapala nissa*, Leech, Butt. China, Japan and Corea, p. 413, pl. xxix, figs. 12 ♂, 12 ♀ (1893).

One male specimen.

Chikung (8,200 ft.), July 4.

203. HYSUDRA MICANS.

*Thecla micans*, Bremer and Grey, Schmett. N. China's, p. 9 (1853).

*Thecla betuloides*, Butler, Ann. and Mag. Nat. Hist. (5) vii, p. 34, pl. iv, fig. 2 (1881).

*Rapala micans*, Leech, Butt. China, Japan and Corea, p. 414, pl. xxvii, fig. 13 ♂ (1893).

One female specimen of the *betuloides* form.

Nyachuka (10,000 ft.), May 25.

204. ARHOPALA RAMA.

*Thecla rama*, Kollar, Hügel's Kashmir, iv, pt. 2, p. 512, pl. iv, figs. 1, 2, ♂ (1848).

*Arhopala rama*, Leech, Butt. China, Japan and Corea, p. 344 (1893).

Two male specimens and one female.

Rima (6,500 ft.), July 5; Kahad (5,000 ft.), July 15 (♀); Tula (3,000 ft.), July 22.

205. CURETIS BULIS.

*Anops bulis*, Doubleday and Hewitson, Gen. Diurn. Lep. ii, p. 473, pl. lxxv, fig. 5 ♂.

*Curetis bulis*, Bingham, Fauna Brit. Ind., Butt. ii, p. 441 (1907).

One male specimen.

Tulang (4,000 ft.), July 17.

206. CURETIS ACUTA.

*Curetis acuta*, Moore, Ann. and Mag. Nat. Hist. (4) xx, p. 50. (1877); Leech, Butt. China, Japan and Corea, p. 349 (1893).

One male specimen.

Tulang (4,000 ft.), July 17.

FAMILY.—HESPERIIDÆ.

207. ACHALARUS SIMPLEX.

*Eudamus simplex*, Leech, Entom., xxix, Suppll. p. 58 (June 1891).

*Eudamus gener*, Oberthur, Etud. d'Entom. xv, p. 18, pl. i, fig. 2 (July. 1891).

*Achalarus simplex*, Butt. China, Japan and Corea, p. 561, pl. xxxviii, fig. 12 ♂ (1893).

Seven specimens including both sexes.

Liu Yang (7,000 ft.), May 9; Drowa Gompa (10,000 ft.), June 21. Giada (9,500 ft.), July 2; Chikung (8,300 ft.), July 3, (7,500 ft.), July 4.

208. ACHALARUS NEPOS.

*Eudamus nepos*, Oberthur, Etud. d'Entom. xi, pl. vi, fig. 49 (1886).

*Achalarus nepos*, Leech, Butt. China, Japan and Corea, p. 561 (1893).

Six specimens.

Leng Chu (4,500), May 7; Batang (9,000 ft.), June 6; Gera (9,000 ft.), June 7.

209. CELÆNORRHINUS CHINENSIS.

*Celænorrhinus chinensis*, Swinhoe, Ann. and Mag. Nat. Hist. (7) xx, p. 431 (1907).

Two male specimens. Probably a form of *C. leucocorae*, Koll.
Pangam M. (2,500 ft.), July 24; Ding Manon (3,000 ft.), July 27.

210. CELÆNORRHINUS? BADIA..

*Celænorrhinus badia*, Hewitson, Ann. and Mag. Nat. Hist (4) xx, p. 322 (1877).
One female specimen which seems to be referable to *badia*.
Tulang (4,000 ft.), July 17.

211. CELÆNORRHINUS TIBETANA.

*Merogospidæ tibetana*, Mabille, Ann. Soc. Ent. Fr., 1876, p. liv.
*Notocrypta tibetana*, Leech, Butt. China, Japan and Corea, p. 628, pl. xxxviii, fig. 6 (1894).
Two male specimens.
Di Chu (6,000 ft.), July 8; Kahao (5,000 ft.), July 15.

212. DAIMIO MOOREI.

*Pterygospidæ moorei*, Mabille, Ann. Soc. Ent. Fr., 1876, p. clii.
*Daimio sinica*, Leech (part), Butt. China, Japan and Corea, p. 565 (1893).
Three specimens.
Lêng Chu (4,500 ft.), May 7.

213. HESPERIA OBERTHÜRI.

*Syrichthus oberthuri*, Leech, Entom. xxiv, Suppl., p. 59 (June 1891).
*Syrichthus delavayi*, Oberthur, Etud. d'Entom. xv, p. 20 (July 1891).
*Hesperia oberthüri*, Leech, Butt. China, Japan and Corea, p. 579, pl. xli, fig. 5. ♂ (1893).
Five specimens, three of which are of the small form.
Zhasha la (14,500 ft.), June 20 (small form.); Poda (15,000 ft.), June 30.

214. HESPERIA BIETI.

*Syrichthus bieti*, Oberthür, Etud. d'Entom. xi, p. 26, pl. vi, fig. 50 (1886).
*Hesperia bieti*, Leech, Butt. China, Japan and Corea, p. 578 (1893).
Four male specimens and one female.
Ti-zu (13,000 ft.), May 21 (♀); Rama la (15,000 ft.), May 26; Litang (14,000 ft.), May 28; Nenda (12,700 ft.), May 31.

215. THANAOS PELIAS.

*Nisoniades pelias*, Leech, Entom. xxiv, Suppl. p. 60 (1891).
*Thanaos pelias*, Leech, Butt. China, Japan and Corea, p. 581 (1893).
Four specimens.
Ti-zu (1,300 ft.), May 21; Nenda (12,700 ft.), May 31; Batang (10,000 ft.), June 3; Kia la (13,000 ft.), June 10.

216. THANAOS MONTANUS.

*Pyrgus montanus*, Bremer, Bull. Acad. Pets. iii, p. 473 (1861).
*Thanaos montanus*, Leech, Butt. China, Japan and Corea, p. 580 (1893).
One male specimen.
Shen chia chou (3,600 ft.), April 10.

217. THANAOS NIGRESCENS.

*Thanaos montanus* var. *nigrescens*, Leech, Butt. China, Japan and Corea, p. 581, pl. xlii, fig. 2 ♂ (1893).
Two male specimens.
Ta pen ba (5,000 ft.), May 8; Batang (10,000 ft.), June 2.

218. TAGIADES ATTICUS.

*Hesperia atticus*, Fabricius, Ent. Syst. iii, p. 339 (1793).
*Tagiades atticus*, Leech, Butt. China, Japan and Corea, p. 573, pl. xxxviii, fig. 13 (1893).
One male specimen.
Muku M. (3,400 ft.), July 21.

219. KORUTHAIALOS BUTLERI.

*Astictopterus butleri*, Wood-Mason and de Nicèville, Journ. As. Soc. Beng. lii., p. 98, pl. ia, fig. 3 (1884).
*Koruthaialos butleri*, Watson, Proc. Zool. Soc. Lond. 1893, p. 77.
One male specimen.
Payne (2,000 ft.), July 26.

220. PAMPHILA PULCHRA.

*Pamphila pulchra*, Leech, Entom. xxiv, Suppl. p. 59 (1891); Butt. China Japan and Corea, p. 586, pl. xl, fig. 20 ♂ (1893).
*Carterocephalus ops.*, Grum-Grshimalio, Horæ. Ent. Ross. xxv, p. 460 (1891).
Two male specimens.
S. of Ta hsiang ling (Sze chuan) (8,000 ft.), May 3; Liu yang (7,000 ft.), May 9.

221. AUBERTIA NIVEOMACULATUS TIBETANUS, Nov.

Differs from typical *niveomaculatus*, Oberthür*, in having a small white spot at basal end of cell of forewings, and a larger one above it extending almost to base of the wing, in these characters agreeing with *christophi*; the white spot at outer end of cell is smaller as also is the one below it, third spot absent; the transverse white markings on forewings are narrower and rather shorter; the medial series of white spots on hindwings are not so clearly separate.
Five male specimens. One of these (Gon se) has two extra white spots on forewings, placed between the medial spot and the dorsum.
Gon se (12,000 ft.), June 8; La gyap (12,500 ft.), June 18; Sanga chu Dzong (11,000 ft.), July 1.

222. AUBERTIA MONTANA, sp. n.

♂. Forewings black; a spot at base of the costa, a central oblique band formed of four united spots, and a double spot before apex, all yellowish white. Hindwings black, a large central spot and two small spots beyond, yellowish white. Fringes yellowish white, suffused with blackish towards apex of forewings. Underside of forewings blackish, markings as above but whiter; discoidal spot white, linear; apex tinged with chocolate brown, a diffuse whitish dash from apex: hindwings chocolate brown, a small whitish cloud at base of the costa, a whitish oblique dash above dorsum, and a black ringed silvery white dot between the cloud and dash; medial band silvery white, the inner edge almost straight and the outer edge undulate, outlined in blackish; subterminal spots silvery white, eight in number, the first and last pairs united and the third and sixth larger than the others, fringes and termen white, marked with chocolate brown below apex.
Expanse 26 millims.
One male specimen.
Litang (14,000 ft.), May 8.

* Etud. d'Entom. xi, p. 27, pl. ii, fig. 8 (1886).

223. AUBERTIA POSTNIGRA, sp. n.

♂. Forewing black, sprinkled with yellowish grey scales on basal area; a small yellow spot towards basal end of the cell and a larger one at the outer extremity, between the latter and the dorsum are two other yellow spots representing an interrupted medial band; subapical band composed of five yellow spots, the lower two rather out of line with the others; fringes black, mixed with yellow, white at apex. Hindwings black; medial spot yellow, transversely elongate; fringes yellowish white. Underside of forewings dark olivaceous, spots white and rather larger than above; the medial and subapical series connected by a white streak along costal area; some white marks beyond medial series and two white spots at apex. Hindwings blackish, powdered with yellow; a white spot about middle of cell, and a long silvery one at outer end of cell, a white point before the lower extremity of the latter; four silvery white subterminal spots, two near apex, and two below middle, followed by white marks on termen.

Expanse 28 millims.

One male specimen.

The markings are asymetrical, thus on upperside of left forewing the third spot of medial series is double; on the underside of the left hindwing there is a white spot on middle of costa.

Batang (12,000 ft.), June 2.

224. AUBERTIA DIECKMANNI.

*Carcharodes dieckmanni*, Græser, Berl. Ent. Zeit. xxxii, p. 102 (1888).

One male specimen.

Chikung (8,500 ft.), July 3.

225. ÆROMACHUS STIGMATA.

*Æromachus stigmata*, Moore, Proc. Zool. Soc. Lond. 1878, p. 690.

One male specimen.

Tila (3,100 ft.), July 23.

226. AUGIADES SUBHYALINA.

*Hesperia subhyalina*, Bremer and Grey, Schmett. N. China, p. 10, pl. iii, fig. 4 (1853).

*Pamphila subhyalina* var. *thibetana*, Oberthür, Etud. d'Entom. xi, p. 28, pl. vi, fig. 45 (1886).

*Augiades subhyalina*, Leech, Butt. China, Japan and Corea, p. 602, pl. xli, fig. 8 ♂ (1893).

Four specimens.

Menkong (10,000 ft.), June 16 (2 ♂ ♂); Di chu (6,000 ft.), July 2 (♀); Giada (10,000 ft.), July 8 (♀).

227. PARNARA SINENSIS.

*Gegenes sinensis*, Mabille, Bull. Soc. Zool. Jr. 1877, p. 232.

*Pamphila similis*, Leech, Entom. xxiii, p. 48 (1900).

*Parnara sinensis*, Leech, Butt. China, Japan and Corea, p. 608, pl. xlii, fig. 11 ♂ (1893).

One male specimen.

Liu yang (7,000 ft.), May 9.

228. PARNARA BODA.

*Hesperia boda*, Moore, Proc. Zool. Soc. Lond. 1878, p. 688.

*Parnara boda*, Moore, Lep. Ceylon i, p. 167 (1881).

One male specimen.

Salamgam (3,000 ft.), July 28.

229. Baoris eltola.

*Hesperia eltola*, Hewitson, Exot. Butt. iv, (Hesperia) pl. iv, fig. 40 (1869).
*Parnara eltola*, Leech, Butt. China, Japan and Corea, p. 613 (1893).
Four male specimens.
Tinai (4,000), July 16; Minzong M. (3,800 ft.), July 19. Pangam M. (2,500), July 29.

230. Baoris assamensis.

*Baoris assamensis*, Wood-Mason and de Nicéville, Journ. Asia. Soc. Beng. 1887, p. 382, pl. xviii., fig. 5.
One male specimen.
Pangam M. (2500 ft.), July 23.

231. Taractrocera flavoides.

*Taractrocera flavoides*, Leech, Butt. China, Japan and Corea, p. 596, pl. xl figs. 10 ♀, 11 ♂ (1893).
Five male specimens.
Leng chu (Sze chuen) 4,500 ft., May 5; Ta pen ba (5,000 ft.), May 8; Nyachuka (9,000 ft.), May 22.

232. Padraona dara.

*Hesperia dara*, Kollar, Hügel's Kashmir iv, 2, p. 455 (1848).
*Padraona dara*, Leech, Butt. China, Japan and Corea, p. 596, pl. xl, figs. 13, 14 (1893).
Two male specimens.
Rima (6,000 ft.), July 5; Khupa (2 500 ft.), July 25.

233. Halpe aucma.

*Halpe aucma*, Swinhoe, Trans. Ent. Soc. Lond. 1892, p. 325.
Three male specimens.
Tulang (4,000 ft.), July 17.

234. Halpe baileyi, sp. n.

♂. Antennæ black ringed with yellow, club tipped with reddish yellowish below.
Forewings black, flecked with yellowish on basal area and on two-thirds of costal area; six pale golden spots arranged as follows:—one, slightly contracted about middle, in the cell; two, below outer extremity of cell; three, representing a short band, on costal area at three-fourths. Hindwings black sparsely clothed with yellowish hair on basal three-fourths. Fringes of all the wings ochreous, mixed with blackish on forewings. Underside ochreous brown inclining to reddish; spots on forewings as above, dorsal area blackish; a postmedial series of 4 or 5 yellowish dots almost parallel with termen, dorsum streaked with blackish.
Expanse 34 millims.
Allied to *H. blanchardi*, Mab.
One male specimen.
Menkong (10,000 ft.), June 16.

235. Halpe separata.

*Halpe separata*, Moore, Proc. Zool. Soc. 1882, p. 407.
One male specimen.
Tulang (4,000 ft.), July 17.

236. HALPE BIVITTA.

*Pamphila bivitta*, Oberthür, Etud. d'Entom. xi, p. 28, pl. vi, fig. 46 (1886).
*Halpe bivitta*, Leech, Butt. China, Japan and Corea, p. 623 (1893).
Six male specimens.
La Trong (10,000 ft.), June 13; Drowa Gompa (10,000 ft.), June 22; Sanga chu Dzong (11,000 ft.), July 1.

237. HALPE PERFOSSA, sp. n.

♂. Dark brown inclining to black, ochreous hairs on basal area of all the wings; six ochreous tinted hyaline spots on forewings—one in the cell, and three in a line from costa beyond, all these are small, upper one of trio minute; two below cell, the lower one largest and indented on its outer edge. Fringes whitish ochreous, marked with dark-brown at ends of the veins. Underside brown sprinkled with ochreous, spots of forewings appear rather larger.
Expanse 40 millims.
Allied to *H. perara*, Swinhoe.
One male specimen.
Tulang (4,000 ft.), July 17.

238. RHOPALOCAMPTA BENJAMINI.

*Thymele benjamini*, Guérin, Delers. Souv. Voy. Inde. ii, p. 79, pl. xxii. figs. 2, 2a (1843).
*Rhopalocampta benjamini*, Leech, Butt. China, Japan and Corea, p. 641 (1893).
One male specimen.
Deng Mann. (2,000 ft.), July 27.

# PROGRESS OF THE MAMMAL SURVEY OF INDIA, BURMA AND CEYLON.

In the last number of the Journal mention was made that it was proposed to move Mr. Crump to Kumaon. This has now been done and he went up there in August. His first collecting camp was the Pindar Valley at Khati, some days' march beyond Almora. There he collected for sometime, being beyond the full force of the monsoon, and as that slackened, he moved gradually down to Almora. One collection has been received and contains many species new to the survey, *viz.*, mouse-hares, voles, longtailed field mice and mountain foxes. The report on the Kumaon collections should be of considerable interest to members stationed in the Himalayas to the west of that District as there are many species common to the whole of the Western Himalayas.

From Burma Mr. Shortridge has sent in one collection from the N. Shan States made chiefly in the Hsipaw District. This collection also contained many species new to the Survey and among the larger specimens were examples of two kinds of gibbons, Bamboo rats of large size, leopard cats, etc. Another collection is now on its way here which was made in the Myingan District, south of Mandalay, principally at Mount Popa. On his way down the Irrawaddy to Rangoon, Mr. Shortridge stopped at Pagan where he searched the numberless Pagodas for bats, obtaining a splendid collection. On arriving at Rangoon Mr. Shortridge made his way straight to the South of Tenasserim, from where he intends to work carefully up the mainland and the islands of the Mergui Archipelago. Through the kindness of Mr. H. C. Robinson, the Director of the Federated Malay States Museums, two Dyak collectors have been lent to Mr. Shortridge and they will be of great assistance in the heavy jungle of Tenasserim. The collections from these parts will be of great value in showing how far up the Malay element in the Fauna extends.

The climate has been much against Major Mayor's work in the Southern Province of Ceylon but nevertheless he has sent in a second collection containing many specimens of considerable interest which will be reported on shortly. He has now left the Southern Province and gone into the Eastern Province and is working round Anuradhapura which is inland from Trincomalee. On account of the exceptionally heavy rains recently Major Mayor has had great difficulty in getting about. Once the low ground has been worked and when Major Mayor can get up into the higher parts he will be able to get many species of which very little is known and specimens of which are much wanted.

Great assistance has been given to our collectors by many members and others in the different districts. We would however ask

members all over the country to send in specimens even of the commonest species. In Burma, many people in districts not visited by Mr. Shortridge, are continually sending in to him odd specimens and small collections, and in this way many rare specimens have been procured for the Survey. In India proper, the same is being done by Mr. M. M. Mackenzie in Bihar and Mr. P. T. L. Dodsworth at Simla and Delhi and we hope many more will follow their example. Arsenical soap and instructions for skinning can always be had from the Society and we shall be only too pleased to teach the servants of members to skin mammals, etc.

It will be noticed that the subscriptions from members of the Society and from the various Governments now amount to Rs. 56,630 and interest accrued comes to Rs. 1,181, making a total of Rs. 57,811. Against this the Society expended up to 15th October Rs. 42,574 since the commencement of the Survey in March 1911. The expenditure at the beginning was very small, but at the present moment the monthly expenditure is no less than Rs. 2,000. The growth of expenditure is shown by comparing periods of six months, thus:—

| | | |
|---|---|---|
| March 1911 to August 1911 | Rs. 2,040 | .. (Only one Collector was employed). |
| March 1912 to August 1912 | Rs. 4,713 | .. (Two Collectors were employed—both in India). |
| March 1913 to August 1913 | Rs. 11,450 | .. (Three Collectors were employed, one in Burma, one in Ceylon and one in India) |

The Burma and Ceylon expenses are exceptionally heavy, despite the Government help received; in Ceylon especially on account of the great cost of Cart transit, and the present rate of expenditure must continue for sometime, if Ceylon, Burma and Tenasserim are to be properly worked, whilst it is not likely that expenses will be greatly reduced when our Collector moves into Assam. In addition to the mainland of Tenasserim, the islands of the Mergui Archipelago will be worked from Victoria Point northwards.

Amongst recent contributions will be noticed a promise from the Government of the Federated Malay States of Rs. 1,750 during 1914 and a similar amount in 1915.

From the above, therefore, it will be seen that the present balance standing to the credit of the Fund of Rs. 15,000 plus the donations promised of Rs. 7,900—a total of Rs. 22,900—cannot be expected to last more than twelve months.

We are confident that members of this Society recognise the good work the Survey is doing, and we make an earnest appeal therefore for further subscriptions, so that the Survey can be carried on in its present thorough manner.

## MAMMAL FUND.

FURTHER LIST OF SUBSCRIPTIONS UP TO 31ST OCTOBER 1913.

| NAMES. | Amount. | | |
|---|---|---|---|
| | Rs. | | |
| Amount previously acknowledged in Journal No. 2, Vol. XXII .. .. .. .. .. .. | 51,794 | 2 | 2 |
| Executors and Trustees of the late Mr. N. M. Wadia, C. I. E. (2nd Donation) .. .. .. | 500 | 0 | 0 |
| Gharpurey, Capt. K. G. (2nd Donation) .. .. | 15 | 0 | 0 |
| Gough, Major H. (2nd Donation) .. .. .. | 15 | 0 | 0 |
| GOVERNMENT OF CEYLON .. .. .. .. | 2,500 | 0 | 0 |
| Jodhpur, H. H. The Maharaja of .. .. .. | 1,000 | 0 | 0 |
| Montague, Hon'ble E. S., M.P. .. .. .. | 746 | 7 | 0 |
| O'Brien, Major E. .. .. .. .. .. | 50 | 0 | 0 |
| Whistler, H. (3rd Donation) .. .. .. .. | 10 | 0 | 0 |
| Total .. | 56,630 | 9 | 2 |
| PROMISED. | | | |
| | Rs. | | |
| Mr. Ratan Tata (2nd Donation) .. .. | 1,000 | | |
| H. H. The Rao of Cutch (2nd Donation) .. | 1,000 | | |
| GOVERNMENT OF THE CENTRAL PROVINCES.. | 2,500 | | |
| GOVERNMENT OF THE FEDERATED MALAY STATES (for 1914 and 1915) .. .. | 3,500 | | |
| H. H. The Maharaja of Mysore (2nd Donation) .. .. .. .. .. | 1,000 | | |
| | 9,000 | 0 | 0 |
| | 65,630 | 9 | 2 |
| Interest paid by the National Bank of India on Fixed Deposits, etc., up to the end of 31st August 1913 .. .. .. .. .. | 1,192 | 6 | 1 |
| Total .. | 66,822 | 15 | 3 |

# MISCELLANEOUS NOTES.

## No. I.—TIGER TAKING OFF CARCASE OF SLOTH BEAR (*MELURSUS URSINUS*).

When shooting in the Central Provinces in 1911, I was told by the shikari in a certain village that a year before a Sahib had shot a Sloth Bear in the jungle; but when the villagers went to bring in the body, it had been dragged off and partially devoured by a tiger (*Felis tigris*).

C. R. PITMAN.

Dera Ismail Khan, *7th August* 1913.

[There have been several accounts in the Journal of tigers killing and eating Sloth Bears.—Eds.]

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## No. II.—A PORCUPINE-TIGER TRAGEDY.

I was in camp in the Nizam's Dominions two hot weathers ago with Mr. Mackenzie, Chief Engineer, when one morning a "Gond" trotted in to say there was a dead tiger lying in his field, done to death by a porcupine! I galloped out at once to the village, about 8 miles, and was conducted by the villagers to the site of the tragedy. In a field as bare as one's hand lay peacefully dead on his side an almost full-grown well-conditioned tiger, with five large porcupine-quills stuck in his chest, like hatpins in a pin cushion. One hundred and twenty-eight paces distant were the remains of a large porcupine: only quills unfortunately, the body had been roasted and eaten before I could get there! But I was convinced after careful enquiry that practically the whole carcase had been found intact, minus one mouthful bitten out by the tiger. It was late evening before I got the dead tiger into camp, where we made a careful *post-mortem* examination, regretting the absence of a doctor, capable of making a correct diagnosis of the cause of death. We found the pericardium bruised and discoloured, but as far as we could see the heart had not been penetrated by the quills, and was in a normal condition. On the other hand the liver and lungs were in shreds and looked like a black sponge in fragments. Outwardly the body was in excellent condition. It is not uncommon to find bits of quills in tiger's forepaws, pointing to the probability of their usually rendering porcupines harmless first with their paws, before going into them. We concluded that in this case, the tiger, being young and inexperienced, had jumped at the porcupine, and the large dorsal quills had driven with the impact into his chest. We found no bits of quills inside him, although the discoloured and disintegrated condition of his internal economy appeared to point to the probability of his having swallowed something fatal.

What was the cause of death? Perhaps some doctor-shikari will enlighten us. I have heard of tigers having been shot in an emaciated condition, and bits of quills having been found inside them; but this tiger was in splendid condition and certainly died very suddenly, because, firstly, he had left the kill practically uneaten; secondly, he had been able to run only one hundred and twenty-eight paces before death overtook him; and, thirdly, the fact of his having died in a bare field proved a sudden end, because, on the approach of death, if there is time, such animals invariably reach cover to die in.

G. E. C. WAKEFIELD.

Hyderabad, Deccan, 31*st August* 1913.

## No. III.—NOTES ON THE HABITS OF THE SMALL INDIAN MUNGOOSE (*MUNGOS AUROPUNCTATUS*).

I am sending you a few notes on the breeding of the small Indian mungoose (*Mungos auropunctatus*).

I have a tame female of this species, which was given me in August 1911, when about three weeks to a month old. On the evening of the 4th July 1912, she was observed pairing with a wild male, and gave birth to three young ones, 1 male and 2 females, on the night of the 22nd-23rd August—a period of 7 weeks.

On the 14th April of the current year, she again gave birth to two young ones, both females, and again on the 9th July she has given birth to two more, both females.

Unfortunately the dates of pairing on these last two occasions were not observed.

This mungoose makes a charming pet, and a most affectionate one, except when about to pair, when she becomes quite savage, and her temper is also most uncertain for a week before the birth of her young, and a month after. The extraordinary thing is, though she has absolute trust in my wife and self, yet she occasionally turns on us without rhyme or reason during these times. As for the servants and strangers, she will not allow them anywhere near her young, but allows us to handle them. She is a most restless mother for the first two or three weeks, constantly moving her offspring from place to place, carrying them as a cat carries her kittens.

The young when born are remarkably ugly, being practically hairless, and of a dark mouse colour. The eyes open on the 16th to 17th day. While sucking they purr like a cat and to this day when the mother drinks milk she purrs. We have never heard her do this at any other time, or over any other food. When angry they growl and spit.

The mungoose, when attacked, only thinks of itself, never combining for mutual protection. But while the young are helpless, the mother is savage in their defence. There is no doubt that the sexes separate after pairing. I have an idea that the male would make a meal of the young, if he got a chance to do so. Two or three years ago I witnessed a strange thing. A cat of mine had just had her kittens, when a mungoose, owned by a neighbour, came into the room, and in a moment he had one of these kittens and made off with it. He was so quick that I had no time to rescue the poor little mite.

This mungoose is certainly a most useful pet, as all creeping things, such as snakes, centipedes, etc., are eaten by her, as well as scorpions, beetles, wasps, hornets, lizards, rats and mice, and insects of all descriptions. The only thing she does not eat are ants, but white ants are eaten with relish.

Our present house had a bad reputation for harbouring snakes and scorpions, and now there is not one to be seen. There is no doubt that the mungoose is immune to scorpion sting.

If there are any other particulars you would like as to the habits of the mungoose, I shall keep a look-out for them, as we have now five of them in the house.

J. E. POWELL.

GHAZIPUR, U. P., 31*st July* 1913.

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## No. IV.—HEDGEHOGS IN GUJARAT.

Referring to the note *re* distribution of hedgehogs (page 46, Vol. XXII, No. 1), they are to be found in some parts of Gujarat.

About 10 years ago I saw two hedgehogs, the property of some school boys in Borsad in the Kaira District. I did not enquire where they had found them, but as the boys had never been out of their village, it is presumable they had found them locally.

A friend of mine who lived in Gogho for seven years told me of seeing hedgehogs stealing about on the ground in front of the verandah of his bungalow. At one time, when he was sitting out in the open reading in the evenings, he watched one coming evening after evening, apparently attracted by the light of his lamp.

In October last I went on board a boat of the Coast-guard and Customs Service when she lay at anchor here. As we sat talking in the cabin, a hedgehog began to move about. On making inquiries about it, I found it had been procured at Gogho, and that it was a great pet with the few Kalasis on board.

E. A. MONTGOMERY.

ZENANA MISSION HOSPITAL, BROACH,
*20th June* 1913.

[Should anyone come across a hedgehog anywhere in Gujarat, we should be most grateful for specimens.—EDS.]

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## No. V.—PHOTOGRAPH OF A WILD GAUR (*BIBOS GAURUS*).

I send a photograph taken of a bull bison in its natural state in case you should think it of sufficient interest to publish. I also send an enlargement of the same for the Museum.

The bison had squatted in a narrow gorge trusting to our party passing him, but two terriers coming up behind jumped him after we had passed;

he took down the gorge scattering everybody with the terriers in attendance and getting on to a steep hill from which only one path descended, I was able to head him. On finding his way blocked, he charged a forest guard who was with me and failing to get round the sheltering tree as quickly as the guard could, he backed and charged the tree, shaking it to its foundations; after this he showed no inclination to fight and very little energy in getting away. I took three exposures of him, but unfortunately in the hurry some intervening grass close to the lens spoiled the two first pictures. The animal is somewhat abnormal in having a very large dewlap. Most bison in the Central Provinces have only a rudimentary dewlap about the size of two hands on the neck and many have merely a slight fold in the skin. This animal had a large swinging dewlap extending down to his chest.

A. A. DUNBAR BRANDER.

CHIKALDA, BERAR, 14*th May* 1913.

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## No. VI.—RECORD CHEETAL (*AXIS AXIS*) HEAD.

I have just had the pleasure of seeing and measuring the horns of a Cheetal Stag, shot in the Bahraich forests in May last, by Mr. T. J. C. Acton, I.C.S. Measurements of left horn, which is slightly the longer, are as follows:—

| | |
|---|---|
| Length of horn .. .. .. .. | 39¼ inches. |
| „ „ brow tine .. .. .. .. | 14 „ |
| Girth of burr .. .. .. .. .. | 6⅝ „ |
| „ above burr .. .. .. .. | 5¾ „ |
| „ half way up beam .. .. .. | 4⅛ „ |

The horns are very symmetrical, one only abnormality being the presence of three snags on the left brow tine, and one on the right.

The only record book to which I have had access gives 38″ as the record length, but the book was an old edition, and I feel sure that larger heads have been recorded. I would like to know what the present record is.

S. J. MARTIN.

GONDA, 7*th July* 1913.

[Two cheetal heads of 39″ are on record, the one shot by Lady Eileen Elliott in the U. P. and the other by Capt. F. Pope near Jubbulpore.—EDS.]

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## No. VII.—THE EFFECT OF CASTRATION ON A BLACK BUCK (*ANTILOPE CERVICAPRA*).

The following may be of interest to the members of the Society:—

Last cold weather in camp in the Jubbulpore district I noticed when passing through a village a full-grown buck in very good condition, with heavy horns which had been sawn off about twelve inches from the skull, and of an exceptionally pale colour for so large a buck. I questioned the villagers about him and they told me that they had caught him when he was quite young and had kept him in the village for the last five or six years. As his horns grew, he became very dangerous, and so they had them sawn off; but even, thus mutilated, they found that he was a nuisance and so they finally had him castrated. Before this operation he was of the usual dark colour of full-grown bucks, but immediately after it he began to lose his colour and

finally became the pale colour normal in does and immature bucks. The story was obviously true, since the villagers could not possibly have connected the two things. One has often heard of malformation of horn as a result of injuries to the testicles, but I have never heard of such injuries or of complete castration affecting colouration.

Perhaps some other members can tell us of similar cases.

R. A. WILSON, I.C.S.

YEOTMAL, 1*st August* 1913.

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## No. VIII.—REMARKABLE VARIETY OF AN ASTOR MARKHOR (*CAPRA FALCONERI*).

I shot the Markhor, a photograph of which is shown above, in the Mayadass Nullah in Astor. On the 23rd April last I went out about 6 a.m., and about 7 a.m. my shikari saw a herd of about eleven males; they were very low down near the Indus, and at first we did not see the freak. Suddenly my shikari said he thought there was a Bhurrel among them; but, of course, that was impossible as they are never found in that part of the country. We watched the herd for about two hours when they

disappeared into a small nullah and gave us an opportunity of getting near them. There were about three heads of 40 inches and the rest were quite small. When we got within about 150 yards the herd began moving slowly uphill and each in turn stood on a big rock for a few seconds giving a very nice shot broadside on. The freak head came last but one and seemed to be the "boss" of the herd. When he stood still on the rock I let him have it and he sank down and never moved again. The bullet (·256 Mannlicher Schonaher) struck him behind the shoulder, and for some reason glanced up into the base of the neck and shattered the spine. When we got to him the shikari was careful to lift up his leg to see if there was any injury to his testicles to account for his horns being in that shape, but they were quite all right, and there was no sign of any injury on his horns. He was in very poor condition, but I think that was chiefly due to the season of the year, the young grass not having yet come up and very little left of the old. My shikari and all my coolies got ill from eating his flesh, and the next Markhor I shot I would not let my shikari "halal." When first shot this Markhor measured exactly 45" left horn and 44½" right, but now the measurements are right 43¾", left 44⅜"; tip to tip 34½"; girth 10¾". I met several old shikaris during the remainder of my stay in Astor, but they one and all told me that they had never seen or heard of a markhor like mine.

E. EDWARDS, Capt.,
29th Punjabis.

Chaman, 17*th September* 1913.

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## No. IX.—MOUSE DEER (*TRAGULUS MEMINNA*) IN THE CENTRAL PROVINCES.

I found the Chevrotain common on hills of granitoid gneiss in Chanda where they lie up during the day in "forms," under rocks, bushes, dead trees and any convenient hollows in the ground; there is usually a soft lining of dead leaves.

C. R. PITMAN.

Dera Ismail Khan, *7th August* 1913.

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## No. X.—THE INDIAN PANGOLIN (*MANIS CRASSICAUDATA*) IN THE DARBHANGA DISTRICT.

Yesterday evening a specimen of this mammal along with a small Indian Civet (*Viverra malaccensis*) and a monitor lizard were brought to me. The two latter are common but I had never seen, nor had any of the natives ever seen, a pangolin in this district before. I have met with the Malay pangolin (*Manis javanica*) in Cachar and know its burrows well. I do not think I would have overlooked any had I seen them here. The food, as diagnosed from the contents of the stomach was ants, white ants and some very small grasshoppers. Now that the Mammal Survey of India is on, giving any notes on uncommon animals should prove interesting and useful. This specimen was dug out of the soil bank of a tank.

CHAS. M. INGLIS.

Baghownie Factory, Laheria Sarai,
16*th June* 1913.

## No. XI.—THE PALE-BROWN SHRIKE (*LANIUS ISABELLINUS*) IN THE DARBHANGA DISTRICT.

I got a specimen of this bird on the 21st February of this year; at first I took it to be the Brown Shrike (*L. cristatus*) but on shooting it, it proved to be this species. I do not think it has ever been recorded from this District nor in any other places as far east as this, so the record is interesting.

CHAS. M. INGLIS.

BAGHOWNIE FACTORY, DARBHANGA DISTRICT,
16*th June* 1913.

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## No. XII.—THE FOREST WAGTAIL (*LIMONIDROMUS INDICUS*) IN THE DARBHANGA DISTRICT, TIRHOOT.

I have the pleasure of recording the obtaining of this wagtail in this district. Though I have been collecting continually for the last sixteen years in these parts, this is the first time this bird has come to my notice. It was got to-day and was as would be expected in a mango grove, though not a very large one, and when distributed flew up into a tree in the same way as is done by the Indian Tree-Pipit (*Anthus maculatus*).

CHAS. M. INGLIS.

BAGHOWNIE FACTORY, LAHERIA SARAI,
1*st October* 1913.

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## No. XIII.—COMMON CUCKOO (*CUCULUS CANORUS*) LAYING IN THE NEST OF THE PLUMBEOUS REDSTART (*RHYACORNIS FULGINOSUS*).

In June this year I found two eggs of *Cuculus canorus* in nests of *Rhyacornis fulginosus* near Dalhousie.

The first I found on the 3rd June. The nest contained four Redstart eggs and one Cuckoo's egg. They were all hard set—the Cuckoo's egg a good deal more than the Redstart's. The nest was built behind a thick fringe of moss and rocks hanging down a rock face and about 4 inches clear of it; it was about 8 ft. above a small pool in a stream.

The second I found on the 14th June. There were three Redstart's eggs in the nest. They were all slightly incubated, the Cuckoo's egg least of all. The nest was built in a hollow in a grassy bank near but not overhanging the stream. Both nests were near the same stream and about a quarter of a mile apart.

The first Cuckoo's egg measures ·9″ × ·69″. The ground colour is pinkish buff and the egg is evenly blotched and spotted with dull pink. It is a broad oval in shape with the small end rather pointed.

The second egg measures ·75″ × ·62″; it is very similar to the first in colour, but has a slight tinge of grey, and the markings form a distinct zone round the larger end: it is a longer shaped egg than the first and the smaller end is only slightly narrow than the larger.

A. CRUICKSHANK, CAPT.,
32nd Sikh Pioneers.

LAHORE CANTONMENT, 25*th July* 1913.

[The Plumbeous Redstart is not included by Mr. Stuart Baker in his list of nineteen birds in which the Common Cuckoo's eggs have been taken in India, *vide* Journ. B. N. H. S., Vol. XVII, p. 78.—EDS.]

## No. XIV.—THE CUCKOO (*CUCULUS CANORUS*) IN THE CENTRAL PROVINCES.

During May and beginning of June 1913, I constantly heard and saw the Cuckoo in the jungles of South Chanda, C. P., and though I never found any proofs of their breeding there beyond the Cuckoo's breeding season note, I am quite satisfied that these parts may be included in its breeding haunts. In most places Indian Pipits (*Anthus rufulus*) were plentiful, and for other foster mothers this Cuckoo would find a few Magpie Robins (*Copsychus saularis*) and unlimited numbers of the Brown-backed Indian Robins (*Thamnobia cambaiensis*).

C. R. PITMAN.

DERA ISMAIL KHAN, *7th August* 1913.

[Blanford was of opinion that the Common Cuckoo probably breeds in the country between the Godavari and Chota Nagpur. It would be interesting to see a skin of a Common Cuckoo shot in that district in June to see to which race it belongs.—EDS.]

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## No. XV.—OCCURRENCE OF THE HIMALAYAN PIGMY WOODPECKER (*IYNGIPICUS PYGMAEUS*, VIGS) IN RAWALPINDI DISTRICT.

The distribution of this Woodpecker is given in the Fauna of British India, Vol. III, p. 46, as follows:—"Forests of the base and lower valleys of the Western Himalayas from around Katmandu in Nepal to Mussooree." Hence it appears of interest to note that at the end of September 1910, I found this species common in the lower hill jungles, northwest of Kahuta, Rawalpindi District; they were there in parties and were climbing about on the smaller twigs of large trees. Two specimens were obtained and are now in my collection [No. 205—27-9-10, Letrah 3,500 ft. ♀ : 206—25-9-10 Keral.]

HUGH WHISTLER, M.B.O.U.,
Indian Police.

JHELUM, *5th September* 1913.

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## No. XVI.—MALABAR PIED HORNBILL (*ANTHRACOCEROS CORONATUS*).

I came across a pair of these birds in the Central Provinces in lat. 80° 14′ E., long. 19° 50′ N., feeding on the fruit of Peepal trees, in company with green Pigeons, *Crocopus chlorogaster*, in the early morning on either 10th or 11th May 1913. They were very wary and did not allow me to approach close. When at all startled, they quickly made for the forest with a flapping and railing flight. Sportsmen from further south in the Aluri Estate between Bastar and the River Godavari came across them often in flocks of as many as seven.

C. R. PITMAN.

DERA ISMAIL KHAN, *7th August* 1913.

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## No. XVII.—THE HIMALAYAN WOOD-OWL (*SYRNIUM NIVICOLA*, HODGS).

As the nest and eggs of this species have not been observed hitherto, and as very little is said to be known of its habits, the following particulars may be of interest.

This Owl is by no means uncommon in the large oak forests in the neighbourhood of Simla, N. W. Himalayas, and is to be found in these parts throughout the year. It usually keeps in pairs, though it is not unusual to see a solitary bird. It is purely nocturnal in its habits, and during the day sits absolutely motionless, with eyes closed, on the branch of some densely foliaged tree. Its colouration blends admirably with its surroundings, and at times it is most difficult to recognise the bird, even when its exact position has been indicated, for it looks exceedingly like an old stump, and must frequently be mistaken for such.

My friend, Alec. Jones, has made some excellent detailed observations in regard to the note of this bird. He says :—

"The usual call is a double hoot (Hŏ-hŏŏ), and the answer to this (apparently from the bird's mate) is a treble hoot. The hoot of this Owl is deeper than that produced by *S. aluco*. At home I could, with the aid of my hands, generally call up a tawny Owl to within a few yards of where I stood, but here with these Owls (*S. nivicola*), I never succeeded in getting an answer, owing to the fact that I could not get the note low enough to deceive them."

"Besides the usual hoot, *S. nivicola* has a note, which could be produced by placing a blade of grass between the two thumbs, and then blowing through them sharply. This, I think, is a love call. When the bird utters this note, it is usually on the wing, and soars up almost vertically for a few yards, and descends for some distance, with wings closed, gradually opening its wings, and finally settling on the nearest suitable point of vantage."

"On a certain afternoon I heard one of these Owls hooting in an unusual manner. This was more like the bubbling note of the common Cuckoo (*C. canorus*), but not nearly so loud."

An adult bird, which was caught in one of the forests here, was kept in confinement for a few days, but little information could be gleaned in regard to its habits. During the day it would sit huddled up in one corner of its cage, but when night came on, it became exceedingly active. It was fed on dead birds, and it was very noticeable that the heads were invariably eaten first. The food was always held down with the claws, and then torn to bits. For some reason or another, this Owl rejected all the rats that were offered to it, though, curious to relate, these animals form the chief nutriment of the young (*vide* remarks *infra*).

In the "Key to the Species" (Fauna, B. I. Aves, Vol. III., p. 273), Blanford gives the wing of this bird as 12″, but in two specimens, which I have measured, I find that the length of the wing varies from 12·25″ to 12·5″. Then again at page 274, the colouration of the bill is said to be "pale fleshy yellow", but in all my specimens the bill was invariably *light green horny, bluish near base*. Lastly, the claws are not *brown*, but *horny green at bases, and dusky horny at tips*.

The first clue which I obtained to the nesting of this Owl was when on the 1st July, three years ago, one of my hunters brought me an immature bird, which had apparently recently left, or been driven away from its nest, and lacking experience in the ways of this world, had been immediately pounced upon, and almost mobbed to death by a party of Jungle Crows.

The year 1912 passed without any further success, but on the 13th May of this year, the first find was made. I had sent my hunters to examine a Kestrel's nest, which I had found a few days previously on a small cliff, and while ascending this cliff, one of them came across a fairly large cavern, which had not hitherto been observed owing to its mouth being covered over with a mass of brushwood and creepers. Pushing

these aside, the man peeped into the cave through mere curiosity, and before he had time to withdraw himself, he found to his horror that a large Owl was clinging to his bare chest! It was most fortunate that the man had the presence of mind to kill the bird immediately by squeezing it; and on examining the cave again, he found one young, clad in whitish down, which had recently been hatched, and one addled egg.

There was no nest of any kind, and the young and the egg were resting on the bare ground. The remains of a rat were found lying close to the young bird, and with this exception the cave was very clean.

The egg is of course pure spotless white, but is much stained with incubation. It is fairly glossy. Its shape is a broad oval nearly spherical. It measures 1·9″ × 1·6″.

The elevation of the spot was about 6,500 feet.

On my informing Jones about this, he immediately set to work, and made a most systematic and exhaustive search in the neighbouring forests here, with the result that a few days later, he communicated to me the good news that he had located another nest of this species, containing two young, a few days old. There were two partially devoured rats lying beside the young birds.

The nest in this case was in a hollow of an old oak tree, and was placed about 12 feet from the ground. The elevation of the spot was 8,300 feet.

Young of the Himalayan Wood-Owl (*Syrnium nivicola*).

A fortnight afterwards Jones visited the nest again to see how the young were progressing, but much to his surprise, he found that one of them had disappeared; the other was doing splendidly. The old bird was not in the nest at the time, and Jones, taking advantage of its seeming absence, brought down the youngster from the tree, with a view to photographing it. He had barely got the little chap into position, when the old bird appeared on the scene, and made a most determined attack on him, knocking off his hat, and drawing blood from his scalp and face.

From the foregoing it seems pretty clear that the normal number of eggs of this species is 2, and that it lays about the middle or third week in April. The nesting site is either the hollow of an old tree, or a cavern or fissure of a precipice.

Now that we have fairly complete data, there should be no further difficulty in finding more nests of this Owl at the proper season.

P. T. L. DODSWORTH, F.Z.S., M.B.O.U.

SIMLA, 13*th June* 1913.

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## No. XVIII.—SOME FURTHER NOTES ON THE NESTING AND PLUMAGE OF THE SHAHIN FALCON (*FALCO PEREGRINATOR*) VEL THE BLACK-CAP FALCON (*FALCO ATRICEPS*).

Since recording the note about this species in the Journal dated the 21st April 1913 (pp. 197-198), I have taken another nest on the 30th March 1913, containing 2 eggs, in practically the same spot as the one taken last year.

It will be remembered that on the previous occasion I mentioned having shot both the old birds, and a few months afterwards, on visiting this cliff, which had been haunted by them, I found, much to my surprise, that it was tenanted again by another pair of Shahins. These birds did not lay in the old nest, but in a hole of the cliff, about half a mile distant.

In the present case there was no nest of any kind, and the eggs were reposing on the bare ground.

The colouration of the two eggs is entirely different. One—a magnificent specimen—is a rich uniform deep brick-red, the other has a ground colour of brownish-yellow, and is heavily blotched with reddish brown. In shape they are broad ovals, a good deal pointed towards the small end. They measure (1) 1·92″×1·53″, (2) 1·88″×1·52″.

The shells have a fine texture.

One egg was fresh, the other semi-incubated.

I did not shoot the birds in this instance, as I had on several occasions watched them *at very close quarters* before they had laid, and had noted full details of their plumage. The following are the characteristic points which deserve notice:—

(*i*) The cheek-stripe of the *male* was absolutely fused into the black of the head and nape, while in the *female* it was *quite* distinct.

(*ii*) The *male* had no fulvous whatever on the neck, a sign of great age: the *female* had a rufous collar, a sign of immaturity.

(*iii*) The male was ferruginous about the crop and sternum: the corresponding parts in the female were a light salmon, slightly darker on the sternum.

The reverse was the case, as regards all three of the above points, in the birds shot last year.

All these facts tend to confirm my previous impressions:—

(*a*) That the clear "homogeneous unbroken black cap" on which

Hume laid so much stress, for according specific rank to the Himalayan birds, is merely *a sign of age*; and

(*b*) that the Himalayan birds cannot, therefore, be separated on *this* account from the birds found in other parts of India: in other words, the *Falco atriceps* of Hume is identical with the *Falco peregrinator* of Sundevall.

P. T. L. DODSWORTH, F.Z.S., M.B.O.U.

SIMLA, *4th June* 1913.

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## No. XIX.—THE LIMITS OF RANGE OF THE BRONZE-WINGED DOVE (*CHALCOPHAPS INDICA*).

I saw one of these beautiful little doves drinking at a village tank at about 8-0 a.m. on 14th April 1913; this place was about 8 miles west of latitude 80° E. and 70 miles north of the River Godavari. The jungle was fairly open scrub, trees and grass jungle. On 13th May I saw one drinking at a pool in a nallah about 6-30 a.m. in latitude 80° 14′ E. longitude 19° 50′ N., and about 65 miles north of the River Godavari. Hills of granitoid gneiss, thick forest, grassy plains and valleys between the hills: a great deal of Bamboo jungle.

C. R. PITMAN.

DERA ISMAIL KHAN, *7th August* 1913.

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## No. XX.—GREY QUAIL (*COTURNIX COMMUNIS*) IN CUTCH AND KATHIAWAR.

Grey quail have been seen—although only a few—in Cutch, as early as the middle of August, but one never comes across them in May or June. By the beginning of April every bird disappears from this Province, at least I have never seen or heard of any after the first week of April until about the middle of August.

I, therefore, was rather surprised to see last month (May), when I was on the north-west side of the Gir Forest in Kathiawar, no less than seven couple of Grey Quail.

While out riding on the evening on the 27th May, I put up a couple and to make quite sure about them I put them up again. Next morning I was out after black buck and put up about six couple more. The birds were all in a patch of rather long dry grass and got up very close to me, so I have no doubt as to their identity. I saw these quail near a spot called Deval-Bag about a mile and a half from Mendarada, a village which lies in a Kathi State of that name.

M. K. S. VIJAYARAJJI OF CUTCH.

BHUJ, *9th June* 1913.

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## No. XXI.—FLORICAN (*SYPHOETIS AURITA*) IN THE KONKAN.

In No. I, Vol. XXII. I read an article about the occurrence of the Lesser Florican or Likh below the Ghauts. It might interest you to know that in November 1908, I shot a female of this species at Chinchavli, near Neral, while shooting quail in fairly high grass.

I also saw another Lesser Florican from a train between Andheri and Malad stations on the B. B. & C. I. Railway early in December 1912. I am sure of having made no mistake, as the bird was close to the line, and I know the species well, having shot quite a few of them.

M. F. SUTER.

Bombay, 1*st July* 1913.

[In the *Times of India* of June 10th, a Lesser Florican was reported as having been seen in Bombay near Churchgate station two days before, and on the following day Mr. H. A. W. Brent wrote to that paper to say that he had shot one in December last at Kalyan.—Eds.]

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## No. XXII.—BREEDING OF THE INDIAN COURSER (*CURSORIUS COROMANDELICUS*) IN THE DARBHANGA DISTRICT.

On the 13th April of this year, I obtained two nestlings in the down of this species. I had long thought that this species breed here, but none of my collectors ever came across the eggs or young, so I am glad to be able at last to record their breeding here.

CHAS. M. INGLIS.

Baghownie Factory,
Darbhanga District, 16*th June* 1913.

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## No. XXIII.—GREAT SNIPE (*GALLINAGO MAJOR*) IN SOUTH INDIA.

In the Annual Report of the Madras Museum for 1912, Dr. Henderson mentions that the Museum has received a Great Snipe, shot by Mr. G. L. Peters, near Arkonam, on 30th March 1913. As this occurrence has not been recorded before, as far as I am aware, in any Journal I think it is worthwhile putting it on record in the Journal here; otherwise it is apt to be overlooked. The previous records of this snipe in India are near Madras on 5th September 1899 and at Bangalore in October 1910.

N. B. KINNEAR.

Bombay Nat. Hist. Society,
*September* 1913.

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## No. XXIV.—LATE STAY OF SNIPE (*GALLINAGO CŒLESTIS*) IN THE CENTRAL PROVINCES.

I know little about the migration of snipe in the Central Provinces, but the following late dates on which snipe were observed may be of interest.

19*th March*.—I flushed a full snipe from a marsh by the edge of a tank at about 5-45 p. m. in the North Chanda District.

2*nd March*.—About 2-30 p. m. I flushed a snipe from the edge of a tank in South Chanda.

16*th*, 17*th and* 18*th April*,—I observed a snipe by a tank at various hours of the day. None of them were Painted snipe, *Rostratula capensis*, which breed in the Central Province in marshes round large tanks in parts not much frequented by cattle and natives.

C. R. PITMAN.

Dera Ismail Khan,
*August* 1913.

## No. XXV.—WOOD-DUCK (*ASARCORNIS SCUTULATA*) IN MANIPUR.

It may interest you to know that I have recently met with three specimens of the White-winged Wood-Duck, *Asarcornis scutulata*, in the hills near here. This species is common in the Upper Chindwin District of Burma, which adjoins Manipur, and comparatively so in Upper Assam ; but I think I am correct in saying that it has not hitherto been observed in Manipur itself. I was recently on tour in the hills in the north-west of the State, and on July 24th was crossing a small hill stream below Laishan village, known as Laishan Lokchao (height, a little over 3,000 ft.) when the Kukis who were with me, told me that there was a deep pool further up the ravine on which duck were usually found. They told me that the pool had been formed in the night some 15 years ago by a landslip which choked up the ravine. It was with some difficulty that I persuaded them to show me the way to the pool, for they firmly believed it to be haunted, saying that two men who shot duck on the pool a few years ago had died very shortly after. The pool was in a narrow part of the ravine, with steep cliffs on each side. The cliff to the west was wooded, and above and below the pool was high grass above one's head. The pool was about 80 yards long and 30 yards broad. On arriving at one end, I put up a wood-duck, which flew to the other end, where there was another swimming about. I climbed through the jungle to the neighbourhood of the other end, and put up three wood-duck, which flew away down the ravine. The Kukis, who were with me, told me that they had seen that kind of duck occasionally in the rains along the banks of the Iril River (of which this small stream was a tributary), but had never seen them in the cold weather. I doubt, however, if much reliance can be placed in their powers of observation or memory.

J. C. HUGGINS, I.C.S.

IMPHAL, MANIPUR STATE,
14*th August* 1913.

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## No. XXVI.—FIGHTING FISH (*BETTA PUGNAX*).

I obtained six of these little fish from Siam at Singapore on June 26th, 1913, each one being in a separate bottle with a perforated cover, this latter precaution being necessary as they jump out at every opportunity ; in fact I have gone into my cabin two or three times and found one on the mat in quite a dry state and apparently dead, but on placing it back into the water it always returned to life, being a very hardy fish.

I have had several of these fish at different times and have always kept them in a simple glass jam jar, half full of water and a little water weed, changing the water every two days.

As to food I have only given them one grain of boiled rice each fish every two days. This fish when by itself in its own little bottle is quite a quiet, unattractive little fellow and small, only two inches long, with one big dorsal fin, one large and two small long fins like spikes, ventrals, on the underside and two pectorial fins. In colour it is a dull green and red, the fins are all closed up and look small.

The change comes however when you place the two bottles close together and the fish catch sight of each other, suddenly up go their fins which with the tail swell out, and as the fish get more excited, the whole body gets more vivid in colour, red, blue, green and yellow and these colours change rapidly as the fish rush about and the light catches them at various angles.

The pectorial fins fan the water very rapidly, causing strong currents in

the water which stirs up the sediment and two pouches swell out from the lower part of the gills ; these pouches may be called a fringe. They get more and more excited and try to reach each other through the glass, dashing themselves against it and altogether looking very fierce. They have to come up to the top of the water very often for air, each time leaving a little bubble floating on top, then back again to fight, so they will go on for hours, only stopping when the bottles are separated, when they calm down into dull little fish again, their tails and fins closing up and thus they will stay for hours without moving.

The Siamese breed these fish for sport and much betting is done, two fish being put together in the same glass bowl and that fish which kills the other is the winner, some being quite noted for the large number of fights and kills they have had.

I am told the fight does not last long, and sometimes, if taken out in time and placed in a separate jar, the vanquished fish will come to life again, one only wonders how any of these fish survive in their natural state, though I understand, however, it is only the males that fight. I have never put two of my fish together to see a fight as I have always had so much trouble to get them, being rather rare, as however I have now given four to the Bombay Natural History Society's Museum, perhaps they would like to try two ; if so, they may add a note to this, of the result.

One thing I have done, put one fighting fish in a bowl with small Chinese gold fish, with the result, he killed the lot.

F. H. S. STONE.

BOMBAY, *8th July* 1913.

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## No. XXVII.—SOME FACTS ABOUT RUSSELL'S EARTH SNAKE (*ERYX CONICUS*).

On the 17th September this year, I was out on reconnaissance near Tank, N. W. F. P., in the Dera Ismail Khan District, and some of my sepoys called my attention to a snake lying in a field which they said was a double-headed one.

On looking at the beast I saw a snake, well over two feet in length, very sluggish in movement and heavy in appearance. The shape of the body was cylindrical, and it was of the same thickness from head to tail, the circumference being about 2½ inches or more. Of tail there was really none, the posterior being blunt with a slight depression in the centre, two small dark knobs on either side of the posterior rather gave the impression of eyes when looked at from a distance.

The scales seemed very small and of a similar size all over the body, there being no difference in the ventral scales. I did not notice its vent.

The colouration of the body reminded me at first glance of a Russell's Viper, *Vipera russelli*, but was more orange-coloured and the markings less defined, the whole of the under surface from the sides was of a dirty white and the actual belly black. The whole skin was very shiny and its eyes seemed black and beady.

This snake made no attempt to get away and was apparently sunning itself ; but my men, who vowed it was poisonous, killed it. Unfortunately I had no means of taking it along with me.

Now I had with me Afridis, Khattaks, Punjab Mohammedans and Sikhs, and they all had special names for it and all swore as to its various powers. One story was, that a man once bitten will be bitten by a snake every year on the anniversary of the first bite, and I see that this is mentioned in the account of this snake in Vol. XXI, No. 1, J. B. N. H. S.

In regard to the food of *Eryx conicus* rather an interesting point crops up here, as the men told me that this snake at that time of year was very common and could always be found in fields where the quail came, being very partial to a meal of quail. They moreover said that they often came across these snakes when netting quail both by day and night; and they told me not to worry as there were plenty about and they could always get me them.

As to habits I have only twice met this snake, and the nature of the country hard "pat" rather suggests to one that this snake, if an earth-dweller, must be almost amphibious, for very often large tracts of country in its habitat are flooded for months and a couple of days rain will turn the whole of a piece of "pat" country into a mud-marsh. Under such conditions where does this snake go, for is it a good swimmer or not?

In similar circumstances other kinds of more active snakes such as *Echis carinata* would either save themselves by putting distance between them and the danger or escape up into bushes, small trees, etc., but what could the sluggish *conicus* do.

The only other specimen I met was a large one killed in a compound in Tank, but I could not get a vessel capable of holding it at the time.

It measured very nearly 3 feet, which must be very large. I shall be in Tank again this hot weather and will see what I can do about getting specimens.

C. R. S. PITMAN.

Dera Ismail Khan,
*5th December* 1912.

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## No. XXVIII.—OCCURRENCE OF THE SNAKE (*PSAMMOPHIS LONGIFRONS*) AT NAGPUR.

On the 2nd June 1913, I obtained a specimen of this snake for the Nagpur Museum. This is the first time the species has been recorded from here. The type (head and neck only), which is in the British Museum, came from the Cuddapah Hills and others have been recorded from about five localities in the basins of the Kistna and Godavery. In my specimen the condition of the posterior nasal is abnormal; the shield instead of being divided is only partially so and the head lacks the symmetrical undulating black lines described in the type. The costals were in 17 rows on the neck and body reducing to 13 at a point two head lengths away from the vent. Ventrals 174, subcaudals 79 pairs, anal 21, præocular 1, postoculars 2, labials 8, the 4th and the 5th entering the eye, 5 infralabials in contact with the anterior chin-shield.

It had recently fed, six skinks, some of which were *M. carinata*, were found in gastro.

E. A. D'ABREU, F.Z.S.

The Museum, Nagpur,
*15th August* 1913.

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## No. XXIX.—THE OCCURRENCE OF THE SLENDER CORAL SNAKE (*CALLOPHIS TRIMACULATUS*) AT NAGPUR, CENTRAL PROVINCES.

On the 5th August 1913, I secured a specimen of the Slender Coral Snake (*Callophis trimaculatus*) in the Civil Station of Nagpur.

This species has never been recorded in the Central Provinces before, and in extending its habitat it also increases our list of poisonous snakes.

It is a very small snake and remarkably slender, attaining a length of only about 13 inches. There is a great superficial resemblance dorsally between this and another harmless species also found here, which I cannot help noticing, the snake in question being *Polyodontophis subpunctatus*. Both are roughly speaking pale brown snakes with black heads; but the *Callophis* has, in addition, two black bands across the tail. Upset the snakes and the differences are more clearly visible, for while the underparts of the *Polyodontophis* are whitish or yellowish, those of the *Callophis* are bright coral red, or at all events, red near the vent.

My specimen measured 9·7 inches, of which the tail accounted for 1·1 inch. The ventrals and subcaudals were 249+31, the latter in pairs. The anal divided. One præ and two postoculars. One temporal, 6 supralabials, the 3rd and the 4th entering the eye; 4 infralabials in contact with the anterior chin-shield. Costals in 13 rows.

E. A. D'ABREU, F.Z.S.

THE MUSEUM, NAGPUR,
*September 8th*, 1913.

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## No. XXX.—BANDED KRAIT (*BUNGARUS FASCIATUS*) IN OUDH.

If my memory serves me, I think that Major Wall in his interesting papers on the Common Snakes of India, says that the Banded Krait (*Bungarus fasciatus*) had not been recorded from Oudh. It will interest him to know that a fine specimen was lately obtained by Mr. R. H. L. Clarke, I.C.S., in the Western part of the Bahraich district, and that a few years ago, I killed one, and saw two others on the banks of the Mahun river in the Kheri district.

S. J. MARTIN.

GONDA, *7th July* 1913.

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## No. XXXI.—BANDED KRAIT (*BUNGARUS FASCIATUS*) IN HYDERABAD STATE.

A short time ago Mr. A. C. Hankin, C.I.E., Inspector General of the Nizam's Police, was in Bombay, and told us that Mr. G. E. C. Wakefield had killed a Banded Krait (*Bungarus fasciatus*) in Hyderabad State at Christmas time last year. On writing to Mr. Wakefield, he kindly sent the skin and gave us further particulars as follows:—"You are interested in the snake I shot last Xmas at Narsampett, 24 miles N.-E. of Warangal. I shot him at night in a running stream, a light on the bank had apparently attracted him and appeared to hold him there entwined round a bush growing in the running water. By lamp light that night his colour appeared to be black and white, but in day light next morning he was black and pale yellow. But to me, interested as I am in snakes, his most interesting feature was this triangular formation."

The skin which is that of an undoubted Banded Krait measures 7'-3¾" (362 mm.), but having been cured has been considerably stretched and probably did not measure when alive much more than 6'-9". Major Wall

gives the southern limit of this snake as "only known from the Peninsula in the North-East as far South as the Basin of the Mahanadi River," which is about 190 miles North-East of the present locality.

N. B. KINNEAR.

Bombay Natural History Society, 1913.

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## No. XXXII.—KRAITS IN THE DERA ISMAIL KHAN DISTRICT.

This district seems to be rich in Kraits, and according to their habit they are always to be found hunting in pairs. Kill a Krait and look for its mate is a very sound principle on which to act, it will answer in every case: otherwise one is asking for trouble. Moreover, all I have seen here appear to be of an unusually large variety, and I have not met any measuring under 3 feet in length. During the hot weather in August, I saw 2 pairs which had been killed and which were fine ordinary Kraits of the species *Bungarus coeruleus* averaging about 3'-6".

In the middle of September my regiment went out to Tank, which is 42 miles north and a few degrees west of Dera Ismail Khan. There, in less than a month, within a very small area, 3 pairs were killed: all very large and all of the Sind variety, *Bungarus sindanus*. The last pair killed were very big, each measuring over 4 feet in length, and they were very vicious. The first one was killed lying along the step of a well and then the mate suddenly appeared from near at hand and struck at the *mali* repeatedly, fortunately it only struck him on the skirt of his clothing and then it was despatched.

I do not know whether Sind and Common Kraits are found together but it seems curious that these two species should be locally distributed in places which are only 42 miles apart.

Next year, when my regiment will spend four of the hot weather months at Tank, I hope to find out more about the distribution of these Kraits.

C. R. S. PITMAN,
27th Punjabis.

Dera Ismail Khan,
*November*, 1912.

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## No. XXXIII.—A SNAKE-CHARMER'S PERFORMANCE.

On 21st September 1913, I was visited by an old Burman snake-charmer, and his performance was so remarkable that I requested him to come again and repeat it before some friends, whom I invited to come and watch. I had a double object in doing this, first, in order to give me an opportunity to check my own observations, and, if necessary, correct them; and, secondly, to procure the additional evidence of two independent observers. Unfortunately the old man did not turn up on the next day as he was said to be suffering from an attack of fever, and when he did appear on the third day (yesterday) he was so obviously shaking with fever that his performance did not come up to that given on the first day. I was able, however, to check my original observations and conclusions satisfactorily; and I think it will be interesting to describe the whole performance in detail as it appeared to the observers first, adding my own conclusions afterwards.

The old man himself would have delighted the heart of an artist. He gave his name as U Hla Baw of Yenaung village, about 8 miles from Pyawbwe. He was of moderate height, spare figure, wrinkled and almost toothless, and his hands scarred and knotted to a degree, the little finger

of one hand being permanently bent at a right angle from the middle joint. He was accompanied by a small orchestra, consisting of a drum and a pipe on the first day augmented by a pair of brass cymbals and a split bamboo clapper on the second day. When this rude band had tuned up and really got going, the performer divested himself of his coat and removed his "gaung-baung" or silk head-dress which he wound round his waist, tied his hair in a knot on the top of his head and then clad in a vest and a pair of loose black Shan trousers, began his performance by removing the lid from a large round basket and hitting the basket on the side. I expected to see a cobra, the usual adjunct of the snake-charming fraternity, but to my surprise a very large hamadryad reared its head about a foot above the basket and flattened its neck in menace. It was a magnificent specimen in very good coat—I subsequently taped it while it was held out at full length, but for the small curves into which its body was thrown by its struggles, and it measured from nose tip to tail tip just over twelve feet two inches—and no one knowing the swift death that follows a bite from this species could fail to be thrilled by the spectacle it offered. Now the band toned down its raucousness and the old man began droning a song accompanied by a dance of the usual Burmese type, that is, exaggerated posturing of body with a slight shuffle and much waving of the hands. He approached the snake, put his face down close to it and sang leeringly (or was it endearingly?) at it. The snake never moved. Then he knelt down beside the basket with his neck just below the snake and enticed it to strike. The hamadryad lunged out over his neck some two feet or more with half opened mouth and drew back again. The snake-charmer then rose and continued his dance. Presently he squatted in front of the snake and induced it to strike at him. After it had done so several times he approached it slowly and extending his tongue slowly licked its nose, a proceeding he followed by licking its face all over and finally taking its nose into his mouth and closing his lips on it. His next act was to turn it out of the basket which he did by slowly pouring it out while he stepped backwards with the basket so that it presently lay at full length on the ground. He then placed his open hand on its tail and when he pressed on it the snake instantly turned on him with a rush and struck. After this he went through the same tricks he had done with it while it was in its basket and they were all repeated not once but several times. I then requested him to put the snake back in its basket and he did so by deftly seizing it behind the head and lifting as much as he could conveniently reach with the other hand while a small boy lifted the tail. I next asked him if the snake had its fangs and he assured me it had, so I asked him to show them to me. He caught it again by the neck and pushing back the mucous covering said "there," but I could see no signs of them, and on the second day when I tried again I was fairly satisfied that they had been removed and that on one side the mouth was still sore from the operation. He told me he had caught the snake some 26 days previously, and that he had often been bitten and showed me the scars on his hands and wrists. These, of course, may or may not have been due to bites, but I am inclined to think that very likely they were, for on the second day, as he was releasing the snake after showing me its mouth, he sustained a scratch on the finger from one of its teeth though this did not appear to concern him much. I asked him what he did when he was bitten and he said that snake-bites had no effect on him as he had taken medicine for many years. He then produced some small pieces of a blackish substance which, he said, was composed of a certain herb and that when a person was bitten all he had to do was to rub some of the substance on the palm of his hand and then swallow it. This herb, he said,

probably grew round here but the snake always had to find it, a story most of us have heard before from snake-charmers. I begged for a piece of this and he kindly gave me two pieces as well as two pieces of a porous substance which he told me was to be applied to the wound in the event of a bite.

To return to the performance, I noticed, first of all, that the snake seemed to show very little spirit or "animus" when striking at the performer. Indeed his lunges in the direction of the man appeared to me to be more of a threatening nature, as if to say, "be careful or I will bite you." Secondly, I remarked that its blows never actually went home. On one or two occasions I could not see the finish of the blow; but, as a rule, when the snake struck, the old man gently turned the blow aside with his open hand in exactly the way one turns a lunge from a sabre in fencing. This parrying was not so noticeable on the second day, when the snake seemed less inclined to strike than at the first performance. Thirdly, I remarked that the snake never opened its mouth at all widely as if to inflict a real bite but merely lunged with its mouth slightly open. I cannot account for the snake's docile behaviour when the Burman put his face against its face and when he licked its nose and took other familiarities with it, nor can I explain how it was taught to lunge close over the back of his neck when he crouched beside it. To sum up, I arrived at the conclusion that the snake was utterly cowed. It had, I presume, suffered in the extraction of its fangs, and this operation coupled perhaps with its subsequent treatment, had induced in it a sense of impotence resulting in its never striking home and inflicting a wound.

Finally, it would be interesting to know whether the extraction of the fangs had any direct effect on the secretion of the poison in the poison glands, or stopped the flow of poison into the mouth by blocking up the duct by inflammation or in any other way, or whether the poison was in its mouth but sufficiently diluted with saliva to be innocuous for the time being, but I had no means of investigating these questions. I should mention that both performances were very closely watched by my wife and myself from a distance of four yards, and that on the second occasion there were two other gentlemen present not to mention servants. The snake was an undoubted hamadryad of the distinctly banded variety and measured over twelve feet in length and over ten inches in girth.

F. E. W. VENNING, Captain.

Pyawbwe, *25th September* 1913.

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## No. XXXIV.—VARIETIES OF *HEMIBUNGARUS NIGRESCENS* AND *HYDROPHIS TORQUATUS*.

*Hemibungarus nigrescens.*

An unusual specimen was collected by Father Dreckmann, S.J., at Khandalla. It is aberrant in having an entire anal shield, but is otherwise normal in lepidosis. *Ventrals* 244. *Subcaudals* 38. If not a melanotic specimen it deserves recognition as a colour variety, and I would suggest the name *khandallensis* for it. Dorsally it is uniform blackish. A lightish temporal oblique streak, and a similarly coloured nuchal bar alone relieve the dorsal colouration. The belly is coral red. As far as I can ascertain it has only once before been recorded North of Goa, *viz.*, at Karwar (Phipson. Bomb. Nat. Hist. Jourl., Vol. II, p. 248).

*Hydrophis torquatus.*

An interesting melanotic specimen of this snake was found by Father Dreckmann, S.J., in Back Bay, Bombay. In lepidosis it fully agrees with

my many other specimens. *Costals*—two head lengths behind the head are 38, in midbody 46, and two head lengths before the vent 39; subimbricate anteriorly, juxtaposed posteriorly. *Ventrals*—326, entire in whole belly. It is completely black. Some very indistinct indications of the normal light bars are visible ventrally. The records of over 30 specimens show that it has only once before been taken on the shores of Peninsula India, West of Calcutta, *viz.*, on the East Coast at Gopalpore (Orissa). On the Burmese Coast it is common.

F. WALL, C.M.Z.S., I.M.S.

ALMORA, 1913.

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## No. XXXV.—NOTES ON SOME INTERESTING SNAKES RECENTLY PRESENTED TO THE SOCIETY.

*Oligodon erythrogaster.*

A good specimen of this little known species, with the habitat unspecified, has been sent to our Society by Dr. Caleb. The ventrals number 163, and the subcaudals 59. The type in the Indian Museum was from Nepal. I recorded a second specimen (Bomb. N. H. Jourl., Vol. XIX, p. 1,000) from Tindharia (E. Himalayas) since then I have had another from Tindharia, and the specimen now alluded to is the fourth known. The ventrals range from 163 to 184, and the subcaudals from 47 to 59.

*Dryophis pulverulentus.*

Two fine specimens of this uncommon snake have been acquired by our Society. A young one from Mr. E. E. Green is from Ceylon. The ventrals are 183 and the subcaudals 161. The second specimen from Mr. A. Kinloch is from the Nellampathy Hills. It is a very fine ♂ measuring 4 feet 3½ inches, the tail accounting for 22 inches. The ventrals are 202 and the subcaudals 207.

*Dendrophis gorei.*

A *Dendrophis* from the S. Shan States (Taunggyi) collected by Mr. Lightfoot agrees with two specimens of *gorei** from Assam in every respect except that the anal is entire instead of being divided. The ventrals are 195, and subcaudals 107 (tail deficient terminally). The costals two head lengths behind the head are 13, in midbody 13, and two head lengths before the vent 11. The anterior temporal is single. The supralabials 8, the 4th and 5th touching the eye. The 6th infralabial very long, equals the 4 preceding shields of the series. The maxillary teeth are about 17 (the 2 posterior enlarged).

*Dendrophis bifrenalis.*

Among other snakes from Ceylon Mr. E. E. Green has sent our Society a good ♀ ? specimen of this species. The ventrals are 164 and the subcaudals 151.

*Callophis macclellandi*, var *gorei.*

In Vol. XIX, page 842 of this journal I mentioned a new colour variety of this species from Jaipur, Assam. I have now received a fourth specimen from Manipur which I have sent to our Society's collection. The ventrals number 214, and the subcaudals 29.

F. WALL, C.M.Z.S., I.M.S.

ALMORA, 1913.

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* Bomb. Nat. Hist. Jourl., Vol. XIX, p. 829.

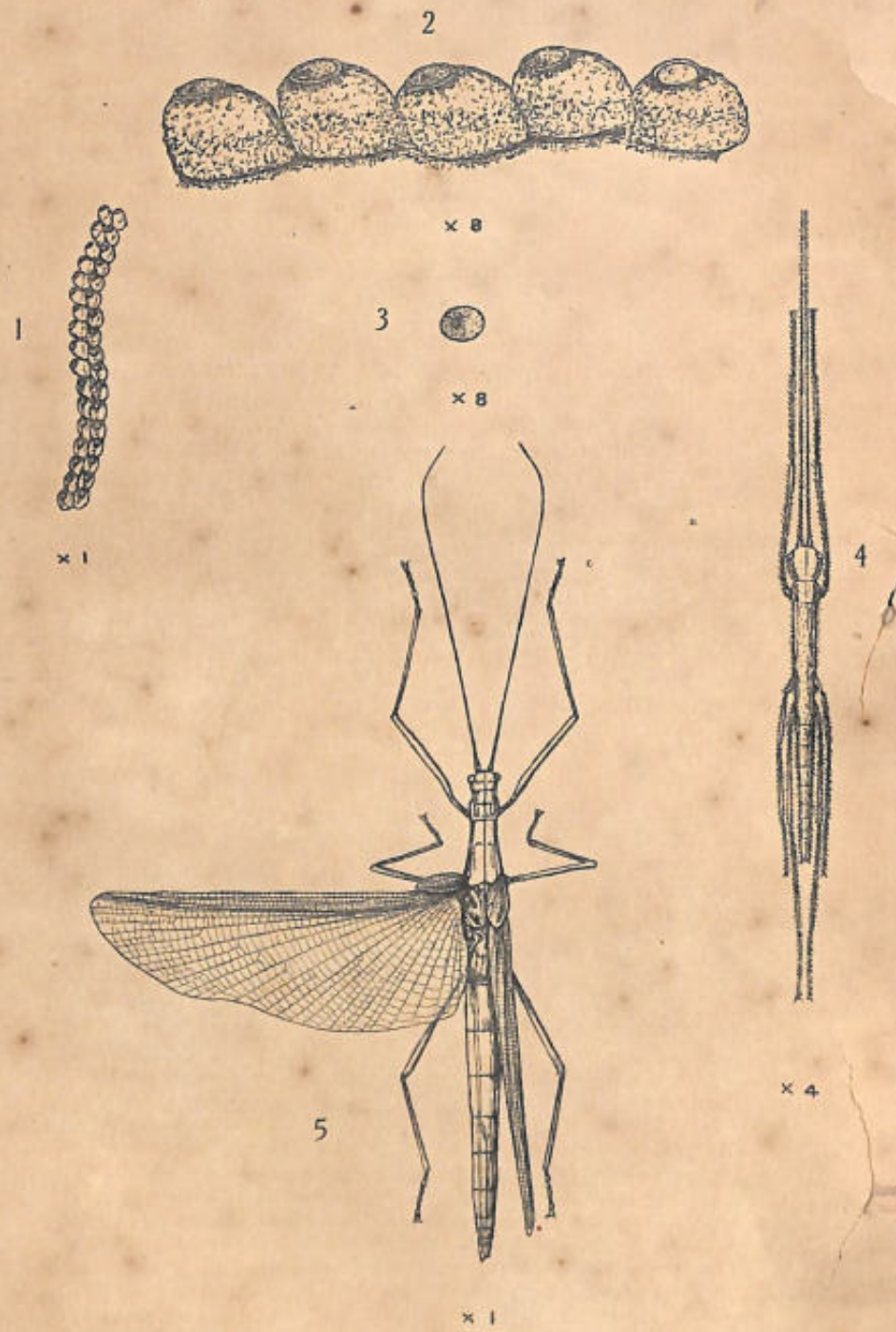
## No. XXXVI.—NOTES ON THE FLYING LIZARD (*DRACO MACULATUS*).

Whilst hunting for specimens amongst the trees in the P. & O. Company's compound at Singapore on the 26th of June at 11 A.M. I saw two small brown lizards basking in the sun on the trunk of a large tree. I give the time, because they are mostly seen between 11 A.M. and 2 P.M., when the sun is strong, for the rest of the day keeping to the upper parts of the trees out of sight.

On closer inspection I found they had "wings," which were spread out; but they were absolutely motionless. I also found that they were a pair. Not having anything to catch them with I hurried back to my ship and got my butterfly net and ran back again to the same place expecting they would have vanished, but they had not; they were still in the same place. I made a dash at the lower of the two lizards, knocked it off the tree, caught it in the net and transferred it to a tin box without hurting it in any way. I then looked for its mate, but he had disappeared high up into the uppermost branches and I did not see him again. I made my way back highly delighted with having caught even one and got the carpenter to knock me up a box with a glass cover, into which I placed my lizard with some earth and dried twigs, also some small grasshoppers as food. I am not certain if she ate these, but anyway they were gone the next morning, perhaps through the holes which were bored in the box for air. However day after day I tried her with flies and small cockroaches, and once with a butterfly which had lost its way and flown on board in mid-ocean; but even this did not tempt her, and she did not eat anything all the time I had her and did not seem much the worse for it.

The colour of this lizard was brown and grey, with black spots, one black spot between the eyes and one on the back of the neck. Then 7 double black and yellow spots along the back which merged into rings along the tail. On the wings were lines of brown black spots with yellowish wavy lines in between. The throat underneath was grey with a tinge of blue green, and mottled with black. "The male has yellow under the throat and a small crest on the back of its neck." The "wings" extended from behind the forelegs to the forepart of the hind legs and were in the form of a parachute, just skin with 6 or 7 long ribs passing through to strengthen them and for expanding and closing them. After being confined in the box it seldom opened its "wings" but kept them folded at its sides. These wings are used as a parachute when jumping from branch to branch which they do so quickly they are hardly to be seen. This lizard is quite harmless, but it certainly looked very fierce when I attempted to handle it, opening its mouth very wide and making faces at me. A Malay who saw me catch it told me that it was poisonous and he evidently believed it was. The whole body is covered with scales but they are very small. This lizard is only found in the Malay Peninsular, Sumatra, Java and Borneo and is different to the flying lizard of India. The day after the capture of the lizard it scraped a little hole in the earth at the bottom of the box and laid three little oval white eggs with a soft skin, then left them exposed and has never been near them since except to jump on them in her excitement or anger when being looked at. Jumping on the eggs dented them in, but after a few hours they always resumed their proper shape again. The eggs when laid were just under half an inch long, but on the ninth day I discovered that they were growing longer and more rounded in the middle. I have kept the earth fairly damp the whole time so that the eggs should have a little moisture.

The first morning after the lizard was on board I found the box full of




THE LIFE HISTORY OF A PHASMID.

Fig. 1. CLUSTER OF EGGS, natural size.
Fig. 2. EGGS × 8.
Fig. 3. OPERCULUM OF EGG × 8.
Fig. 4. NEWLY-HATCHED NYMPH × 4.
Fig. 5. ADULT INSECT, natural size.

ants, so after turning them out I painted a line of Stockholm tar round the outside of the box, and this kept them out alright until we arrived in Bombay, when I handed the lizard and her eggs over to the Society's Museum. I shall be much interested in hearing if they hatch out but the sea air, I am afraid, may have been too much for them.

F. H. S. STONE.

BOMBAY, *9th July* 1913.

[Unfortunately the lizard died shortly after it arrived, and the two eggs shrivelled up.—N. B. K.]

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## No. XXXVII.—THE CONTENTS OF A MARSH CROCODILE'S (*CROCODILUS PALUSTRIS*) STOMACH.

On the morning of 28th April 1913, I shot a 9 feet Crocodile in the River Weinganga, Central Provinces, and on examining the contents of its stomach, I found a fair sized pig, in portions, but still undigested, a pair of metal bracelets and a leaden ball of about ¾ inch in diameter.

C. R. PITMAN.

DERA ISMAIL KHAN, *7th August* 1913.

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## No. XXXVIII.—MARSH CROCODILE (*CROCODILUS PALUSTRIS*) KILLING A PANTHER (*FELIS PARDUS*).

While in camp on the banks of the River Weinganga in the Central Provinces some villagers one day, the 27th of March, brought me a half-grown panther measuring about 5'-6" that they had picked up dead near the river and which from the nature of the wounds on it had undoubtedly been killed by a crocodile.

C. R. PITMAN.

DERA ISMAIL KHAN, *7th August* 1913.

[Sir E. Tennant in the Natural History of Ceylon gives an amusing account of a panther falling a victim to an Esturine Crocodile (*Crocodilus porosus*)—EDS.]

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## No. XXXIX.—NOTE ON THE LIFE-HISTORY OF A PHASMID.

(WITH A PLATE.)

There is very little on record regarding the life-history and habits of Indian Phasmidæ; perhaps the only insect of the group about which something is known is *Phyllium scythe*. As such, it is believed that this short note on the life-history of one of these insects, however incomplete, will contribute a little to our knowledge of this little-known but interesting group of Orthoptera.

On the 18th September 1912, by mere chance, I came across a group of eggs deposited on a wooden rafter in the roof of a shed up the hills (2,000 feet) a few miles west of the Coimbatore Agricultural College. When first observed, I had not the remotest idea that these were Phasmid eggs; they were merely taken for the eggs of some Rhynchotid, and it was only [illegible] the nymphs emerged a few days later that their true identity became evident. The reason for mistaking their true nature is due to the fact that most of the Phasmids known and described in books are known to simply drop their eggs singly on to the soil together with their excrement.

*The eggs.*—The eggs are hard and seed like; they were found arranged on the wooden rafter in two parallel rows. They were cemented to the

surface and each other at the sides by means of a sticky secretion. In arrangement each egg is disposed in an inclined plane leaning towards the side of its neighbour. The shape of each egg resembles an ovoid conical jar broader at the base and gradually narrowing towards the distal free end. At this later region there is a circular operculum or lid which is separated off as a thin hard disc when the embryo emerges from within the egg shell. When this lid is off, the distal end of the shell shows a slightly raised circular rim bounding the opening. The egg capsule is lined inside by a very thin whitish membrane. The outer surface is rough and is covered with uneven reticulations giving it a rugose appearance. The general colour of the eggs may be put down as pale whitish with dark spots here and there. In this group there were in all 20 eggs.

The first nymph emerged on the 3rd September; as it was not known when the eggs were laid by the parent insect; it may safely be stated that it takes not less than sixteen days for the eggs to hatch out. The just-hatched nymph is a slender comparatively elongate creature with the limbs and antennæ very prominent; the antennæ being as long as the body itself. At this stage the insect is 10 m.m. long. It is of a pale whitish green colour. Each side of the body from the eye backwards has a darker hue. The hinder two pairs of limbs are of an orange brown colour. The body and limbs are hairy. When at rest the nymph keeps the front legs and antennæ stretched forwards and the hind legs backwards almost parallel to the body; this gives the creature the appearance often assumed by certain spiders. When touched the insect is so very delicate that one or more of its legs get broken generally below the trochanter, though these broken limbs are gradually repaired.

The first moult took place ten days after emergence from the egg and after this the insect passed two or three moults, but these were not correctly noted.

Not knowing the particular foodplant on which the insect generally feeds, great difficulty was experienced in keeping alive the young nymphs and many different kinds of leaves were tried for their food. A good many of them died before the first moult. After a few days the nymphs—whether due to necessity or liking I cannot say—began to appreciate the leaves of *Hibiscus esculentus*, and they were fed on this leaf regularly afterwards. The nymphs appear to be fond of water, drops of which they lapped often with apparent satisfaction.

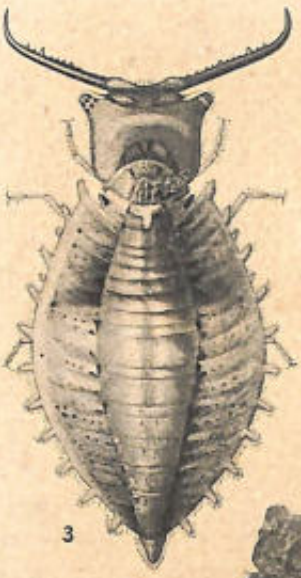
Out of the seven or eight nymphs that continued vigorous for several days after hatching, only one lived to assume the adult stage. This completed the embryonic stage on the 12th December, three months and nine days after birth. The wing pads showed themselves early in December.

The adult has the hind wings well developed reaching the very end of the abdomen, while the first pair or tegmina are very short, hardly a third of an inch in length. The insect appears to belong to Dr. Sharp's group of Necroscides (Cambridge Natural History, Insects, Part I, p. 278) and the species is perhaps one of the genus 'Calvisia' figured in Sharp (*loc. cit*, p. 273). Thus the developmental period from egg to adult may be roughly put down to be not less than four months, the following being the periods passed in the different stages :—

Egg—not less than 16 days.

Embryo—3 months and nine days.

Compared with that of *Phyllium scythe*, which takes 15 or 16 months to pass the embryonic stage, the life-history of our present species is probably shorter; but we cannot be sure of this, since the eggs might have been laid months ago.



LIFE-HISTORY OF HELICOMITUS DICAX, WALK.

Fig. 1. - A row of eggs. x 2.

" 2. - A young larva. x 18.

" 3. - A full-grown larva. x 8.

" 4. - A cocoon from which the imago has emerged, the head of the empty pupa skin is shown protruding. x 8.

" 5. - The imago. x 2.

## Explanation of the Plate.

*Helicomitus dicax*, Walk.

Fig. 1.—A row of eggs, × 2.

,, 2.—A young larva, × 18.

,, 3.—A full-grown larva, × 8.

,, 4.—A cocoon from which the imago has emerged; the head of the empty pupa skin is shown protruding, × 8.

,, 5.—The imago, × 2.

A few eggs, similar to those above described, were subsequently found on cabbage leaves on the College Farm; but these were not reared successfully.

It is not unlikely that the gaps in the life-history will be worked out soon, now that something has been known of the nature of the important stages—egg, nymph and adult.

T. V. RAMAKRISHNA AIYER,
First Asstt. to the Govt. Entomologist.

AGRICULTURAL COLLEGE AND RESEARCH INSTITUTE, COIMBATORE.
*February* 1913.

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## No. XL.—LIFE-HISTORY OF *HELICOMITUS DICAX*, WALK.

(WITH A PLATE.)

The complete life cycle of *Helicomitus dicax* ordinarily occupies a year, it may however extend to more than one year and probably even two years. The imago emerges at any time during the hot weather. Eggs have been collected in May, July, August, October and November and they were not in a state of hibernation or æstivation. The egg, pupa and imago stages are short, lasting for several days, while practically the whole of the long period of the life cycle is passed in the active larval state, the larvæ being active even in winter. The period occupied by the complete metamorphosis was in one case as follows:—

One egg-cluster was collected on the 12th August 1911.
The eggs hatched on the 16th August 1911.
Pupation took place (except of one) from 16th to 30th July 1912.
Imagos emerged from 3rd to 17th August 1912.

One larva did not pupate. It was apparently full-grown, but it did not form any cocoon and continued to feed. It was fed and was actually observed to feed continuously until the 25th February 1913, when it died, probably from starvation as food was supplied to it sparingly. It was discovered dead on 23rd March 1913, death not being suspected till this date.

*The egg.*—Each egg is cylindrical, measuring about 1·5 m.m. in length and about 1 m.m. in breadth, with the ends slightly convex or flattened. The surface is smooth and around one end, which may be called the anterior end, there is a marking or suture. When the egg hatches, the shell splits along this suture, so that the end forms a lid-like structure, which however does not fall off, but sticks to the shell at one place in a somewhat curled-up condition. The colour is dull dirty-brown and hardly undergoes any change. At the centre of each end, there is a dark coloured or black spot.

The eggs are deposited in clusters (see plate, fig. 1) neatly arranged in isolated straight rows, their long axis being at right angles to the length of the row. They are gummed to the surface of the substratum and placed side by side touching one another. The anterior ends of the majority of the eggs in the same cluster are turned in the same direction, and it is curious to notice how only a few may be turned in the opposite direction there being no irregularity or a symmetry in the arrangement of the eggs. Thus out of 43 eggs on a leaf of *Polyalthia longifolia*, 39 were in a row on the upper surface near the margin in the apical half and four in a row near the apex on the lower surface. Out of the 39, the anterior ends of 37 were turned in the same direction towards the margin of the leaf, while those of the remaining two were turned in the opposite direction.

Again, out of the four on the lower surface, the anterior ends of first, second and fourth were turned towards the margin, while that of the third was turned in the opposite direction.

The following are short notes regarding five clusters of eggs collected :—

(1) *23rd May 1906* :—A number of eggs were found laid in two straight rows on opposite sides of a portion of lucerne stem, a few inches above the ground. Only five hatched (after seven days) on May 30th.

(2) *30th October 1908* :—Forty eggs were found laid in a single straight row on a leaf of Dabh grass (*Imperata arundinacea*) at a height of about two feet from the ground. Thirty-three hatched on the same day and the rest did not hatch.

(3) *2nd November 1909* :—One cluster was found similarly laid on the same kind of grass as (2). These hatched on November 7th after five days.

(4) *12th August 1911* :—Forty-two eggs were found similarly laid on the same kind of grass as (2) and (3). They hatched after four days on August 16th.

(5) *6th July 1912* :—Forty-three eggs were found laid in two rows on a leaf of *Polyalthia longifolia*, at a height of about three feet from the ground. Forty-two hatched after two days on July 8th.

No parasite was noticed. The eggs, which did not hatch, shrivelled up.

*The larva.*—The appearance of the larva is best understood from the figures (see plate, figs. 2 and 3). The young larva is flattened and the measurements of its body and different limbs are as follows :—

4 m.m. from the tip of jaws to the end of the abdomen ;
2 m.m. from the head to the end of the abdomen ;
1⅝ m.m. from the base to the tip of the jaw in the curved state ;
1¼ m.m. from eye to eye (outside margins) ;
1 m.m. across the head ;
1½ m.m. across the middle of the abdomen which is the broadest part of the body and from which it tapers both ways.

In shape the jaws take the form of curved hooks bearing teeth on the inner side and they are only movable laterally. The head is square, plate-like in form and the eyes are small groups of shiny ocelli set on a protuberance on the front margin behind the jaws. The antennæ are thin, thread-like, and situated between the jaws and the eyes. The prothorax is narrow forming a neck-like junction between the head and the mesothorax and allowing free and complete movements of the head vertically and to a small extent laterally. The corners of a fold at the posterior part of prothorax are produced into small spines or pointed tubercles. On each side of the body there are thirteen elongated fleshy spines covered with longish stiff hairs, *viz.*, three on the mesothorax, two on the metathorax and one on each of the eight abdominal segments. The head, body and legs are covered with small stiff hairs. The colour of the larva, when it hatches out of the egg, is pale yellowish grey, but it soon darkens into dull dark brown. Small patches (some paler and some darker than the general colour) are faintly distinguishable, especially on the head and thorax. The legs are of the same colour as the body. The tarsi possess two distinct joints, the terminal one having a pair of brown claws.

As the larva grows, it loses its spiny appearance, the spines being reduced to blunt tubercles ; the surface of the body also loses much of the hairy appearance ; the hairs remain but they are very small. The body becomes plump and a cross section through it would be a triangle with the three sides more or less curved outwardly, one side forming the back and the other two the sides of the venter.

Out of the 42 larvæ which hatched on 16th August 1911, eleven were living on 19th December 1911. Their measurements in m.m. were as follows:—

| —— | Length from the head to the tip of the abdomen. | Breadth across the middle of abdomen. | Length of the jaw measured in the curved position. |
|---|---|---|---|
| 1 | 10 | 5 | $2\frac{1}{2}$ |
| 2 | 10 | 5 | $2\frac{1}{2}$ |
| 3 | 10 | 5 | $2\frac{1}{2}$ |
| 4 | $9\frac{1}{2}$ | 5 | $2\frac{1}{2}$ |
| 5 | $9\frac{1}{2}$ | $4\frac{1}{2}$ | $2\frac{1}{2}$ |
| 6 | 8 | 4 | $2\frac{1}{2}$ |
| 7 | 8 | 4 | $2\frac{1}{2}$ |
| 8 | 6 | 3 | $1\frac{3}{4}$ |
| 9 | 6 | 3 | $1\frac{3}{4}$ |
| 10 | $5\frac{1}{2}$ | $2\frac{1}{2}$ | $1\frac{3}{4}$ |
| 11 | $5\frac{1}{2}$ | $2\frac{1}{2}$ | $1\frac{3}{4}$ |

The measurements of the other parts of the first of the above which looked the largest of all were:—

$2\frac{1}{2}$ m.m. from eye to eye (outside margins).
2 m.m. across the posterior part of the head.
$\frac{1}{2}$ m.m., length of the filiform part of the antenna.
$\frac{3}{4}$ m.m., length of the antenna.

The colour was that of dry dust with a greenish and in places a yellowish tinge and scattered black specks in the submedian regions on the back.

On the 10th July, the same larva measured:—

16 m.m. from the head to the tip of the abdomen.
8 m.m. across the middle of abdomen.
$4\frac{1}{2}$ m.m. from eye to eye (outside margins).
4 m.m. across the posterior part of the head.

The jaws were 4 m.m. long, measured in the curved state. The antennæ were of the same length as on 19th December 1911.

There was no change in shape or colour. There were four other larvæ living on this date, and they were all grown to about the same size. They were full-grown and began to pupate on the 16th July.

*Moulting.*—The larva seems to undergo only three moults, the third revealing the pupa.

One lot of larvæ which hatched on 30th October 1908 passed through the first moult from 20th to 30th March 1909; began the second moult on 20th May 1909, but all died by 22nd June 1909.

A second lot of larvæ hatched on 7th November 1908, passed through the first moult from 25th March to 15th April 1909, began the second moult, 31st May 1909, and all died by 8th July 1909.

A third lot hatched on 8th July 1912, went through the first moult on 1st September 1912. Only one survived and moulted for the second time on 6th April 1913. On the 29th April, this larva was about 13 m.m. long and was full-grown.

In moulting, the skin first bursts along the mid-dorsal line, the fissure extending from the junction of the prothorax with the head to the third or fourth abdominal segment. The crack then divides, extending horizontally along the posterior margin of the head on both sides and then turning

forwards continuing in a downward direction and at the same time curving inwards and approaching the mid-ventral line but not quite meeting. The larva then draws out the head and the remainder of the body through the big opening thus formed in the old skin. The cast skins show this big opening gaping widely.

*Larval habits.*—After hatching from the egg, the young larvæ rest for some time upon the empty shells and then they disperse. They are very active and move about rapidly until they find a suitable place where they can lie in wait for small insects upon which they prey, and which afford them food. They sit with opened jaws and as soon as any small insect happens to cross the jaws, it is at once caught between them and ultimately sucked dry. In order that the prey may walk unsuspectingly over their jaws, the larvæ hide their presence by covering their backs with dust when they sit on the ground. In the insectary, some larvæ, which took up their position on a piece of brick, covered their backs with red brick-dust. The dust is actually scraped from the surface by the legs and the jaws, and applied to the back by the jaws, the head being doubled over the back for the purpose. In dust the larvæ hide by thrusting themselves into the dust with a backward movement. The larvæ do not run after their prey, but always wait till it comes to them. They however shift their position at night evidently with a view to finding a place where food will be forthcoming. As they grow, the larvæ lose the quickness and activity they exhibited when quite young. Their sole occupation is to sit patiently and without the least movement for hours or rather days together, waiting for food to come to them. When the body grows large and plump, they hide just under the surface of the soil and keep only the jaws exposed and ready to catch the unwary prey. It seems that the whole, or at least the major part of the larval state is passed in the soil. The large body renders them incapable of climbing or resting upon a vertical surface. Three larvæ, about full grown, were found in natural conditions, all on the surface of the ground and one with a specimen of *Trombidium grandissimum* held in its jaws. Other free-living Ascalaphid larvæ are found, one of which is mentioned in Indian Insect Life, p. 150. This larva seemed to belong to a different species so far as the appearance goes.

In the Insectary the larvæ were fed with aphides, small caterpillars and silverfish (*Lepisma*). They used to sit hidden under earth perfectly motionless. As soon as a silverfish came near them, they woke up and caught the prey with extraordinary celerity in the twinkling of an eye. They showed much more activity and alertness in catching their prey, when it was quick and active like the silverfish than when sluggish like a caterpillar. A slow-moving caterpillar or a dead silverfish was hardly ever caught even when placed between and touching the extended jaws. The larvæ will often seize prey much bigger than themselves and are dragged out of the earth but do not let go their hold. Big silverfish always dragged out the younger larvæ from their hiding places, but were soon overcome and rendered helpless. In such cases the larvæ were often turned upon their backs and continued sucking for some time thus lying upside down; then they would regain their natural position and try to hide again. The silverfish was sometimes caught between the jaws and not between their pointed ends. In such a case it was not injured so much and struggled violently but was held tightly, the teeth on the jaws being thus thrust into its body. When its struggles ceased, one jaw was moved, as each is capable of being moved independently of the other, and the prey pricked with its tip and apparently sucked. Then the other jaw also was moved into a suitable position and the work of sucking went on. Frequently

young silverfish extricated themselves and escaped from the jaws of big larvæ, but not without some injury. On account of the precarious nature of their food-supply the larvæ often have to fast for long periods. In order to get an idea of their capabilities in this direction, a number of larvæ were fed in the following manner :—

On the 8th July 1912, 39 larvæ hatched and until the 22nd July 1912, aphides were supplied in large quantities every second or third day. On the 24th July 1912, they were given number of silverfish. Food (silverfish) was again supplied on the 14th August 1912, at which time many were found dead.

Food was again supplied on the 28th September 1912. On this date only two larvæ were found living. Only two silverfish were supplied and one was seen to be caught and sucked by each of the two larvæ. From this date until the 20th April 1913, the two larvæ were supplied with two silverfish at a time at intervals of twelve to fifteen days and care was taken to see that each of them had one silverfish for its share. This could be done by goading the silverfish to run over the extended jaws of the larva several times. Sometimes it was caught the first time. In the course of about eight months the two larvæ fed on twenty silverfish of medium or big size. At the end of March 1913, a calamity befell one of the larvæ. It had caught and sucked one silverfish but could not get rid of the dead skin which stuck to one of the jaws. On the 6th April, the dead silverfish was wetted with water and removed but the jaw was found disabled, being incapable of movement and this larva appeared weaker than the other. Then on 10th April the stronger larva attacked and sucked its weaker brother at night. It was evident that they wanted more food. Henceforward the surviving larva was always kept supplied with silverfish and it fed on the average on two every day. Some time before pupating the larvæ want to feed voraciously, and if food is short they develop cannibalism and prey upon each other. On another occasion a larva, before pupating, deliberately attacked and sucked another. In winter the larvæ are not dormant.

They have a peculiar way of shamming death. When they sit under the dust with extended jaws they can be lifted by one jaw and they will not make the slightest movement. If they are disturbed while walking they draw in the head and legs and lie motionless.

*Pupa.*—When full-grown the larva builds a cocoon (see plate, fig. 4) with silk exuded from the anal end in the same manner as *Croce filipennis*. In the Insectary the cocoons were built on the wall of the cage just touching the surface of the layer of dust in which the larvælived. A dull or yellowish white silk is thrown out from the anal end and the larva turns continually round and round, at the same time applying the silk to particles of sand, pellets of earth or any foreign material which may be near. The head with the jaws is either held raised and doubled over on to the back or at times deflexed and doubled under the ventral surface, whichever is convenient at the time. The cocoon is completed in about 24 hours and then the larva rests inside with the head doubled on the ventral surface. The actual cocoon is about 9 to 11 mm. in diameter but looks bigger on account of the pellets of earth, sand and other material which stick to its surface. The pupa remains in a ventrally curved position inside the cocoon, the larval skin lying as it was pushed off in the form of a crumpled mass at the end of the abdomen. All the parts and limbs of the future imago are clearly defined and free in the pupa. The wings are folded towards the ventral surface. There is a pair of powerful jaws.

Before the imago emerges the pupa partly comes out of the cocoon by bursting it near the head. The pupa straightens its body at frequent intervals thus striking the head against the cocoon in the bursting of

which the jaws also probably play a part. After the anterior part of the pupa is free from the cocoon, the imago emerges by bursting the pupal skin longitudinally along the middorsal line in the thoracic region, the fissure also extending sideways behind the head.

The pupal stage lasts for about seventeen days. One larva began to build its cocoon on the morning of the 23rd July. The cocoon was completed by the morning of the 24th July. The imago emerged on the 10th August.

Another larva completed its cocoon on the morning of the 31st July and the imago emerged on the 17th August.

*Imago.*—About the habits of the imago, there is nothing to be recorded beyond the fact that it comes to light.

C. C. GHOSH,

PUSA, *April* 1913. Asst. to the Imperial Entomologist.

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## No. XLI.—THE HABITS OF THE SOLITARY WASP (*SCELIPHRON INTRUDENS.*)

I am sending a rough sketch of the nest of a solitary wasp. It may be well known, but as I have taken an interest in these hymenoptera for many years, and have seen nothing like it, I send on the chance of its being unusual. The nest was built on the mantle piece of my study. After the series of cells was finished, the wasp took special pains to strengthen the whole with ordinary clay as usual, but then proceeded for quite a fortnight to model and paint it to resemble the branch of a tree. You will notice that it is bifurcated at its top and grooved to resemble the bark, and that various shades of green and cream clay are used, with light green and white chalk for its lichen. After it had finished the nest, it still went on daubing the wall for a foot away from the cells. The nest is 5½ inches. I did not secure its inmate as I wished to see how much she would do and I hoped to obtain one from the nest. I enclose in a separate parcel portions of the nest with some pupæ nearly hatched and from which I hope you can identify the insect. In a small screw of paper I have put a piece of the "lichen."

I am very sorry I could not get the nest off entire, but it was so firmly fixed to the wall that it broke all to pieces and the bifurcated part was wedged into the ornamentation of the mantle piece.

The resemblance of a branch is marvellous and the painting by the wasp quite artistic.

The wall along the edge of the cells was painted intermittently as shown on the sketch, this if on the branch of a tree would have blended the colours on the natural bark with those on the cells.

The thing which surprised me most was the bringing of grass to act as tiny twigs and the white chalk. I have enclosed a portion with such a twig attached.

C. P. CORY,
Archdeacon of Rangoon.

MAYMYO, UPPER BURMA,
*July 6th*, 1913.

[The wasp was *Sceliphron intrudens*, a species according to Bingham found in Sikkim, Burma, Tenasserim and the Celebes. Unfortunately it was not possible to reproduce Archdeacon Cory's coloured sketch showing the way in which the branch of a tree had been wonderfully copied, which in the situation chosen, was the very reverse from having a concealing effect—EDS.]

## No. XLII.—THE HABITS OF ANTS.

At this time of year the mason wasps, if that is the right name for the wasp like insects that build mud huts on the ceiling, in the angles of the walls, under chairs and tables or even against windows, are very busy bringing caterpillars and storing them in these larders against the hatching of their eggs. I once had a piccolo stuffed with caterpillars and sealed with mud. One of these, rather more than an inch long, had been dropped on my window sill and a small ant was prospecting around this leviathan when I noticed it. When I next looked a minute or two later, a line of some 25 or 30 of the same species was moving obliquely up the wall to the corner where the end of the window sill projected beyond the wall. They went straight to the caterpillar and began to catch hold of it all round, a proceeding which the caterpillar was inclined to resent. It was comatose, but not completely paralysed, and time after time the ants at the tail end were flung violently off or half crushed. The ants at the head seemed to have no difficulty in holding that part down. Did the ants merely hold tight with their jaws, or did they too add a little poison to the dose from which the caterpillar was already suffering? Some minutes passed at any rate, and when I looked again, caterpillar, ants and all had disappeared. I found them under the ledge of the window sill, some 8 or 9 inches from the original spot. The caterpillar was not yet helpless; with a final effort he broke his nether end loose from the ants and it hung suspended, and for the ants, out of reach. It was a tremendous strain for them to prevent the front part from falling but they succeeded; three or four minutes perhaps passed, when to my great surprise a relief party appeared of at least 50 travelling up the wall in the same oblique line. This party did not go to the place where their help was urgently required, but straight to the place where the caterpillar was originally lying; their arrival at the critical moment seems to have been merely a coincidence. They spent an appreciable time hunting round the place for the caterpillar above and then found the track by which it had been removed and very quickly brought the hind part of the caterpillar back to a horizontal position. The caterpillar had been removed by almost exactly the same route by which both parties of ants had come up; yet the second party passed it hurriedly without the smallest notice on their way to the top of the window sill, although some of the first party moving around the caterpillar and the second party, must have come in contact. From this point there was no further difficulty; after travelling about ten feet, down the wall along the same oblique line, along the floor and over a ledge, caterpillar and all disappeared into a crevice in the chunam floor. These ants were of a small black variety, long-legged, almost spidery in appearance; but one came with the second party rather larger and much more heavily built; it took an intelligent interest in the proceedings but never offered to help.

J. SLADEN, I.C.S.

RAJKOT, *24th August* 1913.

# PROCEEDINGS

## OF THE MEETING HELD ON 21st AUGUST 1913.

An "At Home" of members and their friends of the Bombay Natural History Society took place on Thursday, the 21st August 1913, when Mr. John Wallace, C.E., presided.

The election of the following 53 members since the last meeting was announced:—

NEW MEMBERS.

Mr. S. J. Martin, Gonda, Oudh; Mr. F. Newton, Rangoon; Maharaj Kunwar Bhupal Singh Bahadur of Udaipur; Major M. P. Phelps, Colaba, Bombay; Mr. J. B. Wood, I.C.S., C.I.E., Indore; Capt. J. E. Cruickshank, Myitkyina, U. Burma; Dr. M. Barr, Bombay; Major W. M. P. Wood, Rajkot; Mess Secretary, R. A. Mess, Jhansi; Mr. F. H. Sprott, Coorg; Mr. C. B. Paterson, Dehra Dun; The Principal, Dharwar Training College for men, Dharwar; Mr. F. Murdoch, Jalpaiguri; Major H. O. Parr, Ahmedabad Camp; Mr. E. G. Herbert, Bangkok; Lt. A. D. McRae, Rangoon; Mr. E. A. Watson, Narayanganj; Capt. W. K. Blair, R.F.A., Jubbulpore; Major A. D. Musgrave, R.F.A., Neemuch; Capt. F. V. Pogson, Meerut; Mr. V. G. Bell, Kuantan, Pahang, F. M. S.; Mr. F. R. Madam, Kurnool; Dr. Malcolm Smith, Bangkok, Siam; The Curator, Sarawak Museum, Sarawak; Lt. J. C. Hutchinson, Almora, U. P.; The Secretary, Srinagar Club, Kashmir; Mr. D. Milner Moore, Abu Road; Mr. B. Stephenson, Chittagong; Mr. J. T. Millers, I.F.S., Abbottabad, N. W. F. P.; Mr. C. L. Philip, I.C.S., Orissa; Mr. E. G. Peters, Cachar; Mr. A. J. Clark, I.C.S., Jhelum Dist.; Mr. E. A. Andrews, Jorhat, Assam; Dr. R. A. Murphy, Dibrugarh, Assam; The Honorary Secretary, R. A. Mess, Trimulgherry, Deccan; Capt. A. D. Murray, R.G.A., Quetta; Mr. J. F. Holmes, Bilaspur, C. P.; G. E. R. Cooper, Mussoorie; Lt. A. H. Peppe, R.F.A., R. A. Mess, Campbellpore; Mr. W. J. Fitz-Gerald, Gwalior, C. I.; Lt. I. W. Thomson-Glover, Rawalpindi; Capt. O. T. M. Leckie, Baroda; Mr. A. G. Scott, Ellichpur, Berar, C. P.; Mr. C. H. Bristow, I.C.S., Ahmedabad; Mr. T. F. G. Shephard, Bulsar; Mr. R. G. Wordsworth, Murree Hills; Nawab Burzorji Jamsetjee Subedar of Aurangabad; Mr. A. T. Mackenzie, Hyderabad, Deccan; Mr. G. L. Horsfall, Ceylon; Miss L. Harkness, Bombay; Mr. J. Campbell, C.S.I., C.I.E., Kumaon, U. P.; Mr. C. G. Hawes, Poona; Mr. P. N. H. Baker, Parel, Bombay.

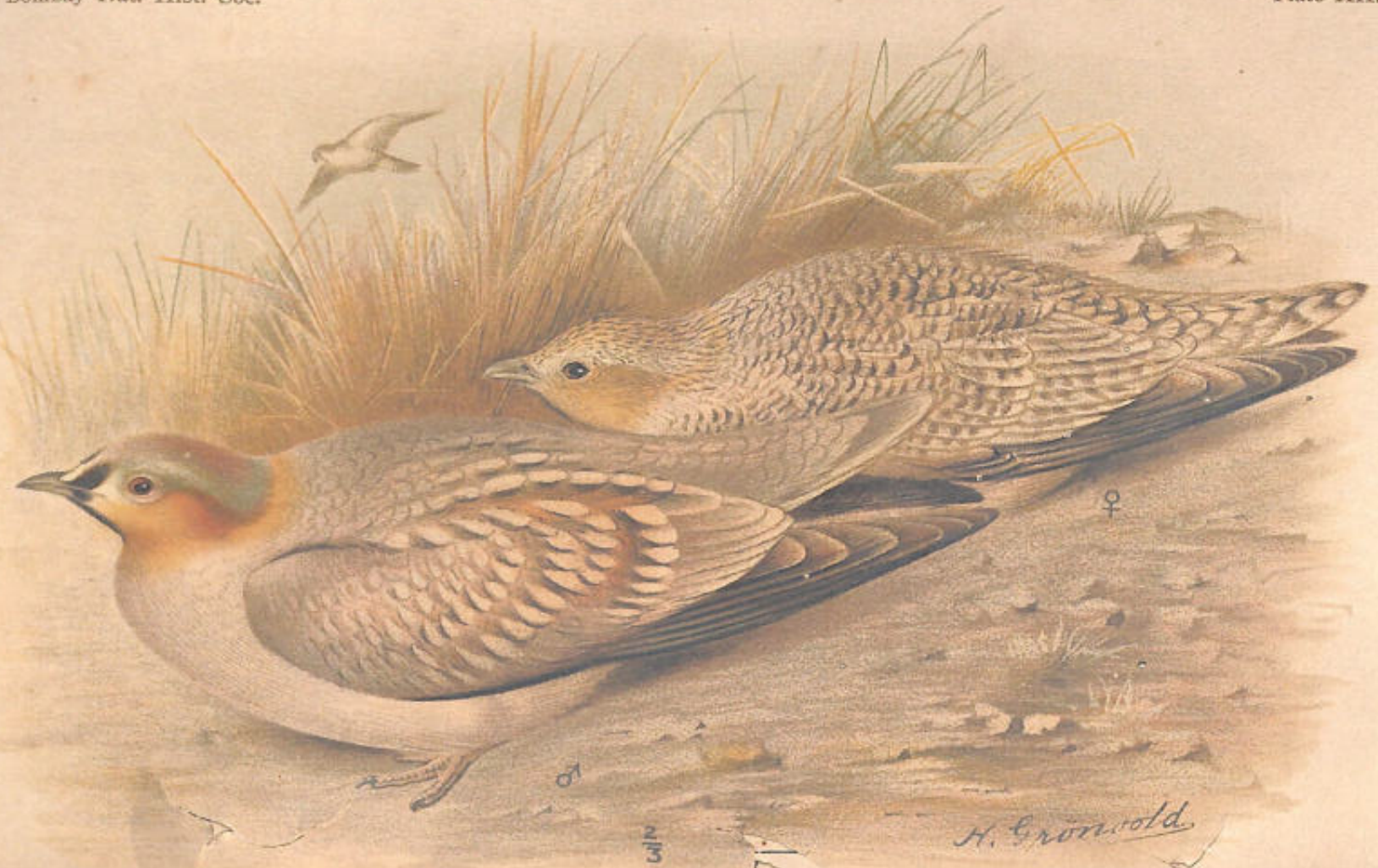
The Joint Honorary Secretaries acknowledged the following contributions to the Museum since the last meeting:—

| Contribution. | Locality. | Donor. |
|---|---|---|
| Skins of large Indian Civet, Mungose, Brown Ferret-badger, 11 bird skins and 2 eggs of Bengal Florican. | Bhutan, Duars .. | H. V. O.'Donel. |
| Burmese Civet and Marbled Cat. | ..... | L. E. C. Everard. |
| Common Ratel (alive) .. .. | Cutch .. .. | H. H. the Rao of Cutch. |
| Clouded Leopard .. .. | Silchar .. .. | Mrs. Jackson. |

| Contribution. | Locality. | Donor. |
|---|---|---|
| Domestic Cat .. .. .. | Coorg .. .. | J. A. Graham. |
| A wild pig, 3 Common Porcupines, one small Indian Civet and one Jackal. | Saran, Behar .. | M. M. Mackenzie. |
| Picked up heads of 3 Sind Ibex and 1 Oorial. | Lower Sind Hills. | H. S. Lawrence, I.C.S. |
| Sind Ibex head .. .. | Do. .. | Maj. A. G. Gardyne. |
| Skulls of 9 wild pigs, 4 Common Porcupines and, Sloth Bear, 1 Shrew (*Pachyura*), 17 bird skins, 1 Russell's Viper and 2 Spiders. | Chanda, C. P. .. | C. R. S. Pitman. |
| Skins of Panther, Brown Palm Civet (*P. jerdoni*) and Common Porcupine. | N. Coorg.. .. | L Newcome. |
| 1 Persian Hare (*Lepus craspedotis*). | Shiraz .. .. | Lt.-Col. J. A. Douglas. |
| 2 Large Red Flying Squirrels (*Petaurista*). | Chitral .. .. | Maj. H. L. Kennion. |
| 1 Large Red Flying Squirrel (*Petaurista*) and 1 Woolly Flying Squirrel (*Eupetaurus cinereus.*) | Do. .. .. | Capt. H. D. Stirling. |
| 1 Small Kashmir Flying Squirrel *Sciuropterus fimbriatus*, 2 Night Herons and Pochard. | Do. .. .. | Capt. R. D. O. Hill. |
| 1 Arabian Desert Cat (*Felis sp?*) and Snakes. | Koweit .. .. | Capt. H. W. Shakespear. |
| A small-toothed Palm Civet .. | Savoy .. .. | C. Beadon. |
| A Jackal skin .. .. .. | Bushire .. .. | Sir P. Z. Cox. |
| „ „ .. .. .. | Do. .. .. | Capt. R. L. Birdwood. |
| Wild Dog skin .. .. .. | Siam .. .. | G. F. W. Elwes. |
| Wolf's skin .. .. .. | Gilgit .. .. | Maj. A. D. Macpherson. |
| 2 Black-buck .. .. .. | Indore .. .. | |
| 3 Frontlets of Javan Sambar.. | Mauritius .. | Capt. D. Meinertzhagen. |
| A White-tailed Rat (*Epimys blanfordi*), a long tailed Tree Mouse and 5 Scorpions | Khandalla .. | Rev. F. Dreckmann. |
| 5 Birds and one nest .. .. | Various localities. | Col. H. Delmé Radcliffe. |
| Skins of a Brown-headed Bull and brown Booby, 1 Flying Lizard (*Draco maculatus*), 4 Fighting Fish (*B. pugnax*), 2 young large headed Turtles (alive), a black cobra and some shells. | Singapore .. | F. H. S. Stone. |

| Contribution. | Locality. | Donor. |
|---|---|---|
| A Missle Thrush .. .. .. | Lahore .. .. | Capt. C. A. Rocke. |
| A small collection of eggs .. | Trimulgherry .. | Major R. Sparrow. |
| ,, ,, .. | Assam .. .. | E. C. Stuart Baker. |
| ,, ,, ,, .. | Murree .. .. | Col. S. E. Marshall. |
| 4 Eggs of Indian Wren Warbler | Lahore .. .. | Capt. A. Cruickshank. |
| Skin of Bears Pochard and Andaman Seal. | Manipur .. .. | J. C. Huggins, I.C.S. |
| Skin of Manipur Bush Quail .. | ,, .. .. | Lt.-Col. H. C. Tytler. |
| Three eggs of Black Ibis .. | Travancore .. | C. E. Rhenius. |
| Malay Bittern .. .. .. | Ceylon .. .. | Maj. H. C. Ward. |
| Female Smew .. .. .. | Shiraz .. .. | Maj. S. Capper. |
| Common Crow (variety) .. | Bikanir .. .. | N. B. Parish. |
| A number of Snakes, Lizards, Butterflies and Hymenoptera. | Baluchistan .. | Capt. G. Jolly. |
| A collection of Snakes, Lizards and Frogs. | Ceylon .. .. | E. E. Green. |
| One Arabian Chameleon (alive). | Aden .. .. | H. E. Standage. |
| One Indian ,, (alive).. | Ratnagiri .. | A. G. S. Agharkar. |
| Several fish and crustaceans .. | Bombay .. .. | F. Knight. |
| 2 Marsh Crocodile heads .. | Vehar, Bombay .. | D. C. Boyle. |
| Turtles skull and fossil tooth of elephant. | Punjab .. .. | Hon. H. C. O. Bridgeman. |
| A collection of butterflies .. | Malay States .. | C. B. Holman-Hunt. |

*Minor Contributions.*—Messrs. W. W. Bulkley, B. S. Carter, D. N. Cursetjee, A. B. D'Souza, A. A. Dunbar Brander, R. E. A. Elliot, T. M. Evans, F. Field, F. Foulkes, F. W. Gore, P. F. Gomes, G. Macdonald, W. R. M. Clements, W. F. Miller, F. J. Mitchell, D. Remedios, B. D. Richards, W. Sharman, W. S. Thom, G. B. Scott, C. Meyer, Lt.-Col. E. M. Hassard, T. W. Irvine, Majors J. W. L. Elgee, J. Giroin, C. W. Burton, W. H. Konrich and A. Wilson, Captains A. G. Frere, E. O'Brien, Llewellyn, C. A. Rocke, Drs. De Castro, R. A. Murphy, Thomson, H. Hankin, Commander Headlam and Archdeacon G. P. Cory.




THE CORONETTED SANDGROUSE natus).

JOURNAL
OF THE
Bombay Natural History Society.

MARCH 1914. VOL. XXII. No. 4.

# THE GAME BIRDS OF INDIA, BURMA AND CEYLON.

BY

## CORRECTION.

THE GAME BIRDS OF INDIA, BURMA AND CEYLON.

The letterpress published in the last number, p. 427, Part XI, of this series, should have been that of the Closed-barred Sand Grouse (*Pterocles lichtensteini*) but in mistake the letterpress of the Coronetted Sand Grouse (*Pterocles coronatus atratus*) was published with the plate of *Pterocles lichtensteini*.

EDS.

*Adult male.*—The forehead with three bars of black and white as in *fasciatus*, but the front white bar runs up and back into the black, and the black in the same way into the posterior white band, so that the two front bands are more or less V shaped, whilst the third band is generally interrupted in the middle; this is also produced backwards as a broad, short supercilium, with a black eyebrow patch in the centre. The blackish band is also

often extended from its posterior base as a fine line under the eye and over the ear-coverts. Rest of the head and neck isabelline buff, each feather with a black central mark, long and forming streaks above, but reduced to spots below; the chin and centre of the throat often immaculate in old birds and, in colour here, a purer buff. Remainder of upper parts very pale buff closely barred with wavy black lines, the upper tail coverts more boldly barred and ochreous buff at the tips; tail feathers barred buff and black, the bars broadening towards the ends which are again widely tipped a richer buff. Scapulars and inner secondaries like the back but more boldly barred and with ochreous-yellow tips; lesser coverts like the back; secondary and median coverts pale clear buff, in some cases almost white, barred with black and tipped yellow: bastard wing, primary coverts and primaries brown, edged paler. Under aspect of the wings and axillaries pale grey. Upper breast barred buff and black; lower breast a rather rich yellow buff, divided in the centre by a band varying from a chocolate chestnut to black and followed again by another black band, generally much broken and mixed with white. Abdomen, vent and external flanks white, each feather with two half moon-shaped bars, the terminal being black and the lower, concealed one, chocolate; under tail coverts pale buff with arrow shaped bars of black or deep chocolate; feathers of tarsi white to pale buff.

The above description gives most of the details in variation of colour but it must be noted that the bird varies in general tone of colouration from a pale sandy-buff to a richer, almost chestnut, buff, more especially on the scapulars and upper back.

The bird from which the plate is taken is a very typical Indian specimen but in a good many the upper parts are slightly richer in colour.

The colour of the breast also varies somewhat and in a few birds the part above the central band is slightly suffused with vinous but I have never seen the upper and lower parts contrasting with one another as is often, generally in fact, the case with *fasciatus*.

*Measurements.*—Wing 6·85" (171mm.) to 7·35" (186·6mm.) with an average of 7·06" (179·3mm.), tarsus ·91" (23·1mm.) to 1·10" (27·9mm.), the average being exactly 1·0" (25·4mm.); bill from tip along culmen to feathers of forehead ·46" (11·6mm.) to ·52" (13·2mm.) and averaging ·49" (12·4mm.) full; tail from vent about ·3" (76·2mm.) or a little over.

"Total length 10·3 inches; wing 7; tail 2·8; tarsus 1·1". (Ogilvie-Grant.)

"Legs wholly feathered in front; feet orange yellow; reticulations white; claws dusky, tipped yellowish; bill fleshy brown, darker in the female; irides brown; orbital skin yellow." (Hume.)

"Iris brown, orbit lemon yellow, bill orange-brown, feet orange yellow." (Blanford.) "Feet chrome yellow." (Sharpe.)

*Adult female.*—The female has the whole head and neck pale earthy buff spotted with black, these spots becoming streaks on the upper part, very fine lines on the lores and ear coverts and fairly isolated spots below. The whole of the upper parts and wing coverts are finely barred pale earthy buff and black, the median and greater coverts tipped narrowly with pale yellowish and the outer webs of the outer coverts with narrower black bars and more, proportionate, pale buff, generally of a lighter, purer tint than that of the back. Greater coverts and primaries like those of the male; under wing coverts grey, obsoletely barred darker; whole lower surface and flanks barred black and white, the latter purest on the abdomen and buff on the breast; on the under tail coverts the bars are broader and the tips are yellowish; feathers of tarsi pale buff.

The female varies to the same extent as the male in general tint; the bird shewn in the plate representing an average bird whilst some may range a good deal paler and sandier and others richer with more of a rufous tint.

The wing of the female measures between 6·55" (166·3 mm.) and 7·10" (180·3 mm.) with an average of 6·85" (176·5 mm.); the tarsus between ·86" (21·8 mm.) and 1·0" (25·4 mm.) with an average of ·93" (23·6 mm.); the bill between ·50" (12·7 mm.) and ·55" (13·9 mm.) with an average of ·52" (13·2 mm.); tail about ·3" (76·2 mm.) or rather less.

It is on an average, therefore, a decidedly smaller bird than the male but, judging from the small series I have been able to examine, the bill is longer though more slender. Hume's measurements refer to one pair of birds only, but he gives the weight of both male and female as 8 ozs.

*Distribution.*—The home of this little Sand-Grouse is Abyssinia, Nubia, Egypt in the extreme South and South Arabia. Thence it extends East through South Persia, Baluchistan and South Afghanistan into Sind. To the South it ranges into Somali land and to the West and North-West into the Soudan and the Sahara. The most Northern record in Persia I can find is that of a bird from the Tigris, N. of the Persian Gulf and it seems also not to work much North of Mecca or Jeddah in Western Arabia, though it thence works North and East round the Persian Gulf.

Within Indian limits the Close-barred Sand-Grouse has only been obtained in Sind, West of the Indus, from Gul Mahomed, Mehar, Upper Sind, where Hume first came across it, to Karachee in the extreme South.

They are, of course, only winter visitors occurring some years in fair numbers whilst in others very few, if any, visit India at

all. They appear never to arrive before January and all leave again before April, the majority in early March. Hume says of these birds: "With us they are generally met with in pairs or parties of three or four, in the neighbourhood of some little patch of cultivation, or where broken, rocky ground, or scrub afford some kind of cover. They lie well and though they fly fast enough, like all their congeners when well under weigh, rise an easy shot."

There is practically nothing else on record about this Grouse in India and Blanford in his Geology and Zoology of Abyssinia gives the best description extant of the habits of this little Sand-Grouse (p. 419 *et seq.*): "This bird has precisely the same habits as the closely allied *Pt. fasciatus* of India. It is rarely if ever seen on open sandy plains; like *Pt. exustus*, it keeps to bush and thin tree jungle, and is usually found solitary, in pairs, or at the most two or three pairs together. I once came upon a considerable flock in January, and possibly at that time these birds may collect in large numbers; but in May, June, July and August, it was rare to see more than four together, except about watering-places. When disturbed, the Sand-Grouse rises with a sharp cackling cry, affording a very difficult shot. It does not rise high, and usually settles again after a short flight. All kinds of *Pterocles*, as is well known, fly to water at particular hours in the day, the hours varying with different species. *Pt. exustus* drinks about 9 a. m. and 4 p. m. In the present case the drinking hours are at daybreak in the morning, and at dusk in the evening, as is also the case with the Indian *Pt. fasciatus*, the crepuscular habits of which are mentioned by Jerdon, ('Birds of India', vol. ii, p. 498), and have been noticed by myself also. In the semi-desert country West and North-West of Massowah, in which *Pt. lichtensteini* abounds, and there are but few places where water is found, the scene at each spring of an evening after a hot day especially is very interesting. At Saati, Ailat, and Ain, there was a constant rush of these birds from sunset till dark, and again in the morning before sunrise. Singly and in small flocks, uttering their peculiar 'queep-queep' like note, they flew up and down the watercourse on their way to and from the water, keeping only a few feet above the bushes and low trees; the noise of their wings being heard in the dusk before the birds themselves appeared. Like all other Sand-Grouse, they are excellent eating, the flesh being rather hard but of delicious flavour; and our party used generally to shoot a few each evening, not an easy matter, for the great swiftness and power of wing possessed by these birds rendered them, in the dusk especially, by no means an easy shot."

"*Pt. lichtensteini* appears entirely confined to the tropical coast region. At some water in the Lebka Valley at Mohabar, only

2,000 ft. above the sea, scarcely any come to drink in the evening and at higher elevation not any were met with."

Occasionally, at all events the Close-barred Sand-Grouse collects in flocks of some size for Yerbury (*ibis*, 1886) speaks of finding a flock of eighty to a hundred individuals" at Shulaif near Lakey.

There is hardly anything on record about the breeding of this Sand-Grouse, although it must breed practically throughout its range. Ogilvie Grant, in his Game-Birds, quotes Heuglin to the effect that he found nests of this species containing "two cylindrical eggs, much the colour of dirty and faded Pewits eggs."

There is one egg of this species in the British Museum collection taken at Moraul, by Malan, in 1851. In ground colour this is a dirty yellowish stone colour, or earth colour, and it is rather profusely covered all over its surface with largish blotches of dirty vandyke brown and with others again underlying these of dull lavender grey. It is of a dull, glossless surface with a texture comparatively rough to both touch and sight. In general appearance it is like a small, pale and very dull coloured egg of *Pterocles alchata*, but it can be matched by no egg I have seen in very large series of the latter and its texture is totally different.

It measures 1. 70" × 1. 20" (=41 × 27·3 mm.). There is no date given to shew in what month it was taken. It came to the Museum with the rest of the Crowley Bequest and in the Crowley Catalogue there is the following remark: "One egg from Minereh. Revd. S. C. Malan, *ex* Tristram 'Tristram says the species is not quite certain'."

*(To be continued).*

# SCIENTIFIC RESULTS FROM THE MAMMAL SURVEY.

By Kathleen V. Ryley.

## VI.

### A.—Two new varieties of Vandeleuria.

In going through the Vandeleuria group, I find considerable variation in size among the specimens available for examination. Those from Coorg are the largest and probably represent *V. nilagiricus*, but at present there is no example from the Nilgiris for comparison. A series from the Kolaba District are also rather large, but come nearest to the type of *oleracea*, which was taken by Col. Sykes in 'the Dukhun.' On the other hand five specimens collected by Mr. Wroughton in the Surat District are all decidedly smaller, and I propose to describe them under the name of

Vandeleuria wroughtoni, sp. n.

A Vandeleuria similar to *oleracea* in general appearance, but smaller throughout, and of rather a lighter and more rufous colour.

Fur soft; tail longer than head and body; ears rather large; general colour above rufous fawn, base of fur ashy-grey, tips reddish yellow; flanks paler in colour; underside pure white; limbs the same colour externally as the body, and white on the inner side; feet rather lighter in colour than body; tail thinly covered with light hairs.

*Dimensions of the type* (measured in the flesh):—

Head and body 71 (82·8), tail 103 (115), hindfoot 18 (18·8), ear 14 (15).

*Skull*:—Greatest length 20·8 (23·2), condylo-incisive length 18·8 (21·8), basilar length 16 (18·3), length of upper molar series 3·7 (4), diastema 5 (5·9); nasals 7·3 (7·8); zygomatic breadth 11·6 (12). The numbers in brackets refer to the average size of a series of six from Kolaba representing *V. oleracea*. All the specimens in both series are fully adult.

*Habitat*:—Patal, Surat District. Altitude 200 ft.

*Type*:—Old male. B. M. Nos. 98. 4. 2. 31. Collected by Mr. Wroughton, 19th February 1898, and presented by him to the National Collection.

Furthermore, a series of four specimens from Lunwa, Palanpur (Gujerat) are so much lighter in colour that they should apparently be separated subspecifically.

Vandeleuria oleracea spadicea, subsp. n.

A Vandeleuria similar to *oleracea* in size, but very different in colour, having a much lighter and more reddish fawn coat. It is also much paler than *V. wroughtoni*, besides being larger.

Fur very soft. Tail longer than head and body. General colour above light sandy red, base of hairs, dark slate grey; the middle of the back is shaded with brown; flanks lighter; belly pure white;

limbs same colour as body and white on the inner side; feet covered with hairs of a lighter shade than the body; tail sparsely covered with short hairs.

*Dimensions of the type* (measured in the flesh).—Head and body 85 mm, tail 117, hindfoot 19, ear 16; weight ¾ oz.

*Skull*:—Greatest length 23·7, condylo-incisive length 21·9 mm, basilar length 19, length of upper molar series 3·9; diastema 6; nasals 8·5; zygomatic breadth 12·3.

*Habitat*:—Lunwa, Palanpur, Gujerat. Altitude 150 feet.

*Type*:—Old male. B.M. No. 13. 8. 28. 4. Original No. 2940. Collected 9th April 1913 by C. A. Crump and presented to the National Collection by the Bombay Natural History Society.

This subspecies is readily distinguished by its light sandy-red colour.—*V. oleracea* is darker and browner in appearance.

### *B.*—A NEW SUBSPECIES OF MILLARDIA.

The large series of *M. meltada* collected at Lunwa, Palanpur, are so much lighter in colour than all the specimens from Dharwar, Kanara, Coorg, etc., that I propose to make them a subspecies of *M. meltada*, which was originally described from the Southern Mahratta Country. A specimen from the Punjab, collected by Major Dunn, had already been noticed by Mr. Wroughton as being different from the ordinary *M. meltada*.

### MILLARDIA MELTADA PALLIDIOR.

*The Northern soft-furred Field-Rat.*

A *Millardia* similar to *meltada* in general appearance, but differing markedly from that species in colour, being a light sandy grey, while *meltada* is a darkbrown-grey.

Fur soft and silky. Tail about the same length as head and body. General colour above pale sandy-grey with a slight yellowish tinge, and some brown speckles. Hairs dark-grey at the base and yellowish white at the end, some with brown tips; paler on the flanks shading into a grey white underside; belly with a much whiter appearance than in *meltada*, as the grey hairs, instead of only being tipped with white, are white for more than half their length, the base only being grey. Chin and inner side of legs also much whiter. Feet covered with white hair, tail sparsely covered with hair, darker above and paler below.

**Dimensions of the type* (measured in the flesh):—

Head and body 125 mm., tail 125, hindfoot 24, ear 19; weight 2½ ozs.

* There is a considerable variation in size among the individuals of the series. One large male has a head and body measurement of 146 mm. and is proportionately large throughout, but the one selected as type is of a more average size.

*Skull*:—Greatest length 32·2 mm., condylo-incisive length 31·3, basilar length 27·2, length of upper molar series 5·5; diastema 9·3; nasals 12·3; zygomatic breadth 15·5.

*Habitat.*—Lunwa, Palanpur, Gujerat. Altitude 150 feet.

*Type.*—Adult male. B. M. No. 13. 8. 23. 3. Original No. 3196. Collected 13th April 1913 by C. A. Crump and presented to the National Collection by the Bombay Natural History Society.

The characteristic pale-grey colour is very constant throughout the fine series of twenty-three specimens.

### C.—Two new subspecies of Mungoose.

Three specimens of mungoose from Palanpur are so conspicuously pale in colour in comparison with the eighty odd specimens already obtained during the survey, and with those in the British Museum, that I consider that a new subspecific name appears to be necessary for them.

#### Mungos mungo pallens, subsp. n.

*The pale-grey Mungoose.*

A mungoose similar to *Mungos mungo* in size and general appearance but differing considerably in colour and in the coarseness of the speckles.

Following Mr. Wroughton's example, I am taking the Dharwar group of mungoose as typical of *mungo*, the type locality of which is not known; but as he has pointed out, the S.-W. Coast may be accepted, as the name is based on the Portuguese name of the animal.

Whereas this southern species has a general colour of dark steel-grey, closely speckled with deep-brown, which gives a very dark impression, the Palanpur specimens have a general colour of light (almost whitish) grey coarsely speckled with light-brown. The under fur of *mungo* is a pale brownish grey, that of *pallens* is practically white. The head and feet of *pallens* are of a red roan colour; the southern specimens have very dark-brown feet, and no roan on the head. The tail is also paler, the tip being nearly white. The throat and belly are very light, being dirty white in some cases, while *mungo* has a yellow-brown underside, slightly speckled with grey.

*Dimensions of the type* (measured in the flesh):—

Head and body 378 mm., tail 398, hindfoot 74, ear 27, weight 3¼ lbs.

*Skull.*—Condylo-incisive length 79·3, basilar length 73·2, palatilar length 41·5; front of canine to back of carnassial 25·3; breadth across carnassials (from outerside) 26; zygomatic breadth 41·1; least inter-orbital breadth 15·5; inter-temporal constriction

12; breadth across bullæ (from outersides) 30; squamal breadth of cranium 28·2.

*Habitat.*—Palanpur, Gujerat. Altitude 150 feet.

*Type.*—Old male. B. M. No. 13. 8. 23. 2. Original No. 2765. Collected 21st March 1913 by C. A. Crump and presented to the National Collection by the Bombay Natural History Society.

Three specimens in the British Museum Collection from Sambhar, Rajputana, agree with this Palanpur series of *pallens*. This Mungoose differs from *M. ferrugineus*, Blanf. (Larkhana, Sind). in not having a red head or red tips to the hairs.

MUNGOS AUROPUNCTATUS HELVUS, subsp. n.

*The small yellow Mungoose.*

A small mungoose closely allied to *M. auropunctatus pallipes*, Blyth, but distinguished by its paler and yellower colour and by its yellow feet, which are scarcely perceptibly speckled.

General colour yellow grey, minutely speckled with brown; tail of same colour and about 2 inches shorter than head and body. Under fur drab, very light-brown at base (in *pallipes* the base is seal brown). Forehead of a deeper yellow buff, feet light yellow, almost without speckles. Underside pale yellow drab.

*Dimensions of the type* (measured in the flesh):—

Head and body 303 mm., tail 258, hindfoot 50, ear 22, weight 1 lb. 3 ozs.

*Skull.*—Condylo-incisive length 63·3; basilar length 58·9; palatilar length 32; front of canine to back of carnassial 20·7; breadth across carnassials (from outersides) 20; zygomatic breadth 30·8; squamosal breadth of cranium 22·4; breadth across bullæ 23·8.

*Habitat.*—Deesa, Palanpur, Gujerat. Altitude 450 feet.

*Type.*—Adult male. B. M. No. 13. 8. 23. 1. Original No. 3191. Collected 5th May 1913 by C. A. Crump and presented to the National Collection by the Bombay Natural History Society.

These nine specimens from Palanpur are very constant in colour, and although they bear a strong resemblance to *Mungos auropunctatus pallipes* from Kandahar, they are decidedly yellower in their general appearance.

*D.*—FUNAMBULUS TRILINEATUS, Kel.

*The Newera Eliya ground Squirrel.*

1852. *Sciurus trilineatus*, Kelaart, Prod. p. 54.

1891. *Sciurus sublineatus*, Blanford, Mammalia, No. 256 (*partim*).

The Ceylon specimens of this squirrel differ sufficiently to make it necessary to separate them from the S. Indian *F. sublineatus*, and

I therefore give a description of the points in which the differences are most noticeable. The name of *trilineatus* must be used as although it only appears as a *nomen nudum* in 1850* and in 1851† Blyth mentions it as a synonym of *Sc. delesserti*, Kelaart published a description of the Ceylon squirrel under this name in 1852, though he did not separate it from the S. Indian species and gave Waterhouse the credit of describing it, including *Sc. delesserti* and *sublineatus* as synonyms.

It is a small *Funambulus* similar to *sublineatus* in general appearance, but differing from that species in being larger throughout, and darker in colour, having more brown and less of the olive shading which is pronounced on the mainland species, this browner tinge being especially noticeable on the flanks; the tail much more bushy, the hairs decidedly longer and more coarsely speckled; stripes down the back wider and less distinct. The skull measurements larger. Fur soft and very dense.

General colour dark brown finely speckled with yellow, three slightly paler longitudinal stripes with a darker brown, less speckled, fur between them, the stripes become indistinct on the shoulders and rump. Underside pale tawny; flanks ruddy brown. The hair on the tail is black at the base, followed by a narrow band of tawny, then a wide black band tipped with pale yellow, while in *sublineatus* the hairs are much shorter and evenly speckled brown and yellow throughout.

*Dimensions* (measured in the flesh).—Head and body 125 (120) mm.; tail 122 (117); hindfoot 31 (29); ear 13 (13).

*Skull.*—Greatest length 37·7 (35) mm.; condylo-incisive length 32·5(30); basilar length 27·6(25·3?); tooth row (upper molar series) 7 (6·6); diastema 8·4 (7); nasals 11 (9·9); zygomatic breadth 20·8 (19·2).

(The figures in brackets refer to a specimen of *sublineatus* from Coorg.)

The specimen described is a young male, collected by Major E. W. Mayor at Kottawa, S. P. Ceylon, on April 11th, 1913. Original No. 13.

Five specimens from Ceylon and 19 from Southern India are available for comparison and the distinguishing characters are constant throughout the two series.

*E.*—SCIURUS ATRODORSALIS SHANICUS, subsp. n.

*North Shan States Black-backed Squirrel.*

A squirrel similar to *Sciurus atrodorsalis* but without the red underside and practically without the black patch on the back.

* Journ. R.A.S., Ceyl., p. 310.
† J.A.S.B., XX, p. 165.

General colour rather paler than "deep olive" (Ridgeway); hairs banded black and yellow. There is a darker, blackish tinge on the back in some cases, mostly in young specimens, in many adults it is very slight and hardly noticeable; even in the most pronounced examples it is only the ends of the hairs that are black; in the black patch of *atrodorsalis*, the hairs are black throughout. The head is similar to the body in colour, whereas in *atrodorsalis* it is reddish yellow; the ears only in *a. shanicus* are rufescent. The whiskers in all these specimens are black, the type of *atrodorsalis* and most of the other skins have white ones. The fur is dark slate grey at then base and then banded yellow and black. The underside is like the back only more shaded with yellow, especially on the underside of the arms and legs, which in some cases are rufous, but none of the specimens have the chestnut red underside which is so marked in most of the *atrodorsalis* skins. Feet, same colour as body, tail banded black and yellow, the same as above.

Skull characters as in *atrodorsalis*, as far as can be determined, there being practically no whole skulls of the latter for comparison. in some instances the zygomatic arch is wider in *atrodorsalis*.

The co-types of *Sciurus atrodorsalis* are two dilapidated specimens received from the East India Company's Museum, and marked as coming from "Bhotan." This is evidently a mistake, as they closely agree with a series from Moulmein, which may therefore be taken as the type locality.

In addition to this present series of 32, there are 6 other specimens available for comparison from the N. Shan States, and as they are all very constant among themselves it seems necessary to separate them subspecifically; Mr. Wroughton had, I believe, intended to separate them some time ago.

*Dimensions of the type* (measured in the flesh):—Head and body 208 mm.; tail 183; hindfoot 48; ear 22.

*Skull.*—Greatest length 51·1mm.; condylo-incisive length 45·9; basilar length 39·9; tooth row 10·5; diastema 11·1; zygomatic breadth 29·9; nasals 15.

*Habitat.*—Gokteik, Northern Shan States, Burma. Alt. 2,133 feet.

*Type.*—Adult Male. B. M. No. 13.11.18.1. Original No. 2765. Collected 23rd April 1913, by G. C. Shortridge, and presented to the National Collection by the Bombay Natural History Society.

A new Field-Mouse from Burma.

*F.*—Mus cookii, sp. n.

*The Burma Field-Mouse.*

A mouse most nearly resembling *Mus booduga* but differing from that species in being larger throughout.

General colour above dark brown speckled with buff, flanks paler than back, fur soft slate grey at base, tips light brown. Undersurface grey, base of the hairs being slate grey, terminal half white, feet white, tail dark above and pale below. Skull similar to *booduga* in appearance, but larger, the teeth especially being bigger and stronger.

*Dimensions of type* (measured in the flesh).—Head and body 88 (60-75) ; tail 91(55-74) ; hindfoot 19(14-17) ; ear 17(12-14).

*Skull.*—Greatest length 23·3 ; condylo-incisive length 22·8 ; (18·4-19·5) ; basilar length 19·4(16-18·5); diastema 6·7 (5·4-6·4) ; tooth row 4·2(3.6-3.8) ; zygomatic breadth 12 (9.6-10·8) ; nasals 8·5 (7·4-8·5).

(The figures in brackets are taken from specimens of *M. booduga* from Dharwar, the Southern Maharatta country being the type locality).

*Habitat.*—Gokteik, Northern Shan States, Burma. Altitude 2,133 feet.

*Type.*—Adult male. B. M. No. 13.11.18.2.; original No. 2755. Collected by G. C. Shortridge, 22nd April 1913, and presented to the National Collection by the Bombay Natural History Society. The series consists of 4 adult and immature specimens. I have named this species after Mr. J. P. Cook who assisted Mr. Shortridge by sending in a small collection of specimens from Moulmein.

# THE PALMS OF BRITISH INDIA AND CEYLON, INDIGENOUS AND INTRODUCED

BY

E. BLATTER, S.J.

PART X.

*(With Plates LVII—LXIII, and text figure 30.)*

*(Continued from page 463 of Volume XXII.)*

*C. Sub-tribe: Iriarteæ:*

Spadix below or rarely between the leaves, simple or branched; peduncle clothed with several tubular spathes. Flowers oblique, free on the surface of the stout rhachis or slender branches. Female and male flowers in clusters of 3, or both sexes by abortion on separate spadices (monœcious). Male flowers: calyx small, corolla oblique, valvate, or only with the apices overlapping; stamens 6-∞, free; anthers erect. Female flowers: calyx short, staminodes never united, often resembling fertile stamens; ovary of 3 united carpels, oblique, 3-locular.

Fruit nearly always monocarpellary with 1 seed; berry with thin endocarp; raphe branched.

DISTRIBUTION.—Tropical America, from Costa Rica in the north to Juan Fernandez in the south.

*Iriartea*, R. & Pav., *Catoblastus*, Wendl., *Wettinia*, Poepp. & Endl., *Ceroxylon*, H. B. Kth., *Juania*, Dr.

No representatives in India.

*D. Sub-tribe: Morenieæ.*

Spadix below or between the leaves; spathes tubular. Flowers free on the surface or slightly sunk in cavities, symmetrical, unisexual on the spadix or male and female together. Calyx short, 3-lobed or of 3 leaves; petals free or united, valvate (except some species of *Chamædorea* and *Synechanthus* which have an imbricate corolla in the female flowers). In the female flower the ovary completely or incompletely 3-locular.

Fruit a berry of 1-3 separately developing carpels. Leaves regularly paripinnate (rarely pinnately dentate).

DISTRIBUTION.—All the genera (except *Hyophorbe* and *Chrysalidocarpus*) are American, especially tropical South Mexican.

*Chamædorea*, Willd., *Morenia*, R. & P., *Kunthia*, Humb. & Bonpl., *Chrysalidocarpus*, H. Wendl., *Hyophorbe*, Gaertn., *Gaussia*, Wendl., *Pseudophœnix*, Wendl. & Dr., *Synechanthus*, Wendl., *Reinhardtia*, Liebm.

Key to the genera described below:

| | | | |
|---|---|---|---|
| Flowers diœcious | stem cane-like | ... | *Chamædorea.* |
| | stem not cane-like | ... | *Chrysalidocarpus.* |
| Flowers monœcious | ... ... | ... | *Hyophorbe.* |

## *CHAMAEDOREA*, Willd. Spec. Pl. IV. 638.

(From the Greek "chamai," on the ground, and "dorea," a gift; alluding to the fruits of the palm being easily reached.)

R. & Pav. Prodr. Fl. Peruv. & Chil. 144, t. 31 (Nunnezharia).—Otto, Gartenz, 1834, 145, 153, t. 6.—Mart. Hist. Nat. Palm. II, 3, t. 3; III, 157, 307, t. 126-138.—Kunth. Enum. Pl. III, 170.—Wendl., Bot. Zeitg. 1859, 29, 102.—Drude Fl. Brasil. III, II, 527, t. 125.—Rgl. Grtfl. 1880, 101.—Benth. & Hook. Gen. Pl. III, II, 910, 59.

Stem unarmed, slender, cane-like, annulate, rarely climbing, often soboliferous and forming small tufts. Leaves terminal, mostly pinnate with broad-lanceolate pinnæ, in some species only a bifid apex.

Spadix, when in flower, mostly below the crown of leaves, long peduncled, with from 3-7 tubular spathes; male spadix with mostly yellow flowers; female spadix with smaller, greenish flowers. Flowers diœcious, scattered or dense on the simple or oftener on the simple-branched spadix. Male flowers with short, cupular trilobed calyx; corolla of 3 petals, valvate; stamens 6; pistillode columnar. Female flowers: calyx tripartite, cupular; corolla tripetalous, tripartite or tridentate, valvate; no staminodes; ovary trilocular, 3-ovuled; style short, stout or elongate.

Berry 1 (-3) consisting of 1 (-3) carpels with the remains of the style at the base, the size of a pea, often brightly coloured. Seed round or elliptic; albumen equable.

Species about 60.—Tropical America.

CULTIVATION IN EUROPE.—The species of *Chamaedorea* are stove palms. In their natural habitats they are invariably growing under the shade or tall forest trees, and never in exposed situations. In the stove, therefore, shade and moisture are essential. They thrive best in a compost of two parts spongy peat, one part loam, and one of sand, the whole well mixed together.

Dammer observes that most species do well in the drawing-room and that some stand a pretty low temperature in winter as v. g. *C. concolor* and *C. desmoncoides*. Others are more delicate (as v. g. *C. geonomiformis*).

Hybrids are easily produced.

*CHAMAEDOREA AREMBERGIANA.*, H. Wendl. Ind. Palm. 66; Kerch. de Denterg. Les Palmiers 75, f. 33.—*C. latifrons* and *latifolia*,

*Chrysalidocarpus lutescens*, H. Wendl.

FLOWERING SPADIX OF *Chrysalidocarpus lutescens*, H. Wendl.

Hort.—*Spathascaphe aarenbergiana*, Oerst. Palm. Centramer. in Vidensk. Meddel. Nat. For. Kjöbenhav. 1858, 30, and L' Amérique Centrale t. 7, f. 29-37.

NAMES.—English: Aremberg's Mountain Palm, Merman's Shaving-brush.
German: Aremberg's Bergpalme.
French: Chamædore, Chamædorée.

DESCRIPTION.—Stem about 6 feet high, green, ringed at intervals of 2 inches. Leaves 5-6, erecto-patent, pinnate, 6-7 feet long; petiole slender, with a long cylindric sheath; leaflets about 10-15 pair, drooping 1-1½ feet long, alternate, oblong-lanceolate from a broad, sessile base, gradually narrowed to a very fine point, plicate with about 30 ribs, bright green above, rather pale beneath; petiole nearly terete.

Inflorescence from below the leaves. Spathes many, sheathing, cylindric, 6-10 inches long, forming a tube 1 foot long, which completely covers the peduncle of the spadix, lightly rolled together with subacute erect tips, the uppermost far exceeding the spadix, green, or the lower brown. Male spadix subumbellately branched within the spathes, the branches effuse, pendulous, 1 foot long and as thick as the little finger, cylindric, pale, straw-coloured, dense-flowered, terminated by the naked subulate tip. Flowers about ⅛ inch in diameter. Calyx very short, 3-toothed. Corolla-lobes rounded, concave, fleshy; stamens 6, filaments very thick, anther-cells divaricate; pistillode columnar, tip 3-lobed. Female spadix simple, erect, six inches long, rather stouter than the branches of the male spadix. Petals transversely oblong, concave; staminodes none; ovary subglobose, 3-lobed, stigmas 3, minute, sessile, trigonous.

HABITAT.—Guatemala.
Cultivated in Indian gardens.

*CHRYSALIDOCARPUS*, H. Wendl. Bot. Zeitg. (1878), 117.

(Wendland has chosen this name because the fruit, deprived of its epicarp, has the appearance of a chrysalis. The name, therefore, does not mean "golden fruit" as suggested in L. H. Bailey's Cyclopædia of American Horticulture, Vol. 1, 301.)

Benth. and Hook. Gen. Plant III, II, 882.—Becc. Palme del Madag. p. 3—Mart. Hist. Nat. Palm. III, 164, t. 143 (*Hyophorbe*).—Drude, Palmae, in Nat. Pflanzenf. p. 64.

Stem unarmed, cylindric, soboliferous, annulate. Leaves terminal, pinnate; segments very numerous, straight, or slightly falcate, bifid at the apex. Spadix ramose. Flowers dioecious. Male flowers: fertile stamens 6, subequal, filaments subulate, anthers versatile; rudimentary ovary conical or columnar, more or less

trifid or trilobed at the apex. Female flowers: ovary globose-ovate or oblong; stigmas stout, triangular, patent at the time of fertilization.

Fruit baccate, ovoid-elliptical; stigmas subbasilar; epicarp very thin; fibres of mesocarp applanate. Seed oblong-obconical, acute at the base; albumen equable; embryo at or below the middle of the back.

Species about 7.

DISTRIBUTION.—Madagascar (elsewhere?).

Two species are cultivated in India:

Segments of leaves 40-60 pairs .....*C. lutescens.*

Segments of leaves much more numerous...*C. madagascariensis.*

*CHRYSALIDOCARPUS LUTESCENS*, H. Wendl. Bot. Zeitg. (1878), 117; Benth. & Hook. Gen. Plant. III, II, 882.—*Areca madagascariensis*, Mart. ex Becc. Palme del Madag. p. 2.—*Areca madagascariensis*, Lodd. ex Dammer, Palmenz. p. 91—*Areca lutescense*, Bory ex Salomon Palmen, p. 110—*Areca Indica*, Hort.—*Areca barbonica*, Hort.—*Areca Dicksonii*, Hort.—*Areca flavescens*, Hort.—*Hyophorbe indica*, Hort. ex Drude l. c. p. 64.—*Hyophorbe lutescens*, Hort. ex Drude l. c. p. 64.—*Hyophorbe Commersoniana*, Mart. Hist. Nat. Palm. III, 164, t. 143, I, (*non H. Commersonii*, Mart. in Herb. Paris.)—*Sublimia vilicaulis*, Commers. ex Salomon, Palmen, p. 110.

NAMES.—Yellow Areca Palm (English).

Arec jaunâtre, Arec poison, Palmiste Marron, Palmiste poison (French).

Gelbliche Puppen-Areka (German).

DESCRIPTION.—Stem about 25 feet high, cylindric, about 3 inches in diameter, soboliferous, annulate, rings more or less 4 inches distant from each other. Leaves 6-8, terminal, spreading, more or less 8 feet long, regularly pinnatisect, vagina about 1½ feet long, cylindric; petiole about 2 feet long, narrowly and deeply canaliculate above, margins acute; rhachis about 5 feet long; segments dark green, 40-50 pairs, at base and apex of leaf approximate, the middle ones 2 inches distant from each other, narrowly lanceolate, contracted at the base, long acuminate at the apex and unequally bifid.

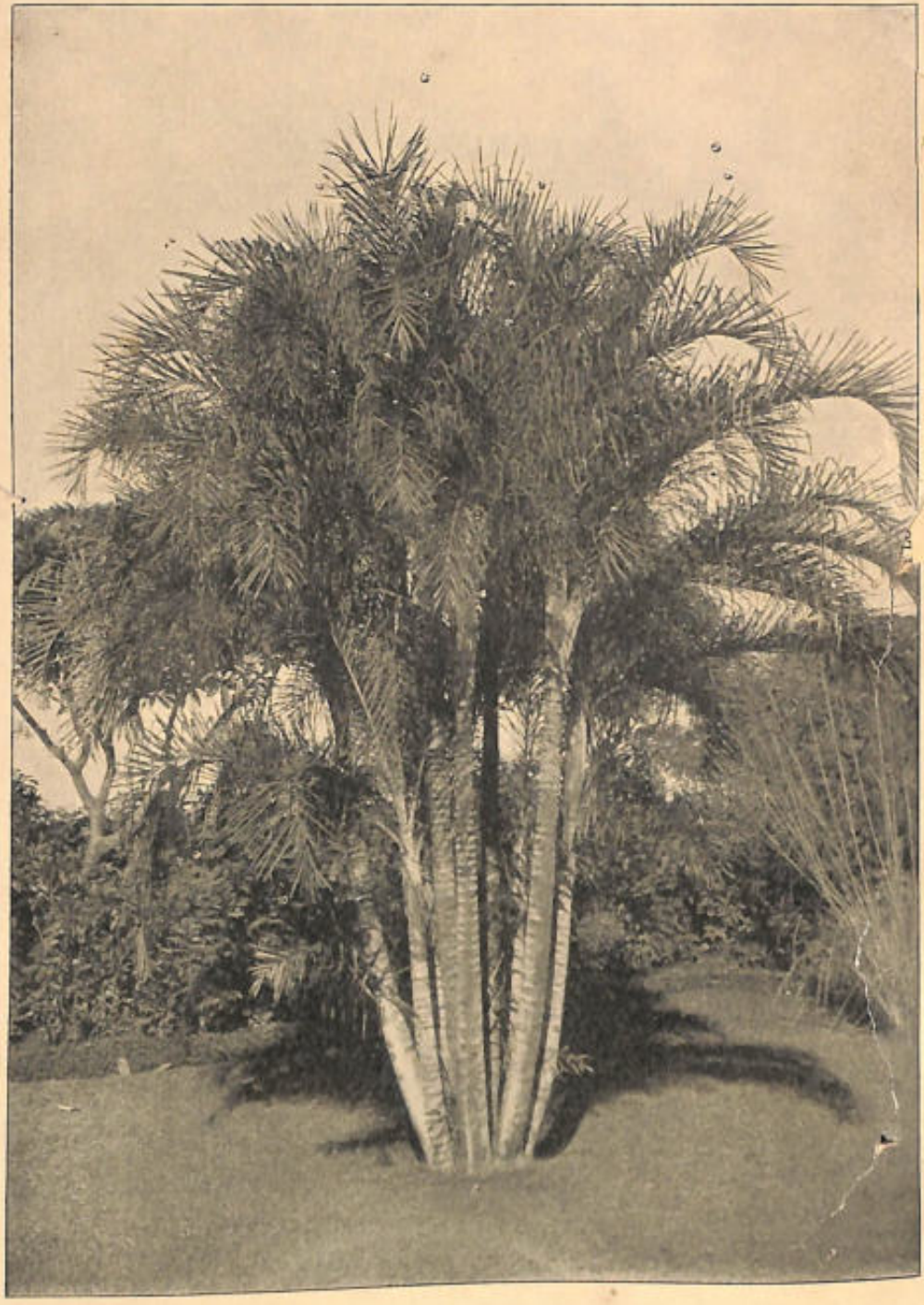
Flowers dioecious, white.

Fruit consisting of one carpel, baccate, black-violaceous, resupinate, ellipsoideo—turbinate. Mesocarp consisting of applanate fibres, adherent to the membranous endocarp. Seed oblong-obconical, acute at the base, branches of raphe about 18, radially ascending and slightly anastomosing on the dorsal side. Albumen equable. Embryo below the middle height of the albumen.

HABITAT.—Madagascar (Salomon, Palacky [1]), Bourbon (Bailey's Cyclop. Americ. Horticult).

[1] Palacky, J. Catalogus plantarum Madagascariensium. Prague, 1907.

Chrysalidocarpus lutescens, H. Wendl.



*Chrysalidocarpus madagascariensis*, Becc. (*Dypsis madagascariensis* of Indian Gardens).

GARDENING IN EUROPE.—"In growing *Chrysalidocarpus* in quantity, it will be found a good plan to sow the seeds either on a bench, in boxes or seed pans, so prepared that the seedlings will remain in the soil in which they germinate until they have made two or more leaves. The first leaf made above the soil is small, and if plants are potted off at this stage they must be very carefully watered in order not to sour the soil. In the preparation of the receptacles for the seed, a little gravel in the bottom will be found good, as the roots work very freely through it, and when the time comes to separate the plants previous to potting, it is an easy matter to disentangle the roots without bruising them. Probably the plan which works best is to wash the soil and gravel entirely from among the roots. Pot in soil not too dry, and for the next few days keep the house extra warm and humid, and the plants shaded from the sun without any moisture applied to the soil for the first few days." (Cyclop. Amer. Hort.).

ILLUSTRATIONS.—Plate LVIIA shows a characteristic tuft of *Chrysalidocarpus lutescens*, growing in Victoria Gardens, Bombay. There is a marked difference between this species and *Chrysalidocarpus madagascariensis*, represented on the next plate. The beautiful curves of the leaves and the smaller number of leaflets distinguish the former at once.

Plate LVIIB shows a spadix of *Chrysalidocarpus lutescens* in flower. The peduncle of the inflorescence is covered by its sheaths, and only a few flowers are open near the tips of the branchlets.

I have to thank the Rev. Fr. Max Maier, S. J., for the two photographs.

*CHRYSALIDOCARPUS MADAGASCARIENSIS*, Becc. Engl. Bot. Jahrb. Vol. 38 (1907), Beibl. No. 87, p. 35.—*Dypsis madagascariensis*, Hort. —*Areca madagascariensis*, Hort.

DESCRIPTION.—Stem about 3 inches in diameter. Leaves interruptedly pinnate, rhachis about 8 feet long; petiole more or less $1\frac{1}{6}$ foot long, canaliculate above; segments very numerous, about 90 pairs linear, the larger ones $1\frac{1}{4}$-$1\frac{2}{3}$ foot long, 3/5 inch broad, long acuminate, slightly bifid at the apex.

Spadix ample, 3-plicate-ramose, first scarcely furfuraceous, then quite glabrous; panicle ample, diffuse, branches patent, the floriferous branchlets filiform, about 1/12 inch in diameter and 8-10 inches long. The glomerulate flowers in 5-seriate pits which are narrow spirally arranged, supported by a very short subdimidiato-cupular bract; bracteoles very narrowly semilunar. Male flowers globose, 1/12 inch in diameter; sepals orbicular; petals twice as long as the sepals; anthers oblong; rotundate at the apex and scarcely apiculate, with parallel loculi; pistillode trigonous-pyramidal, acute. Female flowers ovate; sepals orbicular, petals twice as long as the

sepals, very broad, shortly apiculate; ovary gibbous-ovate, with triangular stigmas; staminodes 6.

Fruit ovoid-elliptic, at both ends slightly attenuate, straight (not sigmoidal), about ½ inch long, ¼-7/24 inch broad; remains of stigmas basilar; fibres of mesocarp applanate, uniseriate, spirally sinuose and anastomosing. Seed obovate, acute at the base; embryo about the middle of the back.

Habitat.—There is scarcely a doubt that the palm comes originally from Madagascar (Beccari).

In Indian gardens the palm is generally known under the names of *Dypsis* or *Areca madagascariensis*.

Illustration.—On plate LVIII we reproduce a photograph of *Chrysalidocarpus madagascariensis* taken by Mr. Phipson. The crown of leaves is much denser than in the foregoing species, owing to the greater number of leaves and leaflets. In addition to this, the appearance of this palm is changed considerably by the fact that the tips of the leaflets are hanging over.

*HYOPHORBE*, Gaertn. Fruct, II. 186, t. 120.

(From the Greek "Hys," swine, and "phorbe," food)

Wendl. Illustr. Hort. 13, t. 462, 463.—Bak. Fl. Maurit. 382.—Benth. and Hook. Gen. Pl. III, II, 912, 62.

Stem of considerable height, often very thick; petiole subterete on the back, grooved or flat on the face with a large, complete, basal sheath; leaves pinnate with slightly reduplicate subopposite pinnæ.

Monœcius. Flowers superposed in linear, spirally-arranged, 3-7-flowered clusters on the branches of a compound spadix, the females 1 or 2 at the base of the cluster. Spathes many, distichous, imbricated. Inner segments of the perianth valvate, twice as long as the outer. Male flowers: Stamens 6, included; filaments connate at the base; pistillode a triquetrous or conical column, shorter than the stamens. Female flowers: Staminodes forming a cup with 6 teeth.

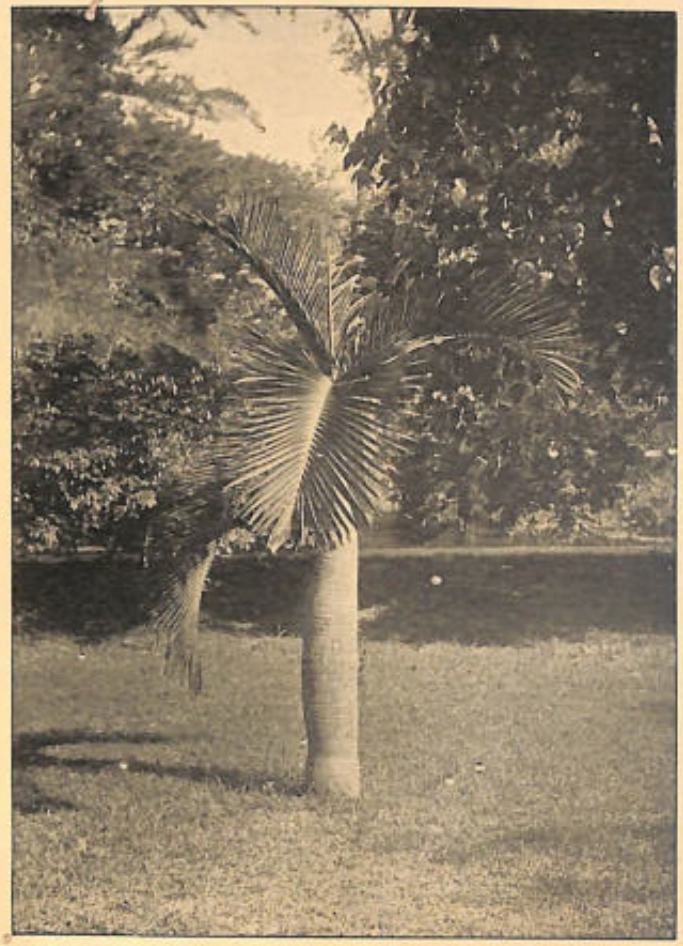
Fruit a purplish drupe; scar of the stigma subbasal; mesocarp succulent and fibrous; endocarp chartaceous. Seed solitary, ascending; albumen homogeneous; raphe branching, but not anastomosing; embryo subapical or median.

Species 3.—Mascarene Islands.

Cultivation in Europe.—Ornamental, middle-sized stove palms. They grow well in a compost of loam, peat and leaf soil in equal parts with a liberal addition of sand. When they are fully grown about two-thirds of the compost should consist of loam. Propagation is effected by seeds, which are sown in a compost similar to the one just mentioned and placed in a moist gentle heat.

Young Specimen of *Hyophorbe amaricaulis*, Mart.





*Hyophorbe amaricaulis*, Mart.

The following are cultivated in India:—

Pinnæ with prominent lateral nerves; no yellow line on back of petiole ... *H. amaricaulis.*

Pinnæ with no prominent lateral nerves; a yellow line on back of petiole ... *H. Verschaffeltii.*

*HYOPHORBE AMARICAULIS*, Mart. Hist., Nat. Palm. III, 309; Baker Fl. Maurit. and Seych. 383; O. Drude Palmae 64.—*Sublimia amaricaulis* Commers.—*Hyospathe amaricaulis*, Hort.—*Areca speciosa*, Hort. and Versch.—*Areca purpurea*, Makoy.

NAMES.—Palmiste Gargoulette (French).

Bitterstielige Eberpalme, Viehfutterpalme (German).

DESCRIPTION.—Stem 60 feet high, 15-24 inches in diameter near the base, bottle-shaped, slightly diminishing upwards to the base of the leaf-sheaths, and there abruptly constricted. Leaf-sheath cylindrical; petiole 12-18 inches long, somewhat trigonous, grooved on the face; leaflets in 40-60 pairs, lanceolate, acuminate, 18 inches long, 2 inches broad, with the central and one lateral vein prominent on the upper surface, and several secondary veins also prominent beneath, which are clothed towards the base with subrigid, appressed, lanceolate scales.

Spadix with clustered branches; peduncle 1 foot long. Pistillode of the male flowers elongated, grooved.

Fruit elliptic-oblong. Seed elliptical, $\frac{3}{4}$—$\frac{7}{8}$ inches long, with the branches of the raphe diverging a little above the hilum; embryo subapical or median.

HABITAT.—Mauritius; common on Round Island. (Endemic.)

ILLUSTRATIONS.—Plate LIXA shows a young specimen of *Hyophorbe amaricaulis*, growing in the Victoria Gardens, Bombay. The photograph was taken by Mr. Phipson. The specimen figured on plate LIX B is some years older and grows in the Sibpur Botanic Gardens. Both pictures show the characteristic bottle-shape of the stem, and in both we notice a stick-like young leaf just at the time when it begins to unfold.

*HYOPHORBE VERSCHAFFELTII*, H. Wendl., Illust. Hort. XIII, t. 462, 463; Baker, Fl. Maurit. and Seych. 383.—*Areca Verschaffeltii*, Lem. and Hort.

NAMES.—Palmiste marron (French).

Verschaffelt's Eberpalme (German).

DESCRIPTION.—Stem 25-30 feet high, 6-12 inches in diameter at the base, bulging after a few feet, reaching 12-24 inches in the middle, thence contracting upwards, rarely again bulging. Petiole about 3 inches long, subterete, slightly grooved on the upper surface, with a yellow band extending from the upper part of the leaf-sheath along the face of the petiole to the extremity of the blade; leaflets 30-50 pairs, acuminate, 20-30 inches long,

1 inch broad; the central vein alone prominent, clothed on the under surface towards the base with short linear scales, which are often subrigid at the base.

Spadix with clustered branches; peduncle 8-14 inches long. Perianth orange. Pistillode of the male flower elongated, conical.

Fruit cylindrical-oblong. Seed sub-cylindrical, $\frac{1}{2}$-1 inch long, $\frac{1}{4}$-$\frac{1}{4}$ inch broad; the branches of the raphe diverging from the middle of the seed, the embryo median and horizontal.

HABITAT.—Rodriguez, not uncommon on the hill slopes. (Endemic).

ILLUSTRATION.—The young specimen of *Hyophorbe Verschaffeltii*, figured on plate LX, is growing in Mr. Millard's garden on Malabar Hill, Bombay. The owner was kind enough to supply the photograph. The stem is distinctly triangular, and as to the leaves, it is not difficult to find out the differences as regards number, size, shape and structure, which distinguish this species from *Hyophorbe amaricaulis*.

*E. Sub-tribe: Arecea.*

Spadix below or between the leaves, always with 1-3 complete spathes, which open only when the male flowers begin to develop (except *Arecea iguanurea*). Flowers free on the surface or in open cavities, monœcious in clusters of 3, the male pair behind the female flower, the upper part of the branches bearing only male flowers. Male flowers: often oblique; calyx small, imbricate; corolla large, valvate; stamens 6-8. Female flowers: calyx and corolla imbricate (exceptions sub A in the following Key: corolla valvate). Ovary of 3 completely united carpels, always 1-locular with one seed by the abortion of 2 seeds, but with 3 apical stigmas.

Fruit a berry of 3 carpels and 1 seed. Leaves pinnate, mostly smooth.

DISTRIBUTION.—In all tropical regions except continental Africa: East-African islands, from India and Ceylon to New Zealand and the Chatham Islands; tropical America from Brazil to the Antilles.

*Dypsis*, Noronh., *Phloga*, Hook., *Hyospathe*, Mart., *Prestoea*, Hook., *Oreodoxa*, Willd., *Gigliolia*, Becc., *Howea*, Becc., *Linospadix*, Wendl. & Dr., *Carpoxylon*, Wendl. & Dr., *Ignanura*, Bl., *Calyptrocalyx*, Bl., *Sommieria*, Becc., *Clinostigma*, Wendl., *Heterospatha*, Scheffer, *Jessenia*, Karst., *Roscheria*, Wendl., *Nephrosperma*, Balf., *Verschaffeltia*, Wendl., *Phoenicophorium*, Wendl., *Acanthophœnix*, Wendl., *Oncosperma*, Bl., *Euterpe*, Mart., *Oenocarpus*, Mart., *Ptychandra*, Scheff., *Cyphokentia*, Brongn., *Hydriastele* Wendl. & Drude, *Kentia*, Bl., *Kentiopsis*, Brongn., *Veitchia*, Wendl., *Drymophloeus*, Zipp., *Cyrtostachys*, Bl., *Ptychococcus*, Becc., *Ptychosperma*,

Young Specimen of *Hyophorbe Verschaffeltii*, H. Wendl.

Labill., *Loxococcus*, Wendl. & Dr., *Actinorhytis*, Wendl. & Dr. *Rhopaloblaste*, Scheff., *Ptychoraphis*, Becc., *Dictyosperma*, Wendl. & Dr., *Archontophœnix*, Wendl. & Dr., *Nenga*, Wendl. & Dr., *Cyphophœnix*, Wendl. & Hook., *Mischophlœus*, Scheff., *Pinanga*, Bl., *Areca*, L.

Key to the genera described below † :—

*A. Arecæ anomalæ.*—Spadix between or below the leaves branching, with two spathes of which at least the upper one is complete. Female flowers with valvate corolla. Ovary unilocular or sometimes with 2-3 ovules. Leaves unarmed, smooth.

Male calyx of rounded imbricate sepals.

Female corolla valvate throughout *Oreodoxa.*

*B. Areceæ iguanureæ.*—Spadix simple with a stout rhachis developed between the short-sheathed leaves. Spathes 1-3. The clusters of 3 flowers in open, flat, or lipped cavities of the rhachis. Male flowers with an imbricate calyx. Female flowers with a broadly imbricate corolla. Leaves unarmed :

Seed not erect, albumen not equable ... *Calyptrocalyx.*

Seed erect, albumen equable ..... *Howea.*

*C. Arecæ heterospathæ.*—Spadix branched, between the leaves. Spathes 2, pierced by the spadix, or upper spathe opening completely on the ventral side. Male flowers with an imbricate calyx. Female flowers with a broadly imbricate corolla. Ovary with 1 ovule. Leaves unarmed.

Pericarp smooth, albumen slightly ruminate *Heterosphatha.*

*D. Arecæ aculeiferæ.*—Spadix once or twice branched, between or below the leaves. Spathes 2 or several, complete. Male flowers with an imbricate calyx. Female flowers with an imbricate corolla. Ovary with 1 ovule, united laterally with the wall. Leaves with long spines :—

(*a*) Spadix between the short-sheathed leaves. Albumen ruminate :

* Leaves irregularly pinnatisect :

1. Spadix twice branched.
   Stamens 6 ..... ..... *Roscheria.*
2. Spadix once branched.
   Stamens ∞ ..... *Nephrosperma.*

** Leaves bifid with pinnately dentate margin :

1. Stamens 6..... *Verschaffeltia.*
2. Stamens 15-20 ..... *Phœnicophorium.*

(*b*) Spadix below the long-sheathed leaves :

1. Albumen equable ..... *Acanthophœnix.*
2. Albumen ruminate ..... *Oncosperma.*

† We follow in the main Drude, Palmae, 65.

*E. Arecew infrafoliacew.* Spadix one or several times branched, below the crown, hidden before flowering in the long sheaths of the axils. Spathes 1—3, complete. Calyx of male flowers mostly broadly imbricate. Corolla of female flowers broadly imbricate. Ovary with one central ovule.—Leaves unarmed.

*I*—Ovule and seed laterally more or less united with the endocarp.

(*a*) Albumen uniform.

1 Ovule and seed united with the endocarp to a little beyond the middle of the raphe ..... *Hydriastele.*

2 Ovule and seed united with the endocarp along the raphe from the base to the apex..... *Kentia.*

3 Ovule broadly united with the endocarp near the chalaza and consequently pendulous ..... *Cyrtostachys.*

(*b*) Albumen ruminate.

1 Leaflets truncate ..... *Ptychosperma.*

2 Leaflets truncate-dentate ..... *Loxococcus.*

3 Leaflets accuminate.

° Rumination of the albumen deep, radial towards the centre of the seed ..... *Actinorhytis.*

°° Rumination of the albumen irregular or flat.

× Stamens 6, albumen deeply grooved along the raphe ... *Ptychoraphis.*

× × Stamens 6, Raphe without groove ..... *Dictyosperma.*

× × × Stamens 9—24..... *Archontophœnix.*

*II*—Ovule free, arising from the base of the loculus.

1 Female and male flowers in clusters of 3 reaching high up the branches *Pinanga.*

2 Female flowers at the base of the branches, solitary or few ..... *Areca.*

*OREODOXA.*—Kunth in Humb. et Bonpl. Nova Gen. et Sp. Pl. I, p. 244, edit. min. p. 305 (1815).

(From the Greek "Oros," the mountain, and "doxa" glory; alluding to the lofty stature of some of the species.)

Mart. Hist. Nat. Palm. III, 166, 310, t. 156, 163.—Jacq., Stirp. Sel. t. 170—Kunth. Enum. Pl. III, 181.—Walp. Ann. III, 459.—Griseb, Fl. Brit. W. Ind. 517.—Benth. & Hook. Gen. Pl. III, II, 899, 35.

YOUNG AVENUE OF CABBAGE PALMS in the Botanic Garden of Peradeniya (*Oreodoxa oleracea*, Mart.).

*ROYSTONEA.*—O. F. Cook in Bull. Torroy bot, Club, 1901, p. 549.

Stem erect, columnar, unarmed, annulate, thickened at the base or in the middle, leaves terminal, pinnate; pinnæ narrow-lanceolate, bifid at the top; petiole long-sheathing.

Spadix at the base of cylinder formed by the leaf-sheaths, thrice-twice divided, equalling the inner lignescent spathe. Flowers monoecious, small, white or yellowish. Male calyx 3—phyllous, short, imbricate; petals 3; stamens 6-12, long-exserted with versatile anthers. Female calyx as in the male; petals 3, valvate; staminodes forming a 6-dentate cupule; ovary 3-locular; stigmas 3, sessile, suprabasilar in the fruit.

Berry drupaceous, 1-seeded; putamen adnate to the testa; albumen uniform; embryo basilar.

Species 4.—Tropical America: Antilles and neighbouring coast of South America.

CULTIVATION IN EUROPE.—These palms are elegant stove plants and are easily raised from imported seeds, sown in a sandy soil in a mild hotbed. When the seedings have attained sufficient size they must be potted off singly into small pots with the same kind of soil in which the seeds were sown. Later on, good turfy loam will be better.

*OREODOXA OLERACEA*, Mart. Hist. Nat. Palm. III, 166, t. 156 fig. 1, 2, t. 163.—Becc. Relig. Scheff. in Ann. Jard. bot. Buit. II, 150, t. 12; Palms indg. to Cuba in Pomona Journ. Econ. Bot. II, (1912) 265.—Drude, in Mart. Fl. Bras. III, II, 474.

NAMES.—The tree is called:

American Cabbage Palm, Barbados Cabbage tree, Cabbage Palm, Cabbage tree (English).

Arbre au chou, Arbre chou des Barbades, Arec d'Amérique Arec légumineux, Arouari des Caraibes, Chou palmiste Palmier des entourages, Palmiste blanc, Palmiste á chou, Palmiste á colonne, Palmiste franc (French).

Echte Kohlpalme, Kohlpalme, Kohltragende Arekapalme (German).

Amerikaanische Koolpalm, Koolboom, Koolpalm, Palmiet (Dutch).

The cabbage or heart of the tree is called:

Chou palmiste (French).

Palmenkohl Palmkohl (German).

Palmkool (Dutch).

DESCRIPTION.—Stem more or less thickened at the base, for the rest equal, 100-130 feet high, annulate. Leaves terminal, up to 20 feet long, patent, forming a graceful crown, pinnatisect; base

sheathing; sheath cylindric, slightly attenuate upwards, about 1 foot in diameter, dark green; peduncle 4 inches broad above the sheath, and 20-25 inches long, semi-cylindric and deeply canaliculate with acute margins; rhachis convex below, excavate on the upper side; segments about 200 on each side with a thickened pulvinus at the base, the lowest and uppermost almost equidistant, the middle ones slightly crowded, 3 feet long, 1½ inches broad, lanceolate-linear, acuminate, bright green, slightly glaucescens on the lower surface.

Spadix rising at the base of the cylinder formed by the leaf-sheaths, 2½-3 feet long, decompound. Inner spathe cylindric, attenuate at both ends, cuspidate, lignescent, opening longitudinally on the ventral side; peduncle almost 1 inch in diameter, slightly thickened at the point of branching; branches furfuraceous-puberulous. Flowers crowded, 3 together, the middle one female; bract at the base of the female flower small, membranous, triangular subulate, persistent; bracteoles 2, minute, broadly-triangular Male flowers: sepals minute, scarcely 1 line long, broadly cordate-triangular, imbricate; corolla 2½ lines long; petals oblong-lanceolate, acute, straw-coloured, valvate; stamens 6, more than 1 line long; anthers linear, bifid at the base, pistillode minute, subtriquetrous. Female flowers half the size of the male flowers; calyx 3-phyllous sepals orbicular-ovate, obtuse, imbricate; petals ovate-subtriangular, slightly concave, valvate; staminodes forming a six-dentate cupule; ovary ovate; stigmas 3, sessile.

Fruit a berry, incurved, obovoid-oblong, 8-9 lines long; fibres of the mesocarp in an oval area. Seed oblong, 4-5 lines long; albumen horny. Embryo cylindric, basilar.

HABITAT.—Bahamas; Jamaica, common in the mountains, Trinidad, Cuba, and other Antilles.

USES.—The "heart" is made into pickles, or when boiled is served at table. The trunks serve as gutterings. The pith furnishes a kind of sago, and the nuts yield oil by decoction. The wood is very hard, but so thin that it is only fit for walking-sticks or ramrods. The leaf-sheaths, after falling off, are woody like deal. When the leaves are cut off green, the inside skin of the sheaths, if dried, looks like vellum; this bears ink very well on one side, on the other it seems greasy. Twenty large sheaths may be procured from one trunk. In their native country the broad part of the footstalks forms a hollow trough or cradle for children; when cut up it makes excellent splints for fractures.

ILLUSTRATION.—The magnificent avenue of Cabbage palms (*Oreodoxa oleracea*), pictured on plate LXI, was photographed by Mr. Macmillan in the Botanic Gardens of Peradeniya. The stems

MOUNTAIN GLORY. (*Oreodoxa regia*, Kth.).

on the right are more characteristic of this species than some on the left as they do not show that thickening about the middle so peculiar to *Oreodoxa regia*.

*OREODOXA REGIA.*—Kunth in Humb. et Bonpl. Nova Gen. et Spec. Pl. I. p. 244.-Mart.; Hist. Nat. Palm. III, 168, t. 156, f. III, IV, V.-Griseb.; Cat. Pl. Cub. 222.-Sauvalle.; Fl. Cub. 153.-Combs; in Trans. Acad. St. Louis, VII (1897) 471, t. II.-Sargent; Silva N. A., X, 31, t. DV.-Hemsley; in Biol. Centr. Amer. Bot. 401.-Becc.; Palms. indig. to Cuba, in Pomona College Journ. Econ. Bot. II (1912) 257.—*Oreodoxa oleracea* (non Mart.) Griseb Pl. Wright. 531, and Pl. Cub.: Wright. n. 1467.—*Roystonea regia* O. F. Cook, in Bull. Torrey bot. Club, 1901, p. 531.

Names :—English: Royal Palm, Mountain Glory.
French: Chou franc, Chou palmiste de montagne.
German: Koenigspalme
Dutch: Koningspalm, Palmiet.
In Cuba Palma real.

DESCRIPTION[1]—Stem generally more or less thickened at the middle, but sometimes almost regularly cylindrical from the base nearly to the summit, unarmed, annulate, 40-60 feet high. Leaves very large; leaf sheath elongate, tightly enveloping the vegetative cone. Leaflets alternately inserted in contrary ways along the rhachis, standing in four different planes, at least in its lower and intermediate part, but more regularly set and almost in one plane towards the end. Rhachis at first more or less sprinkled with small, appressed, orbicular, tobacco-coloured, deciduous scales, but becoming glabrous by age. Leaflets firmly papyraceous, ensiform, quite straight and very gradually narrow above from below the middle, to a very acuminate, rather rigid, briefly bifid apex, generally more deeply split by age, attached to the rhachis by a narrow base, having here the margins strongly reduplicate, green on both surfaces, on the lower rather densely sprinkled with very numerous, very small dots visible under a strong lens; midrib strong, very prominent above, covered below by an almost continuous line of elongate chaffy scales; secondary nerves 2-3 on each side of the midrib; tertiary nerves very numerous and not very prominent; margins acute, not or very slightly thickened; transverse veinlets obsolete. Intermediate leaflets $2\frac{1}{3}$ to $3\frac{1}{6}$ feet long and $1\frac{2}{5}$ to $1\frac{3}{5}$ inch broad.

Spathes 2, the exterior one tubular, pervious at its upper end, considerably shorter than the interior one, which completely envelops the spadix before the anthesis, and is at that time flattened-fusiform and biconvex, later deciduous. Cf. figure 30.—Spadices 3-4 at the

(1). We follow almost word for word the description given by Beccari, l. c.

FIG. 30.—To the right: Spadix of Oreodoxa regia enclosed in the spathes.
To the left: The same spadix after removal of the spathes.

same time, erect when not yet open, at the base of the lowest leaf sheath, spreading when in flower, with a very short, broad peduncular base, twice branched; primary branches conspicuously swollen at their bases and divided into several alternate flowering branchlets which are slender, terete, 3/6 to 5/6 foot long or shorter, more or less sinuous between the flowers.—Flowers light coloured, ternate almost to the end of the branchlets, inserted on very superficial flat orbicular pulvinuli. Male flowers considerably larger than the female, irregularly ovoid, obtuse, 1/5 to 1/4 inch long; calyx very small, with slightly imbricate, scarious, subpellucid, subdeltoid, obtuse or acute, and more or less carinate sepals; petals considerably longer than the sepals, concave, thinly pergamentaceous, irregularly ovate-oblong or oblong-ellipitcal, bluntish or subacute, striately veined, with a nectariferous swelling inside at the base. Stamens usually 6-7, occasionally 8-9, about as long as the petals, also during the anthesis, about $\frac{1}{5}$ inch long on

the whole; anthers relatively large, erect when in the bud, slightly shorter than the filaments, ovate-elliptical or ovate-sagittate, obtuse, the cells united by a broad conspicuous connective, dark coloured in the dry state, inserted on the filament about their middle; filaments $\frac{1}{6}$ inch long, linear subulate at the apex, somewhat flattened; rudimentary ovary globose, with 3 short, acute, stigmatic points.—Female flowers open a short time after the male, horizontal, $\frac{1}{6}$ inch long when full grown, but not yet open, broadly conical and apiculate; sepals reniform, entire, smooth, slightly callous at the base; corolla four times as long as the calyx, urceolate-campanulate when open, divided down to a little below the middle into three triangular briefly acuminate valvate divisions; staminodes forming a cup, lining the undivided part of the corolla, and crowned by 6 obtuse lobes, 3 of them peeping forth between the divisions of the corolla. Ovary globose, usually unicellular, with rudiments of the two other cells, more rarely with two of these perfectly developed, producing then a didynamous fruit; ovule attached along one side of its cell; stigmas fleshy, triangular-subulate, recurved.

Fruit globose-obovoid and somewhat gibbous, $\frac{11}{24}$ inch long, $\frac{3}{8}$ inch broad, with a perfectly round top and with the remains of the stigmas placed a little above the base, on the less convex side; pericarp on the whole about $\frac{1}{24}$ inch thick; epicarp smooth outside, thin and brittle in the dry fruit; mesocarp scanty, softly parenchymatous; endocarp thinly woody and forming a shell or putamen to the seed, its inner wall remaining adherent to and almost connected with a large portion of the antiraphal side of the seed, brittle and removeable on the side of the hilum.—Seed broadly ovoid elliptical, rounded at both ends, slightly compressed and flattish on the raphal side, about $\frac{1}{3}$ inch long and $\frac{7}{24}$ inch broad; raphal side conspicuously marked by a circular central area in which, a little below the centre, is placed the hilum, whence numerous vascular ramose venations radiate. Albumen homogeneous, very slightly excavate on the raphal side. Embryo obliquely basal, penetrating deeply into the substance of the albumen. Fruiting perianth explanate, not accrescent.

Habitat: Cuba, Jamaica, S. Domingo, St. Croix, Panama (Beccari).

*CALYPTROCALYX*, Bl. Rumphia II, 103, tab. 102.

(From the Greek 'kalyptra', an extinguisher, and 'kalyx,' a calyx, in allusion to the form of the outer perianth segments.)

Kunth. Enum. Pl. III, 642.—Miq. Fl. Ind. Bat. III, 44.—Benth. & Hook. Gen. Pl. III, II, 902, 42 (*partim*).

Stem annulate, unarmed; leaves terminal, pinnatisect, segments reduplicate, linear, acuminate, sometimes bifid at the apex.

Spadix elongate, spicæform, declinate between the bases of the leaves. Spathe longitudinally open, coriaceous, remaining on the

peduncle for a long time. Flowers monœcious in cavities of the rhachis which are covered by a persistent scale, glumaceous, surrounded by bracteoles. Each glomerule consisting of two male flowers (one of which opens several days before the other) and one female which develops a long time after the male flowers. Calyx triphyllous, sepals cucullate, narrowly imbricate. Corolla deeply tripartite; segments before opening valvate (according to Blume) but 'segments of female flowers distinctly imbricate' (according to Scheffer). Male flowers: Stamens very numerous; filaments subulate, confluent at the base of the corolla; anthers linear; rudimentary ovary present. Female flowers: Ovary incompletely trilocular; stigma simple, sessile; rudimentary stamens small.

Fruit about 1⅛ inches long and $\frac{10}{12}$—$\frac{11}{12}$ inch in diameter, crowned by 3 dentiform patent stigmas. Seed globular, about ⅝ inch in diameter, often slightly irregular.

SPECIES.—About 5†.

DISTRIBUTION.—Moluccas and New Guinea.

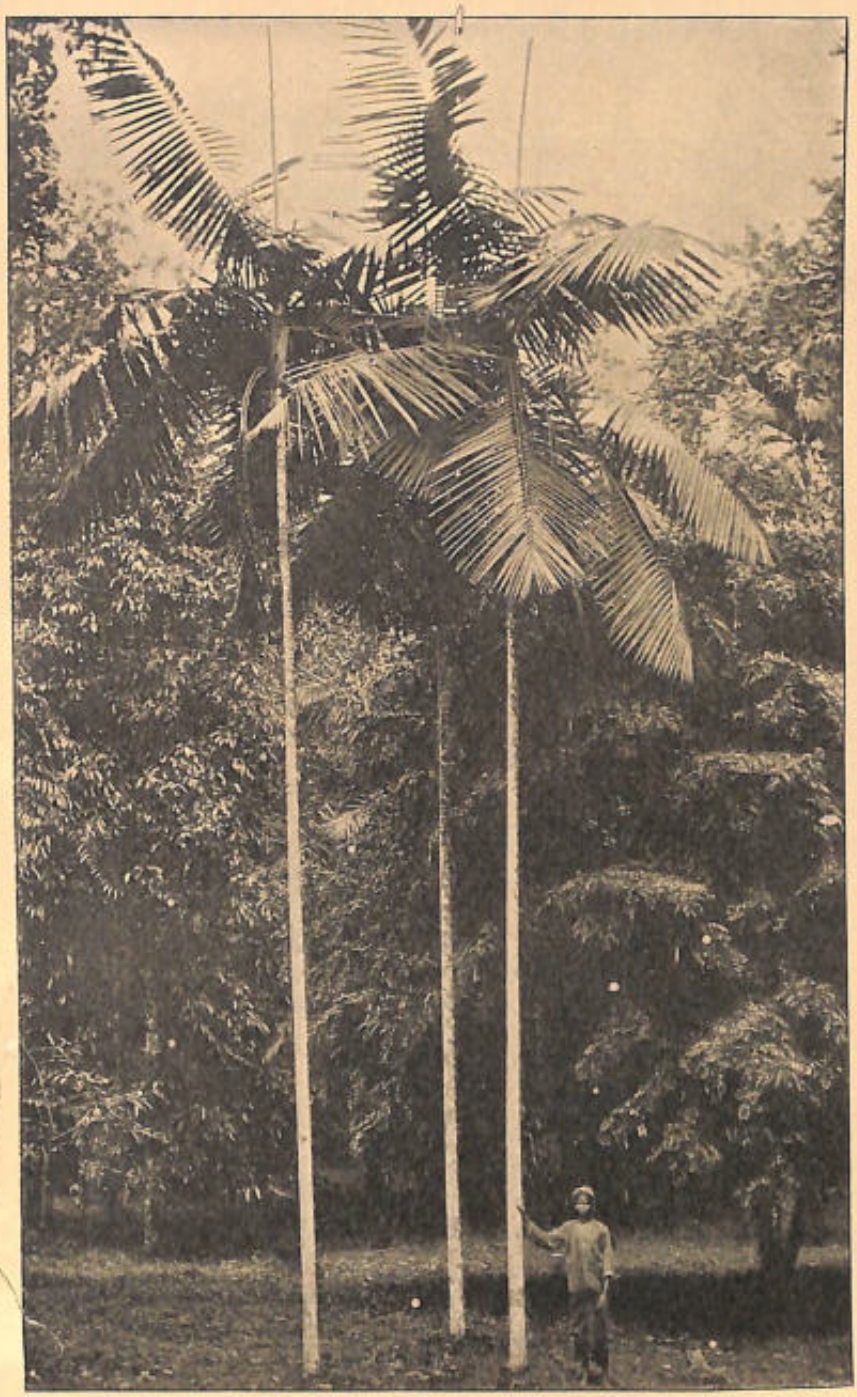
*CALYPTROCALYX SPICATUS*, Bl., Rumph. II, 103, t. 102, D, 118. 161; Miquel Fl. Ind. Bat. III, et de Palm. Arc. Ind. 25; Scheffer in Ann. Jard. Bot. Buit. I, 131; Kunth. Enum. Pl. III, 643; Walpers Ann. III, 468, V, 814; Mart. Hist. Nat. Palm. III, 230, 317; H. Wendl. in Kerch. Palm., p. 238; Becc. in Ann. Jard. Bot. Buit. II, 142.—*Areca spicata* Lam. Enc. Bot. I, 241, No. 2; Willd. Sp. Pl. IV, 595, No. 4; Spreng. Syst. Veg. II, 139, No. 4; Mart. l. c. 179, No. 13.—*Euterpe globosa* Gærtn. Fruct. I, 24, quoad Rumphii citatum, non quoad fruct. descriptun et t.g. illustratum (fide Mart.)

*Pinanga globosa* Rumph. Herb. Amb. I, 38, *t.* 5, f. 1, A.

NAMES.—Nibung, Pinang utan, bezaar (Malay.); Hua niwel Hua ewan (Amboina); Hena Hena (Ternate) (ex Blume l. c.) Æhrige Haubenkelch-Palme (German).

DESCRIPTION.—Stem erect, cylindrical, up to 40 feet high, 7-10 inches in diameter, annulate, scars subequidistant. Leaves many, the lower ones spreading, 8-12 feet long, oblong in outline, divided into narrow segments; petiolar sheath elongate-cylindric, narrow, coriaceous, furfuraceous with minute fuscous scales; petiole short, convex on the dorsal side; rhachis triquetrous. Segments numerous, obliquely adnate by means of callosities, subalternately arranged, linear, very acuminate, entire or divided at the apex into two short unequal teeth, longitudinally plicate, the median lateral ones elongate, 2-2½ feet long, 2-2½ inches broad, the lower ones narrower and shorter, subreclinate, the upper ones gradually more approximate, much narrower than the median ones and not reaching more than 15 inches at the apex.

† The four species not mentioned here (*C. Albertisianus*, Becc., *C. leptostachys* Becc., *C. pachystachys*, Becc., *C. laxiflorus*, Becc.) have been described by Beccari in Webbia I, (1905) 305-313.



*Calyptrocalyx spicatus*, Bl., in the Botanic Garden of Peradeniya.

Spadices arising from between the leaves, solitary, first oblique, then declinate, elongate, cylindrical, spicæform, rigid, virescent, much longer than the spathe; peduncle 1½-2 feet long, compressed-terete, arcuate with scattered ferruginous scales; rhachis reaching 5-7 feet, about one inch thick, attenuate towards the base, sub-angular. Spathe almost as long as the peduncle, narrowly lanceolate, above longitudinally split, coriaceous, rigid, glabrous on the inner side, on the outer striate, obsoletely ferrugineo-punctate.

Flowers monoecious, unisexual, 3 together in cavities (2 male and 1 female). First, one lateral male flower develops; when this has fallen, a second male flower on the other side of the central female flower opens, and when the second male flower has disappeared, the female flower begins to open. There are, therefore, never 3 open flowers in one glomerule at the same time.

Calyx: Sepals 3, excavate, galeæform, slightly unequal, narrowly imbricate. Corolla turbinate, obsoletely triquetrous, deeply tripartite, slightly fleshy at the base, segments ovate, subacute, sometimes somewhat oblique, plano-convex on the outer side, on the inner concave and striate by the pressure of the stamens.

Male flowers: fertile stamens about 160, not much shorter than the corolla, glabrous, unequal, the outermost and innermost ones being shorter than those between them, all inserted at the base of the corolla on a nectariferous disc; filaments straight, subulate; anthers linear, as long as the filaments, attached on the middle of the back, slightly retuse at the apex, at the base deeply bifid; rudimentary ovary ⅓ inch long with 3 patent stigmatic points. Female flowers: ovary ovoid or subconical, slightly attenuate at the apex, usually oblique at the base, subtriquetrous or variously flattened, strigose, at the base incompletely trilocular, uniovulate; stigma sessile, terminal, simple, obsolete. Rudimentary stamens present.

Fruit mucronate at the apex; endocarp thick-fibrous, crustaceous, orange coloured or red, 1-seeded. Seed free, oval or almost round.

Distribution.—Amboina (Rumphius, Zippel); Ternate, Halmaheira (Miquel).

Illustration.—Plate LXIII. Three specimens of *Calyptrocalyx spicatus*, photographed by Mr. Macmillan in the Botanic Gardens of Peradeniya. The rings on the stems, otherwise distinctly visible, are covered in our specimens by a thick growth of lichens.

*(To be continued.)*

# NOTE ON THE GENUS *LEGGADA*.

BY

OLDFIELD THOMAS.

In Part III of the "Scientific Results of the Mammal Survey,"* Mr. Wroughton and Miss Ryley have, at my instigation, accepted the species *platythrix* as the type of *Leggada*, on the ground of tautonymy, that species having according to Elliot the native name of "Leggyede." From this acceptance it followed that the *platythrix* group, with frontal ridges, would bear the name *Leggada*, and that *booduga* and its allies, including all the African species referred to *Leggada*, would fall into *Mus*.

But it has been suggested to me by Mr. Miller that I have in this case overstrained the admirable principle of tautonymy, and on re-investigating the question I am prepared to agree with him. The genus was undoubtedly primarily founded on *L. booduga*, though *platythrix* was mentioned, and the selection of the former species as the type was confirmed in my paper on Indian Rats and Mice in 1881.† Apart from tautonymy therefore, *platythrix* could not be selected by Wroughton and Ryley in 1913 as "first revisers," that position having being taken by me in 1881, even if any selection of a genotype was needed after Gray first founded the genus.

As a result, *booduga* being now considered a member of true *Mus*, the name *Leggada* will have to be sunk as a synonym of that genus, while the group of which *platythrix* is the type will need a new name.

This I would suggest should be *Leggadilla*, technically different from *Leggada*, but like enough to it to recall a name familiar to most Indian naturalists. No confusion between the two can arise, as *Leggada* itself now disappears from our lists as being synonymous with *Mus*.

The genotype of *Leggadilla* would be *L. platythrix* (*Mus platythrix*, Benn.) and there would belong to it the six species enumerated under *Leggada* in Wroughton and Ryley's paper.

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* Journ. Bomb. Nat. Hist. Soc., XXII, p. 16, 1913.

† P. Z. S. 1881, p. 552.

# A NEW SORICULUS FROM THE MISHMI HILLS.

BY OLDFIELD THOMAS.

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I owe to the kindness of Mr. Kinnear the opportunity of examining two small mammals, a squirrel and a shrew, obtained by Capt. F. M. Bailey in the Mishmi Hills, and sent by him to the Bombay Natural History Society. The squirrel is referable to *Dremomys lokriah*, Hodgs., but the shrew appears to be new, and may be called

SORICULUS BAILEYI, sp. n.

Allied to *S. caudatus*, Horsf., and *sacratus*, Thos., but markedly larger than either.

Size approaching that of *S. nigrescens*, but proportions as in *caudatus*. Fur long, rich and fine, hairs of back about 7 mm. in length. Colour dark slaty-grey washed with blackish, much as in *sacratus*, blacker than in *caudatus*. Undersurface drabby brown—near "hair-brown" of Ridgway. Feet brown, the digits white. Tail slightly longer than head and body, black above and laterally, whitish along a narrow line below; the tip slightly tufted.

Skull of type imperfect, the tooth-rows alone preserved. Upper tooth row much longer than in the allied species, but falling short of that of *S. nigrescens*. Unicuspids proportionally large, more extended longitudinally and less transversely than usual ; owing to this, although the upper tooth row is as a whole shorter than in *S. nigrescens*, the combined length of the unicuspids is distinctly greater ; three main unicuspids subequal in horizontal area, evenly decreasing backwards in lateral view ; all of them large in proportion to the general size of the animal, especially the anterior one, which is larger than in any other member of the genus.

*Dimensions of type*, measured by the collector in the flesh :—

Head and body 70 mm. ; tail 76 ; hindfoot 16·4.

Skull, upper tooth row from front of $i^1$ to back of $m^3$ 9·6 ; front of $i^1$ to front of $p^4$ 4·3 ; combined length of three large unicuspids 2·7 ; height of first unicuspid 1·2 ; combined length of $p^4$, $m^1$ and $m^2$ 5. Lower jaw, back of condyle to tip of $i_1$ 14·1.

*Hab.*—Mishmi Hills. Type from the Tsu River. Alt. 7,500'.

*Type.*—Adult, sex unknown. B.M. No. 14.1.1.1. collected 15th March 1913 by Captain F. M. Bailey. Presented by him to the British Museum through the Bombay Natural History Society.

This well marked species belongs to the group in which the tail is about equal to or slightly longer than the head and body. From the two other species of the group, *S. caudatus* and *sacratus*, it differs by its larger size, and, as from every other species of the genus, by its large anterior unicuspid.

# BOMBAY NATURAL HISTORY SOCIETY'S MAMMAL SURVEY OF INDIA, BURMA AND CEYLON.

## Report No. 12.

BY K. V. RYLEY.

*With Field Notes by the Collector, C. A. Crump.*

| | |
|---|---|
| COLLECTION ... ... ... | No. 12. |
| LOCALITY ... ... ... | PALANPUR AND MOUNT ABU. |
| DATE ... ... ... ... | MARCH-JULY 1913. |
| COLLECTED BY ... ... ... | MR. C. A. CRUMP. |
| EARLIER REPORTS ... ... | No. 1, E. Khandesh, Vol. XXI, p. 392; 1912. No. 2, Berars, Vol. XXI, p. 820, 1912; No. 3, Cutch, Vol. XXI, p. 826, 1912; No. 4, Nimar, Vol. XXI, p. 844, 1912; No. 5, Dharwar, Vol. XXI, p. 1170, 1912; No. 6, Kanara, Vol. XXII, p. 29, 1913; No. 7, Central Provinces, Vol. XXII, p. 45, 1913; No. 8, Bellary, Vol. XXII, p. 58, 1913; No. 9, Mysore, Vol. XXII, 283, 1913; No. 10, Kathiawar, Vol. XXII, p. 464, 1913; No. 11, Coorg, Vol. XXII, p. 486, 1913. |

This collection was made partly in the sandy open country in the vicinity of Palanpur and Deesa, partly at Mount Abu, just over the boundary in Rajputana, while the last camp was at Danta, Mahi Kantha.

The following notes on the actual collecting stations are given by Mr. C. A. Crump :—

"*Palanpur, Gujerat.*—"While collecting in this State I received assistance in many ways from Col. W. Merewether, Political Agent and from Nawabzada Mahomed. During my stay in Deesa Cantonment I was fortunate in having the co-operation of Capt. L. S. Fenton, the Cantonment Magistrate, who secured for me many specimens which otherwise I could not have obtained.

The area collected over is a slightly undulating alluvial plain of which the soil is very light with considerable areas of fine yellow sand. The elevated and flat portions of the plain are sparsely vegetated, cactus and babul being most in evidence. In the depressions a good deal of irrigated cultivation is carried on and large trees are numerous. Banas River, rising near the Abu Range flows through the State in a south-westerly direction.

*Palanpur.*—Slightly undulating soil, very light. Collection made on the outskirts of the town. With the exception of the desert Gerbils, bats, house-rats and mice, the specimens were obtained from the cultivation irrigated by wells.

*Lunwa.*—More undulating than Palanpur, otherwise similar. No water except from wells.

*Deesa.*—One of the features of Deesa is the Banas River, now nearly dry, but containing an abundance of grasses and rushes which afford an excellent cover for animals. The Cantonment is

well planted with trees, otherwise the surrounding country is similar to the last two. Thanks are due to Lt.-Col. C. J. Windham, the Resident, for assistance when I was at Mount Abu.

*Sirohi* is situated in the S. W. of Rajputana between the parallels of 24°-20′ and 25°-17′ N. latitude and 72°-16′ and 73° 10′ E. longitude; it has an area of 1,964 square miles. It is bounded on the N. E., N. and W. by Jodhpur; on the S. by Palanpur and Danta; on the S. E. by Idar and on the E. by Udaipur. The country is much broken up by hills and rocky ranges. The main feature is the almost isolated mountain of Abu, the highest peak of which, Guru Sikhar, rises 5,650 feet above sea-level.

The whole of Sirohi is occupied by schists and gneisses belonging to the Aravalli system traversed by dykes of granite. Mount Abu is formed of a highly felspathic, massive and crystal line gneiss with a few schistose beds. On the slopes and round the base of Abu the forests contain a great variety of trees and shrubs. Among the most common are the bamboo (*Dendrocalamus strictus*), the mango (*Mangifera indica*), two or three species of Ahao (*Anogeissus latifolia* and *pendula*, etc.), the bel (*Ægle marmelos*), the haldu (*Adina cordifolia*), the siris (*Albizzia lebbek*), the jamun (Eugenia jambolana), the kachnar (*Bauhinia purpurea*), the timru (*Diospyros tomentosa*), the semal (*Bombax malabaricum*), the dhaman (*Grewia oppositifolia*), the rohira (*Tecoma undulata*), the phaludra (*Erythrina arborescens*), the aonla (*Phyllanthus emblica*) and the horse-radish tree (*Moringa concanensis*).

"The annual rainfall at Abu averages between 57 and 58 inches. Abu is 3,800 feet above sea-level."

(The above information was extracted from the Gazetteer).

Almost all the collection in this neighbourhood was made at Uria, a small village about 5 miles to the N. E. of Abu at an altitude of a little over 4,000 feet above sea-level, and situated almost at the top of a pass lying close to the western slope of the Guru Sikhar Mountain. Large trees are not numerous, but are dotted about among the low jungle which forms the principal cover and is in places more or less dense, but always broken up into clumps by rocks or grassy glades. The soil resembles clay and is very firm. Cultivation is scant, a little wheat, barley and bajri being grown. The immense granite rocks are much eaten away on the under-surface, to such an extent in individual cases that it is no uncommon sight to find rocks resembling gigantic mushrooms and arches of fantastic design.

Some distance below my camp was a small stream running for a short distance and then again disappearing; this was the only surface water I could find. I watched this stream assiduously and found that surprisingly few animals drank there. Undoubtedly a

great many of the larger mammals are partially migratory on the mountain, moving up or down as the supply of food and water sends them. This is particularly noticeable with regard to pigs, which during the cold weather uproot, even the bungalow compound; but during my stay of nearly four weeks I saw no pigs and not the slightest indication of their existence.

*Danta, Mahi Kantha, Gujerat.*—This is a small State lying to the East of Palanpur. The range of hills, part of which cover nearly the whole of this State, almost connects with the Abu Mountains. The annual rainfall averages about 40 inches, although I understand 60 inches have been usual of late. The collection was made on the outskirts of Danta town which is about 20 miles East of Palanpur. While in Danta State I was hospitably received by the Maharajah who also rendered valuable assistance.

Danta lies almost in a circle of hills composed mostly of granite with some more recent formations of limestone. The hills are generally well clad with trees and bushes, but large trees, such as the Fig, Mango, Pipal, etc., are generally confined to the wide open valley where Teak also flourishes in large patches. The soil is a firm yellow sand, inclining to a reddish colour, and is not very fertile. The Monsoon crops consist principally of Jowari, Bajri and Maize; a cold weather crop of wheat is also produced. An endeavour was made to introduce cotton but without success. During the hot weather all the tanks become dry and water is obtained only from wells. The nearest surface water I could find was a spring, two miles from Danta; there was also a second spring not less than three miles distant. I visited both of these but found tracks of animals surprisingly scarce; this rarity of the larger mammals existed everywhere in the vicinity of Danta, and the lack of water must be partly responsible for this state of things, for, otherwise, the jungle is favourable for holding animals in large numbers. I paid particular attention to a tank partly filled by recent rains, on one occasion watching from sunset to sunrise; only one hare, one porcupine and one civet (*Paradoxurus niger*) were observed. I also noticed tracks of pigs of the previous day. The Cutch Rock Rat and most of the Spiney Mice were obtained on the hills but all other Rats and Mice appeared to be confined to the valley. The line separating these is abruptly defined; *Meriones hurrianae*, *Epimys rufescens* and *Mus booduga* may be taken right up to the base of the hills while twenty feet higher up among the rocks only *Cremnomys cutchicus* and *Leggada sadhu* and *phillipsi* can be obtained. A few specimens of spiney mice were taken in the valley in hedgerows but they were rare.

Ants swarm here to such an extent that I lost more than half of the rats and mice caught in traps, even specimens taken out of the traps at 10 p. m. were ruined.

The following species were not obtained:—

*Simia rhesus.* Not found in the neighbourhood of Palanpur.

*Felis leo.* According to the Gazetteer: "In olden days lions were sometimes met with in the south, but they have not been heard of since 1872, when a full grown female was shot on the Anadra side of Abu by a Bhil skikari".

*Felis tigris.* Occurs in the State of Palanpur; it is now rare about Mount Abu and Danta but is sometimes shot at the latter place.

*Felis pardus.* Found in Palanpur, particularly near hills; it is not common near Abu; but is found among the hills round Danta where it was common. A panther here frequently kills buffaloes.

*Felis caracal.* This cat has been obtained at Abu.

*Felis ornata.* Captain L.S. Fenton had a skin obtained locally.

*Paradoxurus niger.* Could not hear of this species round Palanpur, but it has been obtained at Abu. Although seen by moonlight, I am certain that this was the species I observed near the tank at Danta.

*Hyœna hyœna.* Rather rare in the places I visited in Palanpur; in Lunwa a dead cow was left untouched for several nights. Rare at Uria and not very common at Danta; I have seen a few tracks at the latter place.

*Vulpes leucopus.* Found near Deesa, I did not see one.

*Melursus ursinus* occurs at Abu, no sign of it at Uria now. Moderately plentiful at Danta.

*Boselaphus tragocamelus.* Common; is sacred.

*Tetracerus quadricornis.* Said to occur round Danta.

*Gazella bennetti.* Common in the valley between Danta and Palanpur.

*Muntiacus vaginalis.* I did not hear this species barking, but was informed that it was found in these jungles around Danta.

*Rusa unicolor* and *Axis axis.* Both found at Danta.

*Tragulus meminna.* Unknown.

Large squirrels. Unknown.

Otters are found near Deesa in the Banas River, but I failed to obtain a specimen.

Bats were difficult to find at Abu; there were so many hiding places and crevices in the rocks. They were not numerous round Danta; observed in greater numbers when the heavy rains commenced."—C. A. C.

The collection consists of 802 specimens made up of 45 species in 34 genera. Rodents very largely predominate, there being some fine series of rats and mice—*Cremnomys, Meriones, Golunda,* etc., being especially well represented. The fauna is typically of the desert variety and new subspecific names have been given to

these desert representatives of *Mungos mungo* and *Millardia meltada*, and Blanford's name of *watsoni* has been revived to separate subspecifically the yellow variety of *Golunda ellioti*; these three northern forms are all conspicuously lighter and paler in colour than those from further south. Palanpur has also produced a new subspecies of *Mungos auropunctatus* and of *Vandeleuria oleracea*; a description of these new varieties will be found under "the Scientific Results of the Survey." This is the first time that *Gerbillus gleadowi* has been obtained during the Survey. One more specimen of *Hipposideros brachyotis* has been taken; this is evidently an uncommon bat, as only one has previously come in. It is satisfactory receiving a series of nine *Leggada phillipsi*, which was described from the Berars, as only three specimens were collected before. In the *Mus booduga* group the Palanpur series are of the typical drab colour characteristic of the *Mus dunni*, while those from the more wooded country round Danta agree better with the usual variety of *M. booduga*, and in the case of *Cremnomys cutchicus*, *Tatera indica* and *Meriones hurrianæ* the Danta examples are all of a richer deeper shade than the desert specimens.

PRESBYTIS ENTELLUS, Dufr.

*The Langur.*

(Synonymy in No. 1.)

♂ 3171. ♀ 3172. Deesa, Gujerat.

(*See* also Reports Nos. 1, 2, 4, 7, 10 and 11.)

"Plentiful in and near the town of Palanpur, where it may be seen frequenting house-tops and verandahs. Held sacred by the Hindoos.

Observed at Uria, though not in great numbers; they appeared similar to those obtained near Palanpur.

Fairly common at Danta."—C. A. C.

PTEROPUS GIGANTEUS, Bruenn.

*The Common Flying Fox.*

(Synonymy in No. 2.)

6 ♂♂. Deesa, Gujerat.
5 ♂♂. (One skull only). Danta, Mahi Kantha.

(*See* also Reports Nos. 2, 3, 4, 5, 7, 8, 9, and 10.)

A large fruit bat, having a head and body measurement of about 10½ inches. Dark-brown and grey fur on the back with an orange coloured band across the neck and shoulders; dark-red brown on the under-side. Weight about 1 lb. 5 ozs. Those from Deesa are decidedly paler in colour than any specimens previously received.

"Common. In Deesa, the colony appeared to consist entirely of males. A small colony about 8 miles from Danta used occasionally to come in to Danta to feed."—C. A. C.

CYNOPTERUS SPHINX GANGETICUS, K. And.

*The Northern Short-nosed Fruit Bat.*

(Synonymy in No. 7.)

2 ♂♂; 3 ♀♀. Danta, Mahi Kantha, Gujerat.

(*See* also Reports Nos. 4 and 7.)

A fruit bat about four inches in length, colour brownish olive. This bat is slightly larger than *Cynopterus sphinx*, which is found in Southern India.

LYRODERMA LYRA, Geoff.

*The Indian Vampire Bat.*

(Synonymy in No. 1.)

3 ♂♂. Deesa, Palanpur.
1 ♂. Danta, Mahi Kantha, Gujerat.

(*See* also Reports Nos. 1, 4, 5, 6, 7, 8 and 9.)

An ashy grey bat with very large ears united on the inner margin for nearly half their length. Nose-leaf high and narrow. Fur rather long and paler on the underside of the animal. Head and body about two inches long. Weight about 1½ ozs.

HIPPOSIDEROS BRACHYOTUS, Dobs.

*The Dekhan Leaf-nosed Bat.*

(Synonymy in No. 6.)

♀ 3479. Danta, Mahi Kantha, Gujerat.

(*See* also Report No. 6.)

A small greyish brown bat; fur fairly long and soft, grey at the base and dull brown at the tips, very similar to *H. fulvus* and *dukhunensis* in colour, but is considerably larger than the former and smaller than the latter, and has much smaller ears than either. Head and body nearly two inches, tail extending just beyond the membrane. Fairly complicated nose-leaf. Weight about ¼ oz.

This little bat appears to be rare, as it is only the second specimen obtained during the Survey; the other one was taken in Kanara and is rather darker in colour. The National collection is also badly in want of specimens.

HIPPOSIDEROS FULVUS, Gray.

*The bicoloured Leaf-nosed Bat.*

(Synonymy in No. 3.)

♀ 2832. Palanpur, Gujerat.

(*See* also Reports Nos. 3, 5, 6, 7, 8, 9, 10 and 11.)

A very small grey-brown bat with large ears. Fur soft and long, white-tipped with brown, dirty white on the underside, tail extending just beyond the membrane; small nose-leaf. Head and body nearly two inches. Weight ⅛ oz.

"I observed only a few flying about bungalows. Comes out late."—C. A. C.

PIPISTRELLUS CEYLONICUS, Kel.

*Kelaart's Bat.*

(Synonymy in No. 1.)

2 ♂♂; ♀. Mount Abu, Rajputana.

(*See* also Reports Nos. 1, 2, 3, 5, 6, 8, 9, 10 and 11.)

PIPISTRELLUS DORMERI, Dobs.

*Dormer's Bat.*

(Synonymy in No. 1.)

1 ♂ ; 2 ♀♀. Palanpur, Gujerat.
5 ♂♂; 2 in al. Lunwa, Palanpur.

(*See* also Reports Nos 1, 2, 3, 5, 7, 8 and 10.)

A small bat varying in colour from greyish-brown to grey ; paler on the underside, which sometimes has a yellowish shade. Head and body about two inches long. Weight about ¼ oz.

"Most of these were shot flying high round trees, occasionally caught under trees. Comes out fairly early and is moderately fast on the wing".—C. A. C.

PIPISTRELLUS MIMUS, Wrought.

*The Southern Dwarf Pipistrelle.*

(Synonymy in No. 1.)

3 ♂♂. Palanpur, Gujerat.
6 ♂♂. 1 in al. Lunwa, Palanpur.
1 ♂. 4 in al. Mount Abu, Rajputana.

(*See* also Reports Nos. 1, 2, 3, 5, 6, 7, 9, 10 and 11.)

"Fairly common near the town of Palanpur and at Lunwa ; very few observed at Deesa. Habitually flies high and is generally the first bat to emerge. In the early evening it is fond of hunting beneath large trees. The usual mode of progression is a slow flutter ; a favourite trick of these small bats is to float on the breeze."—C. A. C.

SCOTOPHILUS KUHLI, Leach.

*The Common Yellow Bat.*

(Synonymy in No. 1.)

3 ♂♂ ; 10 ♀♀. Palanpur, Gujerat.
1 ♂ ; 10 ♀♀. 2 in al. Lunwa, Palanpur.
6 ♂♂; 11 ♀♀. 2 in al. Deesa, Palanpur.
2 ♀♀. Danta, Mahi Kantha, Gujerat.

(*See* also Reports Nos. 1, 3, 5, 6, 7 and 9.)

A brownish yellow bat, with a head and body about three inches long, fairly bright yellow on the underside ; has no nose-leaf ; tail extends to the end of membrane. It is larger and yellower thar *S. wroughtoni*. Weight about 1 oz.

"In vast numbers everywhere. A favourite resort during the day is between ceilings and roofs of houses. Comes out early and has a low, rapid and direct flight, in action somewhat resembling a sandpiper. With the wind it can move at a tremendous pace. At night, the females return frequently to their haunts for the purpose of feeding their young, which soon after birth are not carried by the parent during flight."—C. A. C.

SCOTOPHILUS WROUGHTONI, Thos.

*Wroughton's Bat.*

(Synonymy in No. 1.)

♀ 2819, ♀. Palanpur, Gujerat.
3 ♂♂; 1 ♀. Lunwa, Palanpur.

(*See* also Reports Nos. 1, 5, 6, 7, 9, 10 and 11.)

"Similar in habits to *S. khuli*, but seems content to hunt in a smaller area."—C. A. C.

TAPHOZOUS LONGIMANUS, Hardw.

*The Long-armed Sheath-tailed Bat.*

(Synonymy in No. 6.)

5 ♂♂; 11 ♀♀. 5 in al. Lunwa, Palanpur.

(*See* also Reports Nos. 6, 7, 8 and 9.)

A dark-brown bat, with a head and body measurement of a little over three inches; dark-brown on the underside also; no nose-leaf and the tail perforates the membrane in about the middle and extends free for nearly half an inch.

"Sexes now apart, but frequenting the same fig tree."—C. A. C.

TAPHOZOUS KACHHENSIS, Dobs.

*The Cutch Sheath-tailed Bat.*

(Synonymy in No. 1.)

♀ 3112. Deesa, Palanpur.

(*See* also Reports Nos. 1, 3, 8, 9 and 10.)

A fairly large bat, with a head and body, measuring about five inches; dark-brown fur, which does not extend to the end of the back, where there are large deposits of fat; tail perforates the membrane in the middle and extends free for nearly an inch. Weight about 2 ozs.

"I knew of a colony near Deesa, but after securing one specimen objections were raised."—C. A. C.

RHINOPOMA HARDWICKII, Gray.

*The lesser Indian Mouse-tailed Bat.*

(Synonymy in No. 3.)

1 ♂; 3 ♀♀. Palanpur, Gujerat.
1 ♂; 4 ♀♀. 43 in al. Lunwa, Palanpur.
4 ♀♀. 2 in al. Danta, Mahi Kantha, Gujerat.

(*See* also Reports Nos. 3, 5, 7, 8 and 10.)

A grey brown bat with a long free tail extending about 2½ inches beyond the membrane. The fur is smooth and thin and does not extend the whole length of the back; no nose-leaf. Weight about ⅓ oz.

"A few specimens were shot hovering over lofty trees."—C. A. C.

NYCTINOMUS TRAGATUS, Dobs.

*Dobson's Wrinkled-lipped Bat.*

(Synonymy in No. 3.)

♂ 3407; ♀ 3395. Mount Abu, Rajputana.

(*See* also Reports Nos. 3, 5, 9 and 10.)

A small dark greyish brown bat, nearly three inches in length, having a tail which extends free beyond the membrane for half its length; ears fairly large; fur rather short. Weight about ⅛ oz.

"Fairly numerous. After several showers of rain, I saw these bats hunting during the late evening over water, when their speed was terrific."—C. A. C.

PACHYURA, Sp.

*Shrews.*

1 ♂. Palanpur, Gujerat.
2 ♂ ♂; 2 ♀ ♀. Lunwa, Palanpur.
5 ♂ ♂. Mount Abu, Rajputana.
6 ♂ ♂; 3 ♀ ♀. Danta, Mahi Kantha, Gujerat.

(*See* also Reports Nos. 1, 2, 3, 5, 6, 7, 9, 10 and 11.)

"I should say that shrews are scarce in the neighbourhood of Palanpur; there were but few cases of mice being eaten by shrews. Comparatively rare in the jungle round Mount Abu; my specimens were taken in hedges; and they were not common out of the town at Danta"—C. A. C.

ERINACEUS MICROPUS, Blyth.

*The Northern Pale Hedgehog.*

(Synonymy in No. 3.)

1 ♂. Lunwa, Palanpur.
1 ♂; 8 ♀ ♀. Deesa, Palanpur.

(*See* also Reports Nos. 3 and 10.)

A pale coloured hedgehog. Fur on face and underside mostly white, muzzle and limbs brown. Spines white with a narrow dark-brown band and then white again at the tip. The spines commencing on the forehead are divided by a small bare parting on the tip of the head. Length about 9½ inches. Weight about 10 ozs.

"Both *E. micropus* and *collaris* are common round Palanpur; they hide in bushes and holes in the ground during the day."—C. A. C.

ERINACEUS COLLARIS, Gray and Hardw.

*Hardwicke's Hedgehog.*

(Synonymy in No. 3.)

2 ♂ ♂; 1 ♀. Palanpur, Gujerat.
1 ♂; 1 ♀ 3087. Lunwa, Palanpur.
4 ♂ ♂; 4 ♀ ♀. Deesa, Palanpur.

(*See* also Reports No. 3.)

A dark-coloured hedgehog. Fur on face and underside dark-brown. Spines white with black at the terminal end; some have white tips on the flanks, but the general appearance is dark. Length about 10 inches. Weight about 14 ozs.

FELIS AFFINIS, Gray.

*The Jungle Cat.*

(Synonymy in No. 1.)

1 ♂. Lunwa, Palanpur.
1 ♂; 1 ♀. Deesa, Palanpur.
1 ♂; 2 ♀ ♀. Mount Abu, Rajputana.

(*See* also Reports Nos. 1, 3, 4, 5, 6, 7, 10 and 11.)

"All natives agree that cats are rare round Palanpur; they are also rare at Uria and Danta."—C. A. C.

MUNGOS MUNGO PALLENS, Ryl.

*The pale-grey Mungoose.*

1914. *Mungos mungo pallens*, Ryley. Journ., B. N. H. S., Vol. XXII, p. 660.

3 ♂ ♂. Lunwa, Palanpur.
7 ♂ ♂; 3 ♀ ♀. Mount Abu, Rajputana.
2 ♀ ♀. Danta, Mahi Kantha, Gujerat.

A lighter coloured mungoose than the Southern common mungoose; white with brown speckles, pale drab on the underside. Head and body about 15 inches, tail about the same length. Weight 3½ lbs.

"Mungoose not common at Palanpur; in Cutch I saw at least ten to every one observed here. Not found in the immediate vicinity of Deesa, where *M. auropunctatus helvus* takes its place. Very plentiful at Mount Abu; I observed many in the village and in the forest. I saw some half dozen or so at Danta."—C. A. C.

MUNGOS AUROPUNCTATUS HELVUS, Ryl.

*The small Yellow Mungoose.*

1914. *Mungos auropunctatus helvus*, Ryley. Journ., B. N. H. S., Vol. XXII, p. 661.

5 ♂ ♂; 4 ♀ ♀. Deesa, Palanpur.

A small yellow mungoose, minutely speckled with brown; pale yellow feet (which distinguishes it from *M. auropunctatus*); pale drab on the underside. Head and body about 12 inches. Weight about 17 ozs.

"Breeds and sleeps in a hole (undoubtedly dug by itself) in the ground and is diurnal, otherwise differing a good deal in habits from *M. mungo*. It can be bold but generally is rather cautious, keeping near to cover. Its presence may at once be detected by a well-worn tract running the entire length of a hedge. When danger threatens, this mungoose immediately takes cover, and if the hedge is sufficiently dense, it lies up and may be approached to within a few feet, if then conscious of detection it dodges about in the hedge making very little attempt to place distance between itself and pursuer, and is with great difficulty induced to leave the hedge. In contrast to this, *M. mungo* invariably takes the nearest cut to its hole in tree or ground."—C. A. C.

MUNGOS SMITHI, Gray.

*The ruddy Mungoose.*

(Synonymy in No. 7.)

3 ♂ ♂; 1 ♀. Mount Abu, Rajputana.

(*See* also Report No. 7.)

A grey-brown mungoose speckled with white, giving an iron grey appearance, feet almost black, head and legs shaded with reddish brown. Easily distinguished from the ordinary mungoose by having a black tip to its tail. Head and body about 18 inches; tail about 16 inches. Weight about 4 lbs.

"This species is generally found in thick forest, and owing to its retiring habits is more common than is supposed. Apart from my four specimens which were trapped, I saw only two individuals, one of which disappeared between some rocks as I fired.

Reported to occur at Danta, which is probably correct."—C. A. C.

VIVERRICULA MALACCENSIS, Gmel.

*The small Indian Civet.*

(Synonymy in No. 3.)

1 ♀. Palanpur, Gujerat.
1 ♀. Danta, Mahi Kantha.

(*See* also Reports Nos. 3, 5, 7, 10 and 11.)

"Not often observed by the natives round Palanpur; at Mount Abu they seemed familiar with this civet, and at Danta it is well known but always difficult to find. It is supposed to eat the livers of live cattle."—C. A. C.

CANIS INDICUS, Hodgs.

*The Jackal.*

(Synonymy in No. 1 under *C. aureus*.)

1 ♂; 1 ♀. Palanpur, Gujerat.
1 ♂; 1 ♀. Lunwa, Palanpur.
2 ♂♂; 2♀. Deesa, Palanpur.

(*See* also Reports Nos. 1, 3, 4, 5, 6, 7, 9, 10 and 11.)

"Common round Palanpur; not found so high up as Uria; rare in the hot weather at Danta, but after the rain commenced I heard jackals calling."—C. A. C.

VULPES BENGALENSIS, Shaw.

*The common Indian Fox.*

(Synonymy in No. 1.)

1 ♂. Palanpur, Gujerat.
2 ♂♂. Deesa, Palanpur.
1 ♂. Danta, Mahi Kantha, Gujerat.

(*See* also Reports Nos. 1, 3, 5, 7 and 10.)

"Common at Palanpur. At Mount Abu I did not see or hear any. Said to be common in the valley between Danta and Palanpur. I heard them also in the hills."—C. A. C.

FUNAMBULUS PENNANTI, Wrought.

*The common 5-striped Squirrel.*

(Synonymy on No. 1).

5 ♂♂; 3 ♀♀. Palanpur, Gujerat.
5 ♂♂; 1 ♀. Lunwa, Palanpur.
4 ♂♂; 3♀♀. Deesa, Palanpur.
11 ♂♂; 3 ♀♀. 3297, 3382, 3388. Mount Abu, Rajputana.
10 ♂♂; 3 ♀♀. Danta, Mahi Kantha, Gujerat.

(*See* also Reports Nos. 1, 2, 3, 4, 5, 7 and 10.)

A small speckled greyish brown squirrel, with five longitudinal yellowish white stripes down the back and flanks, some are yellower and others greyer in appearance; underside dirty-white or pale-yellow. Distinguished from F. *tristriatus* by being smaller and lighter in colour and having much wider pale stripes.

"Very plentiful everywhere."—C. A. C.

GERBILLUS GLEADOWI, Murray.

*The little Hairy-footed Gerbil.*

1886. *Gerbillus gleadowi*, Murray, A. M. N. H. (5) XVII, p. 245.
1891. *Gerbillus gleadowi*, Blanf., Mammalia, No. 268.

3 ♂♂. Lunwa, Palanpur.

A small reddish fawn gerbil, pure white below. Head and body nearly 4 inches long; tail about 5½ inches longer, hairs on terminal end of tail; hindfoot about 1 inch. Weight about 1 oz.

"Similar in habits to *Dipodillus nanus* and found on the same ground. When dug out this gerbil displays most marvellous agility getting along with a quick succession of leaps, but not rising high off the ground. I spent a great deal of my own time digging for this species and *Dipodillus nanus*, and though I admit that both are very difficult to find I have no hesitation in saying that they are rare here."—C. A. C.

DIPODILLUS NANUS, Blanf.

*The little Gerbil.*

(Synonymy in No. 10.)

4 ♂♂; 4 ♀. 2 in al. Lunwa, Palanpur.

(*See* also Report No. 10.)

A small pale fawn gerbil, white below; tail very long. Head and body about three inches, tail over four inches long and the same colour as the back with longer darker hairs at the end. Weight about ⅝ oz.

"I have little to add to the notes on specimens obtained at Muli, Kathiawar. Burrows examined here varied in length and design, but are always found in soft sand and never go to any depth below the surface."—C. A. C.

TATERA INDICA, Hardw.

*The Indian Gerbil.*

(Synonymy in No. 1.)

6 ♂♂; 9♀♀. Palanpur, Gujerat.
4 ♂♂; 2♀♀. Lunwa, Palanpur.
2 ♂♂; 2♀♀. Deesa, Palanpur.
1 ♂; 1♀. Mount Abu, Rajputana.
7 ♂♂; 3 ♀♀. Danta, Mahi Kantha, Gujerat.

(*See* also Reports Nos. 1, 2, 3, 5, 6, 7, 8, 9, 10 and 11.)

"Found in large numbers near cultivation in Palanpur. Very scarce at 4,000 feet altitude at Mount Abu. By no means abundant at Danta."—C.A.C.

MERIONES HURRIANNÆ, Jerd.

*The Indian desert Gerbil.*

(Synonymy in No. 3.)

19 ♂♂; 14 ♀♀. Palanpur, Gujerat.
2 ♂♂; 1 ♀. Lunwa, Palanpur.
♂♂; 6 ♀♀. Deesa, Palanpur.
5 ♂♂; 7 ♀♀. Danta, Mahi Kantha, Gujerat.

(*See* also Reports Nos. 3 and 10.)

A light yellow coloured gerbil, dirty-white on the underside, tail the same colour as back, with longer dark-brown hairs on the terminal end. Head and body about 5 inches, tail nearly as long. Weight about 3½ ozs.

"In immense numbers wherever there is sand, the country round Palanpur is literally honeycombed with the burrows of this species. It must be partially migratory, for large uninhabited colonies are frequently met with. The food consists of grass and probably roots. With a few exceptions I have noticed that *M. hurrianne* does not burrow in cultivated areas. Until now, at Danta, I have found this species only on bare

sandy plains, here it is abundant in comparatively firm soil and is found right up to the foot of the hills and even in heavy jungle. It has become a pest since 1908."—C. A. C.

VANDELEURIA OLERACEA SPADICEA, Ryl.

*The Sandy-red Tree-Mouse.*

1914. *Vandeleuria oleracea spadicea*, Ryley. Journ., B. N. H. S., Vol. XXII, p. 658.

3 ♂♂; 1 ♀. Lunwa, Palanpur.

A small pale tawny mouse with a very long tail; dirty-white on the underside. Head and body about 3½ inches; tail about an inch longer. Weight about ¾ oz.

"These specimens taken at Lunwa were all obtained in a large Fig tree; they are not easy to trap. Although this mouse is a climber, it is not particularly sure-footed. At night several fell out of the tree under which my camp was pitched. One fell on a box at my side and was easily caught; others were heard to fall on earth and a search with lamps sometimes rewarded us with a specimen. An amusing incident occurred during one of these hunts, the mouse having evaded our clutches for some time, suddenly vanished; after much searching the while my dinner got cold, we were about to give up the chase when one of the searchers appeared to go suddenly mad, when more composed he explained, that the mouse had taken refuge in his trousers!"—C. A. C.

GRYPOMYS GLEADOWI, Murray.

*The Sand-coloured Rat.*

(Synonymy in No. 10.)

7♂♂; 4♀♀. Lunwa, Palanpur

(*See* also Report No. 10.)

A small greyish sandy fawn rat, pure white on the underside. Head and body nearly 4 inches; tail slightly shorter. Weight about 1 oz. Easily distinguished from *Gerbillus gleadowi* by its smaller hind foot and shorter tail which is without the longer hairs at the end.

"Found in soft sand, but favours a firmer soil. Cannot be common here, unless by any chance it inhabits burrows abandoned by *Meriones hurrianne*".—C. A. C.

EPIMYS RUFESCENS, Gray.

*The common Indian Rat.*

(Synonymy in No. 1.)

9♂♂; 16♀♀. Palanpur, Gujerat.
5♂♂; ♀. Lunwa, Palanpur.
5♂♂; ♀. Deesa, Palanpur.
2♂♂. Mount Abu, Rajputana.
4♂♂; 6♀♀. Danta, Mahi Kantha, Gujerat.

(*See* also all previous Reports.)

"Abundant in houses in Palanpur, not common in the fields, but is partial to Fig trees. Only common in the town at Danta."—C. A. C.

MILLARDIA MELTADA PALLIDIOR, Ryl.

*The Northern Soft-furred Field-Rat.*

1914. *Millardia meltada pallidior*, Ryley. Journ. B. N. H. S., Vol. XXII, p. 659.

8 ♂ ♂ ; 13 ♀ ♀. Lunwa, Palanpur.
1 ♂ ; 1 ♀. Deesa, Palanpur.
2 ♂ (1 skull only). Danta, Mahi Kantha, Gujerat.

A pale brownish grey rat, greyish white on the underside; fur soft. Head and body five or six inches long; tail nearly as long. Weight about 2¾ ozs.

"Common at Lunwa, trapped in hedges. Appears to be rare at Danta."—C. A. C.

GOLUNDA ELLIOTI WATSONI, Blanf.

*The Northern Indian Bush-Rat.*

1876. *Pelomys watsoni*, Blanford, P. A. S. B., Vol. XLV, p. 181.
1891. *Golunda ellioti*, Blanf., Mammalia, No. 299 (partim).

2 ♂ ♂; 19 ♀ ♀. Lunwa, Palanpur.
2 ♂ ♂. Deesa, Palanpur.
17 ♂ ♂; 13 ♀ ♀. Mount Abu, Rajputana.
8 ♂ ♂; 2 ♀ ♀. Danta, Mahi Kantha, Gujerat.

In 1876 Blanford described a Golunda, collected by Mr. Watson from near Kotri, Sind, under the name of *Pelomys watsoni*; later he included this name in his synonymy of *G. ellioti*; however I am reviving the name for the specimens from Cutch, Kathiawar and the present collection, which are so conspicuously paler and yellower than the Southern form of Golunda, that they require to be distinguished subspecifically.

A brownish yellow rat, very finely speckled with black drab on the underside. Head and body about 5 inches long; tail about 4 inches. Of a lighter, yellower shade than the ordinary, *Golunda ellioti* which is quite dark-brown with more black speckles. Weight about 2¾ ozs.

"Common in hedges, comes out to feed very early in the evening, when, if approached very quietly, may be observed at a distance of a few feet. Often trapped during the day-time. It is sluggish in movement and is generally hunched up as if cold."—C. A. C.

MUS MANEI, Kel.

*The common Indian House-Mouse.*

(Synonymy in No. 5.)

2 ♂ ♂; 1 ♀. Palanpur, Gujerat.
1 ♂. Lunwa, Palanpur.
4 ♂ ♂; 2 ♀ ♀. Deesa, Palanpur.

(*See* also Reports Nos. 5, 6, 7, 8, 9, 10 and 11.)

"Common in houses in Palanpur, and in cultivation adjoining villages."—C. A. C.

MUS DUNNI, Wrought.

*The Northern Field-Mouse.*

(Synonymy in No. 3.)

8 ♂ ♂; 1 ♀. Palanpur, Gujerat.
16 ♂ ♂; 2 ♀ ♀. Lunwa, Palanpur.
6 ♂ ♂; 1 ♀. Deesa, Palanpur.

(*See* also Report No. 3.)

A very small drab coloured mouse, white on the underside. Head and body nearly 2½ inches; tail about the same length. Weight between ¼ and ½ oz.

The Palanpur specimens agree with the type of *M. dunni* in colour, but some specimens are rather large, however as the drab colour is the most distinguishing characteristic I am considering them as *dunni* not *booduga*.

"Common in Palanpur, found in hedges and long grass."—C. A. C.

MUS BOODUGA, Gray.

*The Field Southern-Mouse.*

(Synonymy in No. 1.)

4 ♂ ♂. Mount Abu, Rajputana.
16 ♂ ♂ : 8 ♀ ♀. 2 in al. 3413. Danta, Mahi Kantha, Gujerat.

(*See* also Reports Nos. 1, 2, 4, 5, 6, 7, 8, 9 and 11.)

These specimens taken from the more wooded country resemble *M. booduga*, while those from the open desert round Palanpur are all of the uniform drab colour characteristic of *M. dunni*. The same thing occurred in Kathiawar where the Junagadh specimens were dark and those from Rajkot and N. E. Kathiawar, pale drab.

"Scarce at Mount Abu. Common in hedges at Danta, very nimble and pugnacious."—C. A. C.

CREMNOMYS CUTCHICUS, Wrought.

*The Cutch Rock-Rat.*

(Synonymy in No. 3.)

36 ♂ ♂ ; 26 ♀ ♀. 1 in al. Mount Abu, Rajputana.
8 ♂ ♂ : 1 ♀. Danta, Mahi Kantha, Gujerat.

(*See* also Reports Nos. 3, 8, 9 and 10.)

A medium-sized rat with a very long tail. Fur very soft and fairly long, brownish grey speckled with buff; white on the underside. Head and body about 5 inches long, tail about an inch longer. Weight about 2¾ ozs.

The Danta specimens are rather darker in colour.

"Very abundant among the rocks at Mount Abu, occasionally trapped in hedges. I observed a pair at play on a large rock when they showed great activity, turning and twisting in a remarkable manner and clearly demonstrating the use of such long tails which were waved over their backs or from side to side for the purpose of balance. Not very abundant at Danta, confined entirely to the hills."—C. A. C.

LEGGADA SADHU, Wrought.

*The Ashy Spiny Mouse.*

(Synonymy in No. 3.)

22 ♂ ♂ ; 10 ♀ ♀. Mount Abu, Rajputana.
3 ♂ ♂ ; 2 ♀. in al. 3459. Danta, Mahi Kantha, Gujerat.

(*See* also Reports Nos. 3 and 10.)

A grey leggad speckled with buff and white on the underside ; fur mixed with spines. Head and body about 3½ inches in length, tail slightly shorter. Weight about 1 oz.

"Common at Mount Abu. Found usually among rocks and stones. C. A. C.

LEGGADA PHILLIPSI, Wrought.

*Phillip's spined Mouse.*

(Synonymy in No. 4.)

1 ♂; 1 ♀. 1 in al. Mount Abu, Rajputana.
6 ♂ ♂; 1 ♀. 1 in al. Danta, Mahi Kantha, Gujerat.

(*See* also Report No. 4.)

A small dark mouse coloured leggad with tinges of drab. Coat composed almost entirely of spines; white on the underside. Head and body nearly three inches long; weight about ½ oz. Distinguished from *L. sadhu* by being slightly smaller, especially in the hind foot, and also having a much more spiny coat.

"Found generally under rocks on hills. Spiney mice are invariably found associating with *Cremnomys cutchicus*."—C. A. C.

BANDICOTA MALABARICA, Shaw.

*The Malabar Bandicoot.*

(Synonymy in No. 5)

2 ♂ ♂; 2 ♀ ♀. Danta, Mahi Kantha, Gujerat.

(*See* also Report Nos. 5, 6, 7, 9, 10 and 11.)

"Specimens obtained from houses."—C. A. C.

GUNOMYS KOK, Gray.

*The Southern Mole Rat.*

(Synonymy in No. 1.)

♀ 3249. Mount Abu, Rajputana.

(*See* also Reports Nos. 1, 4, 5, 7, 8, 9, 10 and 11.)

"Rare at Mount Abu. No workings observed round Danta."—C. A. C.

HYSTRIX LEUCURA, Sykes.

*The Indian Porcupine.*

(Synonymy in No. 1.)

♀ 3118. Deesa, Palanpur.

(*See* also Reports Nos. 1, 2, 5, 10 and 11.)

"Well distributed at Mount Abu. I had the misfortune to lose one at which I fired, and a second that I trapped got free during the night. Rare about Danta, probably was common before."—C. A. C.

LEPUS DAYANUS, Blanf.

*The Sind Hare.*

(Synonymy in No. 3.)

9 ♂ ♂.
1 ♀. Palanpur, Gujarat.
4 ♂ ♂; 3 ♀ ♀. Lunwa, Palanpur.
3 ♂ ♂. Deesa, Palanpur.
4 ♂ ♂; 5 ♀ ♀. 2 in al. Mount Abu, Rajputana.
2 ♂ ♂. Danta, Mahi Kantha.

(*See* also Reports Nos. 3 and 10.)

A yellowish sandy grey hare with some black hairs on the back; reddish yellow legs and feet; white on the underside. Length about 18 inches. Weight about 5¼ lbs.

"Plentiful in Palanpur and Mount Abu; but scarce at Danta where they should also have been plentiful".—C. A. C.

# BOMBAY NATURAL HISTORY SOCIETY'S MAMMAL SURVEY OF INDIA, BURMA AND CEYLON.

## Report No. 13.

BY KATHLEEN V. RYLEY.

COLLECTION ... ... No. 13.
LOCALITY ... ... S. Ceylon.
DATE ... ... March—June 1913.
COLLECTED BY ... ... Major E. W. Mayor.
EARLIER REPORTS .. No. 1, E. Khandeish, Vol. XXI, p. 392, 1913; No. 2, Berars, Vol. XXI., p. 844, 1912; No. 3, Cutch, Vol. XXI, p. 826, 1912; No. 4, Nimar, Vol. XXI, p. 844, 1912; No. 5, Dharwar, Vol. XXI, p. 1170; No. 6, Kanara, Vol. XXII, p. 29, 1913; No. 7, Central Provinces, Vol. XXII, p. 45, 1913; No. 8, Bellary, Vol. XXII, p. 58, 1913; No. 9, Mysore, Vol. XXII, p. 283, 1913; No. 10, Kathiawar, Vol XXII, p. 464, 1913; No. 11, Coorg, Vol. XXII, p. 486, 1913; No 12, Palanpur, Vol. XXII, p. 684, 1914.

This collection was made in the southern portion of Ceylon, beginning with a few specimens from Colombo, the majority however were collected in the extreme south of the Island. Major Mayor gives the following notes on the actual collecting stations :—

*Kottawa, S. P.*—"About 10 miles inland from Galle, the ancient port of Colombo, 280 feet above sea-level, there is a small rest-house and one or two native huts. With the exception of a stretch of original forest (evergreen jungle), which runs either side of the road for a mile or so, the country is covered with Chena jungle, very thickly matted with a kind of bracken. 'Chena" or "Hena" (Singalese) is the general name given to once cultivated land or burnt down forest, on which the jungle has been allowed to grow again. The rainfall is heavy and the climate damp with a muggy heat—land leeches abound.

I attribute the scarcity of small rodents and everything that lives near the ground to the general prevalence of these leeches.

Bats were very scarce. I only saw some small ones flying in the evening.

Galle has a very fine old Portuguese and Dutch Fort in good preservation, with ramparts, two miles round, and quite a town inside.

*Udugama, S. P.*—A small village with a rest-house on the banks of the Gin-Ganya, about 16 miles N. of Kottawa, and at the end of the road. The country is composed of small hills running up to 500 or 600 feet, mostly rubber estates or deserted tea or coffee, covered with Chena. Heavy storms, practically every day and night; rainfall about this district to the end of March (1913) over 40 inches and before the little S. W. Monsoon. In the

valleys and round the villages are small paddy fields. Lot of Sambur or Elk (local name) about, and planters offer a reward of Rs. 10 per head and Rs. 5 for Porcupines; but these are rarely claimed, as the natives are too lazy, even though these rewards can be almost doubled by selling the flesh. Rats and mice seem scarce, also bats. I got practically no help at all from the villagers.

*Hiniduna, S. P.*—10 miles up the Gin-Ganya, thick evergreen jungle, "leechy" and no good.

*Ranna, S. P.*—Rest house, small bazaar and village, eight miles E. of Tangalla; is on a small river about 3 miles from the coast and lagoon; these are full of estuarine crocodiles, with a man-eater, reported length about 16 feet, has killed three people and a number of cattle. The country gets much drier here, no forest, but one mass of "Lantana Chena," with paddy fields near the village, and an old dry tank 1½ miles distant. The Lantana is about 8 or 9 feet high and practically impenetrable, except by native tracts. Saw fresh Elephant tracks in the tank—water scarce. Natives here lazy, apathetic and non-observant with strong religious scruples against killing, and objected to my setting traps round the bazaar or gardens. Langurs plentiful along by the river, but hard to shoot and harder still to get when shot, as the jungle along by the river-bank is rattan cane jungle. Heard spotted deer in Chena, but impossible to see or get round them. Peacocks fairly plentiful.

*Hambantota, S. P.*—A port and fairly large village and bazaar, population about 2,000 with A. G. A. and Government Kacheri and Rest-house on the coast 18 miles E. of Ranna. A flat, dry sandy country, with low scrub and cactus trees surrounding several large salt water lakes or "Lewayas;" these dry up during the hot weather and deposit salt which is the main industry, fishing is also carried on. Population mixed Singalese, Tamils, Malays and Moormen. The Malays are descendants of one of the old disbanded Malay Regiments. The large Government salt store sheds are swarming with bats, but I could only get two species. The short-nosed and fulvous Fruit Bats I found living in a large jungle of Palmyra Palms on the sandhills by the sea. Practically nothing brought in by the local natives, but Mudeliyar Bahur of the salt works gave me a great deal of help and sent me a lot in from Kirinda, 25 miles away; but being so far off, they nearly all reached me too bad to skin. He is the only Mudeliyar so far who has really helped.

*Weligtta, S. P.*—About 9 miles N. E. of Hambantota in the centre of very dry scrubby cactus and thorn jungle; nearest village 4 miles; water very scarce here and drying up daily. There is a large old tank here, but it was burst in January, as at Ranna and many other places, by the exceptional rains which took place then.

Only saw some Langurs in a single clump of trees in the tank and it was impossible to get near them. Leopard were about, as cattle were killed, but there were no water holes near where they came. Bats scarce here, only got a few under a road culvert.

*Wellawaya, Uva Province.*—A small village, bazaar and rest-house in the S. W. of Uva on the Kirinda Oya river. Jungle here very thick, evergreen with large forest trees and rocky hills covered with vegetation; elevation 608 feet.

The Loris is reported to have been got on an estate 8 miles from here, when they felled the big trees in clearing, but I could not get any. A large cavern in the hills about 5 miles from here, evidently ancient nitrate workings, was full of bats, but they were very hard to get, as the roof is very high and an electric torch practically useless.

The natives here—the same as elsewhere—were of no assistance. Some Indian squirrels were brought in, but they wanted too much, as I found they could sell them in the bazaar for eating for 35 cents. each.

In the old Kandyan days this place was densely populated, but apparently it has anen decimated by fever, so I was informed by the M. O. of Badulla. There are large paddy fields around the village. Very few bats about.

*Kumbukkan, Uva.*—About 17 miles N.E. of Wellawaya; this is the beginning of the Rubber estates, that cover the Moneragalla Hills, 6 miles further on. This is an isolated range of Rocky Hills running up to over 3,000 feet. Kumbukkan is in the valley on the Kumbukkan Oya river, elevation 400 feet. On the S. E. is about a 40 mile track of very thick evergreen jungle full of Elephants, Buffalo, Leopards and Bears. Plenty of Langurs and even more Macaques, but very hard to get or see even, unless they are on the trees bordering the road. The large flying squirrel I found here as at Wellawaya. I was helped in every possible way by Mr. G. L. Horsfall, the P. D. of this estate. In Singalese "Ganga" = a large sized river, "Oya," = a medium sized river and "Ella" = a small sized river. This valley is bad for fever."
—E. W. M.

This collection consists of 368 specimens composed of 36 species in 28 genera.

It is particularly interesting having these specimens from Ceylon to compare with the mainland examples, in fact, it is absolutely necessary, in order to work out several of the Indian species which were originally described from Ceylon specimens and have remained rather doubtful until examples were obtained from the type locality. There are 11 species new to the Mammal Survey, *viz:—Simia pileatus, Presbytis cephalopterus* and *priamus, Rousettus seminudus, Miniopterus schreibersi, Mungos flavidens,*

*Petaurista lanka*, *Sciuropterus fuscocapillus*, *Ratufa macroura* and *macroura tennenti*, and *Funambulus trilineatus*.

The Ceylon form of *F. sublineatus* has proved to be distinct from the mainland variety and must in future be known by Kelaart's variation of the name, *trilineatus*. It is interesting to find *Millardia meltada* in Ceylon, this being the first time that specimens of this rat have been received from there.

As this collection was made in rather a restricted area in the extreme south, no attempt is going to be made to work out the specimens thoroughly until the whole of Ceylon has been completed.

SIMIA PILEATUS, Shaw.

*The Toque Monkey.*

1792. *Simia (Cercopithecus) sinicus pileatus*, Kerr, Anim. Kingd. No. 45.
1797. *Simia sinica* (nec. Linn.), Schreb. Saugth, p. 108.
1800. *Simia pileata*, Shaw, Gen. Zool. i pt. 1., p. 53.
1812. *Cercocebus sinicus* (nec. Linn.), E. Geoff. Ann. Mus. Hist. Nat., Paris, XIX, p. 98.
1847. *Macacus pileatus*, Blyth, J. A. S. B. XVI, p. 1272.
1888. *Macacus pileatus*, Blanford, Mammalia No. 11.

1 ♂. Kottawa, S. Ceylon.
1 ♀. Ranna, S. Ceylon.
2 ♀♀. Wellawaya, S. Ceylon.
1 ♀. Kumbukkan, S. Ceylon.

A yellow brown monkey of medium size, head and body length being about 20 inches, tail rather longer. Radiating parting on top of the head, dark fringe above eyes, tail dark grey. Neck and under-surface paler n colour.

PRESBYTIS CEPHALOPTERUS, Zimm.

*The purple faced Monkey.*

1780. *Cercopithecus kepalopterus*, Zimm., Geog. Gesch. 11, p. 185.
1825. *Cercopithecus leucoprymnus*, Otto, Nov. Acad. Caes. Leop. XII, p. 505, pl. XIV bis.
1825. *Semnopithecus fulvogriseus*, Desmoul., Dict. class. Hist. Nat. VII, p. 570.
1833. *Semnopithecus nestor*, Bennett, P. Z. S., p. 67.
1838. *Semnopithecus latibartatus*, Martin, Charlesw, Mag. Nat. Hist. 11 New Series, p. 439.
1852. *Presbytis cephaloptera*, Kelaart, Prod. p. 17.
1867. *Semnopithecus thersites*, Hutton, P. Z. S., p. 949.
1876. *Semnopithecus kelaati*, Schleg., Mus. Pays-Bas, Simiæ, p. 52.
1888. *Semnopithecus cephalopterus*, Blanf., Mammalia No. 17.

2 ♀♀. Kottawa, S. Ceylon.

A brown black monkey, top of head light-brown, neck and bushy tufts on side of face grey; ashy grey also on the rump. Head and body about 22 inches, tail about 4 inches longer. Weight about 14 lbs.

PRESBYTIS PRIAMUS, Blyth.

*The Madras Langur.*

1844. *Semnopithecus priam*, Elliot, Mss. Blyth. J. A. S. B. XIII, p. 470.

1844. *Semnopithecus pallipes*, Blyth, Ann. Mag. Nat. Hist., p. 312.
1847. *Presbytis priamus*, Blyth, J. A. S. B. XVI, p. 732, pl. LIV.
1847. *Presbytis thersites*, Blyth, J. A. S. B. XVI, p. 1271.
1888. *Semnopithecus priamus*, Blanford, Mammalia No. 14.

2 ♂♂, 1 ♀. Ranna, S. Ceylon.
2 ♀♀. Kirinda, S. Ceylon.
1 ♂. Weligatta, S. Ceylon.

A light earthy brown monkey with a creamy grey tinge. Radiating, parting on forehead and slight crest on top of head, and projecting black fringe above the eyes; some individual hairs on the back much longer than the rest, limbs and tail a darker greyish brown. Head and body about 23½ inches, tail about 28 inches. Weight about 16 lbs.

ROUSETTUS SEMINUDUS, Kel.

1850. *Pteropus seminudus*, Kelaart, J. R. A. S., Ceyl. 11, 5, p. 329.
1870. *Xantharpyria seminuda*, Gray, Cat. Monk. etc., p. 115.
1888. *Xantharpyria amphexicaudata*, Blanf., Mammalia No. 137 *(partim)*.

1 ♂. Hambantota, S. Ceylon.

A light yellow-brown fruit bat. Very scanty covering of hair both above and below; shoulders practically bare. Head and body about 5 inches, tail about ½ inch.

CYNOPTERUS SPHINX SPHINX, Vahl.

*The Southern Short-nosed Fruit Bat.*

(Synonymy in No. 6.)

1 ♀. Hambantota, S. Ceylon.

(*See* also Reports Nos. 6, 9 and 11.)

LYRODERMA LYRA, Geoff.

*The Indian Vampire Bat*

(Synonymy in No. 1.)

1 ♀. Udugama, S. Ceylon.
1 ♂, 1 ♀. Nagoda, S. Ceylon.

(*See* alse Reports Nos. 1, 4, 5, 6, 7, 8, 9 and 12.)

HIPPOSIDEROS DUKHUNENSIS, Sykes.

*Sykes Leaf-nosed Bat.*

(Synonymy in No. 5.)

16 ♂♂, 21 ♀♀. 5 in al. Hambantota, S. Ceylon
4 ♂♂. Weligatta, S. Ceylon.

(*See* also Reports Nos. 5, 6, 8, 9 and 11.)

HIPPOSIDEROS FULVUS, Gray.

*The Bicoloured Leaf-nosed Bat.*

(Synonymy in No. 3.)

1 ♀. Hambantota, S. Ceylon.

(*See* also Reports Nos. 3, 5, 6, 7, 8, 9, 10 and 12.)

RHINOLOPHUS ROUXI, Temm.

*The Rufous Horse-shoe Bat.*

(Synonymy in No. 5.)

1 ♂. Wellawaya, S. Ceylon.
8 in al. Lunugalla, S. Ceylon.

(*See* also Reports Nos. 5, 6 and 9.)

A small bat varying very much in colour from greyish-brown to bright reddish yellow. Very complicated nose-leaf and large ears. Head and body a little over 2 inches, tail extending to end of membrane.

PIPISTRELLUS COROMANDRA, Gray.

*The Coromandel Pipistrelle.*

(Synonymy in No. 5.)

1 ♂, 1 ♀. Nakaidiniya, S. Ceylon.

(*See* also Reports Nos. 5, 9 and 11.)

PIPISTRELLUS MIMUS, Wrought.

*The Southern Dwarf Pipistrelle.*

(Synonymy in No. 1.)

2 ♂♂, 2♀♀, 1 in al. Ranna, S. Ceylon.
2 ♂♂, 3♀♀, 4 in al. Hambantota, S. Ceylon.

(*See* also Reports Nos. 1, 2, 3, 5, 6, 7, 8, 9, 10, 11 and 12.)

MINIOPTERUS SCHREIBERSI, Kuhl.

*The Long-winged Bat.*

1817. *Vespertilis schreibersi*, Natterer, Kuhl, Deutsche Flederm, p. 41.
1835. *Vespertilio fuliginosa*, Hodgson, J. A. S. B., IV, p. 700.

2 ♂♂, 8 in al. Wellawaya, S. Ceylon.

A small dark-brown bat with small ears and no nose-leaf. Head and body about 2 inches, tail about the same length and extending to end of membrane.

PACHYURA, Sp.

*Shrews.*

1 ♀. Udugama, S. Ceylon.
1 ♀. Wellawaya, S. Ceylon.

(*See* also Reports Nos. 1, 3, 4, 5, 6, 7, 9, 10, 11 and 12.)

FELIS PARDUS, L.

*The Panther.*

(Synonymy in No. 5.)

1 ♂. Tanamawilla, S. Ceylon.

(*See* also Reports Nos. 5, 6, 9 and 11.)

FELIS RUBIGINOSA, Geoffr.

*The Rusty-Spotted Cat.*

(Synonymy in No. 5.)

2 ♂♂. Weligatta. S. Ceylon.

(*See* also Report No. 5.)

A pale fawn grey cat with dark-brown spotted longitudinal lines down the back, the side ones being light-brown, on the head and shoulders they

appear in the form of very dark-brown lines. Underside nearly white with black spots. Tail fawn grey. Head and body about 17 inches; tail nearly half that length. Weight about 3 lbs.

MUNGOS SMITHI, Gray.

*The ruddy Mungoose.*

(Synonymy in No. 7.)

1 ♀. Ranna, S. Ceylon.
1 ♀. Hambantota, S. Ceylon.
2 ♂♂, 1 ♀. Weligatta, S. Ceylon.
1 ♂, 1 ♀. Wellawaya, S. Ceylon.

(*See* also Reports Nos. 7 and 12.)

MUNGOS FLAVIDENS, Kel.

*The Ceylon Brown Mungoose.*

1850. *Herpestes flavidens*, Kelaart, J. R. A. S. Ceylon II 5, p. 323;
1851. *Herpestes fulvescens*, Kelaart, J. A. S. B., XX, p. 162.
1851. *Cynictis maccarthæ*, Gray, P. Z. S., p. 131 and 184.
1885. *Herpestes ceylonicus*, H. Nevill, Taprobanian, i, p. 62.
1888. *Herpestes fulvescens*, Blanford. Mammalia No. 63.

1 ♂. Weligatta, S. Ceylon.
2 ♀♀, Kumbukkan, S. Ceylon.

Kelaart changed the name of this species from *flavidens* to *fulvescens* in the following year but as it was published first in the J. R. A. S., Ceylon, under the former name, *flavidens* must stand, in 1852 he again uses *fulvescens* in his Prodromus.

A yellow-brown mungoose speckled with black, some of the hairs being tipped with reddish brown, feet almost black. Head and body nearly 16 inches, tail about the same length. Weight about 3 lbs. This mungoose is very similar to *M. fuscus* but smaller.

VIVERRICULA MALACCENSIS, Gmel.

*The Small Indian Civet.*

(Synonymy in No. 3.)

1 ♂. Ranna, S. Ceylon.
1 ♂. Weligatta, S. Ceylon.
1 ♂. Kumbukkan, S. Ceylon.

(*See* also Reports Nos. 3, 5, 7, 10, 11 and 12.)

PARADOXURUS NIGER, Desm.

*The Indian Toddy Cat.*

(Synonymy in No. 5.)

1 ♂, 1 ♀. Udugama, S. Ceylon.
1 ♂. Nakaideniya, S. Ceylon.

(*See* also Reports Nos. 5, 7, 8 and 11.)

MELURSUS URSINUS, Shaw.

*The Sloth-Bear.*

(Synonymy in No. 11.)

1 ♂ Kumbukkan, S. Ceylon.

(*See* also Report No. 11.)

PETAURISTA LANKA, Wrought.

*The Large Grey Flying-Squirrel.*

1891. *Pteromys oral*, Blanford, Mammalia No. 227 (*partim*).
1911. *Petaurista lanka*, Wroughton, H. B. N. H. S., XX, p. 1017.

1 ♀. Kumbukkan, S. Ceylon.
1 ♂. Wellawaya, S. Ceylon.

A large grey flying squirrel, hairs dark-ashy grey, tipped with white; feet and hands black; underside greyish white; fur very soft. Head and body about 16 inches. Distinguished from the mainland form (*P. phillippensis*) by the absence of the reddish-brown tinge.

SCIUROPTERUS (PETINOMYS) FUSCOCAPILLUS, Blyth.

*The Small-Flying-Squirrel.*

1847. *Sciuropterus fuscocapillus*, Blyth, J. A. S. B., XVI, p. 867.
1850. *Sciuropterus layardi*, Kelaart, J. R. A. S., Ceyl., 11., p. 328.
1879. *Pteromys fuscocapillus*, Anderson, An. Zool. Res., p. 294.

1 ♀. Wellawaya, S. Ceylon.

A small reddish-brown flying-squirrel. Fur dark-ashy grey tipped with chestnut-brown. Fur very soft, especially on the tail; underside paler in colour. Conspicuous long dark hairs surrounded the ears, these are absent in *S. fimbriatus*. Head and body about 12 inches, tail about the same length.

RATUFA MACROURA, Penn.

*The Black Giant Squirrel.*

1769. *Sciurus macrourus*, Pennant, Ind. Zool. 1., pl. 1.
1785. *Sciurus ceilonensis*, Boddaert, Elench. An., p. 117.
1888. *Sciurus macrurus*, Blanford, Mammalia No. 241 (*partim*).

2 ♀♀. Kottawa, S. Ceylon.

A large squirrel, black above, sometimes brownish black; tail, hands and feet black; bright yellow buff on the underside, this colour coming round to the outside of the arms and legs which helps to distinguish it from the Burma species *R. gigantea*. Buff markings also on the face and top of the head. Head and body about 16 inches, tail about the same length.

RATUFA MACROURA TENNENTI, Blyth.

*The Grizzled Giant Squirrel.*

1849. *Sciurus tennenti*, Blyth, J. A. S. B., XVIII, p. 600.
1888. *Sciurus macrurus*, Blanford, Mammalia No. 241 (*partim*.)

1 ♂, 1 ♀. Ranna, S. Ceylon.
1 ♂, 1 ♀. Wellawaya, S. Ceylon.
1 ♂, 2 ♀♀. Kumbukkan, S. Ceylon.

A squirrel similar to *R. macroura*, but is bay coloured, grizzled with white above; underside, legs and markings on head and face are creamy yellow. The forehead is almost black, and in some cases the shoulders are brown black and not grizzled. The tail is blackish-brown grizzled with grey. Head and body about 15½ inches, tail slightly longer. Weight about 2 lbs.

Blanford has transposed the names *macroura* and *tennenti* as Mr. Wroughton pointed out in his paper on the "Giant Squirrels" (J. B. N. H. S., Vol. XIX, p. 885, 1910.)

FUNAMBULUS PALAMARUM, L.

*The Palm Squirrel.*

(Synonymy in No. 2.)

2 ♂♂, 2 ♀♀. Colombo, Ceylon.
2 ♂♂, 2 ♀♀. Kattawa, S. Ceylon.
4 ♂♂, 7 ♀♀. Udugama, S. Ceylon.
3 ♂♂, 1 ♀. Ranna, S. Ceylon.
7 ♂♂, 3 ♀♀. Hambantota, S. Ceylon.
3 ♂♂. Weligatta, S. Ceylon.
3 ♂♂, 5 ♀♀. Wellawaya, S. Ceylon.
4 ♂♂, 1 ♀, 1 in al. Kumbukkan, S. Ceylon.

(*See* also Reports Nos. 2, 4, 5, 7, 8 and 9.)

These squirrels may represent *F. brodei* (Blyth), but until specimens come in from further north this cannot be definitely stated.

FUNAMBULUS TRILINEATUS, Kel.

*The Newera Eliya ground Squirrel.*

1852. *Sciurus trilineatus*, Kelaart, Prod. p. 54.
1891. *Sciurus sublineatus*, Blanford, Mammalia No. 266 (*partim.*)

1 ♂. Kottawa, S. Ceylon.

A small dark-brown squirrel finely specked with yellow, having three slightly paler longitudinal stripes on the back, underside pale tawny. Fur soft and dense. Tail hairs banded black and yellow. Head and body about 5 inches, tail about the same length. The differences between this form and *F. sublineatus* will be found in the "Scientific Results", Vol. XXII, p. 661.

TATERA INDICA, Hardw.

*The Indian Gerbil.*

(Synonymy in No. 1.)

1 in al. Udugama, S. Ceylon.
2 ♂♂, 3 ♀♀. Ranna, S. Ceylon.
11 ♂♂, 16 ♀♀. Hambantota, S. Ceylon.
1 ♀. Tellula, S. Ceylon.
3 ♂♂, 3 ♀♀. Welligatta, S. Ceylon.
3 ♀♀. Wellawaya, S. Ceylon.

(*See* also Reports Nos. 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12.)

MILLARDIA MELTADA, Gray.

*The Soft-furred Field-Rat.*

(Synonymy in No. 1.)

2 ♂♂, 2 ♀♀. Ranna, S. Ceylon.
2 ♂♂, 11 ♀♀, 1 in al. Hambantota, S. Ceylon.
2 ♂♂. Weligatta, S. Ceylon.
2 ♂♂, 1 ♀. Wellawaya, S. Ceylon.

(*See* also Reports Nos. 1, 3, 4, 5, 7, 10 and 11.)

EPIMYS RUFESCENS, Gray.

*The Common Indian Rat.*

(Synonymy in No. 1.)

4 ♂♂, 1 ♀. Colombo, Ceylon.

5 ♂♂, 4 ♀♀. Hambantota, S. Ceylon.
2 in al. Kumbukkan, S. Ceylon.

VARIETY with white underparts.

1 ♂. Kottawa, S. Ceylon.
7 ♂♂, 7 ♀♀, 1 in al. Udugama, S. Ceylon.
1 ♂. Nakaideniya, S. Ceylon.
5 ♀♀. Colombo.
6 ♂♂, 5 ♀♀. Hambantota, S. Ceylon.
1 ♂, 1 ♀. Weligatta, S. Ceylon.
3 ♂♂, 1 ♀. Wellawaya, S. Ceylon.
5 ♂♂, 6 ♀♀, 1 in al. Kumbukkan, S. Ceylon.

(*See* also all previous Reports.)

MUS MANEI, Kel.

*The Common Indian House-Mouse.*

(Synonymy in No. 5.)

1 ♂, 1 ♀. Colombo.
5 ♂♂, 3 ♀♀, 3 in al. Udugama, S. Ceylon.
2 ♂♂, 1 ♀. Nakaideniya, S. Ceylon.
1 in al. Wellawaya, S. Ceylon.
1 in Hambantota, S. Ceylon.

(*See* also Reports Nos. 5, 6, 8, 9, 10, 11 and 12.)

MUS BOODUGA, Gray.

*The Southern Field-Mouse.*

(Synonymy in No. 1.)

1 ♂, 1 ♀. Kottawa, S. Ceylon.
3 ♂♂, 4 ♀♀, 1 in al. Hambantota, S. Ceylon.
2 ♂♂, 5 ♀♀. Weligatta, S. Ceylon.
6 in al. Kumbukkan, S. Ceylon.

(*See* also Reports Nos. 1, 2, 4, 5, 6, 7, 8, 9, 10, 11 and 12.)

BANDICOTA MALABARICA, Shaw.

*The Malabar Bandicoot.*

(Synonymy in No. 5.)

2 ♀♀. Udugama, S. Ceylon.

(*See* also Reports Nos. 5, 6, 7, 9, 10 11 and 12.)

LEGGADA HANNYNGTONI, Ryl.

*The Coorg lowland Leggad.*

(Synonymy in No. 11.)

1 ♀. Kottawa, S. Ceylon.

(*See* also Report No. 1).

LEPUS NIGRICOLLIS, Cuv.

*The black-naped Hare.*

1 ♂, 2 ♀♀. Hambantota, S. Ceylon.
2 ♂♂. Kirinda, S. Ceylon.
1 ♂. Weligatta, S. Ceylon.
1 ♂. Kumbukkan, S. Ceylon.

(*See* also Reports Nos. 5, 6, 8, 9 and 11.)

TRAGULUS MEMINNA, Erxl.
*The Indian Chevrotain or Mouse Deer.*
(Synonymy in No. 6.)
1 ♂. Kumbukkan, S. Ceylon.
(*See* also Reports Nos. 6 and 11.)

MANIS CRASSICAUDATA, G. St. Hil.
*The Indian Pangolin.*
(Synonymy in No. 3.)
1 ♂. Kirinda, S. Ceylon.
(*See* also Reports Nos. 3, 6, 8, 9 and 11.)

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## REPORT No. 14.

BY KATHLEEN V. RYLEY.

*With Field Notes by the Collector, G. C. Shortridge.*

| | | | |
|---|---|---|---|
| COLLECTION | ... | ... | No. 14. |
| LOCALITY ... | ... | ... | N. Shan States, Burma. |
| DATE ... | ... | ... | April—June 1913. |
| COLLECTED BY | ... | ... | Mr. G. C. Shortridge. |
| EARLIER REPORTS | .. | .. | No. 1, E. Kandeish, Vol. XXI, p. 392, 1912; No. 2, Berars, Vol. XXI, p. 820, 1912; No. 3, Cutch, Vol. XXI, p. 826, 1912; No. 4, Nimar, Vol. XXI, p. 844, 1912; No. 5, Dharwar, Vol. XXI, p. 1170; No. 6, Kanara, Vol. XXII, p. 29, 1913; No. 7, Central Provinces, Vol. XXII, p. 45, 1913; No. 8, Bellary, Vol. XXII, p. 58, 1913; No. 9, Mysore, Vol. XXII, p. 285, 1913; No. 10, Kathiawar, Vol. XXII, p. 464, 1913; No. 11, Coorg, Vol. XXII, p. 486, 1913; No. 12, Palanpur, Vol. XXII, p. 684, 1914; No. 13, S. Ceylon, Vol. XXIV, p., 700, 1914. |

This collection was made in the Northern Shan States and the following notes on the Geography of the country in general and on the actual collecting stations are given by Mr. G. C. Shortridge:—

"Burma roughly consists of that portion of the Indian Empire which lies to the east of the Bay of Bengal. Extending from about latitude 28° to 10° North, and between 91° and 101° longitude at its broadest part.

It mainly consists of the valleys of the Irrawaddy, Chindwin and Salween rivers with the ranges of hills lying east and west of the two former.

Below the mouth of the Salween river it extends as a narrow strip between the sea and Siam until it almost meets the northern boundary of the Malay States. The province for administrative purposes has been separated into 8 divisions with 35 districts and in addition to the semi-independent Shan States are grouped for the same purpose into two portions known as Upper and Lower Burma.

The hill country of the Chins to the westward of the Chindwin is also a separate administrative district. Population (1911) about

12,115,200. Total area about 171,430 square miles. Principal exports—Rice, timber, beans, cotton, mineral oil, &c.

As regards the Zoology of Burma, the Gazetteer (1900) draws attention to the fact that no systematic scientific research has as yet been carried out.

The present collection was chiefly made in "Hsipaw" one of the Northern Shan States.

Only a portion of the Northern and Eastern frontiers of the Shan States have been as yet defined. The total area is estimated at between 40,000 and 50,000 square miles, and they lie approximately between 19° and 24° North latitude and 96° and 102° longitude. The mountain ranges which run fan-wise from the high steppes of Tibet are at first almost as sharply defined as the deep gorges through which the rivers run. The Shan Plateau is properly the country between the Salween and Irrawaddy rivers. On the West it is abruptly marked by the long line of hills which begin near Bhamo and run Southwards till they sink into the plains of Lower Burma, and on the East it is no less sharply marked by the deep narrow rift of the Salween—the most uncompromising boundary in the world.

The original Salween-Irrawaddy watershed is disturbed in its continuity by the Taping and Shweli rivers, and then comes a geographical fault where the Nam Tu takes its rise at no great distance from the Salween and runs from east to west into the Irrawaddy.

The average height of the Plateau is between 2,000 and 3,000 feet but it is seamed and ribbed by mountain ranges (Peaks rising to the height of from 6,000 to 8,000 feet) which split up and run into one another though they still preserve the original north and south direction, and leave space here and there for broad rolling downs, sometimes only for flat bottomed valleys which form long riband lines of cultivation. Except in the north the hills are covered with forest. That part of the Shan States which extends to the east of the Salween is much less open and presents no clearly defined ranges of mountains, but rather a confused and intricate mass of hills, and beyond a few narrow valleys, no open space can be seen until the basin of the Mekong is reached.

The climate of the Shan States varies considerably from December to February, it is cool everywhere, and in the open downs as much as 10 degrees of frost may be experienced. In most parts during the hot weather the shade temperature does not exceed 80°-90°. Although in the narrow valleys especially in that of the Salween, the shade maximum reaches 100° regularly about April. The rains begin about the end of May and with the exception of one or two breaks are more or less continuous until November, from July to October being the wettest months. The

rainfall varies greatly in different parts of the States but seems to range between 60 and 100 inches.

Hsipaw State lies between 21°-56' and 22°-56' North and 96°-13' and 98° East. Area, 5,086 square miles. Bounded on the north by the Ruby Mines district and the States of Mongmit and Tawngpeng; on the east by North and South Hsenwi; on the south by the Mandalay district from which it is separated for some distance by the Nam Pia river. It is divided into four sub-States, Hsipaw proper, Hsumhsai, Mönglong and Möngtung. The main State lies in the geographical fault which runs east and west from the Salween at Kunlong to near the rim of the Shan tableland at the Gokteik Gorge—one of the chief features of the State down which flows a small tributary of the Nam Tu; and the country is here broken up into a mass of not very well defined ridges and spurs.

The country is drained by the Nam Tu (Myitnge) which on the Southern border of the State runs in a deep gorge about 2,000 feet below the general level of the country. "Taungya" rice is grown on the hills and "wet" rice in the valleys; other crops cultivated are sesamum, cotton, ginger, oranges and tea.

The chief plain land is in the valley of the Nam Tu near Hsipaw town, and the Pyaunggaung—Nawngpeng strath, south-west of the capital of the State. Population (1901), 104,700, by far the greater portion (90,000) being Shans, the remainder chiefly consisting of Burmans, Danus, Kachins and natives of India.

In Hsipaw and probably many of the other Shan States the chief thing to be noted from a zoological point of view is the alteration of the natural conditions of a large part of the country due to "Taungya" or "dry rice" cultivation which will account for the rarity or non-existence of many mammals peculiar to heavy forest country. In "Taungya" cultivation, an area is cleared by fire and roughly tilled; rice is then grown for one or two seasons after which the ground is temporarily exhausted, when another area is similarly cleared, a low deciduous scrub growing up in the tracts that have been abandoned. Except in such inaccessible places as the gorges of the rivers where the jungle is evergreen and very thick, or in the valleys where "wet rice" is grown, a very large part of the State is covered with deciduous scrub forest of more or less recent growth, which at one time or another has been cleared and under cultivation, while the fires lit for this purpose during the dry season spread over and annually burn off the undergrowth nearly everywhere, probably driving away a large number of animals as effectually as the bush fires of Australia do. With a few exceptions the larger Mammals are rare except on the northern boundary of the State on the borders of the Ruby Mines district, where Elephant, Rhinoceros (*sumatrensis*),

Bison, Tsaine, Sambur, Thamin, and Hog Deer are said to occur. Tiger (HSO-LONG), Bear (*torquatus* and *malayanus*), Pig and Serow exist mostly sparingly in suitable localities. I also received reports of the existence of the Clouded Leopard (HSO-AWN), Porcupine, Hare, Loris (LINGLOM), Otter (MOHN); Flying Squirrel, Ferret Badgers and Anteaters (LIN). While in Hsipaw State I received every assistance from the Saw-Bwa of Hsipaw, Messrs. H. A. Thornton, the Superintendent, and F. S. Grose, Asst. Superintendent of the Northern Shan States.

The following are short descriptions of the actual places visited :—

*Gokteik.*—Altitude 2,133 feet.

The station close to the Gokteik Gorge through which flows a tributary of the Nam Tu. The valley is here spanned by a natural arch which is again crossed by a steel viaduct, 350 feet high and almost 1,000 feet above the bed of the river. "Taungya" rice is largely grown. The jungle in the gorge is evergreen, and on the slopes of the hills deciduous.

*Pyaunggaung.*—Altitude 2,794 feet.

A Shan village on the Mandalay-Lashio line, two stations to the east of Gokteik. Situated in fairly level country where "wet rice" is grown. Surrounding country as elsewhere under "Taungya" cultivation.

*Hsipaw town.*—Altitude 1,354 feet.

The capital of the State. Population 3,656. Situated in the valley of the Nam Tu. Surrounded by large tracts of wet rice cultivation.

*Se'en.*—Altitude 1,411 feet.

A small forest village two stations to the east of Hsipaw on the banks of the Nam Yao. Hilly country and rather heavy jungle containing a large proportion of Teak. Patches of "Taungya" cultivation.

*Mamsam Falls.*—Altitude 2,000 feet, about 10 miles to the east of Se'en on the Nam Yao river. Country similar to Se'en. Evergreen jungle on the banks of the river.

*Maymyo.*—The principal hill station of Burma. Altitude 3,500 feet. Population (1901) 6,223. The station occupies an undulating plateau surrounded by hills covered with thin forest. Although in the Mandalay district, Maymyo is on the Shan Plateau and is geographically a part of Hsipaw State.

Through the kindness and assistance on the part of the Honourable Sir Harvey Adamson, K.C.S.I., Lieutenant-Governor of Burma, Messrs. G. B. H. Fell, C.I.E., the Hon. Mr. W. J. Keith and other Government Officials, including those in the Forest and Public Works Departments, Members of the Bombay-Burma Trading Company, as well as numerous Burma Members of the

Bombay Natural History Society, I was able to start the Mammal Survey in Burma under exceptionally favourable circumstances. The amount of local interest shown is particularly welcome as on account of being the first work of its kind to be systematically attempted in Burma, its results are expected to be of the utmost scientific value." G.C.S.

The specimens from the Ataran river were collected by Mr. J. Pemberton Cook, while various others were received from other members of the B. N. H. S.

The collection is made up of 439 specimens containing 37 species in 24 genera.

As was to be expected the majority of the species have not previously been obtained during the Mammal Survey, there being 22 species to add to the list this time.

Three varieties of monkeys were sent in, *viz.*, *Hylobates hoolock*, *Simia rhesus* and *Presbytis phayrei*. Bats were very numerous, some large series being obtained among the Hipposideros, principally *armiger*, *larvatus* and *lylei*, this latter species was especially interesting as Mr. Thomas had just described it on a single specimen from N. Siam. The squirrels were well represented also, and this good series from the N. Shan States made it possible to separate the northern variety subspecifically from the difficult and variable group of *Sciurus atrodorsalis* into *S. atrodorsalis shanicus*, as Mr. Wroughton had suggested some time ago. And in the *Mus booduga* group I have made a new species, *Mus cookii*, of the present form, on its large size. Specimens of the *Tupaia* have at last been obtained, up till now Tree Shrews had been unrepresented in the Survey collections.

There are splendid series of the two species of *Rhizomys*, *castaneus?* and *cinereus*, among the latter there are some very large specimens.

Thanks are due to all those members who helped Mr. Shortridge by sending specimens, which have been included in an Appendix to this report.

### Hylobates hoolock, Harlan.

*The Hoolock or White-browed Gibbon.*

1834. *Simia hoolock*, Harlan, Trans. Amer. Soc., IV., New Series, p. 52.
1837. *Hylobates choromandus?* Ogilby, P. Z. S., p. 689.
1888. *Hylobates hoolock*, Blanf., Mammalia. No. 1.

2 ♂♂, 1 ♀. Gokteik, N. Shan States.
1 ♀. Pyaunggaung, N. Shan States.

General colour black, brownish black on the shoulders, eyebrows white; some specimens are pale-brown shading into pale yellowish white on the head and shoulders. Fur very thick and woolly. Head and body about 23 inches; no tail; weight about 14½ lbs. In these four specimens the two males are black throughout and the females pale whitish brown.

"Blanford is incorrect in stating that even in the females of this species, the frontal band is invariably conspicuously paler than the rest of the head. Although, as in *Hylobates lar*, the sexes may vary in colour, the present set shows that in all probability the male is normally black and the female brown.

Not nearly so plentiful in Hsipaw State as the Langur. The specimens observed were going about either singly or in pairs, although where plentiful they are said to be gregarious."—G. C. S.

Vernacular name.—Wu-Wa (Shan).

SIMIA RHESUS, Audeb.

*The Bengal Monkey.*

(Synonymy in No. 7.)

1 ♂, 1 skull only, 2 ♀♀, 1 in al. Pyaunggaung, N. Shan States.
4 ♂♂, 1 ♀. Mamsam Falls, N. Shan States.

(*See* also Report No. 7.)

These specimens belong to the *Simia rhesus* group, not *Simia assamensis* as might have been expected, as they are without the radiating parting, and their colouring and general appearance are similar to *rhesus*.

General colour grey, washed with yellow brown; the head, shoulders, arms and hands being the darkest, while the hind quarters and hind legs are the most yellow. Black hairs on the supraorbital ridge; no radiating parting on the head. Tail short and similar in colour to the hind quarters. Head and body about 21 inches; tail about 9 inches; weight 14 lbs. None of the above specimens are more than young adults.

"Fairly plentiful in Hsipaw State; apparently more local than *Presbytis*. Like other Macaques often frequenting paddy fields and other cultivated lands. Rather shy. Gregarious though not observed in large parties."—G. C. S.

Vernacular name.—Ling-Leng.

PRESBYTIS PHAYREI, Blyth.

*Phayre's Leaf-Monkey.*

1847. *Semnopithecus phayrei*, Blyth, J. A. S. B. XVI, p. 733, pl. XXXI.
1844. *Semnopithecus obscurus*, Blyth, J. A. S. B. XIII, p. 466 (nec Reid).
1851. *Semnopithecus argentatus*, Blyth, Horsf. Cat. Mamm. Mus. E. Ind. Co. p. 7.
1870. *Semnopithecus rubicundus*, var. C., Gray, Cat. Monkeys, etc., Brit. Mus., p. 7.
1888. *Semnopithecus phayrei*, Blanf., Mammalia No. 23.
5 ♂♂, 6 ♀♀. Gokteik, N. Shan States.
1 ♂, 2 ♀♀. Pyaunggaung, N. Shan States.
2 ♂♂, 2 ♀♀. Se'en, N. Shan States.
1 ♂, 1 ♀. Mamsam Falls, N. Shan States.

A dark earthy brown Langur with a light shade on the back of the neck and shoulders, the longer hairs round the ears are also paler; there is a radiating parting just above the eyebrows; hair round the mouth, whitish; tail slightly lighter than the general body colour. Head and body about 22 inches; tail about 29; weight somewhere about 16 lbs.

"In adults the bare skin around the eyes is of a bright slate blue, with a broad crescent shaped area of bluish white on the inner sides almost encircling each orbit. A triangular patch of flesh colour surrounds the nostrils and mouth. Ears dull slate. In the very young specimens, the fur is straw colour while the bare parts on the face are entirely dull slate. Mr. T

A. Hauxwell, I. F. S., informs me that he once noticed a straw or rufous coloured Langur on the upper Chindwin together with a number of normal coloured individuals—probably this, or an allied species from which it would seem that like the Javan *Presbytis pyrrhus*, the bright colouring of the immature, occasionally remains unchanged through life.

Plentiful in Hsipaw State, going about in troupes like other Langurs. A shy and apparently a not very noisy species."—G. C. S.

Vernacular names.—Lingmun, Lingkang? (Shan).

Cynopterus sphinx sphinx, Vahl.

*The Southern short-nosed Fruit Bat.*

(Synonymy in No. 6.)

1 ♂ juv. Pyaunggaung, N. Shan States.

(*See* also Reports Nos. 6, 9, 11 and 13.)

Lyroderma lyra, Geoff

*The Indian Vampire Bat.*

(Synonymy in No. 1.)

4 ♀♀, 1 in al. Pyaunggaung, N. Shan States.

(*See* also Reports Nos. 1, 4, 5, 6, 7, 8, 9, 12 and 13.)

"In a cave near Pyaunggaung. Megaderms are seldom found in company with other bats, probably on account of their predaceous habits, but these specimens were found in a cave inhabited by a number of *Hipposideros armiger* which were probably too large for them to attack."—G. C. S.

This is probably the first time that specimens of this species have actually been recorded from Burma.

Rhinolophus perniger, Hodgs.

1843. *Rhinolophus perniger*, Hodgs., J. A. S. B. XII, p. 414.
1888. *Rhinolophus luctus*, Blanf., Mammalia No. 145 (*partim*).

1 ♂. Gokteik, N. Shan States.

This species is the largest in the genus and was separated from *Rh. luctus* by K? Andersen (A. M. N. H. Vol. XVI, p. 252, 1905) on its larger size.

It is a large dark brown bat with soft woolly fur, having an ashy brown, almost speckled appearance. Tail extending to the end of the membrane; large ears and large complicated nose-leaf. Head and body nearly 4 inches, weight about 1¼ oz.

Hipposideros armiger, Hodgs.

*The Great Himalayan leaf-nosed Bat.*

1835. *Hipposideros armiger*, Hodgson, J. A. S. B. Vol. IV, p. 699.
1846. *Hipposideros diadema*, Cantor, J. A. S. B. Vol. XV, p. 181, *nec.* Geoff.
1872. *Phyllorhina armigera*, Hutton, P. Z. S., p. 700.
1888. *Hipposideros armiger*, Blanf., Mammalia No. 159.

5 ♂♂, 13 ♀♀, 16 in al. Pyaunggaung, N. Shan States.
1 ♂, 7 ♀♀, 2 in al. Mamsam Falls, N. Shan States.

A large brown leaf-nosed bat. Fur thick and soft, pale at the base with darker brown tips, paler on the shoulders; large ears and nose-leaf.

Fur on underside uniform earthy-brown; tail extending to end of membrane. Head and body about 4 inches; weight about 1¾ ozs.

"Plentiful in caves around Pyaunggaung and near the Mamsam Falls; on one occasion found in company with *H. larvatus*."—G. C. S.

HIPPOSIDEROS LYLEI, Thos.

*Lyle's nose-leaf Bat.*

1913. *Hipposideros lylei*, Thomas, A. M. N. H., Vol. XII, p. 88.

19 ♂, 19 ♀, 36 in al. Pyaunggaung, N. Shan States.

A fairly large leaf-nosed bat, very similar to *armiger* in general colour, the fur being composed of the same two shades of brown, but it is easily distinguished from that bat by its smaller size and its larger and more complicated nose-leaf which is especially large in the male; it also has a pale edge to the interfemoral membrane. Head and body about 3½ inches; weight about 1⅝ ozs.

When Mr. Thomas separated this bat from *H. pratti*, he only had a male specimen of *lylei* and a female *pratti* on which to work, but now that this large series of skins and spirit specimens have been obtained, the differences in the other sexes are equally well borne out. The type locality of *H. lylei* is N. Siam.

"Large colonies found in caves around Pyaunggaung, sometimes in company with *H. larvatus*".—G. C. S.

HIPPOSIDEROS LARVATUS, Horsf.

*Horsfield's leaf-nosed Bat.*

1824. *Rhinolophus larvatus, vulgaris, deformis* and *insignis*, Horsfield, Res. Java.
1844. *Hipposideros larvatus* and *vulgaris*, Blyth, J. A. S. B. XIII, p. 488.
1872. *Phyllorhina larvata*, Dobson, P. A. S. B., p. 155.
1888. *Hipposideros larvatus*, Blanf., Mammalia No. 165.

10 ♂ ♂, 11 ♀ ♀, 13 in al. Pyaunggaung, N. Shan States.
6 ♂ ♂, 1 ♀. Mamsam Falls, N. Shan States.

A bat of the same shades of brown as *H. armiger* and *lylei*, but considerably smaller in size. Large ears and nose-leaf. Head and body not quite 3 inches.

"In caves. Plentiful."—G. C. S.

Vernacular name.—(Shan and Burmese) LINO (all bats).

HIPPOSIDEROS FULVUS, Gray.

*The Bicoloured leaf-nosed Bat.*

(Synonymy in No. 3.)

1 ♀, 2 in al. Gokteik, N. Shan States.

(*See* also Reports Nos. 3, 5, 6, 7, 8, 9, 10, 12 and 13.)

"A small colony found roosting in the roof of the Railway Bungalow at the Gokteik, where they occasionally flew into the rooms".—G. C. S.

PIPISTRELLUS CEYLONICUS, Kel.

*Kelaart's Pipistrelle.*

(Synonymy in No. 1.)

1 ♀, 1 in al. Pyaunggaung, N. Shan States.

(*See* also Reports Nos. 1, 2, 3, 5, 6, 8, 9, 10, 11 and 12.)

"This specimen contained 3 young."—G. C. S.

PIPISTRELLUS COROMANDRA, Gray.

*The Coromandel Pipistrelle.*

(Synonymy in No. 5.)

1 ♂. Pyaunggaung, N. Shan States.

(*See* also Reports Nos. 5, 9, 11 and 13.)

PIPISTRELLUS AUSTENIANUS, Dobs.

1871. *Pipistrellus austenianus*, Dobson, P. A. S. B., p. 213.
1888. *Pipistrellus mordax*, Blanf., Mammalia No. 183 (*partim*).

2 ♂♂. Maymyo, N. Shan States. (T. A. Hauxwell.)

A small bat, fur practically black with light brown tips; underside the same with rather more conspicuous pale tips. Tail extending just beyond the membrane. Head and body nearly 2 inches.

Mr. T. A. Hauxwell obtained the above two specimens of this interesting *Pipistrelle*, which will probably turn out to be *P. austenianus*, but we cannot say for certain until specimens have been obtained from Cherra Pungi, the type locality. Blanford considers it as a synonym of *P. mordax*.

TYLONYCTERIS PACHYPUS, Temm.

*The Club-footed Bat.*

(Synonymy in No. 5.)

1 ♀, 1 in al. Pyaunggaung, N. Shan States.
1 ♀, 1 in al. Se'en, N. Shan States.

(*See* also Reports Nos. 5, 6 and 11.)

"Apparently more plentiful than the Pipistrelles in the camps visited."
—G. C. S.

SCOTOPHILUS KUHLI, Lach.

*The Common Yellow Bat.*

(Synonymy in No. 1.)

1 ♂. Hsipaw, N. Shan States.

(*See* also Reports Nos. 1, 3, 5, 6, 7, 9 and 12.)

TUPAIA CHINENSIS, Anders.

*The Irrawaddy Tree Shrew.*

1879. *Tupaia chinensis*, Anderson, Zool. Res. Yunnan, p. 129, pl. 7.
1888. *Tupaia ferruginea*, Blanf., Mammalia No. 102 (*partim.*)

2 ♂♂, 3 ♀♀. Pyaunggaung, N. Shan States.
2 ♀♀. Se'en, N. Shan States.
1 ♂, 1 ♀, 1 in al. Mamsam Falls, N. Shan States.

Anderson describes his species from the Kakhyen hills on the Irrawaddy. Mr. Lyon is just bringing out a paper on the whole genus of *Tupaia*, so it is not worthwhile to give a proper synonymy at present, as all previous species are being split up and considerably altered by him.

General colour brown (of an olive shade) speckled with black and buff; underside dirty white, sometimes of a yellowish white. There is occasionally a yellow stripe in front of the shoulder. Tail same colour as the body. Head and body about 7½ inches, tail about the same length; weight about 5¾ ozs.

"Diurnal. Fairly plentiful, although probably local. When once recognised they are not likely to be mistaken for squirrels, except at a distance. Although active and constantly on the move they do not take the big leaps from tree to tree that squirrels of a similar size do. Blandford gives the mammary formula for *Tupaia* as 4; in this species and probably in others there are 6."—G. C. S.

FELIS BENGALENSIS, Kerr.

*The Leopard Cat.*

1. Ruby Mines, N. Shan States.
1. Maymyo, N. Shan States (T. A. Hauxwell.)

(*See* also Report No. 11)

"Not plentiful"—G. C. S.
Vernacular name.—HEN-WAP. (Shan).

FELIS TEMMINCKI, Vigors and Horsf.

*The Golden Cat.*

1828. *Felis temminckii*, Vigors and Horsf., Zool. Journ. III, p. 451.
1831. *Felis moormensis*, Hodgs., Gleanings in Science III, p. 177.
1888. *Felis temminckii*, Blanf., Mammalia No. 34.

3145. (no skull). Maymyo, N. Shan States. (Major Stewart.)

A large chestnut-bay coloured cat, with a deeper chestnut stripe down the back and darker markings on the head and face. Paler on the under-surface with dark spots on the breast. Tail thick and dark red. No measurements are recorded on the above specimen.

"This specimen, which was received from Major Stewart, was shot near Maymyo over a calf that it had killed."—G. C. S.
Vernacular names.—HSO-HPAI, MIAO-HTÖN (wild cat).

FELIS PARDUS, L.

*The Panther.*

(Synonymy in No. 5.)

1 (black) Ruby Mines, N. Shan States.

(*See* also Reports Nos. 5, 6, 9, 11 and 13.)

"Plentiful as in the Malay countries. Melanistic individuals seem to be of more frequent occurrence than in India."—G. C. S.
Vernacular name.—Hso-Som (Shan).

FELIS (domestic.)

1 ♂. Maymyo, N. Shan States.
1 ♂. Pyaunggaung, N. Shan States.

(*See* also Reports Nos. 9 and 11.)

"These specimens are typical of those kept in the Shan villages."—G. C. S.
Vernacular name.—MIAO (Shan).

VIVERRA ZIBETHA, L.

*The Large Indian Civet.*

1766. *Viverra zibetha*, L., Syst. Nat. I., p. 55.
1829. *Viverra undulata*, Gray, Spic. Zool., p. 9.

.842. *Viverra orientalis*, hodie melanurus Hodgs. Calc. Journ. N. H. 11, p. 47.
1841. *Viverra melanurus*, Hodgs., J. A. S. B., X. p. 90.
1888. *Viverra zibetha*, Blanf., Mammalia No. 45.

4 ♂♂, 1 ♀. Pyaunggaung, N. Shan States.
1 ♀. Gokteik, N. Shan States.

A dark brownish grey civet, with a black crest down the middle of the back; black feet and black stripes along the side of the neck. Black and white rings on the tail. Head and body about 33 inches; tail 18 inches; weight of a male about 20 lbs.

"Plentiful. Like *Viverricula* this species appears to attach itself to the vicinity of villages, probably a scavenger and a poultry thief. Very easy to trap".—G. C. S.

Vernacular name.—AMNGE, HEN-HAWN. (Shan.)

PAGUMA LARVATA INTRUDENS, Wrought.

*The North Burma Palm Civet.*

1910. *Paguma larvata intrudens*, Wroughton, J. B. N. H. S., Vol. XIX, p. 793.

1 ♂, 2 ♀♀. Pyaunggaung, N. Shan States.

General colour buff grey, under-fur brownish grey, hairs with pale buff ips; in one of the three specimens the tail was the same colour as the body, n the other two it was black for more than half its length. Head black, with white markings on the cheeks and below the ears; a broad white stripe extending up the nose to the top of the head and continuing down between the shoulders where it becomes narrower; chin dark brown; toes nearly black. Underside of body dirty white. Head and body 27 inches, tail about 3 inches shorter; weight 11 lbs.

"All of the specimens were shot in trees by day. Although arboreal, most Paradoxures hide by day among rocks, hollow trees, and roofs of houses. This species seems to choose thick foliage to lie up in. This is a heavier animal than any other species of "Toddy cat" weighed; two specimens weighing 9½ and 11 lbs. respectively".—G. C. S.

CANIS INDICUS, Hodgs.

*The Jackal.*

(Synonymy in No. 1 under *C. aureus*.)

1 ♀. Pyaunggaung, N. Shan States.

(See also Reports Nos. 1, 3, 4, 5, 6, 7, 9, 10, 11 and 12.)

"Considered decidedly scarce in the Northern Shan States, occasionally appearing around Maymyo, where however they cannot be plentiful, as when hounds were kept there, a few years ago, they were seldom put up. Although said to be comparatively numerous in parts of Lower Burma, Jackals in Burma generally appear to be uncommon and migratory where they do occur."—G. C. S.

Vernacular name.—MANIA (Shan) (also used for the wild dog).

URSUS MALAYANUS, Raffles.

*The Malay Bear.*

1822. *Ursus malayanus*, Raffles, Tr. Linn. Soc. XIII, p. 254.

1 (not sent). Ruby Mines, N. Shan States.

"This species as well as *Ursus torquatus* appears to be fairly numerous in suitable localities."—G. C. S.

RATUFA GIGANTEA, McCl.

*The Assam Giant Squirrel.*

1839. *Sciurus giganteus*, McClelland, P. Z. S, p. 150.
1891. *Sciurus bicolor*, Blanford, Mammalia, No. 240 (*partim*).

5 ♂♂, 7 ♀♀. Gokteik, N. Shan States.
1 ♂. Pyaunggaung, N. Shan States.
1 ♂. Se'en, N. Shan States.
1 ♀. Mamsam Falls, N. Shan States.

A large black squirrel, sometimes brownish black. Buffy yellow below; sides of face (beneath the ears) and underside of legs and neck also yellow; tail black throughout. Head and body about 16 inches; tail about the same length. Weight about 5 lbs. This squirrel is similar in colour to the Ceylon species *R. maeroura*, but that squirrel is distinguished by having the yellow markings extending over to the top of the arms and legs and having slight pale markings on the head. Mr. Wroughton in his paper on the "Giant Squirrels" (J. B. N. H. S. Vol. XIX, 1910), separates *R. gigantea* from the Java *R. bicolor* and from Hodgson's *macruroides*.

"Plentiful in all big forests especially round Gokteik, quite identical in habits with other giant squirrels."—G. C. S.

Vernacular name.— MAMAI (Shan).

SCIURUS PHAYREI, Blyth.

*Phayre's Squirrel.*

1855. *Sciurus phayrei*, Blyth, J. A. S. B. XXIV, p. 472, 476.
1891. *Sciurus phayrei*, Blanford, Mammalia No. 247.

7 ♂♂, 7 ♀♀. Gokteik, N. Shan States.
3 ♂♂, 4 ♀♀. Pyaunggaung, N. Shan States.
6 ♂♂, 6 ♀♀. Se'en, N. Shan States.

A grey squirrel finely speckled with black, some have a slightly brownish yellow tinge; tail of same colour with a somewhat ringed appearance, tip black; underside orange yellow with a distinctive blackish band, separating the grey from the orange, on the underside of the flanks. Feet pale yellow; whiskers black. Head and body about 10 inches, tail, slightly longer. Weight about 13½ ozs. These specimens are rather greyer and paler throughout than the Martaban and Tenasserim examples.

"A particularly active species, its leaps from tree to tree almost rivalling those of *Ratufa*. Around Hsipaw town and Se'en, even more plentiful than *atrodorsalis shanicus*. Not observed at Maymyo."—G. C. S.

SCIURUS ATRODORSALIS SHANICUS, Ryl.

*The Shan squirrel.*

1914. *Sciurus atrodorsalis shanicus*, Ryley, Journ. B. N. H. S. Vol. XXII, page 662.

2 ♂♂, 4 ♀♀. Maymyo, N. Shan States.
4 ♂♂, 6 ♀♀. Gokteik, N. Shan States.
13 ♂♂, 3 ♀♀. Pyaunggaung, N. Shan States.

An olive brown squirrel, finely speckled with yellow and black; ears reddish yellow; underside yellower than black, sometimes slightly tawny. Middle of back shaded with black. Tail black and yellow. Head and body about 8 inches in length, tail about 7 inches.

"The most plentiful squirrel in Hsipaw State and around Maymyo, recalling *Funambulus palmarum* of India in its habit of collecting around bungalows. The black mark on the back was seldom conspicuous except in immature specimens."—G. C. S.

Vernacular name.—SOIN (all small squirrels) (Shan).

DREMOMYS RUFIGENIS, Blanf.

*The Red-cheeked Squirrel.*

1878. *Sciurus rufigenis*, Blanford, J. A. S. B. XLVII, pt. 2, p. 156.
1891. *Sciurus rufigenis*, Blanf., Mammalia No. 244.

2 ♂ ♂. Gokteik, N. Shan States.
8 ♂ ♂, 4 ♀ ♀. Pyaunggaung, N. Shan States.

General colour brown, finely speckled with yellow and black, with an olive shade on the back; hindquarters, head and feet, rufescent; sides of head and underside white; tail black, faintly ringed with white. Head and body about 8 inches; tail about 6 inches. Weight 8¼ ozs.

"Not uncommon in forest country but much less plentiful than *atrodorsalis shanicus* and *phayrei*."—G. C. S.

TAMIOPS MACCLELLANDI BARBEI, Blyth.

*The Striped Burmese Squirrel.*

1847. *Sciurus barbei*, Blyth, J. A. S. B. Vol. XVI, p. 875.
1891. *Sciurus macclellandi*, Blanf., Mammalia No. 257 (*partim*).

1 ♂, 1 ♀. Pyaunggaung, N. Shan States.

A small greyish brown squirrel speckled with pale yellow; 5 black longitudinal stripes on the back, with 4 pale yellow ones between, the two outer yellow stripes being much wider and extend from the side of the face. Ears black with a tuft of white hairs. Underside reddish yellow. Head and body about 4½ inches, tail about 5 inches. Weight 1¾ ozs.

"Apparently rare, possibly local."—G. C. S.

EPIMYS RUFESCENS, Gray.

VARIETY with white underparts.

*The Common Indian Rat.*

(Synonymy in No 1.)

2 ♂ ♂, 13 ♀ ♀. Gokteik, N. Shan States.
7 ♂ ♂, 6 ♀ ♀. Pyaunggaung, N. Shan States.
1 ♀. Se'en, N. Shan States.
1 ♂. Hsipaw, N. Shan States.
2 ♂ ♂, 4 ♀ ♀. Mamsam Falls, N. Shan States.

(*See* also all previous Reports.)

"Very plentiful in towns and villages, although all specimens were white below, many had a grey patch on the chest, sometimes extending to form a line down the belly.

The scarcity of jungle rats and mice, other than burrowers, can be accounted for by the "Taungya" cultivation previously described."—G. C. S.

EPIMYS JERDONI, Blyth.

*The bicoloured Rat.*

1863. *Leggada jerdoni*, Blyth, J. A. S. B. XXXII, p. 350.
1888. *Mus jerdoni*, Blanf., Mammalia No. 279.

1 ♂, 1 juv. ♂. Pyaunggaung, N. Shan States.

A red yellow rat, with a very long tail. Under-fur slate grey, tips bright red yellow. Feet and underside pure white, line of demarcation distinct, tail dark above pale below. Head and body nearly 6 inches; tail about 8 inches. Weight 2¾ ozs.

MUS MANEI, Kel.

*The Common Indian House-Mouse.*

(Synonymy in No. 5.)

1 ♂, 1 ♀. Maymyo, N. Shan States.
1 ♀. Maymyo, N. Shan States. (G. B. Fell).
1 ♂, 2 ♀ ♀. Gokteik, N. Shan States.
2 ♂ ♂, 1 ♀. Se'en, N. Shan States.

(*See* also Reports Nos. 5, 6, 8, 9, 10, 11, 12 and 13.)

"Plentiful in Maymyo and in towns and villages throughout Hsipaw State."—G. C. S.

MUS COOKII, Ryl.

*The Burma Field-Mouse.*

1914. *Mus cookii*, Ryley, Journ. B. N. H. S. Vol. XXII. p. 663.

2 ♂ ♂, 1 ♀. Gokteik, N. Shan States.
2 ♂ ♂, juv. 2 ♀ ♀. Pyaunggaung, N. Shan States.

A small dark-brown mouse, slightly speckled with buff; grey on the underside. Head and body about 3 inches, tail slightly longer.

RHIZOMYS CASTANEUS ? Blyth.

*The Bay Bamboo-Rat.*

1843. *Rhizomys castaneus*, Blyth, J. A. S. B. Vol. XII, p. 1007.
1891. *Rhizomys badius*, Blanf., Mammalia No. 312. (*partim.*)

3 ♂ ♂, 7 ♀ ♀. Gokteik, N. Shan States.
7 ♂ ♂, 5 ♀ ♀. Pyaunggaung, N. Shan States.
1 ♂, 2 ♀ ♀. Se'en, N. Shan States.
1 ♀. Mamsam Falls, N. Shan States.

These specimens probably represent *R. castaneus* (Blyth) described from Arrakan, but must only be left provisionally under this name, until specimens are obtained from the type locality. They differ from *R. badius* (Hodgs.) from Nepal in being smaller, especially in the size of their teeth [illegible] from the representatives of *R. minor* (Gray) from Siam in their smaller size; and also in the shape of the bullæ.

The fur very soft and silky, dark ashy brown with a brown sheen on the tips, some have rufous tips; whiskers short. Colour of underside, much the same as above. Feet and tail bare. Head and body 7-8 inches; tail about 3 inches.

The rufous or dark colouration appears to have no connection with age as there are both young and old specimens of each colour. In this series the white spot is absent, in one case only did the collector find any indication of it.

"Blanford gives the mammary formula of *Rhizomys* as 10, and although this is the case, with *Rhizomys cinereus*, this species has only 8, having two pairs of inguinal mammæ instead of 3. The mole hills are similar to those of *Gunomys* except that this species throws up more mounds, being probably a much quicker burrower. The tunnels are as a rule very deep and as all specimens had to be dug up they were not very easy to obtain, [illegible] especially as the ground they chose for burrowing in is often very hard [illegible] and stony. There were numbers of these burrows under the Gokteik [illegible] are not [illegible]uct. This species can hardly be called a bamboo rat, as it feeds on [illegible] find no[illegible]nds of roots including shrubs, grass and other herbaceous plants, [illegible] too fai[illegible]ently coming into gardens.

[illegible] justify [illegible]
[illegible] mated [illegible]

13

Recalling the African *Georychus* and equally savage when caught. Very sluggish in its movements when above ground, and having a curious habit of running backwards when placed in new surroundings. Its powers of sight above ground, except for a very short distance, are very poor. Blanford in describing its ears as hidden by the long fur of the head, evidently judged from dry specimens, as although small, they are white in colour and show up during life very conspicuously."—G. C. S.

RHIZOMYS CINEREUS, McCl.

*The large Burmese Bamboo-Rat.*

1842. *Rhizomys cinereus*, McClelland, Calc. Journ. N. H. II, p. 456.
1877. *Rhizomys erythrogenys*, Anderson, P. A. S. B., p. 150.
1888. *Rhizomys sumatrensis*, Blanf., Mammalia No. 314 (*partim.*)

2 ♂♂, 1 ♀. Gokteik, N. Shan States.
5 ♂♂, 4 ♀♀. Pyaunggaung, N. Shan States.
1 ♀. Se'en, N. Shan States.
1 ♂. Mamsam Falls, N. Shan States.

McClelland described *Rhizomys cinereus* in 1842 from Tenasserim and mentions its red cheeks. Anderson in 1879 puts *R. cinereus* into the synonymy of *Rhizomys sumatrensis* and describes *R. erythrogenys* (from the Salwin Hill tracts), as a new species, on account of its red cheeks, which *sumatrensis* is without, at the same time he mentions a similar specimen from Tenasserim with red cheeks, therefore it would appear that the name *R. cinereus* stands for the red cheeked species as separated from *sumatrensis* (described by Raffles from Malacca), and that *erythrogenys* must be included in the synonymy.

A very large grey rat, the grey hairs being rather more numerous than the black except on the head between the ears where the black predominate. The sides of the head are bright red; tail absolutely bare. Head and body about 17 inches; tail about 6 inches. Weight about 6½ lbs. (one large specimen weighing 11½ lbs.). Incisors very large and strong; head broad.

"This species digs deep, burrows in bamboo jungle, on the roots which they largely feed. Very savage when cornered, facing round and making short rushes at anything moved in front of them; apparently seeing much more clearly than the smaller species; their eyes also being larger in proportion. Although altogether more active than *R. castaneus* they are not quick enough to make their escape readily when above ground, their fastest movement being a clumsy gallop while they will always face about on the least provocation, biting savagely at anything put near them, at the same time making a peculiar grating noise with their teeth and grunting rather like a porcupine which they rather resemble in some ways. I kept specimens for varying lengths of time in a tin bath, and if they could not reach the edge, when standing on their hind legs, they were unable to get out.

Their eyes at night give a bright red reflection.

Tail tipped with white for about a third of its length. A large specimen weighed about 11½ lbs."—G. C. S.

MUNTIACUS VAGINALIS, Bodd.

*The Barking Deer.*

(Synonymy in No. 2.)

2 ♀♀. Gokteik, N. Shan States.
1 ♀. Pyaunggaung, N. Shan States.

(*See* also Reports Nos. 2, 6, 7 and 11.)

## APPENDIX.

The following specimens were received with this collection, but were obtained in other districts and sent in by various members of the Society, all of whom we wish to thank. It is of the greatest help to have specimens sent in during the different months of the year as the survey collector only obtains his skins within a limited period, thus it is often difficult to know how much to allow for seasonal changes in the colour and texture of the fur.

Mr. J. P. Cook sent in the following :—

SCIURUS ATRODORSALIS, Gray.

*The black-backed Squirrel.*

1842. *Sciurus atrodorsalis*, Gray, A. M. N. H. Vol. X, p. 263.
1855. *Sciurus hyperuthrus*, Blyth, J. A. S. B. Vol. XXIV, p. 474.

2 ♀ ♀. Moulmein, Burma.

A yellow grey squirrel, slightly speckled with black; black patch on back; head a reddish yellow; whiskers usually white; underside generally chestnut red, but in some cases it is yellow or even speckled like the back; tail black and yellow. Head and body about 8¼ inches; tail about the same length.

TAMIOPS MACLELLANDI BARBEI, Blyth.

2 ♀ ♀. Moulmein, Burma.

RHIZOMYS CINEREUS, McCl.

1 ♂. Moulmein, Burma.

# NOTES ON SOME MAMMALS FOUND IN THE SIMLA DISTRICT, THE SIMLA HILL STATES, AND KALKA AND ADJACENT COUNTRY.

BY

P. T. L. DODSWORTH, F.Z.S., M.B.O.U.

While working the Ornithology of the Simla District, N. W. Himalayas, I have, during the last eighteen months or so, taken the opportunity of devoting some of my time to the study of the Mammalian fauna of these tracts, and the results of my observations are embodied in the following notes. It must not for a moment be supposed that, the areas to which these observations relate have either been searched systematically, or explored thoroughly and in a business-like manner; for to do so would require a great deal of time and means, neither of which it is my happy lot to possess. As a matter of fact, I have collected only those animals, which have actually come in my way in my wanderings after birds, and without making any special search for them. I hope, therefore, that due allowance will be made for these disjointed notes, which have been hastily strung together at odd moments of leisure. Should they prove of any interest—Mr. Kinnear flatters me that they will be of considerable interest—it may act as an inducement for the publication hereafter of further notes on some more of the animals inhabiting these regions.

Before entering into particulars, it seems desirable to notice, in as brief a manner as possible, the extent and geographical positions of the territories to which the subsequent remarks apply; their physical aspects, and their climatological conditions. Moreover, as the fauna and flora of a country are not only connected with, but to a great measure dependent on, each other, a few references to the vegetation of these hills will not be irrelevant to our subject.

The districts under notice lie very roughly between the 30th and the 32nd degree of North latitude, and between the 77th and 79th degree of East longitude. They comprise—(*a*) the Simla District; (*b*) the Simla Hill States; (*c*) a small portion of the Patiala State, which lies in the Himalayan area; and (*d*) the town of Kalka and adjacent country, including the Western Dun of the Sirmur State.

The Simla District consists of nine detached tracts in the lower Himalayas, between 38° 58′ and 31° 22′ N. and 77° 7′ and 77° 43′ E., with a total area of 101 square miles. It is completely surrounded by territories of independent chiefs, and these territories are known as the Simla Hill States.

The Simla Hill States consist of 28 in number, and occupy an area of about 4,800 square miles. The largest of these States

Bashahr. It lies on either bank of the Sutlej River : all the other Simla Hill States lie to the south of that river.

The small bit of the Patiala State occupies an area of about 1,000 square miles, and stretches from the Siwalik Hills to the town of Simla, of which it forms the northern and eastern boundary.

The town of Kalka is situated at the foot of the outlying range of the Himalayas, and has an elevation of 2,400 feet. It is entirely surrounded by native territory.

The physical aspects and scenery of these tracts have been admirably described in the *Imperial Gazetteer* :—

> "The Simla District and surrounding Native States," remarks the author, "form a continuous series of ranges, ascending from the low hills which bound the plains of Ambala to the great central chain of the Western Himalayas. This central chain terminates a few miles south of the Sutlej in Bashahr, the most northern of the States. The same State is broken on its northern frontier by spurs from the snowy hills, which separate it from Spiti, and on the east by similar spurs from the range shutting it off from Chinese Tartary. Starting from the termination of the Central Himalayas, a transverse range (the last to the south of the Sutlej), runs south-west throughout the length of the Simla States, forming the watershed between the Indus and the Ganges—here represented by their tributaries, the Sutlej and the Jumna. A few miles north-east of Simla, the spur divides into two main ridges, one of which curves round the Sutlej Valley towards the north-west; while the other, crowned by the town of Simla, trends south-eastward to a point a few miles north of Sabathu, where it merges at right angles in the mountains of the Outer or sub-Himalayan system, which run parallel to the principal range. South and east of Simla, the hills between the Sutlej and the Tons (the principal feeder of the Jumna), centre in the great peak of Chaur, 11,982 feet high, itself the termination of a minor chain that branches off southwards from the main Simla range. The mountain system (excluding Bashahr) may be thus mapped out roughly into three portions : the Chaur Peak and spurs radiating from it, occupying the south-east corner ; the Simla range, extending from the Central Himalayas to the neighbourhood of Sabathu ; and the mountains of the sub-Himalayan series, running from the north-west to south-east, and forming the boundary of the Ambala plains. The last-mentioned group may be sub-divided into the sub-Himalayas proper, and an outer range, corresponding to the Siwalik Hills of Hoshiarpur. The sub-Himalayan and the Siwalik ranges form parallel lines, having

between them an open space of varying width, known as the Kiara Dun, a broad and well cultivated valley."

"The scenery in the immediate neighbourhood of Simla itself presents a series of magnificent views, embracing on the south the Ambala plains, with the Sabathu and Kasauli hills in the foreground, and the massive block of the Chaur, a little to the left; while just below the spectator's feet a series of huge ravines lead down into the deep valleys, which score the mountain sides. Northwards the eye wanders over a net-work of confused chains, rising range above range, and crowned in the distance by a crescent of snowy peaks, which stand out in bold relief against the clear background of the sky."

The principal rivers by which the drainage of these hills is effected are the Sutlej, the Pabbar, the Giri, the Ghambar, and the Sarsah.

The upper parts of the Bashahr principality, extending from its northern confines of Kunawar to its eastern limits at Shipki, on the Tibetan frontier, belong to what is generally known as the "Alpine" zone of the Himalayas, and contain much Tibetan admixture both in their flora and fauna. The plants here present an arctic facies. Some of the characteristic Mammalian fauna of these high altitudes are, *Felis uncia*—the Ounce; *Ursus isabellinus*—the Brown Bear; *Pseudois nahura*—the Baral; and *Capra sibirica*—the Himalayan Ibex. These animals seldom descend to low elevations unless driven by the rigours of an exceptionally seve winter. This belt is beyond the influence of the Indian monsoon which are practically spent before they reach Chini (9,000 fe —almost in the centre of Bashahr—and much of the rain[fall] is in winter in the form of snow. Close to the Tibetan bord there is always a continuous wind, driving dust and dry snc along with it, and stunting the whole vegetation.

Next to Bashahr are some of the other Hill States, surrounding the sanitarium of Simla, with elevations varying from about 6,000 to 8,000 or 9,000 feet. The districts embraced between these altitudes are generally spoken of as the "Middle Himalayas," and have aptly been designated the "Forest" region, for nature here wears the garb of the temperate zone. This section is subject to the full force of the monsoons, the average annual rainfall amounting to 65 inches, and "includes some of the largest forests of the Himalayan cedar, especially in the neighbourhood of Nachar, stretching on one side into the Wangur and Baspa valleys, and on the other, along the tops of the hills, to almost the imme-diate vicinity of Simla. About Gaora and Serahan—betw 7,000 and 9,000 feet—some of the finest specimens of *Ul himalayensis*, *Pavia indica*, *Juglans regia*, Mulberry, and other te

occur, and besides a thick vegetation of low forests and brushwood. There exists on these moderate elevations a particularly mild climate, and the supply of water is abundant during the whole year." A few of the animals characteristic of this zone are the Flying Squirrels (*P. fulvinus* and *S. fimbriatus*), the Serow, and the Musk-deer (*M. moschiferus*).

Proceeding southwards from the Military Cantonment of Sabathu (4,500 feet) in the direction of Kalka, the Indian character of the flora and fauna becomes at once prevalent, and we find ourselves in the "sub-tropical" zone of the Himalayas. The Cheer Pine—*Pinus longifolia*—gets rarer the lower we descend, while such Indian forms as *Ficus bengalensis*, *Ficus religiosa*, *Bombax malabaricum* rapidly appear. Thick jungles of Bamboos, *Carissa spinarum*, and *Zizyphus œnoplia* now become the predominant feature in the vegetation, interspersed with shady groves and gardens of *Musæ*, loquat, mango and orange trees. On rocky cliffs and in caverns around Sabathu, Dagshai and Kasauli the first specimens of *Hyæna hyæna*—the Striped Hyæna and *Felis affinis*—the Jungle Cat are to be found. The common Five-Striped Squirrel—*Funambulus pennanti*—and the Indian Wild Boar—*Sus cristatus*—abound everywhere. In scrubby jungles and brushwood are seen the common *Mungos mungo* and *Vulpes bengalensis*; while, at the foot of the hills, *Canis pallipes*, *Mellivora indica*, *Antilope cervicapra*, *Boselaphus tragocamelus*, and other familiar Indian forms occur. Such is the neighbourhood of Kalka and adjacent country, the fauna and flora of which differ in no way from those of the plains of the upper Punjab, and which forms the southern limit of the extent to which my observations apply.

The arrangement followed in the enumeration of Orders and species is that of Blanford in his MAMMALIA, Fauna of British India, 1888-1891, to which references have been given; the nomenclature has, however, been altered, as far as possible, in the light of recent zoological researches.

In conclusion, I take this opportunity of expressing my grateful thanks to Mr. N. B. Kinnear, M.B.O.U., for all his kind help and valuable suggestions, without which my notes would never have seen the light of day; to His Highness the Maharaja of Patiala, for granting me passes and facilities for travelling about in his territory; to Mr. L.W. Reynolds, C.I.E., I.C.S., Deputy Secretary to the Government of India in the Foreign and Political Department, for his kindness in procuring me passes and facilities, without which it would have been impossible for me to visit some of these Hill States; and to Mr. C. H. Johnstone for some of the very interesting material with which he has supplied me for this paper. My grateful thanks are due to Mr. G. W. Marshall, I.S.O., for his kindness in allowing me access to various Government and other publications, during

the course of my zoological studies; and lastly, but not least, to Messrs. Cecil Kirkpatrick and Lionel Harrington for their kindness in having glanced through these sheets, and for having suggested various helpful alterations in the manuscript.

ORDER—PRIMATES.

1. SIMIA RHESUS, Audeb.—*The Bengal Monkey.*

(Blanford No. 3.)

(Simia="Bandar"; Simla Hill States (outer ranges) = "Kailu".)

The following are the measurements of a very large ♂ procured in the neighbourhood of Simla on the 5th September last:—

Head and body (between pegs) 507 mm.; tail (without hair) 228 mm.; hand 108 mm.; ear 44 mm.

*Skull.* From the supraoccipital to the end of premaxillaries 127 mm.; from the anterior margin of the foramen magnum to end of premaxillaries 93 mm.; zygomatic breadth 90 mm.

This Monkey is very common at Simla, and occurs in large troops throughout the lesser ranges. In the station here it has become a perfect nuisance, and seems to be increasing enormously of late years. Blanford speaks of the existence of a *single* colony of these animals on the Jakko Hill (elevation 8,000 feet), but it would have been more correct to say that the hill holds *several* colonies.

Its courtship seems to be a prolonged affair, lasting for several days. Love-makings take place throughout August, September and November when numerous pairs may be observed constantly *in copula*. Between each act of cohabitation a good deal of imaginary lice or flea-picking, tickling of heads, and other domestic reciprocities are indulged in. The young are born about March, April and May. Personally I have never seen more than a single young one clinging to its mother, but have been assured on good authority that twins are occasionally born.

Some of the young females appear to breed in their third year.

There are two facts in connection with this Rhesus at Simla which are very noticeable, *viz.* (*a*) the enormous sizes to which some of the males attain; and (*b*) the long fur, which characterises them all, as compared with the miserable and bedraggled specimens found in the lower hills.

Regarded as sacred throughout these tracts, its shooting is strictly prohibited. A curious thing that I noticed was that these Monkeys in the more remote parts of the hills here had absolutely no idea of the significance of a gun! Another curious fact impressed on my attention is that some of the large males occasionally leave the herds for considerable periods at a time, and live in isolation. They generally take up their quarters near some cultivation, sneak unobserved into the fields in the early mornings, or late in the evenings, and do incredible damage, before they can be discovered or dislodged. These unsociable gentlemen are known to the hillmen as "Kalokurs."

I have witnessed several instances of tender devotion to their offspring in this species, and have great pleasure in putting the following incident on record, if only, as a set-off against their widely chronicled misdeeds.

During the course of a morning's walk here towards the latter end of May 1911, a small troup of *S. rhesus* crossed my path, and I noticed one of the females dragging along with her the *remains* of what appeared to be a young monkey. These relics consisted of a highly decomposed skin, with a few bones protruding out of it. As this proceedin

somewhat unusual, I stood still and closely watched the old monkey. But I soon became aware of a most offensive odour pervading the surrounding atmosphere. The closer one approached the tree tenanted by the female and her ghastly treasure, the stronger did the stench become. I felt some hesitation at first in associating this with the defunct animal. Determined, however, in spite of the abominable smell, to put the matter beyond dispute, I followed, with little difficulty, the herd of animals as they were feeding from tree to tree; and the lapse of a very short time was quite sufficient to convince me that the disgusting smell proceeded from what was left of the dead monkey, and that the latter was beyond doubt the offspring of the old female. I frequently saw the mother tenderly fondle the remains of her young one, then hurriedly put them away from her on a branch, then snatch them up again, look at them in a most anxious manner, smell her hands, and utter a low pitiful moan. There was no doubt whatever that the smell affected her greatly, but she seemed either unable, or unwilling to account for it. How long the mother carried the remains of this loathsome corpse about with her it is of course impossible to say, but the strong affection and acute suffering displayed by this dumb creature for its progeny have, I must confess, left a very strong impression on my mind.

2. PRESBYTIS SCHISTACEUS, Hodgs.—*The Himalayan Langoor.*

(Blanford No. 13.)

(Simla = "Langoor"; Simla Hill States (Outer ranges) = "Gholee;" "Tulaundhar").

The following are the measurements of an adult male skull:—

From the supraoccipital to the end of premaxillaries 140 mm.; from the anterior margin of the foramen magnum to end of premaxillaries 101 mm.; zygomatic breadth 108 mm.

A large male shot some time ago, weighed exactly one maund.

Large herds of this fine Monkey, composed of both sexes and of all ages, are to be seen in the forests here throughout the year. I was much surprised to find it romping about on the banks of the Koshalla stream (elevation 2,300 feet), which is practically at the base of the Himalayas.

It is purely a tree-feeder, and its diet consists of acorns, wild fruits, seeds, and flowers. It is not destructive to crops like *S. rhesus*, but at Simla it frequently steals into the gardens and orchards, and devours any fruit that it can find. Rose-buds are, I believe, readily eaten.

In addition to the low grunting note, it sometimes utters a loud shrill whistle, which is taken up by the whole herd: whether this whistle is used as a cry of alarm, or is simply uttered spontaneously, I have never yet been able to determine satisfactorily.

Blanford forgets to comment on the extraordinary acuteness of this animal's sense of hearing.

It has been asserted that some species of deer, chiefly Chital and Sambhar, are frequently to be seen near a herd of Langoors, but the exact object of this strange association is still a moot point. I once referred it to my friend, Mr. C. H. Johnstone, a good shikari and a keen observer, who has resided in these hills for many years, and I asked him if he had ever had the good fortune to witness this curious fact. He informed me that he had certainly seen Chital under fig and other jungle fruit trees (in the then ons) on which Langoors had been feeding, and judging from the are n erous hoof-marks, he was inclined to think that the deer follow the find n keys about, not for the sake of protection, as has been thought, but to too fai up the fruit that has fallen.

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This Monkey runs with marvellous rapidity on all fours. It is easily tamed, if taken young, and makes a most interesting pet. It has not the vicious or depraved habits of *S. rhesus*.

So far as my personal observations go, the breeding season of this Langoor extends throughout the warm weather, as during this period the females are always to be seen with very young ones clinging to them. These very young ones are not seen during the cold months. Mr. Johnstone thinks that most of the young ones are born towards the latter end of June, and my own observations coincide with his in this respect. Neither of us have ever seen a Langoor in charge of two young ones, and we are both unanimous in thinking that they produce only one young at each birth.

## Order—CARNIVORA.

### 3. Felis tigris, L.—*The Tiger.*

(Blanford No. 29.)

The following facts have been collected in regard to the occurrence of the Tiger in these hills:

It is found, though very sparingly, in the Duns and lower hills of the Sirmur State. Owing to its increasing rarity, the State have been compelled absolutely to prohibit its shooting by sportsmen. A few tigers used to frequent the lower hills in the Bilaspur State (Simla Hill States), but they are now extinct there. Mr. Johnstone tells me that, about thirty years ago, tigers frequented the jungles on the S. E. of Kalka, abutting on the Mornee and Nahan (Sirmur) territory; and also the jungles in the vicinity of Pinjore (Patiala State). He has himself seen the dead bodies of two tigers that were shot within a few miles of Kalka, and on one occasion, while after peafowl in these jungles, he saw a tiger.

### 4. Felis pardus, L.—*The Panther.*

(Blanford No. 30.)

(Simla Hill States and Kulu = "Baragh," "Mirigh"; Kang = "Bagh".)

This animal known to Europeans as the "Leopard," occurs throughout these tracts, but on account of its great acuteness and vigilance is seldom seen. It is most destructive to cattle, goats, sheep and dogs. I have also heard of a panther turning a man-eater in these hills.

Owing to want of sufficient material, I regret that I am unable at present to throw any light on the much disputed point as to whether there is only one or two forms of this animal. All the European sportsmen and Native Shikaris, whom I have consulted, are unanimous in thinking that there are two varieties, and will brook no contradiction on this point. Personally I have an open mind on the subject, but must confess that it is somewhat difficult to believe that the small cat-like, round-headed animal, of from 5-6 feet in length, is identical with the powerful panther, measuring almost 8 feet, and as huge as a tigress. It is a matter of considerable regret that sportsmen and others, who have shot numerous panthers in these hills, should not have availed themselves of the materials and facilities at their disposal to try and clear up this vexed question.

The classification proposed by Mr. Hicks in his book, "Forty years among the wild animals in India," for the two (?) species of this animal, do not appear to be founded on facts, so far as it relates to the caudal vertebræ. Major W. W. Keys reports (J. B. N. H. S., Vol. XXII, p. 189) the number of caudal vertebrae in a small female panthers as 23; last winter I counted

a panther measuring 6'-1"; and Capt. A. H. Mosse found the same number in a female panther measuring 6'-2" (J.B.N.H.S. Vol. XXI, pp. 1319-1320): according to Mr. Hicks the number of caudal vertebrae in all these cases should have been 28. Capt. Mosse rightly observes that a single instance is sufficient to dissipate what he believes to be a myth. And as we have now no less than three specific cases against Mr. Hicks, it is time that his theories in regard to the classification of panthers, which savour of the dreamings of an idealist, should be dismissed from all scientific discussions in future.

While shooting in some of the Native States here, I examined the droppings of panthers on several occasions, and was much astonished to find the undigested quills of porcupines, which had been swallowed whole, and which appeared to have passed through the intestines entire!

Mr. Johnstone sent me the following interesting note on the habits of this species:—

"During the last thirty years or so, I have shot numerous Leopards in these hills, and I am firmly convinced that there are two varieties. One is a large animal of a light colour, and with more open spots; the other is a small animal, with a yellow ground, and closer spots. Leopards move about within a large area, visiting the jungles for miles around, and taking toll of the villagers' goats, cows and dogs, and often picking up a wild pig, or a "Kakur," or a porcupine as a change. I once shot a leopard that had porcupine quills embedded in its paws. I have frequently known Leopards to catch peafowl during the night by climbing up the trees on which these birds were roosting!

"These animals lie up during the day under some dense undergrowth on a hillside, or in caves, or under large rocks, and begin moving about at sunset. A leopard will visit a kill at any time from sunset to 9 P.M., and again from 2 A.M. to dawn, but I have never known them to turn up between 9 P.M. and 2 A.M."

"Leopards have two cubs at a birth. Judging from the size of the cubs in September, I should say that they are born about July."

5. FELIS UNCIA, Schreb.—*The Ounce.*

(Blanford No. 31.)

(Bashahr = "Thurwag"; Tibetan = "Shun".)

Skins of this handsome animal, the "Snow-Leopard" of sportsmen, are frequently brought from the Alpine tracts of the Bashahr State for sale in Simla.

6. FELIS BENGALENSIS, Kerr.—*The Leopard Cat.*

(Blanford No. 36).

(Simla Hill States="Ban Billa"; this term is also used for the next species; Kangra and Kulu="Chitti Billi".)

Up to this I have only seen three specimens of this handsome Cat. One of these animals was an adult, and was captured in a large iron jaw-trap in the compound of a friend here. It had taken to visiting the poultry-yard, and had committed sad havoc among the fowls and ducks. I was unfortunately very ill at the time, and was unable to either measure or skin it. The second animal, a young kitten, sex ♀, about a couple of months old, was caught on the 11th August 1913, while wandering about on an unfrequented road in the station by some employés of the Simla Municipal Committee who generously presented it to me. I kept it alive for a few months, but it proved a more difficult captive to manage than I had anticipated. It was horribly savage, and would sit couched in a corner of its cage, and

growl at any passer-bye. It absolutely refused to touch food, and so forced me to take a step, which my inclination did not favour.

The third animal, an adult ♀ was shot by Dr. Kedar Nath, L.R.C.P.&S., in September last in the Dhami State, elevation 5,000 ft. Its measurements were: head and body 534 mm.; tail 330 mm.; ear 51 mm; hindfoot 147 mm.; height 317 mm.

*Skull*: Basal length from foramen to the premaxillaries 80 mm.; width across the zygomatic arches 64 mm.; extreme length from supra occipital to end of premaxillaries 97 mm.

This species is undoubtedly rare in Simla.

7. Felis affinis, Gray.—*The Jungle Cat.*

(Blanford No. 41.)

The Jungle Cat is found throughout the outer ranges up to about 6,000 or 7,000 feet. It is frequently to be seen in the day-time near villages hunting for food.

8. Felis caracal, Guld.—*The Caracal.*

(Blanford No. 42.)

This animal has never to my knowledge been observed in any of the Simla Hill States, but it is interesting to note that General Osborn mentions it (*Kangra District Gazetteer*, 1904, p. 12,) as having been seen in the Kangra District, which is not very far off.

9. Paradoxurus niger, Desm.—*The Indian Toddy Cat.*

(Blanford No. 51.)

(Kangra="Tutrial.")

Mr. Johnstone informs me that a few of these animals are to be found inhabiting the roofs of some old bungalows at Kalka. They issue forth every night, generally in pairs, occasionally in small parties of 3 or 4 at a time, and commit great depredations in the fruit gardens there. They are very partial to loquats, guavas, mangoes, and custard-apples, but do not touch the oranges.

10. Paguma grayi, Bennett.—*The Himalayan Civet.*

(Blanford No. 55.)

(Kangra="Dehun Kullu"; Kullu="Bansuka").

*Skull measurements of an adult*: Basal length from foramen to premaxillaries 110 mm.; zygomatic arches 70 mm.; extreme length from supra-occipital to end of premaxillaries 123 mm.

Some years back when I took little interest in Zoology, I remember seeing three or four of these animals, which had been shot in the gardens of some residents here. They are very destructive to the local orchards.

These Civets are tolerably common in Simla, and appear to be chiefly frugivorous, but animal food is readily taken when procurable. Several of these animals have been captured here in traps baited with meat. The captives have a peculiar habit of snarling and spitting like a cat when any one happens to go near them.

It may be interesting to mention that this species apparently extends along the Himalayas much further westwards than Simla, as General Osborn records it (*Kangra District Gazetteer*, 1904, p. 13,) from Kyōti where it is known to the hillmen by the name of "Bansuka."

11. Mungos, sp.

Two kinds of Mungooses, a large one and a small one (*Mungos mun*

*Mungos auropunctatus?*) are common around Kalka, but I have been unable to procure any specimens. I hope, however, to do so before long, and settle all doubtful points.

I have observed that the Mungoose found in parts of the United Provinces about the Azamgarh, Ballia and Gorakhpore Districts readily climbs a tree when pursued by dogs.

12. HYÆNA HYÆNA, L.—*The Striped Hyæna.*

(Blanford No. 66.)

(Simla Hill States = "Tarrak"; Kangra = "Tarrak"; Kulu = "Lagar Bagar").

The Hyæna has been seen in the hills at Dagshai, Sabathu and Kasauli. It is fairly common about Kalka. I have heard its unearthly yells on the top of the Shalli Peak (8,000-9,000 feet) in the depth of winter.

13. CANIS PALLIPES, Sykes.—*The Indian Wolf.*

(Blanford No. 68.)

(Simla Hill States (outer hills) and Kangra = "Bhagiara".)

The Indian Wolf has been seen in the neighbourhood of Kalka, but on very rare occasions. It does not appear to enter these hills.

14. CANIS INDICUS, Hodgs.—*The Jackal.*

(Blanford No. 69.)

(Simla Hill States = "Shial," "Phai," "Gidaree").

An adult ♂ shot in Simla on the 16th July 1912, measured as follows:—Head and body 812 mm.; tail 228 mm.; ear 64 mm.; height 482 mm. *Skull*: From anterior margin of foramen magnum to anterior border of premaxillaries 146 mm.; from supraoccipital to end of premaxillaries 153 mm.; zygomatic breadth 97 mm.

The Jackal is common at all seasons in Simla, and abounds throughout the lesser ranges.

It is most destructive to the crops of Indian corn. When the female has young, she becomes exceedingly bold, and frequently carries off the lambs and kids belonging to the villagers in these parts.

It breeds in the hills during May-June, generally producing four young ones at each birth.

In addition to the usual diabolical yells, its peculiar cry "Phiou," is frequently heard in the heart of the station here, and, as suggested by Jerdon, is apparently an alarm note.

The skins of this animal shot in the neighbourhood of Simla, during the winter months, make excellent rugs.

I do not remember to have ever heard of a case of one of these animals having gone mad in the hills.

Some years ago I tamed a pair of Jackals, which were taken when quite young, and were brought up with the house dogs. One of the consequences of this close association was that these animals learnt to imitate the dogs in various ways. They would rush out of the house after strangers just in the manner of dogs, hunt in company with them, and once actually helped to kill a wild cat! They would often come to the table for scraps, but never got rid of that horrible habit of howling when they heard their brethren outside.

15. CUON DUKHUNENSIS, Sykes.—*The Indian Wild Dog.*

(Blanford No. 70.)

My object in mentioning this species in these notes is merely to draw attention to the statement made by Blanford that Wilson discovered a

breeding place *near Simla*. So far as I am aware the Wild Dog does not occur in any of these tracts, but the breeding place referred to is apparently the one mentioned by Colonel Markham in his "Shooting in the Himalayas," p. 175, as being situated high up the *Gangoutrie Valley*, which is in the State of Tehri-Garhwal.

16. VULPES BENGALENSIS, Shaw.—*The Indian Fox.*

(Blanford No. 72.)

This species is common around Kalka (2,400 feet), but does not enter the hills.

It breeds about February. I have never found more than two cubs at a time, and can corroborate what Jerdon says about the youngsters seldom leaving their earths till nearly full grown.

17. VULPES VULPES MONTANA, Pearson.—*The Hill Fox.*

(Blanford No. 75 [*partim.*])

(Simla Hill States, "Phaouta," "Chaura"; Tibetan="Goanu".)

This very handsome animal is common at Simla, especially in the cold weather, and is found throughout these hills.

Mr. Johnstone informs me that he has seen it at Kalka during the winter months, and has actually shot it at that season as low down as Chandigarh (elevation 1,500 feet.)

It brings forth its young about April-May. Unlike the Indian Fox the cubs of this species, even when quite young, appear to come out regularly from their earths in the evenings, and have a romp with their mother. A gentleman here informs me that in 1912 he frequently came across one of these foxes, with two young cubs, on the top of the Tara Devi Hill (7,000 feet).

18. MARTES FLAVIGULA, Bodd.—*The Indian Marten.*

(Blanford No. 77.)

(Simla Hill States (outer ranges)="Kundrialoo," "Dikianee.")

The Indian Marten is tolerably common, at all seasons, throughou outer ranges. I have seen it on the Shalli Hill (elevation 8,000 fe winter.

It is difficult to procure owing to its habit of being constantly move, and rapidly changing ground from one spot to another. It usua keeps in pairs, occasionally in small parties—as many as seven individua have been noticed together—and is to be seen at any time of the day, an anywhere, in brushwoods, coppices, ravines, or by the sides of cultivation.

It is most destructive to game birds in these hills, and is one of th several frequent unwelcome visitors of the poultry yards in the statio here. It is very frugivorous. It is an excellent tree climber, and a ver fair sprinter on ground.

A young of this species, about a month or a month-and-a-half old, wa caught in the station towards the latter end of July, but it died shortly afterwards.

The hillmen have a curious story about this animal. They say that when food gets scarce in the winter months, it visits the beehives in the villages, and secures the honey by inserting its tail into the exit holes which are left in the walls for the bees. The honey is supposed to adhe to the long hairs of the tail, and the animal licks it off, and repeats process till its appetite is satiated or nothing remains in the hive!

19. MUSTELA, Sp.—*Weasels, &c.*

A Weasel, belonging to the above Genus, was observed by me day, near my poultry-yard, during the winter of 1909; but it

before I could shoot it. Its colour, according to notes, taken at the time, was as follows:—

Upper parts, dark reddish-brown, lower parts, deep yellow. Total length about a foot-and-a-half, or a little less.

In my own mind I have no doubt that it was Blanford's No. 85.—*M. cathia.*

20. MELLIVORA INDICA, Kerr.—*The Indian Ratel.*

(Blanford No. 89.)

This species is found in the neighbourhood of Kalka, but is rare. It does not ascend the hills.

21. LUTRA, Sp.—*Otters.*

(Kangra and Kulu="Udar.")

Knowing that specimens of Otters were a great *desideratum*, I made an exhaustive search last winter for them in some of the larger hill streams of the outer hills here, but without success. Not a single animal was seen anywhere. It is very possible that Otters occur in the upper portions of the Sutlej River here, and the necessity of further observations are indicated.

These animals are certainly found in the neighbouring district of Kangra, and the following is General Osborn's account of them:—

"There are two Otters found in Kangra: the first is the common Indian Otter (*L. nair*), which occurs right up to the foot of the Himalayas, and in the Sutlej and Bias Rivers; but in the mountainous part of the district, it is replaced by the Clawless Otter (*L. leptonyx*). * * * The Common Otter, however, has been seen at Dharmsala" (*Kangra District Gazetteer*, 1904, p. 13).

22. URSUS ISABELLINUS, Horsf.—*The Brown Bear.*

(Blanford No. 97.)

(Kangra="Brahbro," "Bhurlen"; Kulu="Rattagai"; Tibetan="'ampu").

The Brown Bear is found in the rugged and alpine tracts of the Bashahr ...e, but is rare. Skins are occasionally brought to Simla for sale.

23. URSUS TIBETANUS, Cuv.—*The Himalayan Black Bear.*

(Blanford No. 98.)

...imla="Bhaloo"; Simla Hill States="Reech," "Banai"; Kangra="...yReech"; Kulu="Chilagai").

The Himalayan Black Bear is fairly common in all the large forests of these hills. It is seldom found below 2,500 feet.

Mr. Johnstone remarks:

"This animal is tolerably common in the lesser ranges, and is most destructive to Indian corn, sugar-cane, wheat, honey and fruits. It is an excellent tree climber, and gets over rocky ground as fast as any Goral (*N. goral*). It frequently kills the goats belonging to the villagers, and I have known it to feed off the carcasses of cattle. It is exceedingly savage, and does not hesitate to maul any one taking him unawares. It does not maul to kill like the large cats. It sometimes charges if its path is obstructed. The charge is made on all fours, and when close to its victim, it rises and strikes either at the face or the head."

"Its sense of smell is very keen, but its sight is not good during the ...ay."

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ORDER—INSECTIVORA.

24. PACHYURA, Sp.—*Shrews.*

...Hill States (outer ranges)= "Chuchoor.gar".)

...g the last two or three years I have captured at Simla, in traps,

baited either with bread or meat, several shrews, all of the same species, and belonging to the Genus Pachyura. These animals are not strictly nocturnal, as two or three were caught in the day. They live here in holes and crevices of walls in old godowns, kitchens, stables, etc.

The following are the measurements of three adults :—

Head and body 108 mm.—119 mm.; tail 66 mm.—71 mm.; hindfoot 20 mm.; ear 12 mm.—14 mm.

The following are the measurements, etc., of two adult females, captured in Simla, on the 24th and 28th August 1913 :—

Head and body 110 mm.—125 mm.; tail 64 mm.—71 mm.; hindfoot 18 mm.—19 mm.; ear 12 mm.—13 mm.

Basal lengths of the two skulls 25—26 mm.

Six mammæ—all inguinal; three on each side. The specimen captured on the 24th August contained three fully developed young in her. Another female captured on the 23rd June 1912, and which was unfortunately not measured, was also pregnant. From this it seems pretty clear that this Shrew breeds throughout the summer and early autumn months, and probably has at least two broods in the year.

I have already sent two specimens (in spirits) of this animal to Mr. Kinnear, Bombay Natural History Society, and these are doubtless available to experts for examination and identification. At present I have ten specimens (5 adults in spirits; 3 young in spirits; and 2 adult skins), and am prepared to send them to anyone in need of further material for working out this little known species.

I take this opportunity of pointing out that the Shrew, which is so common in Calcutta (Genus PACHYURA, sp. ? Head and body 178 mm: tail 90 mm.), is also not purely nocturnal, as I have caught it in traps, baited with bread, *in the day*. On the 12th December 1912, I examined a pregnant female of this species, and found that she contained 3 fully developed young.

## ORDER—CHIROPTERA.

### 25. PTEROPUS LEUCOCEPHALUS, Hodgs.—*The Flying Fox.*

(Blanford No. 134 [*partim*]).

A Flying Fox, apparently belonging to the above form, is common round Kalka, which is at the foot of the hills. It generally keeps below 2,500 feet, but last October, while walking about in the verandah of my bungalow at Simla after dinner, I was much surprised to see one of these bats fly past overhead at a low height. It was a bright moonlight night, and there was no mistaking it. It appeared to have come from a S.-E. direction. Previous to its appearance here, we had been enjoying a spell of particularly fine weather, and this makes it most difficult to conjecture how this animal strayed so far from its regular haunts, and found its way up here.

Since writing these notes my friend, Alec. Jones, informs me that he has seen several of these bats near Sairee which is only about nine miles from Simla.

The curious superstition in Seonee noticed by Sterndale in regard to the beneficial effects to be derived from tying the bones of this bat round the legs as a cure for rheumatism is, I may mention, also prevalent in parts of the United Provinces, but the people there are very careful to use only the bones from the wing.

In the Bird and Animal Market in Calcutta, I noticed several cages full of Flying-foxes, and on my inquiries elicited the sur information that they were bought in large numbers by the Chinamen

esteemed them a great delicacy. A large plump Flying-fox usually retailed for about six annas!

On examining some of these bats in Calcutta, I found that they generally had one or two curious spider-like parasites, belonging to the Genus NYCTERIBIA, adhering to their bodies.

26. RHINOLOPHUS TRAGATUS, Hodgs.—*Hodgson's Horse-shoe Bat.*

(Blanford No. 157.)

(Simla Hill States (outer ranges) = "Chamchira"; this term is applied to all Bats).

*Measurements:*

*Sex*—♂ (4 *adults*). Head and body 61 mm.—67mm.: tail 36 mm. —38 mm.; hindfoot 13 mm.—14 mm.; ear 27 mm.—28 mm.

*Sex*—♀ (2 *adults*). Head and body 63 mm.—64 mm.; tail 33 mm.; hindfoot 13 mm.—14 mm.; ear 25 mm.

In August 1912, I found a colony of these Bats inhabiting the attic of an office at Simla (7,000 feet), and captured several specimens. These animals always issued forth at dusk, in large numbers from their roosting places, and after flying slowly round the building, at only a short distance from the ground, used to disappear into the neighbouring forests.

Their diet is apparently found close to the ground, as I frequently observed them hovering about near the roots of small bushes on the hillsides.

In order to study the habits of these bats, I kept some of them alive for short periods in a box with a glass cover, and noticed that the captives retained their ears in a constant state of vibration: when hanging downwards in the box, their interfemoral membranes were always carefully preserved by being neatly folded backwards. They were very pugnacious, and were constantly biting each other. The immature specimens are *darker* in colour than the adults. I can corroborate what Hodgson says about this species *not* being migratory; but am *not* quite sure about it *not* hibernating, so far as Simla is concerned at any rate.

I got several curious spider-like parasites from the bodies of these Bats.

27. NYCTALUS LABIATA, Hodgs.—*The Noctule Bat.*

(Blanford No. 181 [*partim*].)

Measurements of an adult ♂:

Head and body 84 mm.; tail 49 mm.; hindfoot 10 mm.; ear 20 mm.

Mr. Kinnear kindly identified the above specimen for me. He states that this is the eastern representative of *N. noctula*.

This Bat is a forest loving species, and I have generally found it solitary in natural crevices and holes of trees. Judging from the amount of dung in its abode, it apparently lives in the same spot for a considerable period. Its flight is rapid and strong. As stated by Blanford, it has a most unpleasant odour.

28. PIPISTRELLUS COROMANDRA, Gray.—*The Coromandel Pipistrelle.*

(Blanford No. 187).

(*Vide* Wroughton in J. B. N. H. S. Vol. XXI, p. 1179).

This Bat is very common in Simla (7,000 feet), and is the one that frequently comes into the houses at nights. It is not a forest haunting species, as observed by Blanford, is essentially a house bat, hiding in

crevices and holes of the roofs of bungalows, old godowns, etc. It is generally the first to issue forth in the evenings, and flies at various heights with rapid and irregular twists and turns. It disappears entirely during the cold months, and must therefore hibernate in these parts during that period. A female captured towards the latter end of May had a single young one sticking to her.

29. MYOTIS BLYTHI, Tomes.—*Himalayan Mouse-Eared Bat.*

A single specimen of this rare bat was captured in August 1912, sticking to the roof of a small cave, elevation 6,000 feet, in the neighbourhood of Simla.

Mr. Oldfield Thomas, F. R. S., F. Z. S., very kindly identified the specimen, which is now in the British Museum. He remarks *in epist.*:

"The Bat you have sent is a good thing, and I at first thought it was new. It is *Myotis blythi*, Tomes, wrongly put as a synonym of "Vespertilio murinus" (*Myotis myotis*) by Blanford. Only two examples of this Bat have been got before; one, the type, which is in the British Museum, and, the other, procured by Abbott, the American, in Kashmir, and now in Washington".

30. MYOTIS MURICOLA, Hodgs.—*The Mustached Bat.*

(Blanford No. 212.)

I found a colony of these Bats inhabiting the porch of my bungalow at Simla, and procured several specimens, which are now in the Bombay Natural History Society's Museum. These animals were always very active during the summer months; issuing forth about dusk, and flying at varying heights with rapid twists and turns. They seemed to hibernate for a good portion of the year, as they invariably disappeared about the middle of August, and were not seen again till late in the following spring. They breed during May and June. Several females were captured with single young ones sticking to them. The young are born naked and blind.

31. NYCTALUS MONTANUS, Barrett-Hamilton.—*The Eastern Leisler's Bat.*

On the 2nd September last I captured a pair of these Bats in the roof of my bungalow at Simla (7,000 feet). They always issued forth at dusk and after flying several times at low heights round the house, used to disappear on the hillsides.

Their measurements were:

*Sex* ♂ (*adult*).—Head and body 64 mm; tail 38 mm.; hindfoot 10mm.; ear 12mm.

*Sex* ♀ (*adult*).—Head and body 65 mm; tail 42 mm.; hindfoot 10 mm.; ear 14 mm.

Mr. Oldfield Thomas, F.R.S., F.Z.S., was kind enough to identify these specimens for me. He remarks:

"This Bat is the Indian representative of the European *Nyctalus leisleri*. It has recently been named *N. montanus* by Barrett-Hamilton, and may be called by that name for the time being."

"You are evidently in a very interesting region for Bats, getting these Indian representatives of European forms, and I hope you will go on collecting."

ORDER—RODENTIA.

32. PETAURISTA FULVINUS, Wroughton.—*The Simla large Flying Squirrel.*

(Simla Hill States (outer ranges) = "Een"; this term is applied to Flying Squirrels; Kangra = "Banchiri," "Gharini"; Kulu = "Jue[illegible]

*Measurements:*

*Sex*—♂ *(adults)*. Head and body 344 mm.—385 mm.; tail 452 mm.—456 mm.; hindfoot 71 mm.—76 mm.; ear 43 mm.—50 mm.

*Sex*—♀ *(adults)*. Head and body 356 mm.—388 mm.; tail 433 mm.—476 mm.; hindfoot 73 mm.—75 mm.; ear 43 mm.—46 mm.

The extreme lengths of five skulls, from the supra-occipitals to the end of nasals, vary from 71 mm. to 73 mm.; and the breadths across the zygomatic arches from 46 mm. to 50 mm.

This handsome Squirrel is tolerably common in all the forests here, and generally keeps above 6,000 feet. It usually lives by itself in the holes of large trees, but it is sometimes found in small colonies inhabiting the roofs of bungalows, godowns, etc. Its diet consists chiefly of acorns and other wild fruits: the mulberries and walnuts, when in season, are a great stand-bye. Like the next species, it is confiding in its habits, and visits the trees in the compounds here freely. When feeding it is much noiser in its movements than *Sciuropterus fimbriatus*, and when both these species happen to meet on the same branch, a fight generally ensues.

Its cry is a mournful "Kó-ó-oh", repeated several times.

I have been unable to ascertain when it breeds.

According to Blanford this Squirrel is said to hibernate in Kashmir, but it certainly does not do this here, as I have procured specimens at all seasons.

When collecting these animals, I was much struck with the curious fact that the males predominated enormously over the fe[illegible]s in numbers; the proportion works out to about 8 in 1. The same was the case as regards the next species.

These animals can easily be tamed, even if taken when they are full grown.

The following facts showing that the death-rate is sometimes selective among species differing little from each other in habits, came under my observation a few years ago, and deserve notice:—A colony of these squirrels inhabited the loft of my bungalow in Simla for several years. During the summer of 1911, I noticed that they began to die off one after another, without any apparent cause. This led me to examine some other nests of this species which I had previously discovered at different parts of the station, and where, to my surprise, I found evidence of a similar high rate of mortality. In the neighbouring jungles some more dead bodies of these Squirrels were discovered. It was out of the question to take any measurements of the dead animals, as in all cases the remains were in a highly decomposed state; but there were two points which struck me at the time as worth noting, *viz.* (*a*) *all* the Squirrels which had died belonged to one species (*P. fulvinus*); the other species of Flying Squirrel, which abounds here, did not seem to be affected in anyway; and (*b*) only the *very old* individuals of *P. fulvinus* appeared to have succumbed to the disease. It was curious that not a single dead young or immature one was found anywhere, though special search was made for these.

33. SCIUROPTERUS FIMBRIATUS, Gray.—*The Small Flying Squirrel.*

(Blanford No. 233.)

*Measurements:*

[illegible]—♂ *(adults)*. Head and body 227 mm.—267 mm.; tail 242 mm.—[illegible]; hindfoot 45 mm.—50 mm.; ear 40 mm.—41 mm.

[illegible]♀ *(adults)*. Head and body 231 mm.—254 mm.; tail 229 mm.—[illegible]; hindfoot 51 mm.—55 mm.; ear 41 mm.—47 mm.

The extreme lengths of five skulls, from the supra-occipitals to the end of the nasals, vary from 55 mm. to 59 mm.; and the breadths across the zygomatic arches from 33 mm. to 35 mm.

This is the common Flying Squirrel of Simla. Its habits resemble in many respects those of *P. fulcinus*, but it is far more active, and is generally the first to issue forth in the evenings in quest of food. It lives in pairs in the holes of trees and roofs of buildings, and breeds about September—October, producing 3 or 4 young at a birth.

When feeding, it is silent and stealthy in its movements, and is consequently difficult to detect. It seldom stays long in one spot, but passes on rapidly by leaps or flights, from one tree to another. Some of the flights taken by this animal are immense, and remind one more of a bird gliding swiftly through the air than an animal. In one case I measured the distance, and found that the Squirrel had covered exactly 80 yards!

All the above mentioned specimens correspond exactly with Blanford's description of this species, but I have in my collection a skin of one of these Squirrels—an adult ♂ which is somewhat different in colouration from *S. fimbriatus*, and which may, perhaps, belong to another species? The upper parts, especially near the hind-neck, have a tinge of rufous-brown, and the tail is *reddish-brown*, darker on the tip.

The following are its measurements:

Head and body 241 mm; tail 241 mm; hindfoot 45 mm; ear 40 mm.

*Skull measurements:*

Extreme length, from supra-occipital to end of nasals 60 mm.; zygomatic breadth 33 mm.

This specimen is available for examination. It is the only one of its kind that I have ever seen in Simla. It was procured on the 18th June last, along with two specimens of *S. fimbriatus* from which it does not appear to differ in anyway in its habits.

34. FUNAMBULUS PENNANTI, Wroughton.—*The common Five-striped Squirrel.*

(Blanford No. 253 *partim*.)

(Simla Hill States (outer ranges) = "Karto")

Measurements of an adult ♂.

Head and body 140 mm.; tail 102 mm.; hindfoot 38 mm.; ear 19 mm.

This Squirrel is very common about Kalka. It penetrates the outer hills to about 4,500 feet.

It lives entirely on seeds, fruits, berries, etc., and I doubt whether it ever destroys the eggs or young of birds, as has been alleged. Its nest is a large bulky structure, composed of rags, "sun," and other fibrous matters, and is generally placed in the branch of a tree, sometimes between the rafters and beams of godowns and bungalows, and sometimes in holes of walls. It seems to breed at very different times in various parts of its range. Round about Kalka, Mr. Johnstone informs me that it brings forth its young, usually 4 in number, during March and April. In the United Provinces I have found the young in May and June. In Calcutta I noticed several young ones being hawked about for sale in the Market there on the 22nd November, and in the Kanchrapara District, (24 Parganas), I saw one of these animals carrying building materials to its nest on the 4th December.

35. VANDELEURIA OLERACEA, Benn.—*The Tree Mouse.*

(Blanford No. 270.)

At Kalka, on the 18th January, I found a small colony of three or

mice in a nest made of grass, which was placed in the natural crevice of a large Peepul Tree (*F. religiosa*), not more than three feet from the ground. I sent these animals for identification to Mr. Kinnear, and he remarks *in epist*:—

"The skins look rather darker than Deccan specimens. Hodgson distinguished the Nepal form as "*dumeticola*".

The specimens are available for examination.

In the Journal of the Bombay Natural History Society, Vol. XXI, p. 823, Wroughton uses *V. oleracea*, Benn. for the Dekkan Tree-Mouse, and states that *V. dumeticola* "must stand for the northern form (dark but bright tawny) which undoubtedly is distinct from *oleracea*." The specimens, which I have procured appear to belong to the northern form.

*Measurements of a* ♀ (*adult*).—Head and body 78 mm.; tail 113 mm.; hindfoot 19 mm.; ear 15 mm.

I have subsequently ascertained that this Mouse is common at Kalka.

36. EPIMYS VICERER, (*Bonhote.*):

(Simla = "Chuha" (applied to all rats); Simla Hill States (outer ranges.) = "Moosa" (applied to all rats.)

*Measurements of two* ♀*s*—(*adults*).

Head and body 153 mm.—159 mm.; tail 146 mm.—198 mm.; hindfoot 31 mm.—32 mm.; ear 20 mm.—26 mm.

This is the common house-rat in Simla.

A few years ago I had occasion to have several hundred of these animals trapped, and found that the males predominated over the females in the proportion of about 3 to 1. The males in this species appear to be very pugnacious, for on examining a large number of the captives, I noticed that their bodies and legs were covered with big scars and bites—apparently the results of love encounters.

The following are the results of my investigations as regards the breeding of this rat:

17th July—6 young; 4th August—6 young; 15th August—5 young; 19th August—2 young; 2nd September—6 young.

37. EPIMYS RUFESCENS, (Gray)—*The Common Indian Rat.*

(Blanford No. 272).

In addition to the above species, there are two other varieties of rats which are found in the Simla District and Simla Hill States. As the taxonomic value of the belly colour of these Rats has not yet been determined (*vide* Journal of B. N. H. S., Vols. XXI, pp. 1189-1190, and XXII, pp. 54-55), I have provisionally lumped them under *Epimys rufescens*.

The two varieties are:

(*a*) with *light grey* underparts, and

(*b*) with dark underparts.

(*a*) Occurs in Simla, but is decidedly rare. A special search was made for specimens at the foot of the hills, but not a single one was found.

(*b*) Abounds at Kalka (2,400 ft.), and at the foot of the hills.

*Measurements of* (*a*).

*One specimen—Sex* ♀ (*adult*).—Head and body 168 mm; tail 223 mm; hindfoot 35 mm; ear 23 mm.

*Measurements of* (*b*).

*Specimens—Sex* ♂ *and* ♀ (*adults*).—Head and body 153 mm; tail 191 mm—194 mm; hindfoot 28 mm—31 mm; ear 21 mm—22 mm.

Specimens of the above are available for examination.

38. Mus urbanus, Hodgson—*The Himalayan House Mouse.*

(Blanford No. 283.)

(Simla Hill States (outer ranges) = "Moosarie.")

*Measurements:*

*One specimen—Sex* ♂ *(adult).* Head and body 71 mm.; tail 82 mm.; hindfoot 16 mm.; ear 18 mm.

*Five specimens—Sex* ♀ *(adults).*—Head and body 73 mm.—83 mm.; tail 77 mm.—85 mm.; hindfoot 16 mm.—19 mm.; ear 14 mm.—16 mm.

This is the common House Mouse at Simla.

Two pregnant females examined on the 17th August and 29th November contained 5 fully developed young each. Another pregnant female examined on the 24th August contained 4 young.

The normal number of mammæ in this species appears to be 10 (5 on each side), but in two specimens I find that one has 11 mammæ (5 on one side and 6 on the other), and the other only 9 (4 on one side and 5 on the other).

39. Gunomys. Sp.

On the 1st July 1912 a rat (sex ♂) belonging to the above Genus was caught in the bazaar at Simla, but unfortunately the skin was spoilt, and it is not possible to say for certain now what it was. Mr. Kinnear, who kindly examined the decomposed skin, thinks that it may have been *G. Wardi* (J. B. N. H. S., Vol. XVIII, pp. 744-745). Its measurements were: Head and body 242 mm.; tail 178 mm.

This is the only one of its kind that I have ever seen up here.

40. Hystrix leucura, Sykes.—*The Indian Porcupine.*

(Blanford No. 315.)

(Simla Hill States (outer ranges) = "Sahil"; Kangra = "Seh.")

The Indian Porcupine ranges as high as 7,000 feet in these hills. It has been shot on several occasions in the gardens of the residents here. Judging from the large number of quills which I have picked up at different parts of the station, I should think that it is much commoner than is supposed, but being so essentially nocturnal in its habits, it is seldom seen by

The accompanying photograph is of an adult Porcupine shot on the Tara Devi Hill (7,000 feet).

It is most destructive here to Indian corn, and to potato and other vegetable crops.

In the hills this animal appears to make its home in natural caves and crevices of rocks, and does not burrow as in the plains.

It has been asserted that the Porcupine has the power of discharging its quills with great force, but is not able to direct them, and it would be interesting to know whether any naturalists have ever observed this action? I have been present at the deaths of several Porcupines, which have been cornered by dogs, and brought to bay, and have certainly seen them charge backwards, with erected spines, as related by Blanford, but have never known these to be thrown at their foes.

There is a very curious story prevalent in the United Provinces to the effect that these animals carry water in the quills of their tails to their young!

41. LEPUS RUFICAUDATUS, Geoff.—*The Common Indian Hare.*

(Blanford No. 320.)

(Simla Hill States = "Phuraroo"; Kangra = "Seru.")

In view of Wroughton's remarks in J. B. N. H. S., Vol. XXII, p. 57, I feel somewhat doubtful about mentioning this species under the above name, but all the specimens which I have procured in the hills here correspond with Blanford's description.

This Hare abounds in the submontane tracts, and penetrates into the outer ranges as high as 6,000 feet. I have seen specimens, which had been shot in the neighbourhood of Simla.

It is generally found solitary.

Mr. Johnstone remarks *in epist.* as regards its habits:

"This Hare is most destructive to young wheat, barley, and gram, but prefers nibbling "doob" grass to crops after a certain toughness of stalk has been attained."

"There is only one time of the year when it does not breed, and that is during July. It produces two at a birth on an average every third week."

ORDER—UNGULATA.

42. ELEPHAS MAXIMUS, L.—*The Indian Elephant.*

(Blanford No. 332.)

The Elephant was formerly abundant in parts of the Sirmur State, where it was sometimes captured. A few still occasionally visit the Doons of that State for short periods.

43. PSEUDOIS NAHURA, Hodgs.—*The Baral.*

(Blanford No. 346.)

(Bashahr = "Wa"; Lahul = "Miatu"; Tibetan = "Napoo".)

This Sheep occurs in the Bashahr State, but keeps above elevations of 10,000 feet.

Specimens with 25"—26" horns are now considered good trophies.

In his excellent little book, "The Sportsman's Manual in Kulu, Lahaul, etc.," 1907, Colonel R. H. Tyacke has given the maximum lengths of horns of some Himalayan species of game which sportsmen are likely to get at the present time, and it is difficult to dispute his figures. He remarks:—

"It may be laid down that the following are the limits to the sizes of heads that any sportsman is likely to get, and if he succeeds in reaching this limit, he may be esteemed very fortunate:—

| | |
|---|---|
| Ibex .. .. .. | 50 inches. |
| Tahr .. .. .. | 14 " |
| Serow .. .. .. | 12 " |
| Goral .. .. .. | 9 " |
| Baral .. .. .. | 26 " |
| Barking Deer .. .. | 8 " |

44. CAPRA SIBIRICA, Meyer.—*The Himalayan Ibex.*

(Blanford No. 348.)

(Kunawar = "Buz"; Kulu = "Tagrole"; Tibetan = "Skeyn," "Kiu".)

Only found in the Kunawar Division of the Bashahr State.

The horns of this animal are considered by the local people as very appropriate for the adornment of temples.

45. HEMITRAGUS JEMLAICUS, H. Smith.—*The Tahr.*

(Blanford No. 350.)

(Bashahr = "Jhula," "Tahrni," "Esbu"; Kangra and Kulu = "Kurt" or "Karth".)

Common in the Rohru Tahsil of the Bashahr State.

46. CAPRICORNIS SUMATRAENSIS ROLONI, Pocock.—*The Chamba Serow.*

(Blanford No. 352 (*partim*).)

(Simla Hill States (interior) = "Aimu"; Kulu = "Yamu.")

Few sportsmen in these hills have hitherto troubled themselves much about the Serow, and have, I am sure, always been under the impression that the same form ranges from Kashmir to Burma. Mr. R. I. Pocock's most valuable paper in the last Journal has, however, opened our eyes to the fact that there are apparently several types of this curious animal, and that a great deal yet remains to be learnt about it.

I take it that the Serow found in the Simla Hills belongs to the Chamba race (*rodoni*), but hope to clear up the point definitely before long. Specimens of this animal have occasionally been procured in the rocky and densely wooded hills to the north of Simla. It is tolerably common in the more remote parts of the interior.

A couple of years ago one of these animals, a straggler, was shot close to the Military Cantonment of Jutogh.

47. NEMORHEDUS GORAL, Hard.—*The Grey Himalayan Goral.*

(Blanford No. 354.)

(Simla Hill States = "Ghol"; Kangra = "Bun Bukri", "Pij"; Kulu = "Ban Bukri".)

The Goral or Himalayan Chamois is found throughout the outer ranges and extends as low as 2,500 feet.

It is somewhat gregarious, being usually found in small parties of 2, 3 or 4, but in localities where they are plentiful, very much larger parties are met with. I remember some years ago counting, in succession, no less than 21 Gorals, which were got off a range of cliffs on a single hill, in one of the Native States here.

If alarmed or startled, the animals usually scatter in all directions, and their subsequent movements are quite independent of each other.

When taken young, the Goral makes a very interesting pet.

Blanford states that Jerdon's account of the habits of this animal is difficult to improve upon, but I must confess that I was greatly fascinated by Colonel Markham's account in his charming book, "Shooting in the Himalayas," London, 1854.

My ideal of Goral shooting is not to attempt to stalk them, and thus take them unawares; but, if the ground is favourable, to take up a position either opposite or at the bottom of a precipice or cliff, known to be haunted by these animals, and to have them deliberately driven across the face of it. This method, while avoiding all unnecessary climbing and consequent fatigue, not only affords the Gorals a fair chance of escape, but at the same time gives the naturalist-sportsman an excellent idea as to the manner in which these animals are able to make their way across the most difficult places.

48. BOSELAPHUS TRAGOCAMELUS, Pallas.—*The Nilgai or Blue Bull.*

(Blanford No. 355.)

(Kangra="Ban Gai," "Roj.")

Occasionally found in the jungles below Kalka, but it is very rare.

49. TETRACEROS QUADRICORNIS, Blainv.— *The Fourhorned Antelope.*

(Blanford No. 356.)

(Native name "Chousingha.")

Found in the Sirmur Doons; also in the Marna jungles (Patiala State), below Kalka. Rare in the latter locality.

50. ANTILOPE CERVICAPRA, L.—*The Black Buck.*

(Blanford No. 357.)

(Kalka and Kangra="Hiran.")

A few Black Buck are to be found below Kalka, near Chandigarh, but are not worth shooting, as the horns rarely exceed 18 inches in length.

51. MUNTIACUS VAGINALIS, Bodd.—*The Barking Deer.*

(Blanford No. 362.)

(Simla, Simla Hill States, Kangra, and Kulu="Kakar".)

Whether the W. Himalayan form is identical with, or separable from, the Bengal "Kakar" has not been determined at present (*vide* Wroughton in J. B. N. H. S., Vol. XXI., p. 825). For purposes of these notes, it has been assumed that the two animals are identical.

The Barking Deer abounds throughout most of the wooded ravines, glens and coppices in the lower hills, including the Siwaliks. It is seldom seen above an elevation of 7,000 ft. Its loud barking cry is frequently to be heard in the ravines in the station here.

As is well known this species is solitary in its habits, but it is by no means unusual to find several individuals, whose movements are independent of each other, inhabiting the same patch of jungle. My friend, Mr. G. . Coates, informs me that no less than 24 Kakur were bagged at various ervals, during the shooting season of 1912-1913, in a small jungle about miles distant from Simla, by sportsmen here; and a most curious feature this large aggregate bag was that all but 4 were males! In the previous ar also a large number were shot in the same jungle, and on that occasion ie majority were females.

This species is very constant to its haunts, and if not disturbed or frightened, seldom quits them. If one of them is shot in a particular ravine, its place appears to be shortly afterwards taken by another one.

It feeds in the mornings and in the evenings. It drinks daily at the latter time. It usually rests under a bush, or at the roots of a tree, and the same lairs appear to be used for long periods. Another peculiarity which deserves notice is its habit of depositing its dung in practically the same spots day after day.

In the hills it breeds during June-July, generally producing one, sometimes two young, at each birth.

The best pair of horns that I have yet seen belonged to an animal shot by Mr. W. N. Leicester in 1896 in the Dhami State. They measure—

From base to tip along curve 8½ inches and from bur (pedicel not included) 5½ inches.

Be I can fully corroborate what Blanford says in regard to the buck using its the are n teeth in defence. Some years ago, a couple of my terriers cornered find no r in a ravine here, and one of the dogs was badly ripped open in too fails ces. The wounds were about 4 inches in length, and as clean as justify t s. mated m

52. Rusa unicolor, Bechs.—*The Sambhar.*

(Blanford No. 367.)

This species keeps to the low hills and forests in the submontane tracts. Considerable numbers of these animals are to be found in the Rawin State, where most of the temples are adorned with its horns.

Last winter I came across a herd consisting of about 7 or 10 does wandering about in some scrubby jungles near Koti (elevation 3,600 feet) in the Bhaghat State.

53. Axis axis, Erxl.—*The Spotted-Deer.*

(Blanford No. 368.)

(Kangra = "Bara Singha," "Jhank".)

Found in the Sal Forests of the Sirmur Doon, and also in Raithur (Patiala State).

54. Axis porcinus, Zimm.—*The Hog-Deer.*

(Blanford No. 369.)

The Hog-Deer occurs in the tropical portions of the Sirmur State.

55. Moschus moschiferus, L.—*The Musk-Deer.*

(Blanford No. 370.)

(Simla Hill States = "Kastura", "Moskinafa"; Kangra = "Kastura," "Raunsa"; Kulu = "Beena.")

This Deer is found in most of the forests in the interior of these hills, but is gradually becoming rare. It generally keeps above 8,000 feet.

56. Sus cristatus, Wag.—*The Indian Wild Boar.*

(Blanford No. 374.)

(Simla Hill States, Kangra, and Kulu = "Sur.")

This species is perhaps the most numerous of all the game animals; the lower hills from about 5,000 feet downwards. It abounds in th Simla Hill States of Bhaghat, Bhajji, Baghal, Bilaspur, Nalagarh and most destructive to crops.

Mr. W. N. Leicester, who has shot for many years about these hi assures me that Pigs are frequently to be found as high as 7,000 fee He has seen a few of these animals near the "Catchment area" here, an some close to Narkanda.

So far as my observations go there seems to be only one species of wild hog in these hills; but according to General Osborn two varieties are found in the Kangra District. He remarks:—

"In these hills the boars grow to a very large size, and are very destructive to the crops. The following measurements have been obtained by a well-known sportsman: height at the shoulder, 36 inches; length from tip of nose to end of tail, 6 feet 2 inches; length of tail, one foot. There is another variety occupying the same jungles, which is only three-quarters the size of the large kind. There is no other specific difference between them. The *shikaris* of the Kangra country declare that the smaller variety of wild boar is more savage and dangerous, when wounded, than the larger kind."

In the lower hills here the Pig breeds about the beginning of the rains, generally producing 4 to 8 young at a birth.

1

1a

1b

2

2a

2b

J. G. del.

THE COMMON INDIAN SNAKES. (Wall).

1. Simotes arnensis, *harmless, nat size.*
2. Simotes albocinctus, *harmless, nat size.*

# A POPULAR TREATISE ON THE COMMON INDIAN SNAKES.

## Illustrated by Coloured Plates and Diagrams

By

Major F. Wall, I.M.S., C.M.Z.S.

*Part XX (with Plate XX, Text figure and Map.)*

(*Continued from page 568 of this Volume.*)

Both the subjects of this paper belong to the genus *Simotes*, one of the many into which aglyphous or fangless colubrines are divided. The genus contained 22 species when Mr. Boulenger's Catalogue appeared in 1894. Its representatives are denizens of the Southern part of the Asiatic Continent from the Punjab to Southern China, and range through the Malayan Archipelago from Sumatra as far East as Timor, and as far North as the Philippines and Formosa. Of the 22 species no less than 11 occur within our Indian Dominions.*

The types are the Indian *arnensis*, the Malayan *octolineatus*, and the Malayasian *purpurascens*.

### *SIMOTES ARNENSIS* (Shaw).

#### The Common Kukri Snake.

*History.*—Seba appears to have been the first to depict this snake, his illustration dating back to the year 1735. Later in the 18th Century—in the year 1796—Russell figured and remarked on it twice in his first volume (Plates XXXV and XXXVIII).

*Nomenclature.*—(*a*) *Scientific.*—Dumeril and Bibron are responsible for the generic name which is from the Greek, "simos" a snub-nose and refers to the rostral shield which is reflected back on to the snout to a remarkable degree in all the kukri snakes. (*See* figure A of Diagram.) Arni from which the snake derives its specific name is a town close to Arcot in the Madras Presidency, where the subject of Russell's Plate XXXV was captured.

(*b*) *English.*—The common kukri snake seems to me an appropriate name for it. As already mentioned in a previous article of this series (Vol. XIX, p. 556) the name is suggested by the blade

*It is extremely dubious whether the two genera *Oligodon* and *Simotes* established by Boie and Dumeril and Bibron respectively, and upheld by Dr. Günther and Mr. Boulenger deserve separate recognition. The characters made use of to distinguish them based mainly on the presence or absence of palatine orpterygoid teeth are not tenable. I have skulls of 11 species (6 *Simotes* and 5 *Oligodon*) and can find no important constant differences between them. A study of the lepidosis too fails to reveal any single character, or combination of characters that can justify the division. I feel certain therefore that the two will have to be amalgamated under Boie's title *Oligodon* which is the older.

like character, and peculiar shape of the posterior maxillary teeth in all the species of *Simotes* and *Oligodon*.

(c) *Vernacular.*—Russell says it is called "katla tutta" in the Vizagapatam District, and Mr. Muir tells me that in Bengal around Kalna it is called "sanka." I have heard no special native names for it myself.

*Identification.*—It is not an easy matter to distinguish this from some other kukri snakes to which it bears considerable resemblance in colour and markings. It is safer to identify the snake by attention to scale characters only. The brevity of the suture between the internasal and præfrontal fellows, are, I think, if taken together, sufficient to establish the genus as either *Simotes* or *Oligodon*. The internasal suture is half or less than half the internasal præfrontal suture, and the præfrontal distinctly less and often by half the præfronto-frontal suture. In order to distinguish *arnensis* from the other kukri snakes the following points must co-exist:—(1) a divided anal shield, (2) presence of loreal, (3) 7 supralabials, and (4) more than 40 subcaudals, of course taking care to see that the tail is not imperfect.

Perhaps an easier way of putting the matter is this. Any snake found in the plains of Peninsula India (*see* map of distribution) which has 17 scale rows anteriorly and in midbody, and only 15 at a point two headslengths before the vent, together with only 4 or 5 infralabials will almost for certain prove to be *arnensis*. This remark, though will not apply to the hills the following species combining the same characters, may be associated with *arnensis* in certain upland localities. In the East Himalayas, including of course Nepal, *Oligodon erythrogaster* occ and in the South Indian Hills *Simotes beddomei*, *Oligodon venu* *O. travancoricus*, and *O. affinis*. In these Hills, and their immediately adjacent low country recourse must be had to the method identification first indicated.

*General characters.*—The body is cylindrical, rather short, smooth, and of even calibre throughout. A neck is slightly indicated behind the slightly expanded jaws. The head is moderately depressed, the snout short, rather blunt, and devoid of any canthus. The nostril is open, and evident, and the eye is of moderate size with round pupil, and an iris of ruddy or brownish gold. The tail is short, somewhat compressed basally, and accounts for about one-sixth to one-seventh the total length of the snake.

*Colouration.*—The ground colour is brown of various hues, inclined sometimes to a ruddy, or a purplish tint. It fades to a more or less degree in the flanks. The back is crossed with black bars which are narrowly, but usually distinctly, outlined with whitish or pale yellow. They do not reach the ventrals, but break up in the flanks into streaks. They vary somewhat in width, but are, I think,

always distinctly narrower than the intervals left between them. Their number seems to vary with the locality. In the United Provinces, Punjab, N. W. Frontier and the Western Himalayas my examples have shown from 41 to 54 on the body, and 9 to 12 on the tail. From Orissa I have had one with 37 bars on the body, and only 6 on the tail. Russell's Arni specimen had only 22 on the whole length and Günther mentions one from Ceylon with only 17 on the body. I have seen as many as 62 bars in a specimen from Behar. In the vast majority of specimens these bars are of even width in mid-dorsum and taper costally, but I have seen a specimen in Fyzabad, and another from Bannu in which they were indented in the median line anteriorly and posteriorly and converted into twin beads, or figures of eight. This form of mark is common in many of the species of *Simotes* and *Oligodon*. In the intervals between the bars the flanks are variegated with short streaks. The belly is usually of a uniform pearly white, but is often black spotted, or Mr. Boulenger says the ventrals may be bordered at their free edges with brown. The spotted specimens are, I find, not peculiar to any locality, for I have seen a specimen in Almora in which most ventrals had a spot at one or other side, and Mr. Boulenger records such from Nepal, and S. India, where the majority of specimens are unspotted. The head is adorned with three conspicuous black marks which are often, if not usually, bordered narrowly with white or pale yellow. The anterior mark is crescentic, and passes across in front of the eyes to re-appear below them. The median and posterior are sagittate, the apex of the former reaching to the frontal and the arms to behind the gape, whilst the apex of the latter passes to the parietals, and the arms to the sides of the neck. The posterior sagitta is much the broader one. These three marks are nearly always discrete, unlike the same marks in some other species which are connected by a median shaft. In very old specimens these head marks tend to disintegrate, and become obscured. There are usually some dark streaks to be seen in some of the supralabial sutures.

*Dimensions.*—Adults usually range between 18 and 21 inches, but I have had at least eight specimens exceeding these measurements, the two largest, both females, being exactly two feet long. Günther mentions one 25 inches long.

*Haunts.*—Nearly all the specimens I have had came from within Cantonment limits. I have come across many alive on the roads, or the wayside, and have even met with it on the open parade ground more than once. More usually it does not stray from within easy touch of efficient cover. It appears to make its home for the most part in masonry, frequently domiciling itself in bungalows and outhouses. I have received many with the report that they were found in the house. Mr. Reid tells me that in Behar, where it is common, it frequents buildings and old walls. I once had one sent to me

that had fallen into a well in the compound, having probably fallen from the masonry. One received this year was found at night in the bedding of one of the Gurkhas encamped on granite hill, Almora. This like other kukri snakes is of course harmless, but a specimen in Bannu was responsible for the death of a sepoy. I am indebted to Captain Sumner, I.M.S., for the details of the incident. It appears that the sepoy with others was on duty at Kurram Garti (8 miles from Bannu) and under canvas. He came off sentry at about 11 p.m., removed his uniform, and laid down on his bed on the ground. He jumped up immediately rubbing his buttock, and declared that something had bitten him there. His companions searched his bedding, and there found a snake which they killed. They examined him, but could see no signs of a bite and tried to persuade him, though without success, that he had not been bitten. The next morning he did not get up, and his companions could not rouse him. The Hospital Assistant was sent for and found him comatose. He did what he could for him, and sent him in a dhooly to Bannu, but he expired on the way. Captain Sumner here examined the body, and could find no local signs of the bite, and was much perplexed as to the cause of death. The snake was put into a bottle, and kept in the hospital, and when I heard of the case I wrote to Lt.-Col. Magrath in Bannu, who sent me the specimen. To my surprise I found the author of the mischief was a common kukri snake, 1 foot 7½ inches long. It seems to me that the man must have died of fright, believing himself bitten.

*Disposition.*—I do not consider it a malicious snake, though it will sometimes menace, or even inflict a bite when molested or its liberty is jeopardised. I have had many alive, picked up several in their natural haunts, and had more than one in captivity. Some showed great timidity, others faced round pluckily and menaced or struck without inflicting an injury, or more rarely actually bit me. Russell had one that he brought face to face with pigeons and chickens, but which he could not induce it to bite.

*Habits.*—It is an active and voracious little reptile, easily taking alarm, and hastily attempting concealment. It is often wonderfully adroit in evading swift movements directed towards seizing it by the neck, and has made me realise how cautious one should be in attempting the capture of poisonous snakes in this manner.

I have seen it inflate its body to a remarkable degree under the influence of excitement. It was noticed that the expansion affected a length of the body considerably in excess of the limits of the lug, for it was observed to reach to the 13th cross-bar. Subsequent dissection showed the lug ended at the 11th cross-bar. In addition to this inflating effort, some specimens may be observed

to flatten the posterior part of the head on to the ground by the action of the quadrates, and in so doing they make the neck much more apparent than normal. I have nearly always encountered it in motion in broad daylight, but some specimens I have had sent to me were killed in bungalows after nightfall. It climbs with facility as do most snakes that have their ventrals angulate, this condition approximating to that of the true keeled condition seen in the tree snakes *Dendrophis* and *Chrysopelea*. Two were discovered in Fyzabad, evidently a pair, in the act of scaling a mud wall, another fell off the top of a doorway in Berhampur on to a lady when opening a godown. The situation, some six feet from the floor, was a remarkable one for any snake, and an inspection of the place gave no clue to its probable path of ascent. It is more frequently met with in the rains than at other times during the year.

*Food.*—I have but rarely found anything in the stomach. A specimen killed in Almora contained two sausage-shaped gristly masses of a yellow colour, the nature of which I could not ascertain as the material appeared to have no structure. With these was the flaccid envelope of a snake's or lizard's egg, which had been extensively perforated at both poles. On another occasion I found a plug of hair in the cloaca of considerable proportions. This taken with the choice of an abode about habitations leads me to think that it preys chiefly upon mice.

*The Sexes.*—In Fyzabad out of 15 sexed, 8 proved to be ♂ and 7 ♀. In Almora of 12 sexed, 9 were ♂ and only 3 ♀. The female has a relatively longer body, and shorter tail as might be inferred from the difference in the ventrals and subcaudals in the sexes. There appears to be little, if any, difference in the growth of the sexes, for although my two largest records of two feet were both females, I have had males 1 foot $10\frac{3}{4}$ inches and 1 foot $11\frac{3}{4}$ inches.

*Breeding.*—The mating season in the plains is during the rains. I have on two occasions—both in Fyzabad—acquired gravid females, but both unfortunately were killed. One contained 5 eggs of very considerable dimensions, the largest measuring $1\frac{8}{20} \times \frac{7}{20}$ inches. There was no trace of an embryo within. My second gravid specimen obtained like the first in August had 4 impregnated ovarian follicles enlarged to $\frac{13}{20}$ of an inch. In the latter case a ♂ was killed at the same time, both snakes being discovered within a couple of yards of one another scaling the same wall. This adds another instance to many already mentioned in these papers, to show that the matrimonial bond does not abruptly cease after sexual gratification. The smaller gravid ♀ measured 1 foot $9\frac{3}{4}$ inches, a length which I estimate would be attained by the end of the fourth year of life. It is not known for certain whether this species is

oviparous though this is probably the case. My youngest specimens which I took to be hatchlings measured 6½ and 6⅝ inches in April, 7½ and 7¾ inches in May and 7¼ and 7¾ inches in July. It is probable, therefore, that the breeding season embraces three or four months of the year.

*Growth.*—From my records of length it appears that the young grow some 4 to 5 inches in their first year, and 3 to 4 inches in the second, third and fourth years of life.

*Distribution.*—Peninsular India and Ceylon. In India it extends north to the Himalayas and East and West to the outside limits of the territory drained by the Ganges and Indus Rivers. To the North-East it appears to be limited by the Teesta River, at any rate I can find no record East of this river excepting the Sikkim one to which I will refer again.* To the North-West it ranges to the Frontier, but there is no record of its occurrence in the Indus system further South, *viz.*, in Rajputana and Sind, and it is quite likely that it does not extend into these Provinces.

It is for the most part a snake of the plains, but is common in Almora at 5,400 feet, so that one may suppose it occurs in other hills up to about 6,000 feet. I have had it from the Himalayas as far West as Bakloh (4,500 feet). There are specimens from Nepal in the British Museum, with no altitude specified, but I discredit the locality of the specimen in the same institution said to be from Sikkim.† Nicholson mentions it from Bangalore (circa 3,000 feet) in Southern India, and there are examples in the British Museum from the Anamallays, altitude not specified.

I found it a common snake in the United Provinces. Mr. Reid tells me it is common in Behar, and Mr Muir says it is fairly common in Bengal (Kalna). Jerdon reports it rather common in Southern India, and Haly in the low country in Ceylon. In the last locality it does not appear to have been collected at a greater altitude than Kandy (circa 1,600 feet).

The precise localities known to me are set forth in the accompanying map.

*Lepidosis.*—*Rostral*—Touches 6 shields, the rostro-internasal sutures being equal to, or rather longer than, the rostro-nasal; the portion visible above equal to or little less than its distance to the

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* Mr. W. A. Jacob, I.F.S., has collected assiduously in the Jalpaiguri District, East of Teesta, for some years and has given me a list of 29 species he has found there. This does not include *armensis*. The fauna of this District agrees with that of Assam as remarked upon by me in a previous paper in this Journal (Vol. XIX. p. 897).

† As already stated I can find no record other than this one from East of Teesta; and here, I may remark, that I have examined at least 1,200 snakes from various altitudes in Sikkim, but never seen *armensis*. It is a very significant fact too that Messrs Von Schlagintweit from whom this record emanates are also responsible for the records of *Eryx conicus*, and *E. johni* from Sikkim, both of which are discredited by Mr. Boulenger (*vide* Catalogue, Vol. I, pp. 124 and 128).

frontal. *Internasals.*—A pair, the suture between them equal to, or rather less than that between the præfrontal fellows, less than half the internaso-præfrontal sutures. *Præfrontals*—A pair, the suture between them less than (about half) the præfronto-frontal sutures, touching the internasal, postnasal, loreal, præocular and supraocular.

*Frontal.*—Touches 6 shields, the sutures subequal, or supraoculars rather longest. *Supraoculars.*—Length less than the frontal, breadth about half the frontal opposite the middle of the eyes. *Loreal*—Single, very small, about half the length of the nasals, rarely absent. *Præocular.*—One, not reaching the top of the head. *Postoculars.*—Two *Temporal*—One. *Supralabials*—7, the 3rd and 4th touching the eye. *Infralabials*—5, the 5th largest, and in contact with two scales behind; 4th and 5th touching the posterior sublinguals. *Sublinguals.*—Two pairs; the anterior rather larger. *Costals.*—Two headslengths behind the head 17, midbody 17, two headslengths before the vent 15. The reduction of rows is caused by a disappearance of the 4th above the ventrals, which is usually absorbed into the 3rd (more rarely the 5th). Apical pits and keels absent.

*Ventrals.*—These vary with the sex. In the ♂ 170 to 186, in the ♀ 180 to 199; somewhat angulate laterally. *Anal*—Divided. *Subcaudals*—Divided, varying in number with sex. In the ♂ 48 to 59, in the ♀ 41 to 50.

*Anomalies.*—Sometimes a fragment is detached from the parietal to form a pseudo-temporal. The loreal is rarely absent. In one instance where I found it so the præfrontal touched the 2nd and 3rd supralabials. It is not very unusual to find the 6th supralabial failing to come to the labial margin, but wedged between the 5th and 7th shields (*see* figure B (*a*) of our Diagram). I have once seen the 6th and 7th supralabials completely confluent. Only the infralabials occur somewhat commonly. I have seen one specimen with the anal entire, and another in which the 4th, 6th and 7th subcaudals were entire.

*Dentition.**—The *maxilla* supports from 8 to 11 teeth markedly syncranterian in type, the posterior especially being highly compressed and bladelike. There is an edentulous space in front that would accommodate 3 or 4 teeth. The *palatine* has an edentulous space anteriorly, that might take two teeth, and a much longer space posteriorly. In the middle there are from 3 to 6 teeth. The *pterygoid* has an edentulous space in front behind which are from 6 to 18 teeth (6 to 11 in Almora specimens, and 15 to 18 in a Fyzabad example). The *mandibular* array number 13 to 14, which are small and subequal.

Our plate is good. Many specimens, however, show the bars even more clearly outlined with yellow, and it is not usual for the bars to pass as low in the flanks before disintegrating. The first head

* Taken from 3 skulls in my collection.

mark is not usually so sagittate as represented. Figure 1 (*b*) shows the somewhat unusual ventral maculation.

## *SIMOTES ALBOCINCTUS* (CANTOR.)

### THE LADDER BACK OR LIGHT-BARRED KUKRI SNAKE.

*History.*—Dr. Cantor is responsible for our first introduction to this snake, which he described in the year 1839. It has been confused with several others of the same genus by past authors, partly on account of the great similarity in lepidosis shown by many of the allied forms, and partly owing to the great variability in the colour and markings of many individuals of what are still held to be but one species. Blyth in 1854 remarked on the variability of this species, but as he refers to specimens from Southern India and Ceylon, we may presume that *arnensis* was at least one of the forms to which he alluded. Even, as late as 1894, Mr. Boulenger recognised these varieties in his Catalogue. One of these, *viz.*, Var C., I think, I have shown in (Vol. XX of this Journal, p. 162), is entitled to rank as a distinct species which I have named *juglandifer*. Besides the very distinctive dorsal marks shaped like walnut kernels, or the quadruple spots placed crosswise and the complete absence of light bars, such as are seen in *albocinctus* it shows a short edentulous space in front of the palatine, that does not occur in *albocinctus*.

*Nomenclature*—(*a*) *Scientific.*—The specific name is derived from the Latin "albus," white, and "cinctus," a belt, but is not altogether satisfactory, as the marks referred to are dorsal bars and not belts.

*English.*—The regularity of the bars on the back, and the wonderful uniformity in spacing remind one of a ladder and suggested the name "ladder back," but perhaps the "light-barred kukri snake" may appeal more to some.

*Vernacular.*—The only name I am acquainted with is "sar-vul-saw" which Captain Venning (Vol. XX, p. 335 of this Journal) tells us is applied by the natives in the Chin Hills, Upper Burma, to this as well as to the snakes *Coluber porphyraceus*, and *Callophis macclellandi*, all by the way reddish snakes.

*Identification.*—Attention must be directed to the sutures between the internasal and præfrontal fellows, to which I have already referred in discussing the identification of *arnensis*. The following combination of characters will separate the "ladder back" from other kukri snakes except *juglandifer* :—(1) Costals 19 in midbody, (2) anal entire, (3) a single temporal. The bars across the back of *albocinctus* are very distinctive, and no trace of them is to be seen in *juglandifer*.

*General characters.*—The body is cylindrical, smooth, stout, and

rather short, and the skin as in other kukri snakes is not nearly so loose as in most colubrines and vipers. The belly is angulated at the sides. The head is short and broad, and the snout subtruncate. There is no indication of a canthus, and the head even at the back is barely broader than the neck. The nostril is open, and placed between two shields. The eye is of moderate size with round pupil and a yellow iris. The tongue is reddish at the base and black at the tips. The tail is compressed at the base and short, accounting for about one-fifth to one-sixth the total length.

*Colouration.*—Though Blyth has remarked on the variability of the snake, and other writers have recognised three, and even four varieties, my experience—I have examined over fifty specimens—shows that it is variable in its general colouration, but wonderfully constant, and distinctive in its markings. The ground colour is brown of various tones, but often more or less strongly tinged with purplish or red. In some the hue is much the same as in a cigar, in others it is like raw beef, and in others again berry-red, and even lobster-red. In the ruddy specimens the underlying hue is usually a lobster-red, which on close inspection will be seen at the bases and edges of the scales. A suffusion of brown on the rest of the scale tones down the general colour, which is always however most vivid in the flanks. Rarely there is no suffusion of darker tones, and the specimen is uniform lobster or salmon-red.

The back is crossed by bars which differ from those seen in *arnensis*, in being light centrally, and heavily bordered with black. These bars which number from 17 to 25 on the body and 4 to 8 on the tail are seen at wonderfully regular intervals in the whole length of the snake, and they involve two or three scales in the body length, the intervals involving from five to eight. Each bar is of uniform width, and extends well into the flanks, its central zone blending with the light underparts. The light central zone may be whitish, greyish-white, grey, or pale yellow, the last hue being often seen in the berry-red examples. In some specimens some rather obscure longitudinal striping may be observed just as one sees in *S. cyclurus*, and some of the other species. When present this consists of a dark band about five scales broad which passes down the middle of the back, and a narrower similar band on the 3rd and 4th scale rows above the ventrals.

The head is pale greyish or yellowish and bears the usual three marks which are so characteristic of the kukri snakes. In the lobster-coloured specimens the marks are white. There is a great tendency for some or all of these marks to be disintegrated and more or less confluent, as will be seen in figure 2 (*a*) of our Plate, where the median sagitta is much broken up, and its isolated central macula is confluent with the apex of the nuchal sagitta. In many

specimens one sees a light black-edged stripe on the nape, the edges of which may be parallel as in our Plate, or more or less U shaped. The belly is pearly-white, or in the ruddy specimens more or less mottled with pinkish, and is always spotted or mottled with dark tones. Usually there are squarish spots just within the angulation of the ventrals, and arranged with a tendency to miss each alternate or third shield. These spots may be discrete, and distant, or united by a band passing across each ventral, as seen in figure 2 of our Plate.

A solitary specimen collected by Theobald in the Arakan Hills was made the type of a distinct species (*amabilis*) by Günther. It is, however, considered by Mr. Boulenger only a variety of *albocinctus*, differing only in having more numerous bars, *viz.*, 55, with correspondingly shorter intervals, involving from 3 to 4 scales.

*Dimensions.*—The average length of an adult is about two to two-and-a-half feet. My largest example taped exactly three feet.

*Haunts, Habits, etc.*—I have seen very few specimens in life, nearly all having been spirit specimens. As nearly all of these came from Tea Estates in Assam, or in the vicinity of Darjeeling, I may safely infer that this kukri snake is commonly to be met with in the day-time among the tea bushes during plucking operations. Two specimens at least were killed actually inside a bungalow in Dibrugarh. I know nothing of its disposition.

*Food.*—I found a mass of soil in the stomach of one, mixed with grits, shreds of vegetable fibre and two longish hairs, which I can only suppose were swallowed during its death throes, the scene being perhaps a stable floor. On the other few occasions, where I have found the stomach full, a mouse had furnished the repast. In one case the tail only was discovered, and the quarry must have made its escape.

*The Sexes.*—In the neighbourhood of Darjeeling the ♂ appears to be much more abundant than the ♀. I having had no less than 23 of the former to 14 of the latter sex. The tail is longer in the ♂, as may be inferred from the numbers of subcaudals, *viz.*, 61 to 68, compared with from 42 to 57 in the ♀. There is also some slight difference in the relative lengths of the body in the sexes, but this is not so obvious from the ranges of the ventrals, which number from 181 to 199 (177, Boulenger) in the ♂, and from 182 to 206 in the ♀.

*Breeding.*—My only note bearing on this subject is to the effect that a ♀ killed on the 10th of July in Dibrugarh was found with three impregnated ovarian follicles measuring from $\frac{3}{8}$ to $\frac{5}{8}$ of an inch. The specimen measured 2 feet 5¼ inches, but the tail was imperfect, and accounted for only 4 inches of that length.

*Distribution.*—The light-barred kukri snake has a more restricted range of distribution than most of the snakes dealt with in

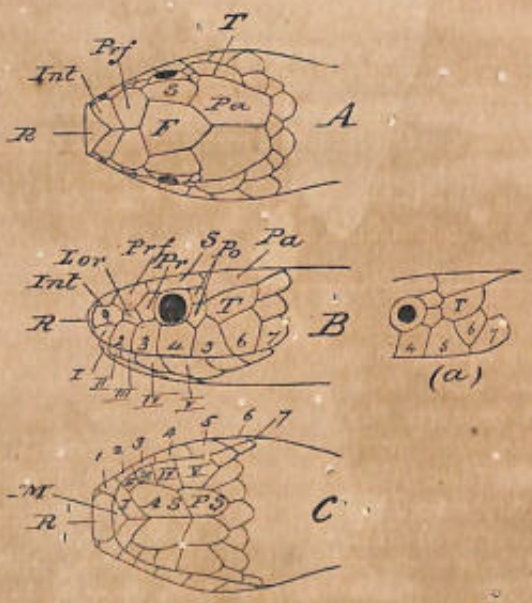
these papers, but is so common within that area that it deserves mention in the series. It inhabits the Assam Hills and plains ranging North into the Eastern Himalayas, and East to the conterminous ranges bounding the North and West of Burma, *i.e.*, the Kachin Hills, Manipur Hills, Chin Hills and Arakan Yomas. Its probable Western limits are the Teesta and Brahmaputra Rivers. The exact localities known to me are given in the accompanying map, but I have not been able to include the many places referred to in Sclater's list of the snakes in the Indian Museum, as it is impossible to tell from this list what are specimens of true *albocinctus* and what may be *jugbandifer*.

It appears to be a Hill snake, at any rate it is much commoner in most of the Hills within its habitat than it is in any part of the plains. In the Eastern Himalayas it is a very common snake between the plains and 5,000 feet elevation, but, although Mr. D'Abreu got one in Kurseong at 6,000 feet, it rarely ascends to to this altitude. At Buxa Dooars (1,200 to 1,500 feet) I found four specimens in a collection of twenty-two. Mr. Jacob has collected several in the plains at about the 350 feet elevation in the Jalpaiguri District. It was not a common snake about Dibrugarh but I got a few there. It is known from the Khasi Hills, but out of 335 snakes collected in Shillong at 4,900 feet I failed to get one specimen. In the Chin Hills Mr. Venning has met with it up to 6,500 feet.

*Lepidosis.—Rostral.*—Touches 6 shields, the internasal sutures equal to or rather longer than the anterior nasals; visible portion above equals, or nearly equals its distance to the frontal. *Internasals.*—A pair, the suture between them equals or nearly equals that between the prœfrontal fellows less than half the internaso-prœfrontal suture. *Prœfrontals.*—A pair, the suture between them half or less than half the prœfronto-frontal suture; in contact with internasal, postnasal, loreal, prœocular and supraocular. *Frontal.*—Touches 6 shields, the sutures are subequal, or those made with the supraoculars rather largest. *Supraoculars.*—Length rather less than frontal, breadth half or less than half the frontal opposite the centres of the eyes. *Nasals.*—Quite divided, in contact with the 1st and 2nd supralabials. *Loreal.*—One. *Prœocular.*—One. *Postoculars.*—Two. *Temporal.*—One. *Supralabials.*—7, the 3rd and 4th touching the eye. *Infralabials*—5, the 4th and 5th touching the posterior sublinguals, 5th largest, and in contact with two scales behind. *Sublingual.*—Two pairs, the anterior rather the larger. *Costals.*—Two headslengths behind the head 19, midbody 19, two headslengths before the vent 15 (rarely 17); no apical pits; no keels. *Ventrals.*—Angulate laterally; 177 to 199 in the ♂, 182 to 206 in the ♀. *Anal.*—Entire. *Subcaudals.*—Divided, 61 to 68 in the ♂, 42 to 57 in the ♀. *Anomalies.*—The

commonest abnormality is to find 8 supralabials, the 4th and 5th touching the eye. I have seen the præocular divided once, also the 2nd supralabial divided once. In Evans's specimen the loreal and præfrontals were confluent. The costal rows reduce sometimes only to 17 posteriorly. I have seen the 3rd and 4th subcaudals entire in two examples.

*Dentition.*—The *maxilla* has 10 or 11 teeth rapidly increasing in length from before backwards. The *palatine* supports 8 to 10 subequal teeth (7 on one side in one specimen), and there is no edentulous space anteriorly.* The *pteryoid* teeth number from 16 to 19, and are subequal, and much smaller than the palatine. The *mandible* bears from 13 to 10 subequal teeth. Our Plate is good in every way, but perhaps it was a pity that a specimen for painting was selected that exhibited abnormal supralabials.




Simotes arnensis.
( × 1½ )

* In this respect it differs from *juglandifer* where a space is seen anteriorly that would take one tooth. The teeth in 3 skulls of *juglandifer* number 7 (6 on one side in one specimen).

Map to show distribution of *Simotes arnensis* in red, *Simotes albocinctus* in grey.

..... lines shown thus, imply boundary doubtful

LOCALITIES IN MAP SHOWING BY FIGURES DISTRIBUTION OF

*SIMOTES ARNENSIS.*

(1) Ceylon (Haly and Bo. M.), (2) Travancore (Bo. M. and Ferguson), (3) Nanamallays (B. M.), (4) Bangalore (Nicholson), (5) Arni (Russell), (6) Madras (B. M.), (7) Hyderabad (Bo. M.), (8) Vizagapatam (Bo. M.), (9) Aska (I. M.), (10) Berhampur (F. W.), (11) Chanda (Bo. M.), (12) Singbhum, (I. M.), (13) Kalna (F. W.), (14) Serampur and Bankura (I. M.), (15) Calcutta (I. M.), (16) Kaliganj (I. M.), (17) Purneah (I. M.), (18) Champaran (F. W.), (19) Muzzaffarpur (I. M.), (20) Nepal (B. M.), (21) Almora (F. W.), (22) Fyzabad (F. W.), (23) Allahabad (I. M.), (24) Nowgong (I. M.), (25) Bakloh (F. W.), (26) Lahore (F. W.), (27) Bannu (F. W.), (28) Deesa (B. M.), (29) Bombay, Bassein, Kalyan, Karwar (Bo. M.) and (30) Poona (B. M.)

B. M., implies British Museum, I. M., the Indian Museum, Bo. M., our Society's collection, F. W., the author.

LOCALITIES IN MAP SHOWING BY LETTERS DISTRIBUTION OF

*SIMOTES ALBOCINCTUS.*

(A) Darjeeling and vicinity (F. W.), (B) Buxa Dooars (F. W.), (C) Jalpaiguri (F. W.), (D) N. Lakhimpur (F. W.), (E) Dibrugarh (F. W.), (F) Sadiya (F. W.), (G) Sadon, Kachin Hills (Evans), (H) Jaipur (F. W.), (J) Khasi Hills (B. M.), (K) Cherrapunji (Gunther), (L) Haflong, N. Cachar Hills (F. W.), (M) Manipur (F. W.), (N) Chin Hills (Venning), (O) Arakan Hills (B. M.).

B. M. implies British Museum, F. W. the author.

# NOTES ON INDIAN BUTTERFLIES—(*continued*).

By

Captain W. H. Evans, R.E.

8. Occurrence of **Mycalesis (Mydosama) fuscum. Fd.** at Myitta, Tavoy. Mr. O. C. Ollenbach has recently sent me a specimen of this insect caught in March 1912. A description is given of the species in a footnote on page 132 of De Nicéville's "Butterflies of India," vol. 1. *Fuscum* was placed by Moore in his genus *Mydosama*, which is closely allied to *Nissanga*, containing the Indian Junonia, etc. Fruhstorfer places it in his Group III along with *perseus*, *malsara*, *mestra*, etc., all of which have similar male secondary sexual characters. The butterfly was described from the Malay Peninsula and has since been found in Java, Sumatra, Borneo, Banka and Nias. Mr. Ollenbach's specimen is a female; above it is rather pale-brown, darker basally; the lower median ocellus on the forewing and all the ocelli on the hindwing show through prominently and are surrounded by bright fulvous rings, though obscurely so on the forewing. Below the ground colour is pale yellow-brown with a slight fulvous tinge; across both wings there is a prominent narrow bright ferruginous sub-basal band followed by a similar postdiscal band, also the ends of the cells are obscurely outlined in the same way: the postdiscal band on the forewing is curved outwards at the lower end near the dorsum, on the hindwing it follows the curve of the ocelli to which it is adjacent. Beyond the postdiscal bands the outer area is paler; there are two small apical and one large median ocellus on the forewing, whilst on the hindwing there are seven ocelli of exactly equal size, except for the anal pair, which are smaller. The outer marginal lines are sharply defined and similar in arrangement to that prevailing all representatives of the genus. In size and shape the insect resembles female of *mineus* or *malsara*.

9. Changes and corrections in the list of Indian butterflies. Since the list was published (J. B. N. H. S. XXI, 982), Swinhoe has progressed rapidly with *Lepidoptera Indica* and the work is now nearly completed; Fruhstorfer has nearly reached the end of the *Nymphalidæ*; and there are a few mistakes in the original list, which require correction. I give Fruhstorfer's races for what they are worth; the validity of some of them seem doubtful, but I have not sufficient material in my own collection to give an opinion.

(1) **Hestia jasonia, Wd.** Fruhstorfer names ab *diabolica* a form with the underside suffused dark-brown. He suggests that *jasonia* is a race of the Malayan *lynceus*, Drury.

(2) **Danais melaneus, Cr.** Fruhstorfer names the dry season form *neopatra*.

(3) **Danais plexippus, L.** Fruhstorfer calls a light yellow dry season form from Sikkim and Annam *grynion*.

(4) **Euploea harrisi, Fd.** Fruhstorfer names ab *discalis* from Assam, with a blue cell spot and 5 discal spots on the forewing and two normal rows of white spots on the hindwing.

(5) **Euploea klugii, M.** In the appendix to the *Danainæ* Fruhstorfer places *leucostictos*, Gmelin, and its races as races of *klugii*.

(6) **Euploea diocletiana, Fab.** Fruhstorfer gives the name *despoliata* to specimens with no transcellular spots.

(7) **Melanargia halimede, Men.** Fruhstorfer gives the name of the genus as *Arge*, Hub. on the ground of priority. From Birgham's figure he considers that the Indian form is nearest to the race *montana*, Leech, but in size it is nearer *leda*, Leech.

(8) **Orinoma damaris, Grey.** Fruhstorfer names race *harmostus* from Tandong, Tenasserim; smallers spots lighter, yellow cell spot larger.

(9) **Aulocera swaha, Koll.** Fruhstorfer divides this into three races; *swaha* from Kashmir with a narrow light yellow band above, this band being white below; *garuna*, Fruh. from Kulu with a wider band, always yellowish, especially below; *tellula*, Fruh. from Mardan, N. W. F. Province, intermediate between the other two, but above the band on both wings is uniform straw colour, whilst in the other forms the darker yellow of the forewing contrasts with the much paler colour of the band on the hindwing. My own experience of *A. swaha* is that the form that flies in Chitral agrees closely with that found in Simla; in the interior of Kulu, etc., however, there flies a form with a much darker yellow band above which may perhaps be called *garuna*. Fruhstorfer appears to have received many butterflies from Mardan, "collected by officers of the garrison"; as many of these have only been found by other people at much higher elevations, there would seem to be some mistake about the locality.

(10) **Epinephele cheena, M.** The Western race, *kashmirica*, M., from Chitral and Kashmir deserves to be separated; it is much smaller and duller, the underside is paler and the discal band on the forewing is straighter and less prominent.

(11) **Erites argentina, But.** I gave the Indian race as *ines*, Fruh. Its occurrence in Indian limits is very doubtful, though Moore stated that he had received a specimen from Adamson. It should be removed from the Indian list, as there appears to be no other record of its capture nearer to India than Singapore.

(12) **Lethe confusa, Aur.** The name of the Eastern race should be *gambara*, Fruh., not *gambara*.

(13) **Lethe minerva, Fab.** The typical form flies in Java; all Indi specimens belong to the race *tritogeneia* Fruh. (not *tritogenia*).

(14) **Lethe mekara, M.** Fruhstorfer names the spring form *vajra*. describes the Tonkin race as *crijnana*, stating that it probably occurs Tenasserim; it differs from the typical form in lacking the discal sil bordering of the very narrow dark-brown median areas of both wi thus forming a link to the Macromalayan races.

(15) **Lethe gulnihal, DeN.** Fruhstorfer separates pale specimens from Saipha, Upper Burma, as *issa*.

(16) **Lethe sidonis, Mar.** Dry season form *gelduba*, Fruh.

(17) **Lethe balacava, M.** The name of the Kumaon race should be *aisa*, Fruh. not *asia*.

(18) **Ypthima newara, M.** The name of the Eastern race is *sarcaposa*, Fruh., not *sarcoposa*.

(19) **Melanitis phedima bela, M.** The small pale form from the Western Himalayas deserves to be separated = *phedima galkissa*, Fruh.

(20) **Melanitis zitenius, Herbst.** Fruhstorfer names ab *decolarata*, a dry season form with no yellow band.

(21) **Elymnias hypermnestra undularis, Drury.** Fruhstorfer names female ab *paraleuca*, with a white hindwing.

(22) **Elymnias malelas, Hew.** Fruhstorfer names female ab *subdecorata*, with a white submarginal band.

(23) **Clerome, Wd.** Fruhstorfer changes the name to *Faunis*, Hub., and includes in this genus *Melanocyma*, Wd. *Faunis* certainly ought to be adopted on the score of priority; *Melanocyma* might be retained as a subgenus.

(24) **Zeuxidia doubledayi, Wd.** The typical form was described from Borneo; the continental race is named *chersonesia*, Fruh.

(25) **Amathusia phidippus, Joh.** The type was described from Java; Fruhstorfer names the continental Indian race *friderici*.

(26) **Discophora celinde continentalis, Stdg.** Fruhstorfer states that *celinde*, Stoll, is a Javan insect, specifically distinct from the Indian *continentalis*. The latter was described from Sikkim and the Tonkin race is *seminecho*, stich, which Fruhstorfer thinks is probably the form occurring from Upper Burma to Tenasserim. *Celinde* has no small yellow scent patch in a bare space on the internal nervure of the hindwing, which is always present in *continentalis*. *Seminecho* differs from *continentalis* in having a curved series of crescentic spots, dull yellow, running from the costal spot beyond the cell as a submarginal band.

(27) **Discophora tullia, Cr.,** was described from South China. Fruhstorfer states that the oldest name for the North Indian form is *zal*, Wd., the wet season form being *indica*, Stdg. Specimens with no blue spots on the forewing above are *despoliata*, Stich. Stichel has named the South Indian race *muscina*; it was discovered at Karwar, North Kanara, by Davidson, Bell and Aitken (J. A. S. B. 1900). Fruhstorfer gives a complete description of *muscina*, but does not say how it differs from *continentalis* from North India.

(28) **Discophora lepida, M.** Stichel has named the wet season form *significans*. Fruhstorfer separates the Ceylon race as *ceylonica*: the main difference is that in the females the subapical pale band on the forewing above is broken into spots.

(29) **Cyrestis thyodamas, Bdl.** The yellow variety flying in the Himalayas with the typical form is *ganescha*, Koll.; it may occur in either sex but more commonly in the female.

(30) **Cyrestis periander, Fab.** The typical form is confined to Siam, and all Indian specimens belong to the larger race *binghami*, Martin; the difference, however, is trifling.

(31) **Cyrestis cocles, Fab.** This species occurs in three forms; *coeles* was described from Siam and is an intermediate form, outwardly dark; *natta*, Swin., described from Assam, is the darkest form with sepia bases; the pale form was described as *earli* by Distant from the Malay Peninsula; the three forms are connected by intermediates. Andaman specimens only differ in being larger; an intermediate form between *earli* and *cocles* was described by Felder as *formosa*: the pale form is *andamanica*, Wm. and DeN.; the dark form does not seem to occur. In Assam the *cocles* and *earli* forms appear to fly together in the autumn, while the *natta* form occurs by itself in the earlier months of the year, April and May.

(32) **Cyrestis risa, Db.** Martin has named the larger, darker spring form *transiens*.

(33) **Junonia iphita, Cr.** Fruhstorfer separates the race from South India, Ceylon and the Maldive Islands as *pluviatalis*, stating that it is darker and lacks the paler margin of the typical form.

(34) **Junonia lemonias, L.** It is rather difficult to follow Fruhstorfer's treatment of this species. *Lemonias* is the wet season and *aonis*, Cr., the dry season form from the Himalayas to Burma. *Persicaria*, Fruh., is said to be a small form occurring at all seasons and in Fruhstorfer's collection from Cashmere, Ceylon and Siam; *vaisya*, Fruh., is a form said to occur in Bombay and Luzon. From the letterpress it is not clear how the last two forms are defined or whether they are races or varieties; *persicaria* may be a variety with a peach coloured underside and *vaisya* the small form.

(35) **Junonia orithyia, L.** Fruhstorfer confines *orithyia*, the larger race, with the blue apical spot on the forewing small, to China, and calls the race flying from Sikkim to Tenasserim *ocyale*, Hub., the wet season of which he names *phycites*. He separates off two further races from the

Indian region, *viz.*, *swinhoei*, But., from Baluchistan to the N. W. Himalayas, always with a stone-coloured underside and *patenas*, Fruh., from Ceylon, with a much dwarfed wet season form. He does not say what we are to call the South and Central Indian form. He also states that in Baluchistan *swinhoei* gradually merges into *ocyale*; this is strange, as from his statement of the distribution of the two races their meeting place should be somewhere between Kumaon and Sikkim.

(36) **Vanessa indica, Herbst.** The Ceylon race is *nubicola*, Fruh., which differs from *indica* in that the outer margin of the hindwing is comparatively much more broadly black. South Indian specimens are intermediate and are called *pholoe* by Fruhstorfer.

(37) **Vanessa antiopa, L.** Indian specimens are stated to agree best with the race from Siao Lou, *yedanula*, Fruh., as the yellow border is dusted with black.

(38) **Vanessa cashmirensis, Koll.** This is the Kashmir form; Fruhstorfer separates the race flying from Simla to Sikkim as *æsis*, differing in having the yellow submarginal zone above shaded with black.

(39) **Vanessa v-album, Fab.** Fruhstorfer says that this should be called *l-album*, Esp.

(40) **Yoma sabina vasuki, Doh.** The typical form has broad white bands below; specimens with black fungiform spots on these bands are *atomaria*, Fruh., those with no bands are *sabulosa*, Fruh., small; rich yellow specimens with yellow, not grey, undersides are *javana*, Fruh.

(41) **Hypolimnas bolina, L.** Wet season males are *bolina-liria*, Fab.; specimens with two rows of marginal white dots are *ornamentalis*, Fruh. Dry season males with no white are *charybdis*, But.; specimens lacking the light border and median area below are *luctuosa*, Fruh.; if the striation on the underside is irrorated with violet, we have *subviolacea*, Fruh. *Jacintha*, Drury, are females with no blue on the forewing and broad cream borders on the hindwing; *æria*, Fab., are females with a blue suffused forewing; *egna*, Fruh., are small females of the dry season form with a double anteterminal row of white spots and a narrow pale violet to dark-blue transverse band.

(42) **Kallima inachus, Bdl.** The Western Himalyan race is *huegeli*, Koll., described from an extreme dry season form from Kashmir; *boisduvali*, M., is the wet season form and *buckelyi*, M., an intermediate form from both from Kashmir; *huttoni*, M., and *atkinsoni*, M., are wet season forms from Mussoorie. As *inachus*, Fruhstorfer designates the race that flies from Nepal to Tonkin, *inachus* itself being a dry season form; *ramsayi*, *iisa*, M., is the wet season form described from Nepal. As varieties based on the undersides he names *foliacea*, all pale-grey; *siccifolia*, with black midrib and veins; *marmorata* yellow clouded red-brown and *uredinophora*, with black fungiform spots. *Limborgi*, M., he treats as a distinct species, much darker and with the outline of the wing very rounded; its distribution is from Upper Burma to South Tenasserim. The predominating underside variety of *limborgi* is "beautiful red-brown," *acerifolia*, Fruh.; *foliacea* and *uredinophora* also occur. He states that all the underside varieties occur in the South Indian *horsfieldii*, Koll., except *marmorata*; in the Ceylon race *philarchus*, Wd., *foliacea* and *uredinophora* predominate, while *acerifolia* occurs rarely.

(42) **Kallima alompra, M.** Fruhstorfer separates this as a species with *knyvetti*, Den., as a race.

(44) **Terinos clarissa, Bdl.** This was described from Java and the Indian race is *malayana*, Fruh.

(45) **Cynthia erota, Fab.** The dry season form is *pura*, Swin. = *circe*, Fawcett. A variety of the female just like the male is named *auricoma*,

Fruh. A variety of the wet season form with an extra eye spot on the hindwing is *triocellata*, Fruh.

(46) **Cirrochroa bajadeta, M.** Fruhstofer states that the oldest name for this species is *emalea*, God., and that the Indian race should be so named; the dry season form is *martini*, Fruh. *Bajadeta=ravana*, M., is the Javan race of *emalea*.

(47) **Cirrochroa mithila, M.** This is placed as a race of *tyche*, Fd., from the Philippines.

(48) **Cirrochroa aoris, Db.** *Jiraria*, Swin., is the dry season form. *Stramentica*, Fruh., is a wet season form with a straw coloured zigzag band on the underside.

(49) **Argynnis maia, Cr.** The Indian form probably belongs to the eastern race *pasarygades*, Fruh.

(50) **Argynnis aglaia, L.** Fruhstorfer names the dark race occurring at low elevations in Chitral *yopala*. I have already given this form the name *ashretha*,(J. B. N. H. S. XXI, 982); the description of *ashretha* was published on March 31st, 1912, and of *yopala* on April 11th, 1912, so the name *ashretha* will stand.

(51) **Argynnis adippe, L.** Fruhstorfer describes a new race, *mohmandorum*, from the border between Afghanistan and the North-West Frontier Province; it is said to be larger and darker.

(52) **Argynnis pales, W. V.** The small pale form from Kashmir and Kulu is *sipora*, M.; of *baralacha*, M., Fruhstofer merely says "separated by Seitz." The large form from Afghanistan and Ladak usually called *generator*, Stdg., is said to be nearer to *korla*, Fruh. On account of its variegated underside Fruhstorfer separates the Sikkim race as *cupales*. From the specimens in my own collection I certainly think that the Sikkim race is worth a name.

(53) **Melitæa didyma, Esp.** Fruhstorfer gives as races *chitralensis*, M. from Chitral: *robertsi*, But., from Afghanistan; *persea*, Koll., from Rawalpindi, and *dodgsoni*, GRS., from Baluchistan. I adhere to the opinion given in my list of Indian butterflies that the only *didyma* race flying in India is *chitralensis*, and that the other allied *Melitæas* are races of *trivia*, W. V. In Chitral *didyma chitralensis* and *trivia mixta*, mihi, fly together, and I think that the *trivia* race occurring from the Punjab to Baluchistan should be called *persea*, though it is possible that the Baluchistan form is worth separating under the name *dodgsoni*.

(54) **Ergolis ariadne, Joh.** The nymotypical form is from Java. Fruhstorfer describes the race that flies from the Himalayas to Burma as *pallidior*, differing in being larger and having a fiery red yellow band in the underside of the hindwing. The Southern race is *minorata*, M., described from Ceylon, smaller and with the black lines above more prominent. *Indica*, M., said to occur in Calcutta, Madras and the Nilgiris only differs from *minorata* in being slightly smaller.

(55) **Ergolis merione, Cr.**, was described from the Coromandel Coast and is the form occupying the whole of South India; *taprobana*, M., can only be separated from the typical form as being slightly smaller. *Tapestrina*, M., was described from Dehra Dun and is the race that flies from Simla to Assam; it is distinguished by paleness of the dry season form and the light grey longitudinal bands below. The Burmese form is *pharis*, Fruh.; it is much lighter and more variegated above. Fruhstorfer makes no mention of the small pale form that occurs in the Central Provinces, with a dry season form that is much more variegated than any other specimens of *merione* that I have seen form anywhere in India and Burma.

(56) **Cethosia biblis, Drury.** Fruhstorfer states that *biblis* is Chinese and calls the Indian race *tisamena*; he does not say how *tisamena* differs from

*biblis*. There are three forms of the female; one like the male, a green form, *viridiana*, Fruh., and an intermediate form *mixta*, Fruh., which has the base of the forewing red, the sub-anal area being greenish, and the hindwing with the anterior half red and the basal half green.

(57) **Papilio helena cerberus, Fd.** Jordan calls a variety of the male *eumagos*; on the underside of the forewing there is no pale sub-basal streak behind the cell. The form of female with white streaks on the forewing is *gypsothelia*, Jor., the form without these streaks is *azdia*, Jor.

(58) **Papilio helenus heliconoides, M.** The female with white streaks on the forewing is *aphnea*, Jor.; *rhyparia*, Jor., is the form without these streaks.

(59) **Papilio darsius, Gray.** *Cambyses*, Ehrm, is a variety of the male with black discal spots on the yellow patches on the hindwing.

(60) **Papilio jophon, Gray.** Jordan treats *pandiyana*, M., as a species.

(61) **Papilio coon doubledayi, Wall.** Jordan treats *Cacharensis* as an aberration.

(62) **Papillo fuscus prexaspes, Fd.** Does not occur in India, the only Indian race of *fuscus*, Goetze, is *andamanicus*, Roth., from the Andamans.

(63) **Papilio siateri, Hew.** Fruhstorfer has named a variety with white streaks on the hind wing as *jaintinus*: also ab *cnephas*, a variety of race, *marginata*, Ober., with no white patches on the hind wing.

(64) **Papilio castor, Wd.** Ab *mesites*, Jor., is a variety of the male with white submarginal spots on both sides of the hind wing.

(65) **Papilio machaon asiatica, M.**, ab *pendjabensis*, Eimer, are small specimens of da *ladakensis*, M.

(66) **Papilio demoleus, L.** ab *demoleinus*, Ober., is the name for specimens, which have the red spot on the hind wing separated from the blue lunule by a dark spot.

(67) **Papilio demolion, Cr.** Jordan treats *liomedon*, M., as a separate species.

(68) **Papilio helenus, L.** ab *rufatus*, Jor., are specimens with the white area on the hind wing reddened.

(69) **Papilio polytes, L.** Jordan describes ab *astreans* from South India with part of the band of the hind wing suffused with blue.

(70) **Papilio bianor, Cr.** Jordan states that *gladiator*, Fruh., is merely an aberration from Tonkin; Indian specimens would appear to be true *bianor*.

(71) **Papilio polyctor ganesa, Db.** In the Khasi Hills flies ab *porphyrina*, Jor., with the submarginal spots on the hind wing enlarged.

(72) **Papilio paris, L.** The small spring form is *splendorifer*, Fruh.

(73) **Papilio aristeus hermocrates, Fd** ab *aristeoides*, Eimer = *aristinus*, Fruh. has the white discal area on the forewing restricted.

(74) **Papilio antiphates, Fab.** Jordan treats *epaminondas*, Ober., as a distinct species.

(75) **Papilio doson axion, Fd.** *praestabilis*, Fruh., is the summer form with small submarginal spots below.

(76) **Papilio eurypylus cheronus, Fruh.** Potina, Jor. = *acheron*, Fruh., is the small spring form with a broad border.

(77) **Papilio bathycles chiron, Wall.** *Ligyra*, Jor., is the spring form with large spots below and a small discal spot on the hind wing before the first metian vein.

(78) **Papilio xenocles, Db.** *Theronus*, Fruh., is the spring form with the marginal area on the hind wing below pale-brown. *Xenocratis*, Fruh., is the corresponding rains form of race *phrontis*, DeN., and *nero us*, Fruh., the spring form of race *kephisos*, Fruh.

(79) **Parnassius hardwickii Gray.** *Otos*, Fruh., is the albinotic and *harino*, Elw., the melanotic form of the typical race. *After*, Fruh., is the

melanotic, *albicans*, Fruh., the albinotic and *parva*, Verity, a small mountain form of the race *viridicans*, Fruh.

(80) **Parnassius charltonius, Gray.** *Deckerti*, Verity, is a variety with very red ocelli on the hind wing.

(81) **Prioneris clemanthe, Db.** Fruhstorfer calls the race flying from the Shan States to Tenasserim *helferi*, Fd.; darker, with the veins on the underside of the forewing united by bands.

(82) **Gonepteryx zaneka, M.** Verity considers this to be a race of the Chinese *aspasia*, Men.

(83) **Pareronia valeria hippia, Fab.** The yellow variety of the female is *philomela*, Fab., not *livilla*, Fruh., as given by me.

(84) **Lycaenesthes emolus topa, Evans.** This proves to be a synonym of *Nacaduba hampsoni*, DeN., and I regret having described it.

(85) **Ilerda androcles, Db.** In separating the Eastern race as *viridis*, I am sorry to say that I overlooked the fact that the typical form was described from Sylhet; the name of the race from the Western Himalayas is *coruscans*, M., and the name *viridis* must be sunk.

(86) **Chrysophanus caspius evansii, DeN.** Swinhoe describes this insect as having a tail; in his figure the tail is omitted and Swinhoe gives a special note to say that the tail has been omitted by mistake. There is of course no tail.

(87) **Chrysophanus phloeas, L.** The Indian forms appear to fall into two perfectly distinct races, *stygianus*, But., a pale form from Baluchistan to Kashmir and *timeus*, Cr., a much darker form from Kashmir to Kumaon.

(88) **Rapala buxaria, DeN.** According to Swinhoe this should be called *rectivitta*, M.

(89) **Tajuria thyia, DeN.** Druce, P. Z. S. 1902, describes *pallescens*, a pale form from the Jaintia Hills, probably belonging to the dry season.

(90) **Tajuria drucei.** Swinhoe describes this as a new species from a unique female from the Shan States. Nearly allied to *longinus*, Fab., which Swinhoe gives as *cippus*, Fab., paler, forewing more acute: on the forewing the black border is very narrow at the dorsum and there is no black on the hind wing: the underside is much paler.

(91) **Tajuria yajna, Doh.** Swinhoe keeps *istroideia*, DeN., separate and places his *teza* as the dimorphic female of it.

(92) **Tajuria jangala ravata, M.** Swinhoe considers the very distinct race *andamanicus*, Wm. and DeN., to be inseparable from *ravata*.

(93) **Chliaria kina, Hew.** Swinhoe keeps *cachara*, M., separate giving it from Sikkim and Cachar; paler, clearer colour, forewing longer and anal angle hindwing produced: under forewing, 3 upper spots in line, second spot not shifted inwards.

(94) **Chliaria watsoni.** Swinhoe describes this as a new species from the Karen Hills, only the male known. Closely allied to *mergui*, Doh., but above purple not blue, the black border narrow and not even, but narrowing towards the dorsum. It would appear to be the dry season form of *mergui*.

(95) **Biduanda thesmia, Hew.** Swinhoe gives this as *fabricii*, M. The Indian form should stand as *thesmia fabricii*.

(96) **Marmessus lysias, Fab.** Swinhoe records in addition *moorei*, Dist., the Malay race, which Doherty is said to have obtained in Mergui: it differs in having no red band in the male and a very narrow one in the female.

(97) **Cheritra freja jaffra, But.** Swinhoe keeps the Ceylon form separate as *pseudo-jaffra*, M.; smaller and more silvery white below.

(98) **Orthopaetus phanaeus, Hew.** According to Swinhoe this insect does not occur in India and what Watson called *phanæus* was really *lalita*, Doh.

(99) **Capila zennara, M.** Swinhoe places this in *Pisola*.

(100) **Celaenorrhinus clitus, Leech.** The Chinese form has dark antennæ, while the Indian form has them white in front and should be known as *aspersa*, DeN.

(101) **Celaenorrhinus pyrrha, DeN.** Swinhoe keeps *patula* and *plagifera*, DeN., separate, and as far as I can judge from DeNiceville's types quite rightly. The antennæ are white in front in the male of *sumitra*, M., and in both sexes of *patula*; they are dark in front in *pyrrha* and *plagifera*, the latter being a larger insect with larger spots on the hindwing.

(102) **Celaenorrhinus munda, M.** Swinhoe gives this as a synonym of *leucocera*, Koll., but I think it is quite distinct. He keeps *putra*, M., from N. E. India and Burma separate from *leucocera*: with all the spots much reduced. I have failed to recognize two forms from this part of India, but specimens from Southern India certainly have the markings reduced; the type of *putra* came from Bengal and perhaps this name might be applied to the race from districts South of the Himalayas.

(103) **Celænorrhinus fusca, Hæmp.** Swinhoe says that the correct name for this is *area*, Plotz.

(104) **Celænorrhinus asmara, But.** The type came from Malacca: according to Fruhstorfer the Assam race should be called *consertus*, DeN., and the Burmese race *cacus*, DeN.

(105) **Coladenia indrani, M.** The race *tissa*, M., with the *cilia* on the hindwing unchequered, is confined to Ceylon. Specimens from the Himalayas are always paler than Central and South Indian ones, but perhaps there is no need to differentiate between them. Specimens from Burma, however, are golden yellow on the hindwing above and have been called *uposathra*, Fruh. Swinhoe states that this name is only applicable to the dry season form of *indrani*.

(106) **Coladenia dan, Fab.** The type is from South India and Swinh records it from Burma as well. Fruhstorfer calls the Burmese race *d. dhyana*. From the Himalayas Swinhoe gives *fatih*, Koll., as a separa species; Fruhstorfer calls this *dan fatih*. *Fatih* is said to differ from *d* in being bigger and brighter, with much larger hyaline spots; the spot n 1 on the forewing is hyaline, while the spot in the cell is large and sin not small and double.

(107) **Coladenia hamiltonii, DeN.** Swinhoe places this in the genus *Gerosis*, Mabille.

(108) **Tapena thwaitesi, M.** Swinhoe places *minuscula* and *hampsoni*, El. and Ed., as synonyms, as the only difference is in the genitalia.

(109) **Caprona.** Swinhoe calls this *Abaratha*: he puts *saraya*, Doh., as a separate species from Kumaon, South India and the Punjab.

(110) **Tagiades helferi ravi, M.** Swinhoe keeps *helferi*, Fd., as a separate species. The correct name for the continental form is *atticus*, Fab., *khasiana*, M., and *khasiana ravina*, Fruh. *Helferi* is certainly conspecific and should be called *atticus helferi*.

(111) **Tagiades alica, M., etc.** Swinhoe restricts *alica* to the Andamans, the Burmese form he calls *meetana*, M., the Ceylon form *distans*, M, and the South Indian form *obscurus*, Mab.

(112) **Tagiades atticus, Fab.** Aurivillius has discovered that this name should be applied to the butterfly hitherto known as *ravi*, M.; *litigiosa*, Moschler, is the oldest name for what has been known as *atticus*. Swinhoe keeps separate *menaka*, M.=*vulturna*, Plotz, from Kashmir to Upper Burma; it has 8, not 10, spots on the forewing and a prominent black spot on the white area of the hindwing. Fruhstorfer calls the South Indian and Ceylon race *menaka vajuna*.

(113) **Tagiades dealbata, Dist.** Swinhoe calls this *pteria*, Hew., and Fruhstorfer *pteria dealbata*: the type of *pteria* came from the Phillippines.

(114) **Tagiades pralaya, M.** Fruhstorfer treats this as a race of *trichoneura*, Fd.

(115) **Satarupa.** Swinhoe places all, except *gopala*, M., and the *sambara* group in *Daimio*.

(116) **Satarupa (Daimio) milliana.** Swinhoe describes this as a new species from the Shan States and Pegu: it is apparently very closely allied to *bhagava*, M., there are numerous spots and the two spots on the costa of the hindwing and the four lower spots on the forewing are very prominent.

(117) **Satarupa sambara, M.** Swinhoe places *dohertyi*, Wat., as a synonym. He states that *affinis*, Druce=*var. cognata*, Dist., does not occur in India and names the Indian form *kirmana*.

(118) **Sarangesa dasahara. M.** Swinhoe describes as a new species *davidsoni* from Mahableshwar and Kanara: smaller than *dasahara*, paler, cilia white not dark, hyaline spots on both sides more prominent.

(119) **Sarangesa albicilia, M.** Swinhoe describes as a new species *hampsoni* from the Nilgiris, closely allied to *albicilia*, but differing somewhat above.

(120) **Carcharodus.** Swinhoe gives *alceæ*, Esp., from Chitral: *swinhoei*, Wat., from Baluchistan, Chitral and the N. W. Himalayas; *dravira*, M., from Baluchistan, Afghanistan and the N. W. Himalayas.

(121) **Hesperia.** In this genus Swinhoe only places *cashmirensis*, M. In *Spialia*, Nov., he puts *galba*, Fab., *zebra*, But., *geron*, Wat., and *sao*, Berg., the latter is what I have recorded as *orbifer*, Hub. In *Pyrgus* he places *poggei*, Led.=*standingeri*, Freyer, recording it from Baluchistan and Chitral, *poggei* does not, I think, occur in Chitral and the specimens I recorded from there as *standingeri* turned out to be *Carcharodus altheæ*, Hub.

(122) **Sancus pulligo, Mab** The type came from the Malay Peninsula and the Indian race should be called *subfasciatus*, M.

(123) **Astictopterus henrici, Holland.** The typical Chinese form is darker than the Indian race, which should be called *kada*, Swin.

(124) **Suastus gremius, Fab** Swinhoe treats *subgrisea*, M., as a separate species from Ceylon, where it flies with *gremius*.

(125) **Taractrocera archias, Fd.** The type came from Aboina; Swinhoe describes the Indian form as a new species under the name *quinta*.

(126) **Taractrocera ziclea, Plotz.** The type came from the Phillippines and Fruhstorfer has named the Indian race *samadha*.

(127) **Ampittia maro, Fab.** Swinhoe gives this under the older name *dioscoroides*, Fab.

(128) **Aeromachus.** In this genus Swinhoe places *stigmata*, M., and *dubius*, El. and Ed.; *discreta*, Plotz., he regards as a synonym of *stigmata*. In *Machacus*, Nov., *jhora*, DeN., *kali*, DeN., and *indistincta*, M.; *obsoleta*, M., he puts as a synonym of *indistincta*.

(129) **Pedestes sala, Hew.** Swinhoe put *sala* as a synonym of *Suastus aditus*, M., and calls this insect *submaculata*, Stdg., placing *maculicornis* and *fuscicornis*, El. and Ed., as synonyms of it. See my note on this species in my "List".

(130) **Zographetus ogygia, Hew.** Swinhoe considers *flavipennis*, DeN., to be a separate species as there is a prominent spot at the end of the cell.

(131) **Scobura phiditia, Hew.** This apparently does not occur in India.

(132) **Erionota thrax acroleuca, W. M. and DeN.** Swinhoe gives *acroleuca* as a distinct species from Sikkim, Assam, South India, the Andamans and Nicobars.

(133) **Erionota batara, M.** Swinhoe gives this as *attina*, M.

(134) **Kerana.** Swinhoe re-names this *Tainela*.

(135) **Stimula.** This unfortunate genus started life as *Watsonia*, El. and Ed., the name was found to be pre-occupied and changed to *Stimula* DeN., Bery has discovered that this also is pre-occupied and has re-named it *Watsoniella*.

(136) **Plastingia callineura, Fd.** Swinhoe considers this doubtfully Indian; he adds *latoia*, Hew., to the list of Indian butterflies on the strength of a specimen caught on Sullivan Island.

(137) **Plastingia idyalis, DeN.** Not Indian according to Swinhoe.

(138) **Plastingia pugnans, DeN.** This was described from Borneo; Swinhoe records it from the Atara n Valley. Tenasserim.

(139) **Latongus zeus, DeN.** The type was from Borneo: Fruhstorfer states that the Indian form is different and names it *zeus optimus*; Swinhoe gives it as *Zela optimus*.

(140) **Zea taprobanus, Plotz.** Not an Indian butterfly.

(141) **Hidari irava, M.** Swinhoe states that the oldest name for this butterfly is *thrax*, Hub. (nec. Linnæus).

(142) **Pithauria aitchisonii, W. M. and DeN.** Swinhoe gives this as *Pithauriopsis marsena*, Hew. *Marsena* was described from a female and *aitchisonii* from a male; Pjepers, in Java, captured the two in copula.

(143) **Notocrypta feisthamellii, Bdl.** Swinhoe gives this from India, Burma, Ceylon and the Andamans. Also as separate species *restricta*, M., from India, Burma and Ceylon and *albifascia*, M., from Burma.

10. Mr. W. M. Crawford, I.C.S., recently sent me some butterflies caught by him in January 1913 in the Meghasani Hills, 3,800 feet, Morbhanj District, Orissa. Amongst them were the following butterflies, which have not, as far as I know, been recorded from South of the Himalayas, *viz*: *Apatura parisatis*, God.; *Parhestina persimilis*, Wd.; *Papilio helena cerberus*, Fd.; *Papilio chaon*, Wd.; *Papilio paris*, L.; *Papilio doson axion*, Fd. The last butterfly has also been caught in Sambalpur where Mr. Crawford has lately obtained a female of *Appias libythea*, Fab. The sifigle specimen of *P. helena cerberus* that was obtained is a male with a post-discal row of prominent black spots on the yellow area of the hind wing thus resembling *Papilio darsius*, Gray; ab *camoyses*, Ehrm. The specimens of *P. paris* resemble the small cold weather form of this insect, but with the green patch on the hind wing enlarged, thus approaching the Southern race *tamilana*, M.

# DESCRIPTIONS OF INDIAN MICRO-LEPIDOPTERA.

BY

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## XVII.

(*Continued from page 182 of this Volume.*)

### TORTRICIDÆ.

*Ulodemis falsa*, n. sp.

♂ ♀. 22-25 mm. Head, palpi, and thorax brown, in ♂ with a blackish patch on upper part of face. Antennæ of ♂ without notch. Abdomen grey. Forewings sub-oblong, in ♂ slightly narrowed anteriorly, costa anteriorly strongly arched, without fold, posteriorly nearly straight, apex obtuse, termen in ♂ nearly straight, little oblique, in ♀ sinuate, nearly vertical; brown, strewn with blackish-grey dots, arranged in oblique transverse series; markings darker, edged with faint pale striæ; outer edge of basal patch straight, oblique; central facia moderate, oblique, slightly narrower towards costa, anterior edge nearly straight, posterior slightly bent in middle; costal patch small, semi-oval, obsolete posteriorly: cilia dark-brown, at apex and towards tornus greyish-ochreous. Hindwings rather dark-grey, rather thinly scaled, except towards termen; in ♂ with a dorsal pencil of long dark-grey hairs, and on lower surface with a shallow naked prismatic groove running beneath lower margin of cell and along vein 2.

Nilgiris, 3,500 feet, from August to October (Andrewes), 9 specimens (5 ♂, 4 ♀); also 1 ♂ from Ceylon, without further particulars. Almost exactly resembling *trigrapha* in all particulars both of structure and markings, except in absence of notch of antennæ in ♂, and in slight difference of posterior edge of central fascia, which in *trigrapha* forms a very slight but regular curve, in *falsa* is distinctly bent in middle and faintly sinuate above this. Besides the original examples I have a pair (♂ ♀) from Khasi Hills which are truly referable to *trigrapha*. This is a very curious case, but on the structural difference I cannot treat these forms otherwise than as specifically distinct.

### EUCOSMIDÆ.

*Argyroploce æolantha*, n. sp.

♂ ♀. 14-17 mm. Head and thorax dark fuscous suffusedly spotted with fulvous-orange. Palpi with appressed scales, curved, ascending, orange. Abdomen orange, segmental margins dark-fuscous. Forewings moderate, sub-oblong, slightly dilated posteriorly, costa gently arched, apex obtuse, termen slightly rounded, somewhat oblique, deep fulvous-orange, strewn with about twenty irregular dark indigo-blue-grey spots and marks edged with some black scales, and some scattered minute black strigulæ between these: cilia fulvous-orange, with several partially indicated dark bars. Hindwings orange-yellow; dorsal and subdorsal streaks of blackish suffusion, and costal whitish space edged beneath with blackish; an interrupted streak in disc sometimes more or less indicated; a broad blackish terminal band; cilia orange, base blackish.

Khasis, in October; Baco River, Mindoro, Philippines, in February; two specimens. Allied to *solaris* and *eximiana*.

*Argyroploce liochlora*, n. sp.

♂. 15 mm. Head, palpi, and thorax dull green mixed with blackish. Antennæ simple. Abdomen dark-fuscous, beneath yellowish. Forewing-

elongate, rather dilated posteriorly, costa gently arched, apex obtuse, termen slightly rounded, little oblique; light bluish-green; costa shortly and indistinctly strigulated with blackish; basal patch yellow-green, edge obtusely angulated in disc, its dorsal margin suffused with blackish; central fascia moderate, oblique, yellow-green, narrowed at extremities, posterior edge somewhat irregular, slightly marked with blackish and towards middle edged with white; wing beyond this wholly light-dull purple marbled with leaden-bluish, with some broken dark fuscous strigæ partially edged with whitish, and an irregularly triangular blackish-fuscous partially whitish-edged blotch with one angle resting on middle of termen: cilia bluish-fuscous, base dark fuscous; with subbasal and apical series of minute white specks. Hindwings dark-fuscous; cilia fuscous becoming light-bluish-grey towards apex, with darker basal line.

Ganesh Gudi, Kanara, in May (Maxwell), one specimen.

*Laspeyresia torodetta*, n. sp.

♂ ♀. 9-10 mm. Head light greyish-ochreous. Palpi very pale greyish-ochreous. Thorax-light bronzy greyish-ochreous. Abdomen dark-grey. Forewings elongate, rather dilated posteriorly, costa gently arched, apex obtuse, termen nearly straight, slightly oblique; purplish-grey or purplish-fuscous, irregularly mixed or marked with dark-fuscous suffusion in disc and towards dorsum; costa marked with oblique whitish strigulæ, with several longer dark-fuscous strigæ between these, one from ⅔ of costa running to termen above middle; a triangular ochreous-white blotch on middle of dorsum, its apex somewhat produced a little obliquely posteriorly; ocellus margined laterally by obscure violet-leaden-grey streaks, and containing about four black dots or short linear marks: cilia fuscous sprinkled with whitish specks, with dark fuscous subbasal line. Hindwings dark-fuscous; cilia whitish, with dark-fuscous basal shade.

Coimbatore, and in Malabar, bred in December and January (Fletcher); eight specimens, larva pale-green, head reddish; burrows into the growing tips of stem of *Dolichos lablab* (*Leguminosæ*), causing it to droop and die; pupation within the burrow (Fletcher).

*Laspeyresia pycnota*, n. sp.

♀. 10 mm. Head fuscous, face whitish. Palpi whitish, second joint loosely rough-scaled. Thorax and abdomen rather dark-fuscous. Forewings sub-oblong, costa gently arched, slightly bent in middle, apex obtuse, termen almost straight, rather oblique; dark-fuscous, crossed by thick dark-leaden lines angulated in disc, on posterior half of costa rising from four pairs of whitish strigulæ, first of these running to ocellus, other confusedly to termen; ocellus indicated by leaden-metallic lateral approximated streaks, without dots: cilia fuscous, with blackish subbasal line. Hindwings rather dark-fuscous; cilia light-fuscous, with dark-fuscous subbasal line.

Yellapur, Kanara, in October (Maxwell), two specimens.

### Gelechiadæ.

*Frisilia verticosa*, n. sp.

♂ ♀. 23-24 mm. Head and thorax pale-yellow-ochreous, thorax sometimes tinged with brownish. Palpi in ♂ ochreous-yellowish, base and apex infuscated, in ♀ with second joint yellowish, basal ⅔ infuscated, terminal joint whitish-ochreous with anterior edge dark-fuscous. Antennæ whitish-ochreous, more or less infuscated towards base. Abdomen whitish-ochreous. Forewings elongate, rather narrow, especially in ♀, posteriorly rather dilated, costa slightly arched, apex obtuse, termen faintly sinuate, rather oblique; 3 and 4 out of 2, 7 and 9 stalked, 8 absent, yellow-ochreous, sometimes partially tinged with brownish, more or less sprinkled with dark-

fuscous; base of wing in ♂ more or less suffused with dark-fuscous; first discal stigma blackish; in ♂ a patch of dark-fuscous suffusion along median third of dorsum, anteriorly with an oblique extension across fold towards base of costa, posteriorly emitting a suffused dark-fuscous streak across wing towards costa at ⅔, more or less obsolescent towards costa, second discal stigma sometimes apparent as a darker mark on anterior edge of this; in ♀ these markings are hardly traceable, but second discal stigma is distinct; a more or less developed streak of fuscous suffusion along termen, in ♀ faint: cilia light yellow-ochreous. Hindwings whitish-ochreous, faintly fuscous-tinged towards apex and on termen; a grey discal dot on end of cell; cilia pale whitish-ochreous.

Pykara, Nilgiris, 6,500—7,000 feet, from March to May (Andrewes); eight specimens.

*Hypelictis albiscripta*, n. sp.

♂. 14 mm. Head and thorax dark ashy-fuscous. Palpi with second joint bronzy, broadly dilated with appressed scales, strongly compressed laterally, terminal joint deep purple, considerably thickened with scales, projecting posteriorly towards apex, appearing obtuse. Abdomen fuscous. Forewings elongate, narrow, costa slightly arched, apex obtuse, bent down, termen obliquely rounded; 6 to apex, 8 absent; dark-slaty-fuscous, with violet reflections, veins sprinkled with blackish; stigmata small, whitish, plical beneath first discal; a very fine interrupted whitish line from ¾ of costa to tornus, obtusely angulated above middle; a pale ochreous apical patch, anterior edge nearly straight, enclosing two or three dark-grey longitudinal marks: cilia dark-ashy-grey, round apical patch with basal half pale-ochreous barred with dark-grey. Hindwings light-bronzy fuscous; cilia paler, with a basal pale-ochreous dot at apex.

Anshi, Kanara, bred in January (Maxwell); one specimen. Reared from a pupa found between closely-spun leaves of *Salix*; some very young larvae feeding between similarly spun leaves were probably the same species (Maxwell).

*Pachnistis arens*, n. sp.

♀. 13 mm. Head and thorax pale-greyish ochreous. Palpi ochreous-whitish sprinkled with grey. Abdomen light-grey. Forewings elongate, rather narrow, costa gently arched, apex obtuse, termen obliquely rounded; pale-greyish ochreous irrorated with light fuscous; discal stigmata moderately large, fuscous, rather approximated, plical smaller, hardly before first discal: cilia pale greyish ochreous sprinkled with pale-fuscous. Hindwings ochreous-whitish slightly sprinkled with pale-grey; cilia ochreous-whitish.

Pusa, Bengal, in June (Fletcher); one specimen.

*Pachnistis monodryas*, n. sp.

♂♀. 24-27 mm. Head fuscous, sides of crown orange-ochreous, face pale-ochreous. Palpi fuscous, posteriorly light-ochreous. Antennæ whitish ochreous. Thorax rather dark-purple fuscous. Abdomen pale fuscous. Forewings elongate, posteriorly slightly dilated, costa gently arched, apex rounded-obtuse, termen rounded, little oblique; rather glossy ochreous-fuscous, with a faint purple tinge: cilia brownish. Hindwings rather light-fuscous; cilia light-brownish.

Nilgiris, 3,500 feet, in August and November (Andrewes); two specimens.

*Brachmia crypsilychna*, n. sp.

♂. 15 mm. Head ochreous, crown fuscous-tinged, collar dark-slaty-fuscous. Palpi pale-ochreous, terminal joint sprinkled with dark-fuscous. Antennæ dark-fuscous, serrate, ciliations ½. Thorax dark-slaty-fuscous. Posterior legs dark fuscous, with whitish-ochreous rings at apex of joints middle of tibiæ. Forewings elongate, rather narrow, costa gently apex obtuse, termen slightly rounded, rather oblique; 2 and 3

stalked, 7 and 8 stalked, 7 to apex; dark-slaty-fuscous, somewhat sprinkled with blackish; a large blackish dot beneath costa near base; plical and first discal stigmata represented by round blackish adjacent spots placed transversely; second discal represented by a somewhat 8-shaped spot outlined with blackish suffusion and filled in with pale fuscous-ochreous; an ochreous-whitish dot on costa at $\frac{2}{3}$; some blackish scales along posterior part of costa and termen: cilia grey, sprinkled with whitish. Hindwings light-grey, tinged with ochreous anteriorly; cilia pale-grey.

Bassein Fort, Bombay, bred in October (Fletcher); one specimen. Larva tapering much posteriorly and slightly anteriorly, black; collar banded with white; plate of 2 smoky-black with a triangula brownish-yellow space; second and third interstices creamy-white, next three dull-brown; 7, 8 and 10-12 with V-shaped creamy marks between, spun leaves of *Ipomœa arvensis* (*Convolvulaceæ*) (Fletcher).

*Brachyia insulsa*, n. sp.

♂ ♀. 12-16 mm. Head and thorax pale-greyish ochreous. Palpi whitish-ochreous, second joint dark-fuscous except apex. Antennæ $\frac{2}{3}$, greyish-ochreous, ciliations in ♂ $\frac{1}{2}$. Posterior tibiæ whitish-ochreous, beneath fuscous. Forewings elongate, posteriorly slightly dilated, costa slightly arched, apex obtuse, termen somewhat rounded, rather oblique; 2 and 3 stalked, 7 and 8 stalked, 7 to apex; light greyish-ochreous; stigmata dark-fuscous, plical slightly before first discal; some cloudy dark-fuscous dots round apex and termen, sometimes almost obsolete: cilia whitish-ochreous slightly sprinkled with fuscous. Hindwings ochreous-grey-whitish; cilia ochreous-whitish.

Pusa, Bengal, from April to July (Fletcher); six specimens. Allied to *episticta*.

*Chelaria scopulosa*, Meyr.

Larva burrows in shoots of *Careya arborea*, showing some excrement on opening of hole; only one found, though often searched for (Maxwell).

*Anarsia melanoplecta*, n. sp.

♂. 10 mm. Head and thorax whitish-grey. Palpi with second joint blackish on basal half, then with several whorls of blackish white-tipped scales, tuft grey-whitish mixed with fuscous, terminal joint whitish with fine oblique black lines. Abdomen grey. Forewings elongate, narrow; costa gently arched, apex obtuse, termen extremely obliquely rounded; fuscous finely irrorated with whitish; an obscure darker blotch in disc about $\frac{1}{3}$; a thick black oblique streak from middle of costa, reaching half across wing; a semi-oval black spot on costa at $\frac{4}{5}$; a black præapical dot, preceded by whitish, area above and below it tinged with ochreous: cilia whitish with rows of dark-fuscous points, basal third grey limited by a dark-grey shade interrupted with whitish bars. Hindwings grey; cilia light grey.

Pusa, Bengal, bred in May (Fletcher); one specimen. Larva boring into shoots of mango (*Mangifera indica*) (Fletcher).

*Anarsia sagittaria*, n. sp.

♂ ♀. 13-15 mm. Head pale greyish-ochreous. Palpi dark-fuscous, apical edge of second joint whitish-ochreous, terminal joint of ♀ whitish-ochreous with dark-fuscous basal and supramedian rings. Thorax pale greyish-ochreous, longitudinally streaked with blackish. Abdomen light greyish-ochreous. Forewings elongate, narrow, costa gently arched, apex obtuse, termen very obliquely rounded; light fuscous, slightly sprinkled with ochreous-whitish; some scattered black scales here and there on veins; a black streak along submedian fold, strong on basal half, attenuated posteriorly; a blackish mark beneath this at base; a slender black longitudinal streak in disc from before middle to $\frac{4}{5}$, reduced to scattered scales posteriorly; a slender subdorsal streak of black irroration dark-

to ¾: cilia grey sprinkled with ochreous-whitish. Hindwings grey, paler and thinly scaled anteriorly; in ♂ an expansible pencil of long fine blackish hairs from disc near base: cilia whitish-ochreous-grey. Forewings beneath in ♂ with expansible pencil of long fine blackish hairs from disc near base.

Pusa, Bengal, in June (Fletcher); two specimens.

*Trichotaphe geochrota*, n. sp.

♂. 13 mm. Head and thorax lilac-fuscous. Palpi whitish, second joint dark-fuscous except apical edge, scales roughly expanded towards apex above, anterior edge of terminal joint dark-fuscous. Antennæ serrate, ciliations 2. Abdomen grey. Forewings elongate, rather narrow, costa gently arched, apex obtuse, termen slightly rounded, oblique; light ashy grey irrorated with fuscous; extreme costal edge ochreous-whitish; a cloudy dark-brown dot in disc at ½; stigmata dark brown, obscure, discal approximated, plical hardly before first discal, second discal connected with dorsum by an irregular dark brown line; a fine indistinct irregular ochreous-whitish transverse line at ⅔, forming a small distinct spot on costa; several blackish dots round apex and termen: cilia pale fuscous, base obscurely spotted with whitish-ochreous suffusion. Hindwings grey; cilia light-grey.

Bassein Fort, Bombay, in October (Fletcher); one specimen.

COSMOPTERYGIDÆ.

*Cosmopteryx semnota*, n. sp.

♂. 11-12 mm. Head and thorax dark-bronze, with three very fine whitish lines, face light shining bronze. Palpi white lined with black. Antennæ blackish, towards base with dotted white line, with two fine white rings near apex and two others about ⅔. Abdomen dark bronzy-grey. Posterior tibiæ blackish with white median and apical rings. Forewings narrowly elongate-lanceolate, apex slenderly long-caudate; dark-bronzy-fuscous; a fine white oblique subcostal line from base to ½, and short median and subdorsal lines beneath posterior portion of this, each reaching somewhat beyond the one above it; a lighter bronzy-fuscous postmedian transverse band, tinged with ochreous towards costa, edged by violet-golden lines, first vertical, followed above middle by a large black dot, second inwardly oblique, narrowed or almost interrupted in disc; a sinuate ochreous-yellow line running from middle of this to apex: cilia rather dark fuscous, with a white bar at apex, and a white spot on costa on posterior edge of band. Hindwings dark-fuscous; cilia rather dark-fuscous.

Pykara, Nilgiris, 7,000 feet, in April (Andrewes); two specimens. Distinct by the bronzy-fuscous band.

*Trissodoris*, n. g.

Head smooth-scaled, forehead rather prominent between antennæ, face flat, somewhat retreating, crown rather depressed, side tufts slightly raised; ocelli absent; tongue developed. Antennæ 1, in ♂ somewhat thick, simple, basal joint long, somewhat dilated with scales, with slight pecten. Labial palpi very long, recurved, somewhat diverging, second joint thickened with rather rough scales towards apex beneath, terminal joint longer than second, acute. Maxillary palpi very short, filiform, appressed to tongue. Posterior tibiæ with rough projecting scales from base to ¾ and apical group of expanded bristly scales, spurs with fine pecten of scales, tarsi with rough projecting tuft of scales above on basal joint, and somewhat roughened with scales throughout. Forewings with 1*b* furcate, 2 [illegible]e, 3-5 approximated, 7 and 8 out of 6, 7 to costa, 11 from middle. [illegible]ings ⅔, narrow-lanceolate, cilia 4; 2-5 remote, parallel, 6 and 7 [illegible].

*Trissodoris honorariella*, Wals.

(*Stagmatophora honorariella*, Wals., Faun. Haw. 1, 515, pl. XV, 21; *S. quadrifasciata*, Wals., *ibid.* 516, pl. XV, 22.)

Ambulangoda, Weligama and Barberyn Island, Ceylon, from January to March (Fletcher). Occurs also in New Guinea and the Pacific Islands, and is probably attached to some cultivated plant. I have examples from the localities quoted by Lord Walsingham; there is only one species, the colour characters being variable, and the curious tuft on undersurface of forewings always present in ♂ but absent in ♀.

EPIMARPTIDÆ.

The following curious genus may, I think, be regarded as the type of a new family, since I am unable to refer it to any existing group without doing violence to established characters. It differs from the *Cosmopterygidæ* by the terminal ending of vein 7 of forewings, and the structural features of the antennæ and palpi are peculiar. Superficially it has some resemblance to the *Heliodinidæ* (*Stathmopoda* group), but does not show the characteristic leg-structure of that family, nor agree in other respects, and even the markings are really different, being based on the stigmata, which are never exhibited in the *Heliodinidæ*. Probably it is a development of the *Oecophoridæ*.

*Epimarptis*, n. g.

Head smooth, rounded; ocelli present; tongue developed. Antennæ nearly 1, in ♂ simple, near base of stalk with a notch covered by an oblique tooth beneath it, basal joint elongate, without pecten. Labial palpi long, curved, ascending, with appressed scales, second joint with a projecting pencil of scales at apex above, terminal joint shorter than second, acute. Maxillary palpi very short, filiform, appressed to tongue. Posterior tibiæ rough-haired above. Forewings with 2-5 very short, approximated, 6 and 7 out of 8, 7 to termen, 11 from middle. Hindwings ½, narrow-lanceolate, cilia 4; 2-4 parallel, 5 absent, 6 and stalked.

*Epimarptis philocoma*, n. sp.

♂. 11 mm. Head ochreous whitish, crown slightly tinged with fuscous on sides, and behind with pale yellow. Palpi whitish, sprinkled with dark fuscous. Antennæ whitish. Thorax pale yellow. Abdomen pale whitish ochreous. Forewings narrowly elongate-lanceolate, widest near base, long-pointed; clear brassy-yellow; basal third of costa sprinkled with dark-fuscous; an ochreous-brown triangular patch with violet reflections extending along posterior half of dorsum and termen to apex, reaching more than half across wings, anterior edge obliquely marked with two silvery-lilac spots sprinkled with blackish representing plical and first discal stigmata, plical anterior; a less marked similar spot above tornus apparently representing second discal stigma: cilia yellow-ochreous, beneath tornus tinged with fuscous, on termen and dorsum sprinkled with dark-fuscous on basal third. Hindwings grey; cilia light-greyish-ochreous.

Karwar, Kanara, bred in September (Maxwell): one specimen. Larva reddish (including head); lives in a white web on midrib of an unknown plant, the web being on both sides of the leaf, kept off the surface by little pillars of excrement; the webs on either surface of the leaf are connected by holes through the leaf itself, and the larva uses these alternative abodes as a means of escaping observation, dodging through the hole with much agility: cocoon separate, close to midrib, oval, resembling a bird-dropping (Maxwell). These singular and interesting habits are curious, the peculiarity of the type.

dark-

ŒCOPHORIDÆ.

*Tonica teratella*, Walk.

Pupa erect on its tail, exposed; found on a leaf of bamboo (Maxwell).

*Cryptolechia arvalis*, Meyr.

Larva greyish-green, head black; feeds between two or more leaves of *Careya arborea*, spun together so as to adhere flatly; pupates in same position; abundant in larval stage, but never met with on the wing (Maxwell).

PHYSOPTILIDÆ.

I propose this new family for the following genus, which at present stands isolated as a peculiar type. I suppose it to be a derivative of the *Xyloryctidæ*, from which it may be technically distinguished by the absence of vein 6 of hindwings.

*Physoptila*, n. g.

Head smooth, densely scaled, side tufts erect; ocelli absent; tongue short. Antennæ ♀, in ♂ minutely ciliated, basal joint elongate, without pecten. Labial palpi long, recurved, very widely divergent, second joint thickened with dense scales gradually expanded and somewhat rough beneath towards apex, terminal joint much shorter than second, thickened with loose scales, acute. Maxillary palpi rudimentary. Thorax with strong posterior crest. Posterior tibiæ clothed with dense long rough hairs above and beneath. Forewings with tufts of raised scales on surface, apex strongly caudate; 1 b long-furcate, 2 from towards angle, 3 from angle, 4 somewhat approximated to 3, weak, 5 from middle of transverse vein, 6 absent (obsolete), 8 absent (coincident with 7), 7 to apex, 9 and 10 from near end of cell, 11 from middle. Hindwings under 1, subtrapezoidal, apex long produced, termen deeply sinuate, cilia 1½; 2 rather curved, 3 and 4 very long-stalked from angle, 5 from middle of transverse vein, 6 absent, 7 to apex.

*Physoptila scenica*, n. sp.

♂ ♀. 11-13 mm. Head ochreous-whitish; palpi ochreous-whitish, outer terminal joint with more or less indicated fuscous subbasal and subapical rings. Antennæ whitish, with grey band at ⅔ and two narrower ones towards apex. Thorax whitish, with irregular zigzag light ochreous antemedian and postmedian transverse bars. Abdomen whitish-ochreous more or less tinged with grey. Forewings elongate, costa gently arched, apex very long-produced, falcate-caudate, termen concave beneath it, then obliquely rounded; ochreous-whitish; an irregular streak of yellow-ochreous suffusion along fold throughout, and some irregular lighter patches on dorsal area; discal stigmata indicated by undefined spots of yellow-ochreous suffusion, sometimes with a few black specks, plical by a short fine linear mark of black scales, very obliquely before first discal; a patch of raised (probably erectile) whitish scales beneath fold in middle of wing; a slightly projecting tuft of raised scales on middle of costa, preceded by a blackish dot, from about which proceed two very oblique obscure pale ochreous streaks running together into apex; an irregular transverse brown blotch on costa at ⅔, reaching rather more than half across wing, crossing these: cilia whitish-ochreous, at base beneath apical prominence with a few black specks. Hindwings grey, thinly scaled and subhyaline in disc and towards base; cilia light-greyish-ochreous.

Karwar, Kanara, bred in July (Maxwell); four specimens. Larva feeding internally in young (but not quite new) shoots *Careya arborea*; can be detected by excrement protruded in a bunch from the original entrance-hole in stem (Maxwell).

XYLORYCTIDÆ.

*Amorbœa galbanea*, n. sp.

♀. 30-32 mm. Head orange, forehead and face whitish except on sides. Palpi light-yellowish. Thorax rather dark-purplish-fuscous. Abdomen dark-fuscous. Forewings elongate, costa gently arched, apex obtuse, termen obliquely rounded; 3 and 4 separate; rather dark fuscous, with a faint purplish or orchreous gloss; extreme costal edge ochreous-whitish; cilia fuscous, tips pale. Hindwings dark fuscous; cilia fuscous.

Maskeliya, Ceylon, from February to April (Green, Alston); three specimens. This differs from the two previously described species of the genus in having veins 3 and 4 of forewings separate, instead of stalked, the same variation occurs within the limits of the allied genus *Ptochoryctis*, but the genera are natural without further subdivision.

*Metathrinca memron*, n. sp.

♂. 24 mm. Head, palpi, and antennæ blackish, second joint of palpi suffused with whitish anteriorly. Thorax silvery-white. Abdomen whitish. Forewings elongate, costa gently arched, apex obtuse, termen obliquely rounded; silvery-white; costal edge blackish towards base; a slender slightly curved blackish streak from dorsum beyond middle, reaching about half across wing; several very fine linear dark-fuscous marks round apex and termen: cilia white. Hindwings and cilia ochreous-whitish.

Kakgala, Ceylon, in April (Green); one specimen.

*Ptochoryctis anguillaris*, n. sp.

♂ ♀. 12-15 mm. Head, palpi, and thorax, white. Antennæ blackish. Abdomen grey-whitish. Forewings elongate, costa gently arched, apex obtuse, termen very obliquely rounded; silvery-white; 3 and 4 separate; a curved dark-fuscous streak running from ⅔ of costa to near apex; a dark fuscous streak running along termen from near beneath apex of preceding to tornus, where it is expanded into an oblique bilobed fasciaform mark reaching to middle of disc: cilia white, with dark-fuscous subbasal line, and apical third fuscous. Hindwings ochreous-white; cilia white.

Hambantota and Maskeliya, Ceylon, in October and December (Fletcher, Alston); two specimens.

*Ptochoryctis parabola*, n. sp.

♀. 25 mm. Head, palpi, thorax and abdomen white, palpi infuscated above towards base. Forewings moderately elongate, costa moderately arched, apex obtuse, termen rounded, rather oblique; 3 and 4 stalked; silvery-white; costal edge dark-fuscous towards base; dorsal area tinged with ochreous; a submarginal series of blackish dots round apex and termen, that between veins 5 and 6 absent, one on each side of this minute, one above apex and two nearest tornus large: cilia white. Hindwings ochreous-white; cilia white.

N. Coorg, 3,500 feet in May (Newcome); one specimen. Similar to *rosaria*, but in that species the palpi are blackish, and the submarginal dots uniform and complete.

*Ptochoryctis illuvialis*, n. sp.

♀. 26 mm. Head and thorax whitish-ochreous. Palpi blackish, towards base whitish internally. Abdomen whitish. Forewings elongate, costa gently arched, apex obtuse, termen rounded, rather oblique; 3 and 4 stalked; whitish-ochreous, with a faint grey tinge; costal edge dark-fuscous towards base; a submarginal series of seven large black dots round apex and termen: cilia ochreous-whitish, with dark-fuscous subbasal and fuscous subapical line. Hindwings ochreous-whitish; cilia white.

Khasis, in April; one specimen.

*Epimactis turbida*, n. sp.

♀. 14-18 mm. Head whitish. Palpi white, second joint externally dark-fuscous on basal ⅔. Thorax fuscous, shoulders whitish. Abdomen whitish-grey. Forewings elongate, costa slightly arched, apex tolerably pointed, termen sinuate, oblique; light fuscous; costal edge ochreous-whitish; dorsal area towards base suffused with rather dark purplish-fuscous; stigmata dark-fuscous, plical small, slightly beyond first discal, second discal rather large, connected with dorsum by dark-purplish-fuscous suffusion, terminal area beyond this more or less darker-suffused; some undefined cloudy-dark-fuscous spots round posterior part of costa and termen: cilia whitish-fuscous, with faint darker subbasal shade. Hindwings pale-grey or whitish-grey; cilia ochreous-grey-whitish.

Khasis, in September; three specimens.

*Epimactis spasmodes*, n. sp.

♀♂. 21 mm. Head whitish-ochreous; palpi ochreous-whitish, second joint externally fuscous, except towards apex, terminal joint anteriorly infuscated towards apex. Thorax fuscous. Forewings elongate, posteriorly somewhat dilated, costa gently arched, apex tolerably pointed, termen sinuate, oblique; whitish fuscous; costal edge whitish-ochreous; a suffused dark fuscous wedge-shaped spot along base of dorsum; stigmata dark-fuscous, plical, beyond first discal; a fuscous shade from ⅓ of costa to dorsum before tornus, angulated inwards to touch second discal; a strongly outwards-curved series of cloudy dark-fuscous dots from beneath costa at ⅔ to dorsum before tornus; a series of cloudy dark-fuscous dots round posterior part of costa and termen: cilia whitish-ochreous, slightly fuscous-tinged, with a basal series of dark fuscous dots on termen. Hindwings pale whitish-grey-ochreous; cilia whitish-ochreous.

Palnis (Campbell); one specimen.

*Epimactis infulata*, n. sp.

♂. 14 mm. Head whitish. Palpi white, second joint externally dark-fuscous on basal ⅔; antennal ciliations 4. Thorax light fuscous, shoulders whitish. Abdomen grey. Forewings elongate, costa gently arched, apex round-pointed, termen rather sinuate, somewhat oblique; brownish-grey; costal edge white, costa towards base more broadly suffused with whitish; stigmata dark-fuscous, plical rather obliquely beyond first discal, second discal connected with dorsum by a direct dark-fuscous rather irregular streak; three blackish linear marks on posterior part of costa, and a black line round apex and termen: cilia white, beneath tornus light-brownish-grey, round apex with a light fuscous subbasal shade becoming faint, spots on termen. Hindwings light-grey; cilia whitish, with grey subbasal suffusion.

Kegalle, Ceylon (Alston); one specimen.

*Epimactis strombodes*, n. sp.

♂ 17 mm., ♀ 24 mm. Head, palpi and thorax whitish-yellow, second joint of palpi fuscous except towards apex. Antennal ciliations 4. Abdomen whitish-ochreous. Forewings moderate, costa rather strongly and evenly arched, apex rounded, termen rounded, little oblique; whitish-yellow; cilia whitish-yellow, round apex suffused with ochreous-orange, with tips dark-fuscous, the orange suffusion in ♀ extending over costal cilia on apical fourth of wing. Hindwings yellow-whitish; cilia whitish-yellow.

Kandy, Ceylon, in March and May (Mackwood, Green); two specimens.

*Antolœa*, n. g.

Head with dense appressed scales; ocelli absent; tongue developed. Antennæ ⅘, in ♂ minutely ciliated, basal joint broadly dilated with dense scales. Labial palpi long, recurved, with appressed scales, second joint

somewhat roughened anteriorly towards apex, terminal joint as long as second, pointed. Maxillary palpi very short, filiform, appressed to tongue. Posterior tibiæ with dense loose hair scales above. Forewings with discal tuft of scales; 1b furcate, 2 from towards angle, 3 and 4 stalked from angle, 7 and 8 stalked, 7 to costa just above apex, 11 from middle. Hindwings under 1, oblong-ovate, cilia nearly 1, 2 tolerable, 3 and 4 stalked, 5 nearly parallel, 6 and 7 stalked.

*Antolæa xanthopa*, n. sp.

♂♀. 13-14 mm. Head white. Palpi white, second joint tinged with yellowish. Thorax white, dorsally tinged with yellowish. Abdomen whitish. Forewings elongate, costa rather strongly arched, apex obtuse, termen nearly straight, somewhat oblique; white; a large undefined blotch of ochreous orange suffusion occupying lower part of disc posteriorly, with some scattered black specks within and above it, and including a tuft of scales mixed with black representing second discal stigma, and a small spot or group of black scales towards dorsum; a large black dot in disc towards termen, and a few black specks above and below this: cilia white. Hindwings and cilia white, faintly tinged with yellowish.

Khasis, in April; two specimens.

*Odites atmopa*, n. sp.

♀. 26-27 mm. Head, palpi, thorax, and abdomen pale whitish-ochreous; palpi slightly brownish-tinged towards base. Forewings elongate, costa moderately arched, apex obtuse, termen straight, nearly vertical, rounded beneath; whitish-ochreous; costal edge ochreous except towards base; discal stigmata minute, blackish, second immediately followed by a pale grey cloudy spot; a curved subterminal series of a very few grey scales; a terminal series of cloudy blackish-grey dots: cilia whitish-ochreous, on costa ochreous with tips dark fuscous just before apex. Hindwings and cilia yellow-whitish.

Kandy, Ceylon, in December (Green, Mackwood); two specimens. Allied to *paracyrta*.

*Odites actosa*, n. sp.

♀. 18 mm. Head and thorax pale greyish-ochreous. Palpi ochreous-whitish, second joint suffused with dark fuscous. Abdomen grey. Forewings elongate, costa gently arched, apex obtuse, termen faintly sinuate, somewhat oblique; pale greyish-ochreous; a black dot on base of costa and one at base in middle; stigmata black, plical elongate, somewhat beyond first discal; a series of black dots round termen: cilia whitish-ochreous. Hindwings light-grey; cilia ochreous-whitish, with light-grey subbasal shade.

N. Coorg, 3,500 feet, in February (Newcome). Resembles *sphendonistis*, but in that species the termen of forewings is not sinuate, the median black dot is not quite basal, the terminal dots not quite marginal, and continued round apical portion of costa.

*Odites euphema*, n. sp.

♀. 15-17 mm. Head and thorax light ochreous-yellowish. Palpi whitish-yellowish, second joint externally fuscous except apical third. Abdomen whitish-yellowish. Forewings elongate, rather narrow, costa gently arched, apex obtuse, termen rather obliquely rounded; ochreous-yellowish; second discal stigma moderate, round, dark-fuscous: cilia light-ochreous yellowish. Hindwings and cilia whitish-yellowish.

Mundgod and Pala, Kanara, in October (Maxwell); N. Coorg, 3,500 feet, in August (Newcome); three specimens.

*Odites pragmatias*, n. sp.

♀. 17-18 mm. Head white, palpi white, second joint externally fuscous, fuscous on lower ⅔, terminal joint with extreme base dark fuscous, dark-

tinged with dark-fuscous towards apex. Thorax whitish, sometimes greyish-tinged. Abdomen ochreous-whitish. Forewings elongate, posteriorly slightly dilated, costa gently arched, apex pointed, termen sinuate, rather oblique; whitish, sometimes partially suffused with very pale greyish-ochreous, with irregularly scattered blackish scales; a blackish transverse mark on base of costa, and a short suffused blackish streak along base of dorsum; stigmata black, plical obliquely beyond first discal; a curved series of four large blackish dots in disc at $\frac{1}{2}$, and one on dorsum below second discal; a series of blackish dots round posterior part of costa and termen: cilia ochreous whitish. Hindwings with 3 and 4 long-stalked; pale greyish-ochreous; cilia ochreous-whitish.

Pykara, Nilgiris, 7,000 feet, in April (Andrewes); two specimens.

*Odites sphenidias*, n. sp.

♂. 16 mm. Head ochreous-white. Palpi whitish, lower half of second joint dark-fuscous, terminal joint with extreme base dark-fuscous, and somewhat suffused with dark-fuscous towards apex. Antennal ciliations 3. Thorax ochreous-whitish, posterior extremity blackish. Forewing elongate, costa gently arched, apex obtuse, termen slightly rounded, rather oblique; ochreous-whitish; a black dot on base of costa, one at base in middle, one towards costa at $\frac{1}{3}$, and one beneath fold below this; stigmata black, first discal large, subtriangular plical obliquely beyond first discal; a small triangular blackish spot on middle of costa; a strongly curved series of rather large cloudy blackish dots from $\frac{3}{4}$ of costa to dorsum before termen, interrupted towards dorsum; a series of blackish dots round posterior part of costa and termen, two on costa about $\frac{4}{5}$ enlarged and suffused beneath with fuscous: cilia ochreous-whitish. Hindwings and cilia ochreous-whitish.

Khasis, in October; one specimen.

# REVIEWS.

## LEPIDOPTERA INDICA.

Entomologists in India will be glad to hear that *Lepidoptera Indica* has now been completed. The work was commenced in 1890 by Dr. F. Moore and dedicated by him to Queen Victoria. In 1907 Moore died before he had completed the work, a fatality that befell the authors of the only other books on Indian butterflies, thereby seriously interfering with our prospects of obtaining a complete account of the butterflies of India. However, an able successor to Dr. Moore was found in Col. C. Swinhoe and he is to be heartily congratulated on having completed the work.

The book has been published in 123 parts, to be arranged in ten volumes; there are 835 coloured plates. Two hundred and fifty copies have been printed and the price complete is £85. The publishers, Messrs. L. Reeve & Co., announce that they are prepared to supply the work on the deferred payment system and to furnish sets with uncoloured plates or of the letterpress only.

The book contains a full list of references, and a detailed description of every family, genus and species: also, when known, an account of the earlier stages and of the habits generally. There is a coloured figure of the male, female and underside of every species, and in many cases of the larva and pupa, and of the various seasonal forms. In the latter parts drawings of the genitalia, head, etc., have been given. The book can, in fact, be said to be as complete as it was possible for the authors to make it.

The first attempt to produce a connected account of Indian butterflies was made by De Nicéville, though Moore had some years previously written a magnificent work in three volumes on the butterflies of Ceylon. In his *Lepidoptera Indica*, Moore followed generally the arrangement adopted by De Nicéville, but he divided up many of the more important genera into numbers of new genera based on slight differences in the venation or in the secondary sexual characters. In addition to this, he divided up the six families into 48 sub-families, one of which, the Nymphalinæ, was further subdivided into 8 groups. This system is, perhaps, scientifically correct; it is certainly not popular with the collector and it remains to be seen whether it will survive. As to species, Moore and Col. Swinhoe belonged to what may perhaps be called the old school of entomologists who separated any apparently constantly differing form as a species, and many of us will, no doubt, remember the somewhat heated controversies that raged between Watson and De Nicéville on the one hand and Moore, Butler and Col. Swinhoe on the other. The modern school, of which the Tring Museum and the German entomologists are the exponents, have struck a happy mean in the "race" system, thus reviving in another form many of Moore's species, that Watson and De Nicéville and later Bingham would have nothing to do with. That Moore was an extremely careful and conscientious observer is undoubted, there is none of the carelessness in his work that one comes across so often in Bingham's volume on butterflies in the *Fauna of India* series. It is only just to Col. Swinhoe to state that he has fully maintained the standard set by Moore, though, perhaps, not always so accurate. He is, however, a member of the same school and his treatment of some of our well known species was somewhat alarming; for instance the *hecabe* group of the genus *Terias*, where 26 "species" are given for what have generally been considered to represent at most 3 or 4 really distinct species. In the descriptions of the genera and species a detailed account is given of each feature, a system that is excellent as

far as it goes, but one cannot help thinking how useful it would have been, if we had been briefly told exactly how two closely allied species differed from one another; as an instance *Parnara flexilis* and *colaca* may be quoted.

The plates, as already indicated, are most complete, but here again the times have changed, and one has only to look at Seitz's work on the Butterflies of the world to see the difference. In the plates in *Lepidoptera Indica* the uppersides of both sexes are portrayed in full, while the underside of one-half only is given; the figures are arranged far apart so that only 3 or 4 species are to be found on one plate; no names are given and the plate index has to be consulted in order to ascertain the name of any particular insect figured. In Seitz's plates some fifty figures are crowded on to one plate; only half the upperside and half the underside are figured; females are not figured when they differ but little from the male; and, what is most important, the name is given under each figure. The plates of *Lepidoptera Indica* are hand coloured and in most cases, especially towards the end of the book, the work has been well done; this cannot, however, be said of some of the plates towards the middle of the book.

We may now call a stop to criticism and conclude by saying that *Lepidoptera Indica* is a book that will stand for very many years as the most important and complete work of reference on Indian Butterflies. Alas! that only a few of us will be able to afford the luxury of a copy; it will, however, be certain to find a place in every Museum and thus be accessible to us all.

W. H. E.

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## "INDIAN PIGEONS AND DOVES"

BY

E. C. STUART BAKER, F.Z.S., F.L.S., M.B.O.U.

The Indian Pigeons were not included by Hume in his *Game Birds of India*, (Witherby & Co.,) although quite as much "Game Birds" in the wide sense of the word as many of the birds given by him, and no illustrated work has ever been published on these interesting birds. In the fourth volume of the "Birds" in the "Fauna of British India" Series, Blanford gives an excellent account of all the different kinds of Pigeons and Doves; but as that work is in four Volumes and each species is treated as briefly as possible, it is not in the hands of many sportsmen and bird-lovers and therefore Mr. Stuart Baker's Volume should be all the more welcome. The ornithologist too will find the book most useful as it brings up to date and amplifies Blanford's work.

Under each species full descriptions of plumage, including in many cases young in down, which were not given by Blanford, distribution, nidification and vernacular names are given in small type under heavy type headings, and notes on habits and shooting in large type, so that any information required can be easily found.

There has unfortunately been some changing of generic and specific names, the latter necessitated by the recognition of subspecies; but the reasons for these have been clearly shown by Mr. Stuart Baker, and since the sportsman and bird-lover, as a rule, confine themselves to English names, the changes should not cause any confusion.

In his introduction the author makes clear his position as regards subspecies or geographical races; and we think that, after a careful study of his book, most Indian Ornithologists will agree with his views.

The total number of true species recognised by Blanford was forty-five, while Mr. Stuart Baker gives an account of fifty-one species and subspecies. This difference is made up by the addition of two subspecies

recently described and by four of Blanford's species being divided into two subspecies each. It may also be remarked that thirteen of Blanford's full species have only been given subspecific rank by Mr. Stuart Baker.

The principal stronghold of the different kinds of green pigeons being in Assam, where Mr. Stuart Baker was long stationed, he is able to give us some excellent personal observations on habits and interesting accounts of the sport he has had amongst these birds. In regard to the latter he has been fortunate enough to take part in some big shoots at two of which over four hundred birds were obtained by several guns on one day shooting in the morning and evening. At these shoots it is interesting to note that two-thirds of the birds shot were Ashy-headed green pigeons, while the remainder included no less than ten other kinds of pigeons and doves shot by mistake. Though not generally shot, many of the doves, as pointed out by the author, give quite good shooting, and are not by any means to be despised as an addition to the pot when game is scarce.

As illustrating the tameness at times of some doves, Mr. Stuart Baker gives an account of how a pair of Spotted Doves (*Streptopelia suratensis*), which nested in the verandah of his bungalow, used to descend on to a table to pick up vegetable scraps.

The Little Brown Dove, too, is a confiding bird, and often breeds in verandahs and even inside bungalows, an instance being given of a pair breeding in a dining room between a picture and the wall.

Of some species there is still a good deal to be learned in regard to different plumages, distribution and as to what parts of the country they are resident and migratory in; and it is to be hoped that members who are in a position to add to our knowledge in anyway will do so and send in notes to our Journal. The addition of a few avicultural notes at the end of the accounts of each species will, no doubt, be an incentive to many who have the facilities and inclination to keep pigeons or doves as pets.

There are twenty-seven coloured plates chiefly by H. Gronvold, but a few by G. E. Lodge. As regards the illustration, the colours are beautiful, but we cannot help feeling that the method of reproducing them has in some cases made the appearance of the bird a little flat. We do not think the artist can have drawn such a flat-breasted bird as that gilly on plate 3. In spite of these remarks, however, the plates, as a whole, are excellent, and should be of the greatest assistance in identifying the different species.

The book is bound as a companion Volume to "Indian Ducks and their Allies," and has one great advantage over that work, and that is that it is much lighter to handle.

We can strongly recommend "Indian Pigeons and Doves" to all members interested in birds, and Mr. Stuart Baker is to be congratulated on producing such an excellent book. A word of praise too is due to Messrs. Witherby & Co. for the general get-up and printing of the Volume.

N. B. K.

## PROGRESS OF THE MAMMAL SURVEY OF INDIA, BURMA AND CEYLON.

There is not very much progress to report since the last Journal was published in December 1913.

Mr. Crump has been collecting in Kumaon at Ramnagar to the West of Almora and then moved to Naini Tal. As it was desirable for a camp to be made a little nearer the N.-W. border of Nepal he then went to Lohaghat and thence to Philibit. He has now left Kumaon for Palamau and Hazaribagh in the province of Behar and Orissa. Mr. Oldfield Thomas writes from the British Museum that the Kumaon Collection is most interesting since it contains many animals illustrating Hodgson's Nepal work.

Mr. Shortridge arrived at Victoria Point, Lower Tenasserim, in December and has been steadily collecting in that neighbourhood and on the Pakchan River since then. As there are more than 800 Islands in the Mergui Archipelago it was decided to work the mainland first and to leave the Islands till another dry season. He is now leaving the extreme South for Mergui. As was anticipated the specimens obtained from Lower Tenasserim are of much interest and contain a large number of specimens similar to those collected by Anderson in this locality some fifty years ago.

Major Mayor is still collecting in Ceylon and is now at Kandy and is working the higher parts of the Island.

As regards finance many members have kindly sent in donations since the last Journal was issued as will be seen from the list of subscriptions received given below.

The Government of Bombay have kindly promised a further donation of Rs. 10,000 towards the expenses of the Survey in addition the Rs. 2,500 contributed by them in 1912.

The Trustees of the British Museum have also promised a further gration of £100.

The thanks of the Society are due to the following railways who have kindly promised to carry our Collectors and their assistants with free luggage over their systems whilst working in connection with the Survey :—

Ceylon Railways.
Oudh and Rohilkund Railway.
North Western Railway.
Eastern Bengal Railway.
Assam Railways and Trading Company.
Assam-Bengal Railway.
Bengal and North Western Railway.
Bengal-Nagpur Railway.
Bombay, Baroda and Central India Railway.
Burma Railways.
East Indian Railway.
Great Indian Peninsula Railway.
Madras and Southern Mahratta Railway.
Rohilkund and Kumaon Railway.
South Indian Railway.

The British India Steam Navigation Company have also generously agreed to bring over from Burma and Ceylon boxes of

specimens free of charge, and the acknowledgments of the Society are due to all these Companies who are so generously contributing to what is evidently felt to be an important advance to the scientific knowledge of the fauna of the Indian Empire and Ceylon.

## MAMMAL FUND.

FURTHER LIST OF SUBSCRIPTIONS UP TO 3RD MARCH 1914.

| NAMES. | Amount. | | |
|---|---|---|---|
| | Rs. | a. | p. |
| Amount previously acknowledged in Journal No. 3, Vol. XXII .. .. .. .. .. | 56,630 | 9 | 2 |
| Acworth, E. C. B. .. .. .. .. .. | 50 | 0 | 0 |
| Alston, G. C. (2nd Donation) .. .. .. .. | 15 | 0 | 0 |
| Archibald, W. .. .. .. .. .. .. | 15 | 0 | 0 |
| Bailey, Capt. F. M. .. .. .. .. .. | 15 | 0 | 0 |
| Bannerman, Surgeon-General W. B., C.S.I., I.M.S. (2nd Donation) .. .. .. .. .. | 50 | 0 | 0 |
| Boyle, D.H.M. .. .. .. .. .. | 14 | 4 | 0 |
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| Culbertson, T. M. S. (3rd Donation) .. .. .. | 10 | 0 | 0 |
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| Fenton, Col. L. L. (2nd Donation) .. .. .. | 15 | 0 | 0 |
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| Government of Bombay (2nd Donation) .. .. | 10,000 | 0 | 0 |
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| Hardy, G. S., I.C.S. (2nd Donation) .. .. | 50 | 0 | 0 |
| Heath, R. H., C.E. (3rd Donation) .. .. .. | 10 | 0 | 0 |
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| Hingston, Capt. R. W. G., I.M.S. .. .. .. | 15 | 0 | 0 |
| Jennings, Lt.-Col. W. E., I.M.S. .. .. .. | 15 | 0 | 0 |
| Julius, V. A. (2nd Donation) .. .. .. .. | 15 | 0 | 0 |

| Names. | Amount. | | |
|---|---|---|---|
| | Rs. | a. | p. |
| Junagadh The Minor Nawab Saheb | 2,500 | 0 | 0 |
| Langford, Capt. E. G. | 5 | 0 | 0 |
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| Scott, Capt. F. B. (2nd Donation) | 15 | 0 | 0 |
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| Webb, J. E. | 15 | 0 | 0 |
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| Wickham, P. F. (2nd Donation) | 25 | 0 | 0 |
| Williams, E. Alban | 5 | 0 | 0 |
| | 76,760 | 5 | 2 |
| **Promised.** | | | |
| | Rs. a. p. | | |
| Mr. Ratan Tata, 2nd Donation | 1,000-0-0 | | |
| Government of Federated Malay States (2nd Donation) | 1,750-0-0 | | |
| | 2,750 | 0 | 0 |
| Interest previously received from the Bank | 1,192-6-1 | | |
| Interest paid by the Bank on Fixed Deposits, etc., up to the end of 28th February 1914 | 224-7-10 | | |
| | 1,416 | 13 | 11 |
| Total Rs. | 80,927 | 3 | 1 |

# MISCELLANEOUS NOTES.

## No. I.—NOTES ON WROUGHTON'S FREE-TAILED BAT (*OTOMOPS WROUGHTONI*).

These bats were found at Talewadi in the Belgaum District, some 20 miles North of Castle Rock. They occupied a large cave which is locally known as the Bara Pêde (12 caves) and is reported as being a favourite haunt of bears. The entrance is completely screened by vegetation, the interior is very roomy and the sides and upper surface are scarred with deep hollows and ridges. The cave contained 2 different kinds of bats, *Megaderma spasma* and the present species. The Vampires seemed to favour the innermost portion of the cave, where it was extremely dark, while the *Otomops* sought shelter in the hollows about the entrance. Deep within these holes both males and females cluster in masses and single shot fired into one of these hollows secured some 30 specimens. As a rule, they hang by their hind feet, head downwards, but I saw two specimens clinging flat against the surface of the roof, using the claw at the end of the wing for support. Last December, Mr. J. B. Anding, who secured several specimens for the Society, found a female with a young one clinging one in front of it. Out of the same lot we secured 3 or 4 fœtal specimens, but never more than one from each bat. These bats utter a very sharp cry when alarmed, which they prolong for some time. The year I was fortunate enough to obtain a specimen alive. It lived in captivity for about 6 days, and used to spend the greater part of its time hanging by the legs from a 'game carrier' which was suspended on the wall, though occasionally it climbed up and lay flat on it. From what I observed this species seemed to prefer a fruit diet and invariably spat out any flies I offered him: at first he would not eat by itself, but showed no reluctance in swallowing pieces of banana put into its mouth, latterly it fed itself and while in the museum ate a couple of figs that were put into the cage.

S. H. PRATER.

Bombay Natural History Society's Museum,
20*th October* 1913.

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## No. II.—POSSIBLE OCCURRENCE OF A BLACK TIGER (*FELIS TIGRIS*).

I say possible, as the animal was not bagged. My son, who has shot several tigers and who knows what a black leopard is, writes as follows:—

"Have you ever heard of such a thing as a black *tiger*, not leopard? While up the Kaukkwe in the Bhamo District, I went out to the 'Lwins' (open grassy spaces in the forest) for Tsine, but on returning about 10 a.m. near the edge of a Lwin we heard a grunting at intervals of about 10 or 15 seconds. I insisted that it was a pig wallowing, but my shikari said he thought it was a Tsine about to calve. We followed up the sound and then hearing a deep guttural grunt, we knew it was a tiger. I told the shikari I was off home and put up my hand to show him a road out of the Lwin when from about 10 yards in front of us a big black mass made two bounds and was away. I let off my ·577 at it at about 15 yards range, and I think, hit it in the stomach. The animal being quite black I turned to the shikari and told him it was a pig, while he insisted it was a bear, but on tracking up we found enormous pug marks (they measured 1′-8″ round). After the shot it went on for some 5 or 6 yards, stopped

for a moment, and then went on another 100 yards and started growling again. We then left and returned next day, but could not find it. It was evidently hit, as it had torn up a lot of undergrowth and small bushes."

It is a great pity that the animal was not obtained, as even if the remains are found later on, there will probably be no traces of its having been black.

T. A. HAUXWELL,
Conservator of Forests.

MAYMYO, BURMA, 1*st October* 1913.

[Dr. Blanford in the "Fauna" mentions a black tiger which Mr. C. S. Buckland reported to him as having been shot near Chittagong.—Eds.]

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## No. III.—MONGOOSE *V.* COBRA.

In the last Journal, mention is made of a fight between the above. This reminds me of an incident which I witnessed while riding from Sirohi to Anadra one day. My attention was drawn by some brown thing moving in a small *Cassia auriculata* bush. It proved to be a mongoose, *Mungos mungo*, attacking a cobra, *Naia tripudans*. The cobra (fairly young, some 4 feet I should say) was lying in waves over the twigs, the mongoose was leaping up at it from below, the cobra making such plunges at him as his unstrategical position allowed. A forlorn babbler was hopping dismally about on the twigs all the time; so probably the cobra had been paying attentions to the babbler when the mongoose's arrival drove him up to higher ground. I brought my horse's head close to the bush, but neither combatant seemed to notice us. After perhaps half a minute of upward jumps of the mongoose at the snake's body and as many counters by the snake, the mongoose ran off into the long grass 10 yards off. The snake lowered his hood and slid downwards off the bush into the low grass, moving off in a line at right angles to that taken by the mongoose. He had not gone far when the long grass stirred, and the mongoose peeped out. The snake stopped and raised its head, suspecting danger, but did not expand its hood. For a second or two they remained thus, when in a second the mongoose had sprung forwards, nipped the snake's head and dragged him off, back downwards, into the long grass.

J. H. SMITH.

BHUJ, CUTCH, *January* 10*th*, 1914.

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## No. IV.—FEMALE ELEPHANT GIVING BIRTH TO THREE YOUNG.

We think that the following may be of interest to you. On the 27th October 1913 one of our working female elephants gave birth to triplet calves, all males.

We have no note of the date of impregnation, but the mother was heavy in calf in October 1912 and was said to be due in one to two months. Of the calves, one was still-born, one was normal and one was very small; the two latter only survived until 8th and 9th November.

Everything was done to bring them up but the mother would not look after them and kicked them away when they came to suckle, or if let loose would run away from them.

The mother's height is 7 feet 4 inches, she is probably about 25 years old and has never to our knowledge had calves before.

D. F. MACFIE, MANAGER,
The Borneo Coy., Ltd.

CHIENG-MAI, SIAM, 20*th December* 1913.

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## No. V.—RED SEROW IN UPPER CHINDWIN.

I shot last April in the Upper Chindwin District of Burma a full-grown male Serow with 8 inch horns. I made a fairly careful description of it at the time, which I find answers to Mr. Pocock's description of *Capricornis sumatraensis*, subspecies *rubidus*, in his article on the Serows, Gorals and Takins of British India. This subspecies, however, he only mentions as being found in (Burma) in Arakan and Salween. As it is also found in Assam, I should think it likely that it may be found here and in the Chin Hills as well.

J. M. D. MACKENZIE.

KINDAT, BURMA, 8*th December* 1913.

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## No. VI.—LARGE MARKHOR FROM BALTISTAN.

I am sending you a photograph of a good (though one-horned) Markhor which I got this year, as I thought it might be interesting enough to insert

among the "Miscellaneous Notes" of the Journal. The details of measurements, etc., I give below :—

| | Over curve. | Circumference. | Straight. |
|---|---|---|---|
| *Left horn* | 53″ | 10½″ | 33½″ |
| *Right horn.* | 18″ | 11″ | .. |

Shot, 25th May 1913, below Rondu (Baltistan).

W. M. LOGAN HOME, CAPT.,
112th Infantry.

NOWSHERA, N. W. F. P., *8th December* 1913.

[To this note Capt. Logan Home added in a later letter (10th January 1914), that he had been informed by the Secretary of the Game Preservation Department, Kashmir, that the unbroken horn was the record head for Baltistan proper.—EDS.]

## No. VII.—HOW WILD BOARS FIGHT.

In the September number of the Journal of our Society I see an interesting note about the wild boars and how they fight. I have several times seen fights.

Once, in Algeria, many years ago, I was waiting for a panther in a clearance of very thick jungle. It was sandy ground at this place and the opening, under a bright moonlight, was nearly as clear as daylight. I was sitting on the ground, screened by some branches, with my feet in a little gully cut by running water at the very edge of the clear space, which might have been, say, twenty yards broad by thirty or forty.

At about eleven, I heard, all at once, a sudden row in the jungle close by and some grunts of wild boars. My first idea was that the panther was just attacking a boar. But as it lasted for some while, I saw, I was mistaken, but was at a loss to account for the noise. Presently a rush in the jungle to my right and the swaying of some branches quite close to me, with more grunts, made me feel that my shelter would have been more comfortable if stronger. I then saw a large boar backing out in the clear space suddenly stop and charge full speed into the thicket out of which he had come out. Then more grunts and row in the wood. This was very puzzling, but after a short time and a dead silence, a large boar walked out in the open space just in front of me and stood motionless, head low and hair standing on end on the back. Almost directly another, about the same size, came out trotting and the first one charged at him as straight as a cannon ball. They kept fighting by turns for certainly a quarter of an hour sometimes quite near my hiding place and sometimes in the jungle. I did not care to shoot them on account of my panther which I was afraid would be scared away. These two boars were grand chaps: fully two hundred and fifty pounds weight, each of them seemed exactly the same size and I had a good look at them.

Evidently, when boars fight, they go at each other full tilt, head rather high, and they nearly always both rear up like horses on their hind legs when coming into contact, both chins touching and trying to get at the other for a broadside swing. Then they stop and stand motionless a few yards apart for a rest. At this time they never utter a sound. The grunting takes place only when they touch each other. After a short rest one can see the fringe of hair on the back bristling and the boars munching a few times; then they appear to stiffen their body and raise themselves on tip toe, the fore legs seem to ve at this time a sort of quivering motion and as soon as one of

them is doing this the other goes through the same performance and both charge together as hard as they can. The grunting takes place at this time of the real hard tussle. It seems that as long as both heads are held high enough and that neither of the fighters gives a broadside or flank chance at the other, very little damage will occur. Once, one of them got his snout under the chest of the other and lifted it with incredible speed, the other gave him repeated cuts on the top of the shoulder and made him back a little then had a chance at the side and went at him with all his power, both very nearly rolled over, but, after a short contest—difficult to see in the dust—both brutes were looking at each other about a yard apart munching rapidly but none the worse. As far as I could see they never try a direct vertical toss, but always a slanting upwards broadside cut. The shape of the tusks and their position makes this last cut the only effective one. I carefully observe the cuts on boars when I kill any, and the scars are always the same; some may be seen at the end of the lower jaw near the neck, but much oftener on the shoulder and ribs. I never saw but one further back than the flanks. These cuts are rarely more than four or five inches long and generally only two. It is common to see old boars with a few healed scars about, and, I believe, that they fight very often if two of them of about the same size are discussing family questions; but a small one will never stand the charge of a bigger one and to drive him away the big one has only to rise on tip toes with the quivering motion of the legs announcing the charge. Sometimes a big chap feeding will make a short charge at a little one who never waits for him but runs away a short distance at once.

It is easy to see that the big one does not mean more than that, because his charge is not made with a will, and, being heavier, even if he wanted to catch the other, he could not manage it. When turning sharp it seems to me that they fix firmly their fore legs on the ground and swing the hind quarters round. Given the weight of the shoulders it is very logical, because the heavy part of the body acts as a pivot for the lighter part. But all these moves are well known to pigsticking people, who do not ignore that a boar at full gallop can turn sharp on its fore legs and jump or rear right up to the level of the saddle.

I did not see the end of the fight described above, because it was finally carried on in the jungle; but I was very much astonished on the morrow to find hardly a drop of blood on the ground. Animals are proportioned to their natural means of attack and do not injure each other half as much as we believe. Even a rhinoceros can dig at another with all its power without making much impression on him. It is necessary that it should be so. If wild boars, rhinoceroses and the like could injure each other, as they can do animals of different species there would not be many left.

Another time, in Assam, I saw two boars fighting. It was early morning in a burnt place and not far from my camp. It was about two hundred yards away and did not last more than a minute in sight of me. As far as I could see it was the exact repetition of my Algerian experience.

Again in the Caucasus I saw two large boars fighting. It was in the dim light of sunset and about eighty yards from us. They came out of the forest at full gallop, one chasing the other which was dodging like a hare and all at once wheeled on his fore legs to wait for him. Then both reared against each other grunting and began just the same sort of thing which I had seen in Algeria.

In Somaliland I got a glimpse of Wart Hogs fighting, but too far to see them properly. The grass being about two feet high at this place, all I could see was from time to time the two Wart Hogs rearing and even jumping high up against each other, but when they were on the ground,

they were out of sight. I dare say they fight pretty well, the same way as the common wild boar.

If large wild boars are fighting and anybody disturbs them, the chances are for a charge at the intruder. In my opinion, it is very likely that both would make straight for the man if he came unexpected quite close to the battle, but if over, say, fifty yards away he will hardly be noticed and if he shows himself and shouts, the Boars will stand motionless for a while and then, as soon as one of them goes away, the other will charge at him and both will go away together wheeling and fighting the while. I never saw or heard any reliable evidence of wild Boars killing each other in a fight. I wonder if it is possible, given the length of the tusks and the thickness of skin and flesh and muscles on the exposed parts. No doubt, they can rip open a pony, but what is the skin of a horse to compare with that of a Boar?

VICOMTE EDMOND DE PÔNCINS.

FEURS, LOIRE, FRANCE, *December* 1913.

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## No. VIII.—NOTES ON THE WEIGHTS OF ANIMALS.

The following is a list of weights of a number of "chiefly small" Indian mammals. In some instances it has been possible to weigh a series of each species and so arrive at an average weight; in others marked * only one or two specimens were weighed.

It may perhaps be noticed that an animal's weight is often deceptive, the large Indian Civet and the Mongooses being heavier than would be expected in comparison with the Cats and Paradoxures. The Large Bamboo Rat is heavier than an average Cat; while the weight of a Jackal is hardly more than that of an English Fox. "*The Field*" Feb. 8th, 1913, recording a Dog Fox from Dorset weighing 21 lbs. Blanford records the weight of an Indian Fox (*Vulpes bengalensis*) as being only from 7-8 lbs.

*Hylobates hoolock* (the White-browed Gibbon), one male weighed 14½ lbs. and two females, 13¼ lbs., respectively.

*Presbytis entellus anchises* (the Southern Langur).

Monkeys even when adult are very variable in size and weight, though, as a rule, the males are larger than the females. This species was found to be heavier than any other species of Indian Monkey yet weighed, averaging from 15-30 lbs., the heaviest male weighing 35 lbs., and the heaviest female 27 lbs.

*Presbytis johni** (the Nilgiri Langur) an adult male 21 lbs.

*Presbytis phayrei* (Phayre's Leaf Monkey), 17¼-20 lbs.

*Simia sinica* (the Bonnet Monkey), 8-19¾ lbs.

*Simia rhesus* (the Bengal Monkey, from N. Shan States), 12-15½ lbs.; the difference in the size of the sexes was not very noticeable in this species.

*Loris lydekkerianus* (the Madras Slender Loris) 9½-12¼ ozs. The weight of these animals was very deceptive, they were not half the weight of an average bandicoot.

*Felis tigris** (the tiger), weight of a male, 9 feet 1 inch between pegs, from North Kanara, 350 lbs.

*Felis affinis** (the Jungle Cat), weight of a large male, 13 lbs.

*Felis bengalensis** (the Leopard Cat), an averaged sized specimen, 6¼ lbs.

*Paradoxurus niger* (the Indian Toddy Cat) from 5¾-8 lbs.

*Paradoxurus jerdoni* (the Brown Toddy Cat), 5½-9½ lbs.

*Paradoxurus hermaphroditus* (the Malayan Palm Civet), 6¾-7¼ lbs.

*Viverra zibetha* (the large Indian Civet), three specimens 18¼, 19½ and 20 lbs. respectively, Blanford records specimens weighing 25 lbs.

*Viverricula malaccensis* (the Small Civet), 5½-7½ lbs.
*Mungos mungo* (the Common Mongoose), 3-4 lbs.
*Mungos vitticollis* (the stripe-necked Mongoose) 6-7½ lbs.
*Mungos fuscus* (the Nilgiri Mongoose), 3½-6 lbs.
*Mustela flavigula** (the Indian Marten), 4½ lbs.
*Canis indicus* (the Jackal), specimens average from 13-18 lbs., the two heaviest weighing 19 and 19½ lbs. respectively. Blanford records 20 lbs.
*Lutra lutra* (the Common Indian Otter), 10-11 lbs., exceptionally large specimens will probably be found to weigh more than this: Blanford records specimens weighing 20 lbs. and more.
*Aonyx cinerea** (the Clawless Otter), an adult male, 9½ lbs.
*Muntiacus vaginalis* (the Indian Barking Deer), two females weighed 41 and 60 lbs. respectively, while a large male weighed over 75 lbs.; this is considerably over the estimate given by Blanford, who records the weight of a male as only 38 lbs.
*Tragulus meminna* (the Indian Mouse Deer), average weight from 8-10 lbs.; these are also considerably more than the weight given by Blanford, who gives the average weight at between 5 and 6 lbs.; the males and the females weighed about the same.
*Pteropus giganteus* (the Indian Flying Fox), 2-3½ lbs.
*Lepus nigricollis* (the South Indian Hare), 4½-6 lbs., an exceptionally heavy male from Coorg, 8 lbs.
*Hystrix leucura** (the Indian Porcupine), 21½ lbs. (not an exceptionally large specimen).
*Petaurista philippensis* (the Flying Squirrel), 4¼-5 lbs.
*Ratufa indica* (the Giant Squirrel), 3½-5½ lbs.
*Bandicota malabarica* (the Bandicoot 2-2½ lbs.), a particularly large specimen weighing 11½ lbs.
*Epimys rufescens* (the Indian Mouse Rat), 3-5½ ozs.

G. C. SHORTRIDGE.

c/o National Bank, Rangoon,
*December* 1913.

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## No. IX.—CRESTED BLACK TIT IN THE PLAINS.

Among a party of Indian Grey Tits disporting themselves in the trees in my compound on 22nd December 1913, I noticed 4 or 5 Crested Black Tits *Lophophanes melanolophus*. In the "Birds of Kohat and Kurram" Whitehead, the Crested Black Tit, was noted as having been found on the Safed Koh from 6,500 to tree limit. Its descent to the plains has not, as far as I know, yet been recorded, and Kohat is in the plains and 50 miles or more from forest-clad hills, the natural habitats of *L. melanolophus*. The weather was cold at the time and there was snow on the hills towards Tirah.

H. A. F. MAGRATH, Lt.-Col.

Kohat, *2nd January* 1914.

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## No. X.—*SYLVIPARUS MODESTUS*, THE YELLOW-BROWED TIT, IN SEHORE. A CORRECTION.

In my notes on the Birds of Sehore, C. I., Volume XXI, p. 169, for *Sylviparus modestus* read *Cephalopyrus flammiceps* the firecap. The skin of the above was originally verified in the British Museum as *S. modestus*. It has since been found to be *C. flammiceps*.

Kohat, *January* 1914. C. H. T. WHITEHEAD, Capt.

## No. XI.—THE GREY-HEADED FLYCATCHER (*CULICICAPA CEYLONENSIS*, Swains).

On 29th December last, in the District Board Garden at Gujranwala, my notice was attracted by the loud notes of a small bird in a thicket of young trees. Investigation shewed it to be a Grey-headed Flycatcher: the next evening I saw it hawking insects from a neighbouring tree; and securing it, found it to be an adult female. It is sufficiently rare in these parts to be worthy of record.

Jhelum, Punjab. HUGH WHISTLER, M.B.O.U.

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## No. XII.—ROCK THRUSH (*MONTICOLA SAXATILIS*, Linn.) IN HAZARA.

This species occurs in Gilgit on the autumn migration, and it has been also recorded lately from Kohat and Lahore in September, yet we have otherwise but little information about the species as an Indian bird. Hence it is worth recording that I secured a female on September 29th between 8,000 and 9,000 ft., on Mirsanjani Hill, Hazara. This bird was perching on the tops of the one or two trees that grew on the bare hillside, and first attracted attention by the chestnut tail which was spread in flight.

HUGH WHISTLER.

Jhelum, Punjab, 20*th October* 1913.

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## No. XIII.—OCCURRENCE OF THE WHITE-BROWED BUSH-ROBIN (*IANTHIA INDICA*, Vieill) IN THE NORTH-WEST HIMALAYAS.

Owing to the indefatigable efforts of my friend, Alec. Jones, I have much pleasure in recording the occurrence of the rare *Ianthia indica* in the N. W. Himalayas. This find is, in my opinion, by far the best of the season, in the Ornithological line, from these parts.

Towards the latter end of July last, Jones sent me for inspection the skin of a bird, shot on the 5th July, which he said he took for *Ianthia indica*. On examining it, I had no hesitation in referring it to this species, but in view of Oates' remarks (F. B. I. Aves, Vol. II, p. 107), about the habitat of this bird, I thought it best to consult Mr. Kinnear, M. B. O. U., about the specimen, and he states *in epist*.: "I must congratulate you on obtaining this Bush-Robin, which, I think, is without doubt *Ianthia indica*. It is a great find, being so far west of all previous records. I can find no notice of this bird's occurrence *west* of Nepal."

Jones has very kindly sent me the following very interesting notes from his diary in regard to the habits of this little known species:—

"During my stay in the N. W. Himalayas, I have come across *Ianthia indica* near Dalhousie, and in the Native State of Mandi, between elevations of 7,000 and 8,000 feet. This bird is the prince of skulkers, hiding continuously in dense undergrowth, and hence probably the reason of its having been overlooked here. Up to date, I have only *seen* this one bird, but have *heard* several singing in suitable spots along a three mile stretch of road, which I traversed in the Mandi State. Its song is very characteristic, and could not, I think, be mistaken for that of any other bird. It might be syllabalized as "I'll fleece you." The first note, low and prolonged, and gradually ascending the scale, and the remaining notes being finished off with a quick flourish. Occasionally two or three

deep liquid notes are added. I tried very hard to obtain further specimens, but after fruitless efforts had to content myself with only one. Possibly other Ornithologists have been more successful!"

"The bird, which I send herewith, showed that the breeding season was then (July 5th) in progress, its testes were much enlarged. I found several small sun-beetles in its gizzard."

P. T. L. DODSWORTH, F.Z.S., M.B.O.U.

SIMLA, W., 17*th October* 1913.

## No. XIV.—THE BREEDING HABITS OF THE BROWN-BACKED INDIAN ROBIN (*THAMNOBIA CAMBAIENSIS*) IN THE JUNGLES OF THE C. P.

The following notes were on the nesting of the Brown-backed Indian Robin made in the Chanda District during April 1913 :—

All the nests were found between 1st April 1913 and 31st May 1913.

This robin appears to be very versatile in its nesting habits, both in the choice of the site for its nest, the amount of material used in its construction, also in the number of eggs it lays.

Oates says, four to six is the usual number, but on no occasion did I find more than 3 eggs which was the usual number, while some nests only contained two. Nests varied from a flimsy construction of a few bents to a massive nest and were placed on the ground and any distance from the ground up to twenty feet. On several occasions I found nests lined with pieces of the "slough" of snakes. From my observations I have come to the conclusion that this bird brings up two successive broods in the year.

Appended is a list and description of nests taken.

*A.*—1st April 1913.—Konsuree, Chanda, one egg fresh.

2nd April 1913.—By a road in the fork of a Pitas tree about 4 feet from the ground, one egg fresh.

*Nest.*—Cleverly hidden in the fork of a Pitas tree about 4 feet from the ground. Composed of bents, dead grass and twigs.

*Eggs.*—Spotted with brown, grey, purplish and maroon: more thickly and a ring at larger end. ·82″ × ·59″, ·86″ × ·62″, average = ·84″ × ·595″

*B.*—8th April 1913.—Huldee, Chanda. In the Jungle (scrub and thorn thickets), 3 eggs. Incubation very advanced.

*Nest.*—A neat little nest of dead grass, lined with pieces of a snake's slough, placed in a hollow in the stump of a broken tree about three feet from the ground.

*Eggs.*—Greenish white, spotted and speckled with brown and purplish grey. Thickly spotted at larger end where there is a ring of purplish grey.

·82″ × ·64″, ·80″ × ·63″, ·81″ × ·62″; average = ·81″ × ·63″.

*C.*—9th April 1913.—Huldee, Chanda. In the jungle (scrub and thickets), 1 egg and 1 young one. Egg hatching: young one just out of shell.

*Nest.*—Placed in a hole in the dead top piece of the trunk of a small tree; about 14 ft. from the ground and about one foot down in the hole. Composed of dead and dry grass, bents and stalks, lined with finer grass and fibrous roots. Nest scanty.

*Eggs.*—For description and colour, see previous notes. No measurements taken.

*D.*—10th April 1913.—Huldee, Chanda. In the fields, near the village, 1 egg and 1 young one. Young one just hatched.

*Nest.*—Placed in a well-hidden hollow, at the side of a stump. About 4 ft. from the ground and screened by a mass of thick thorn. A very large nest with bulky foundation. Composed of dead grass and bents; lined with finer grass.

*Eggs.*—For description and colour, see previous notes. No measurements taken.

*E.*—10th April 1913.—Huldee, Chanda. Just at the edge of the jungle (well tree-ed thickets).
Two eggs. Incubation very advanced, almost hatching.

*Nest.*—Placed at the foot of a small tree, well concealed in a hollow in the ground. Composed of dead grass and bents, lined with pieces of the 'slough' of a snake.

*Eggs.*—Pale greenish white, spotted and speckled with brown, greyish and purple grey, more thickly at the larger end. ·76″×·58″, ·76″×·60″; average = ·76″×·59″.

*F.*—19th April 1913.—Walsera, Chanda. At the edge of the jungle by the village in a small thicket.
3 eggs, fresh.

*Nest.*—Placed in a hole in a stump about 3½ ft. from the ground very little in the way of nest. Just a few pieces of dead grass, lined with pieces of a snake's "slough."

*Eggs.*—Pale greenish white, thickly spotted and speckled all over with brown, sepia, grey and blue-grey. More thickly and merging into a ring at the larger end. One egg is blotched. ·79″×·60″, ·76″×·62″, ·74″×·62″; average=·77″×·61″.

*G.*—20th April 1913.—Walsera, Chanda. In the jungle, in a slight clearing, fairly open jungle, thinly tree-ed.
1 egg and 1 young one.
Egg just hatching: Young one just hatched.

*Nest.*—Placed in a hole in a stump, about 5 feet from the ground. Very little nest, just a few bits of dead grass placed to soften the hollow.

*Egg.*—Pale greenish white, thickly spotted and speckled all over with brown and sepia.

*Young one.*—Darkish in colour, with tufts of black down.
No measurements taken.

*H.*—26th April 1913.—Huldee, Chanda. In the jungle (Teak Forest).
3 eggs. Fresh.

*Nest.*—Placed about two feet from the ground in the hollow trunk of a small tree. Very narrow entrance. Composed of a few sticks and stalks for foundation, with nest of dead grass: no lining.

*Eggs.*—Pale greenish white, thickly spotted and speckled, more so at the large end where there is a ring of colour, with brown sepia, bluish grey and purplish grey. One egg unfortunately was smashed in withdrawing it from the nest. One egg was spotted with a fine dark ring at the larger end; the other is speckled and the rings not so distinct, the speckling being thicker.
·77″×·62″, ·77″×·63″; average = ·77″×·625″.

*I.*—27th April 1913.—Huldee, Chanda. In the jungle (thin forest and thickets), 3 eggs, fresh.

*Nest.*—Placed in a hole in the side of a broken stump, about 2 feet from the ground. Composed of dead grass and fine stalks, lined with a few bits of black hair.

*Eggs.*—Pale greenish white, spotted and slightly speckled with sepia brown, bluish grey and purple grey. Spotted all over, more thickly and ring shaped at the larger end.
·80″×·62″, ·76″×·62″, ·79″×·62″; average = ·76″×·62″.

*J.*—2nd May 1913.—Jamgiree, Chanda. Near a jungle road (forest and scrub), 3 eggs, on the point of hatching.

*Nest.*—Placed in a hollow stump at the top. About 5 feet from the ground. Quite a massive nest of small bents, stalks and dead grass and roots.

*Eggs.*—Pale greenish white, speckled and spotted all over with sepia, brown, bluish-grey and purplish-grey.
·81″ × ·58″, ·81″ × .58″, ·78″ × ·59″; average = ·80″ × ·58″.

*K.*—3rd May 1913.—Koothégaon, Chanda. By the side of a jungle path (thin forest), * 2 eggs, one young one.
Eggs on the point of hatching. The young one just hatched.

*Nest.*—Placed at the bottom of a stump in a hollow about 8 inches above the ground. A heavy massive nest of dead grass and stalks lined with finer materials.

*Eggs.*—Pale greenish white, spotted and speckled all over with sepia, brown, bluish-grey and purplish-grey; more thickly and ring-shaped at the larger end.
No measurements taken.

*L.*—4th May 1913.—Koothegaon, Chanda. In scrub jungle on a grassy plain. No eggs.

*Nest.*—Usual type, lined with pieces of a snake's slough. Placed in a hole at the top of a stump, about 5½ ft. from the ground.

*M.*—31st May 1913.—Vithulwara, Chanda. Placed in the eaves of a P. W. D. Bungalow. 2 young ones and 1 egg.
Egg probably unfertile, young ones a few days old.

*Nest.*—A slight construction of dry grass and fine roots, lined with softer materials; about 10 feet from the ground.
Eggs not taken, so no measurements.

Average of all the eggs taken by me works out at ·79″×·69″ which makes my eggs a bit bulky than Oates' measurements of ·79″×·59″.

C. R. S. PITMAN,
27TH PUNJABIS.

JUNE 1913.

* These two eggs were lying on cotton wool in my tent and hatched out on the 4th and 5th May.

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## No. XV.—NESTING OF *ANTHUS SIMILIS*, JERDON (THE BROWN-ROCK PIPIT).

The fact that the Brown-Rock Pipit (*A. similis*) is a common summer visitor to the *lesser* ranges of the Himalayas is well known, but during the last three or four years my friend, Alec. Jones, has demonstrated to me, on more than one occasion, that a few of these birds nested every year,

*close to Simla, and as high as 7,000 feet*, Jones has actually taken two nests at this altitude, and he thus describes his finds:—

"16*th May* 1909.—This morning whilst searching the hillside for Pipits' eggs, I had the good fortune to flush a Brown-Rock Pipit (*A. similis*) from her nest, and found 4 slightly incubated eggs in it. The nest was beautifully concealed under a tussock of grass, and had I not seen the bird leave the spot, I should never have found its abode. The eggs resemble very closely the eggs of the Upland Pipit (*O. sylvanus*). The speckling is, however, appreciably finer, and the ground colour more of a stone or greyish-green tinge. Nest of grass blades: lining, fine grass stems. Elevation 7,000 feet."

"27*th June* 1909.—A nest and 4 hard set eggs of *A. similis*. Nest well concealed, and placed under a small creeping plant. Structure made of grass, and more substantial than the one mentioned above. Female shot and identified. Eggs finely speckled and closely resembling the former clutch. The ground colour was, however, a pale creamy-white: elevation 7,000 feet."

The following is an extract from my diary, relating to a nest of this Pipit, taken on the 22nd June in Keonthal territory, about six miles from Simla, N. W. Himalayas:—

The result of to-day was, among other eggs, a beautiful clutch of 4 eggs of the Brown-Rock Pipit (*A. similis*). We had just emerged from a 'deodar' forest, and were traversing a steep grassy slope, bordering on some fields, when a male of the Brown-Rock Pipit flew past overhead, uttering his characteristic note. This immediately put us on the alert, and he had scarcely proceeded a few steps further, when our attention was diverted to the curious behaviour of another Brown-Rock Pipit, which was tumbling and fluttering about, close to us, on the ground, in a most extraordinary manner. The dogs at our heels soon caught sight of this rolling ball of feathers, and were instantly in hot pursuit after it; but, of course, *we* knew what these "injury feigning" tactics meant, and quite disregarding the bird and its attempts to divert us from the spot, commenced making a thorough search for its nest, which we shortly afterwards discovered. It was placed in a hole of the bank under a tuft of grass, and, as already stated, contained 4 eggs, which were slightly incubated.

The nest was a shallow cup, composed exteriorly of coarse grass-stems, roots, pieces of sticks, with some moss attached here and there to its sides, and lined with very fine grass stems. It measured:—diameter of egg-cavity 3": depth of ditto 1·25": external diameter 4·25: thickness of sides ·65": thickness of bottom ·5".

The altitude of the spot was fully 6,000 ft.

On comparing 10 eggs of this Pipit with 16 authentic specimens of the Upland Pipit (*Oreocorys sylvanus*), taken in the neighbourhood of Simla, I find the following differences:—

(*a*) The eggs of *Anthus similis* are smaller than those of *Oreocorys sylvanus*: 10 specimens of the former, average ·83" × ·65"; while 15 of the latter, average ·89" × ·68".

(*b*) The markings are different. The eggs of *Anthus similis* are *finely* and *profusely* speckled and spotted *all over* with various shades of dark and dull sienna-brown and pale inky-purple, some of the eggs are so heavily marked that they closely resemble the very dark type of eggs of *Passer domesticus*. On the other hand the ground colour on most of the eggs of *O. sylvanus* is clearly visible, and the markings are, on the whole, *much bolder and "more spotty."*

They have a good deal of the reddish and purplish brown, with pale inky purple, and in most of the specimens, the markings are chiefly towards the large ends, where they show a tendency to form irregular caps or zones.

P. T. L. DODSWORTH, F.Z.S., M.B.O.U.

SIMLA, W., 10*th September* 1913.

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## No. XVI.—NESTING OF HODGSON'S HAWK EAGLE (*SPIZAETUS NEPALENSIS*, HODGS).

As it is stated that this species invariably breeds on *trees*, it may be of some interest to record that on the 6th January 1913, I found a nest in the process of construction, which was placed *on the face of a huge cliff* overhanging the Ashni River, near Solon, 5,000 feet, N. W. Himalayas. Both the old birds were noticed carrying sticks.

For almost a month after this, the weather became most unsettled, and it was not till the 18th of the following February that I was able to visit the spot again. On arrival, I found that the nest was tenanted—both the old birds sat in it by turns—and immediately made the necessary "bunobust" to lay siege to the eyrie. Owing to its difficult position, it had to be approached with great caution; and after several ineffectual attempts, during which my climber twice got jammed in a narrow fissure, just above the nest, he reached the structure and lowered me down its contents—two very hard set eggs. The birds hovered about while the man was in the nest, but made no "demonstrations" whatever.

The specimens were broad ovals: ground colour, a dull white, and sparingly blotched and spotted (one chiefly at the large end, and the other chiefly at the small end) with shades of dingy and reddish-brown. They measure 2·81″×2·17″ and 2·77″×2·17″.

The nest was a mighty structure of twigs and sticks. In the centre there was a depression, lined with green leaves on which the eggs reposed. Judging from the successive layers of sticks composing the base of the nest, I should think that it had been used by these birds for many years.

The young chicks, or rather bits of them, which were got out *above*, were covered with greyish-white down.

I may add that this species is to be seen throughout the year in the outer ranges here between elevations of 3,500 and 5,000 feet. To the hillmen it is known as the "Muriaree."

P. T. L. DODSWORTH, F.Z.S., M.B.O.U.

SIMLA, 2*nd October* 1913.

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## No. XVII.—PLUMAGE OF THE NESTLINGS OF (*i*) THE KOKLA GREEN PIGEON (*SPHENOCERCUS SPHENURUS*, VIGORS), AND (*ii*) THE BEARDED VULTURE OR LAMMERGEYER (*GYPAETUS BARBATUS*, LINNEUS).

### (*i*) *Kokla Green Pigeon* (*S. sphenurus*).

The whole of the upper plumage is dull-green, slightly brighter on the head, upper tail-coverts, scapulars and lesser and median wing-coverts. Greater coverts dull-green and edged on the extremities of the outer webs with pale-yellow, forming a bar. Winglet blackish, primary-coverts blackish, primaries blackish and the majority of them very faintly edged

on the outer webs with pale-yellow; secondaries blackish, and also edged on the outer webs with pale-yellow; tertiaries dull-green.

In the lower plumage, the feathers of the throat, breast and upper portion of the abdomen are pale-grey edged with greenish-yellow; the feathers on the abdomen and vent fluffy yellow-white, thigh-coverts pale fluffy-grey, tipped with dark-green; undertail coverts dull-green, broadly edged with pale-yellow.

*Bill*, light fleshy-brown, tipped with dusky; there is a tinge of blue at the base of the lower mandible. *Orbital skin*, very dull-blue. *Iris*, brown. *Tarsi* and *feet*, fleshy-brown, the former have a tinge of dull blue on their upper extremities. *Soles of feet*, very pale fleshy-brown. *Claws*, brown horny, darker at tips.

(*ii*) *Bearded Vulture* (*G. barbatus*).

*Simla, 7th May* 1911.—Visited the Lammergeyer's eyrie to-day. There was only one young about a month and a half or a couple of months old in the nest, and we had this brought down, and subjected it to a most careful examination.

The whole of its body, almost the whole head, neck, the upper and lower surfaces of the wings and tarsi were covered with down of a light brownish-grey. The primaries (which were about 3" in length), secondaries, tertiaries, scapulars and tail feathers (about 2½" long), were beginning to sprout, and were of a dark brownish-black colour. The back of the crown had a few brownish-black feathers showing through the down, and a few feathers of a pale buffy-white (much lighter than the down), and intermingled with blackish ones, were sprouting up here and there from the neck. A few feathers also of a buffy-white, intermingled with a few brown ones, were sprouting from the chest and sides of the body.

The bill was of a light-greenish horn colour, darker at the tips. The lores and base of the upper mandible were covered with the usual black bristles, about a quarter of an inch in length. Similar bristles and of a similar length, projected from the base of the lower mandible.

The gape was fleshy and also the mouth; pupil of eye, black; iris, light hazel; sclerotic membrane, blood-shot.

The feet were of a pale leaden green; the claws, which were long and very sharp, were of a shining jet black, their undersurfaces being whitish; soles of feet, whitish.

Feet absolutely bare, *no feathers of any sort on side of mid-toes*.

In connection with the above note, it is interesting to mention that, according to Gurney (Raptorial Birds in the Norwich Museum, Pt. I., pp. 82-83) both adult and immature specimens of these birds occasionally "present the singular peculiarity of a row of small feathers running down the outside of the first joint of the middle toe." The late Captain Hutton in describing (Rough Notes, p. 40) a young bird of this species states that one of the toes had a bunch or tuft of feathers on it. I have never yet come across this peculiarity in any of the birds that I have shot from time to time, and, on referring to Hume, I find that he also comments on the absence of this peculiarity in his specimens.

P. T. L. DODSWORTH, F.Z.S., M.B.O.U.

SIMLA, *2nd October* 1913.

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## No. XVIII.—THE HABITS OF THE PAINTED SPUR-FOWL (*GALLOPERDIX LUNALATA*).

During May 1913, I had many opportunities of studying the habits of the Painted Spur Fowl (*Galloperdix lunalata*). I have found them in the

Central Provinces in vast quantities about lat. 80°-15′ E. and long. 19°50.′ N. on rocky forest covered hills granuoid gneiss grass, and they seem more partial to those covered with Bamboo Jungle. I never saw them in the valleys, unless they had been frightened there from the crest or sides of the hill near the crest. The more open and grassy the crest line of the hill, the more likely was one to find several pairs of Painted Spur Fowl there. As the birds were very plentiful, I shot several to examine and also for skins for the Society, although it was in the close season. However I came across many broods and by this time "cheepers" were very strong or the wing and almost as large as and similarly coloured to the adult hens. I found the best way to beat them out, was to walk along the crest of a hill with a beater in line with one on either side of the hill and about 60 yards down it.

The birds if on the hillside would always run up and, on seeing me at the top, often rose at once and flung themselves headlong down the hill or went shooting along the crest. I never saw one actually fly up a hill in cold blood, but in cases where birds had scuttled down to a lower crest they often broke back, flying part of the way back to their original refuge.

Both seem often perched in trees when frightened. I did not find them very difficult to flush, although if the cover and ground suited them they much preferred to run. The males usually rose with what I describe as a curious bubbling half scolding clucking note, which sounds rather complex, but I find it hard to describe. I used to hear Fowl calling on the hills during the night, but did not know whether it was this spur fowl as well as the grey jungle cocks.

I only once saw them drinking and at that time a pair came down to a pool in a nullah at 6-30 a.m.

At this date (May), the breeding season was apparently over. I found two nests with the remains of 2 and 3 eggs in them, out of which the young had been hatched. I should not say nest, as the eggs were in a hollow in the ground under a projecting piece of rock. They were both on the slope of a hill not far from the crest.

As regards their food, it seemed to be mostly vegetable matter, but in all their crops that I examined was practically nothing but "mush" and some rotten old and stale Mhowah flowers.

In regard to the number of spurs, I noted carefully the number carried by all I shot, which was as follows:—

1 ♂3+3, 2 ♂♂3+2, 2 ♂ ♂2+2; 4 ♀♀2+2, 3 ♀♀1+1, 1 ♀1+0.

4 immature and almost full grown specimens had *no* spurs.

C. R. S. PITMAN,
27TH PUNJABIS.

DERA ISMAIL KHAN, N.-W. F. P.,
*9th August* 1913.

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## No. XIX.—NOTES ON THE GAME BIRDS OF THE BASTI DISTRICT, U. P.

Living in the adjoining district of Basti, I have read with interest the article in your issue of 20th December 1913 by Mr. A. E. Osmaston, I.F.S., upon the Birds of Gorakhpur. The Basti district resembles Gorakhpur precisely, save that the sal forests that covered a great portion of both within living memory have now totally disappeared from the former. Consequently, with the exception of purely forest forms, such as the red jungle fowl, the Avifauna is identical. I regret that my own knowledge

of Indian birds does not extend beyond the varieties classified as game. However, the bag of a sportsman during two consecutive seasons may be of interest to your readers, and I append it—

| 1912-13. | | 1913-14 up to 9th January 1914. |
|---|---|---|
| 3 | Grey partridges, *Francolinus pondicerianus* | 0 |
| 3 | Quail, *Coturnix communis* | 1 |
| 7 | Hill Pigeons, *Columba rupestris* | 0 |
| 4 | Peewits, *Vanellus vanellus* | 0 |
| 372 | Snipe, *Gallinago cœlestis* | 410 |
| 2 | Mallard, *Anas boscas* | 5 |
| 11 | Gadwall, *Chaulelasmus streperus* | 52 |
| 17 | Teal, *Nettion crecca* | 57 |
| 13 | Garganey teal, *Querquedula circia* | 7 |
| 11 | Red crested pochard, *Netta rufina* | 11 |
| 71 | White-eyed pochard, *Nyroca africana* | 32 |
| 1 | Red-headed pochard, *Nyroca ferina* | 6 |
| 1 | Tufted pochard, *Fuligula fuligula* | 6 |
| 1 | Grebe, *Podicipes p.* | 1 |
| 519 | | |

Birds shot this year only are—

| | | |
|---|---|---|
| | Spotted-billed duck, *Anas pœcilorhyncha* | 2 |
| | Pintail, *Dafila acuta* | 7 |
| | Widgeon, *Mareca penelope* | 6 |
| | Grey goose, *Anser rubirostris* | 2 |
| | Golden plover, *Charadrius fulvus* | 2 |
| | | 607 |

It is certain that 1913-14 has been a better year for sportsmen in the Gorakhpur Division than 1912-13. The drought in Northern India has driven down birds in large numbers that usually winter in colder climates. It is instructive that there should be fewer white-eyed pochard this year than last. These birds want plenty of water, and do not mind the heat, so go presumably in Lower Bengal. However the ducks that feed on the surface, such as gadwall, pintail, widgeon, mallard, find water enough in Basti for all their necessities, and are here in exceptional numbers. I fancy that Mr. Osmaston should include the grey goose and common crane as constant cold weather residents of Gorakhpur. One does not get them, but they are there all right, the grey geese in the middle of the big jheels and the cranes somewhere near the barred headed geese on the sandbanks. I would like to be sure that the pintailed snipe is common. To the best of my belief I have never seen a pintailed snipe in my life, though I have shot snipe in the United Provinces in thousands. I would also like to know when the favourable year for quail is coming, and what determines it. My own experience of three years in Basti and the adjoining two submontane districts of Gonda is that one may pack up ones shot gun, when one is away from the jheels. Yet quail were abundant (in 1895) in the very next submontane district, namely, Bahraich. It seems to me that jungle grass is essential to the welfare of dry game, such as hares, partridges and quail, and that they can't thrive in closely cultivated districts. The absence of cover in the hot weather does not explain everything. Quail are not affected by it, and hares ought to adopt themselves by taking to holes in the ground. A possible explanation seems to

me to be the absence of protection against heavy night dews. For 16 hours out of the 24, the dry game has to endure a cold bath, and their constitution will not stand it.

W. B. COTTON, C.S.

BASTI, U. P., *9th January* 1914.

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## No. XX.—THE SMALL INDIAN PRATINCOLE (*GLAREOLA LACTEA*, TEMM.)

In working at the plumage of this common species I have lately had occasion to look up its history and distribution, and have been struck by the paucity of records regarding it. In the Fauna, Vol IV, p. 217, its distribution is summed up as follows:—"Resident in suitable places throughout the plains of India, Ceylon and Burma, as far west as the Indus. Found in Kashmir, but not observed elsewhere in the Himalayas. Unknown outside our area."

Now this is not quite correct, for in portions, at all events, of its range it is highly migratory; for instance, Capt. Whitehead in his "Birds of Kohat and the Kurram Valley" writes:—"A summer visitor from April till August. Col. Rattray found it breeding freely on the banks of the Kurram River in April. It was very common when we passed through Thall in April and on our return in May."

In my own experience I have found it as a very numerous summer visitor from roughly March to October on some of the Punjab rivers; here on the River Jhelum it occurred in extraordinary numbers this past year.

Now, even if the bird is a resident species, generally speaking, it is not so in the Punjab and N.-W. F. P., which, therefore, supply an enormous number of individuals that must appear as winter visitors in some other portions of our area; the suddenness of their departure and arrival points to the migration being a real one, and not merely a gradually southerly or northerly movement dependent on the approach or cessation of cold weather. Is there then any portion of our area in which the species is a winter visitor only? Or do these birds disperse over a large area which has its own resident population? And is that area so large that the addited of these Punjab birds makes no appreciable difference? These are questions to which I can find no answer: perhaps some of our members can enlighten me. It should be an easy matter to clear up. The species is entirely confined to our area; it is very common and most easily recognized, and is known to both sportsmen and naturalists.

Surely, if each member wrote on a postcard the places and months where and when he has met with the bird; and any other particulars he may be able to add about nesting and migration, and these postcards were sent to a common destination, *e.g.*, one of our Committee, the material thus forthcoming might be sufficient to throw light on the problem?

HUGH WHISTLER.

JHELUM, *21st January* 1914.

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## No. XXI.—SWINHOE'S SNIPE (*G. MEGALA*) IN BURMA.

I enclose what I believe to be the skin of *Gallinago megala*, Swinhoe's Snipe, shot by me in the Tharrawady District on the 5th November. The bird was flushed in some tall king grass while shooting Fantail and Pintail.

In Vol. XIX, No. 5 of the Journal of 24th June 1910, I see that there are only 2 records of this Snipe's occurrence in India. I send therefore the skin to add to any further records that may have been received since the above date.

C. GWYER, I.F.S.

THARRAWADY, L. BURMA,
*8th November* 1913.

[The skin is, as Mr. Gwyer thought, that of Swinhoe's Snipe, *Gallinago megala*, and is the fourth record of the bird within our area, Capt. Venning having recorded one from Pyawle in 1911, in the Journal Vol. XXI, p. 269.—EDS.]

## No. XXII.—SOLITARY SNIPE AT QUETTA.

Since the end of September, 10 Solitary Snipes, *Gallinago solitaria*, have been shot here mostly in gardens round cantonments. I think I am correct in saying that there is no record of one having been shot here for 40 years before this. We have had particularly mild weather so far so that hard weather can hardly be the cause. I do not know if Solitary Snipe migrate in numbers, but if so I should say the solution was that they have found better food coming down by this route than by their old route wherever that was. It would be interesting to know if there has been a scarcity of them in any place where they have been observed in any numbers before.

B. L. CLARKE.

QUETTA CLUB, 11*th November* 1913.

## No. XXIII.—A NOTE ON THE SUB-SPECIES OF THE SPOT-BILL DUCK (*ANAS PŒCILORHYNCHA*.)

In the Bombay Natural History Journal, Vol. XVII, p. 558, the late Mr. E. W. Oates described a new form of *Polionetta* (*Anas*) under the name of *Polionetta haringtoni*. At that time I considered that this duck had been so named on insufficient material, and when writing "Indian Ducks" I refused to accept the duck as a good species.

The Society are now in possession of quite a good series of skins, 10 in number, of the supposed *haringtoni*, and these have been sent home for me to examine, together with the British Museum skins of *zonorhyncha*, the Chinese Spot Bill, and *pœcilorhyncha*, the Indian Spot-bill. This material has enabled me to modify my former opinion, and I now think we can fairly satisfactorily discriminate between the three sub-species, *pœcilorhyncha*, *zonorhyncha* and *haringtoni*.

The skins available for examination in the British Museum collection are as follows:—

| | |
|---|---|
| Typical *pœcilorhyncha* | 19 skins. |
| Typical *zonorhyncha* | 12 „ |
| Skins labelled *pœcilorhyncha* from Burmah | 6 „ |
| The Bombay Skins | 10 „ |

In addition to these I have been able to examine about forty other skins from India, Burmah and China.

The result of my examination shews that *Anas pœcilorhyncha haringtoni* is the connecting link between the two other forms *p. pœcilorhyncha* and *p. zonorhyncha* and that the three forms may be discriminated according to the following key, though it must be remembered that amongst these, as with all other sub-species, individuals are to be met with, more especially in the area where two forms meet, which cannot well be placed definitely in any one of the three.

KEY TO SUB-SPECIES.

(*A.*) A broad white band posterior to the speculum—

*a.* A red spot at base of bill on either side, average wing measurement 10·″60, bill from forehead to tip 2·″14 .. .. *p. pœcilorhyncha.*

*b.* No red spots at base of bill, wing average 10·″25 and bill average 2·″05 .. *p. haringtoni.*

(*B.*) No white band posterior to the speculum .. *p. zonorhyncha.*

The measurements of the three sub-species overlap very considerably, but the following table gives the average measurements of the bills and wing, together with the extremes between which they range. It includes both sexes.

BILLS

| | AVERAGE. | LEAST LENGTH. | GREATEST LENGTH. |
|---|---|---|---|
| *Anas p. pœcilorhyncha* .. .. | 2·″14 | 1·″95 | 2·″30 |
| „ „ *zonorhyncha* .. .. | 2·″07 | 1·″85 | 2·″25 |
| „ „ *haringtoni* .. .. .. | 2·″05 | 1·″93 | 2·″26 |

WINGS

| | AVERAGE. | LEAST LENGTH. | GREATEST LENGTH. |
|---|---|---|---|
| *Anas p. pœcilorhyncha* .. .. | 10·″60 | 9·″58 to | 11·″50 |
| „ „ *zonorhyncha* .. .. .. | 10·″71 | 10·″20 to | 11·″30 |
| „ „ *haringtoni* .. .. .. | 10·″25 | 9·″30 to | 10·″75 |

From this it will be seen that *pœcilorhyncha* has a bigger bill than either of the other two sub-species which are equal in this respect, whilst *haringtoni* has, sex for sex, a smaller wing than either of the others which have wings practically the same in size.

The under plumage of Harington's Duck agrees with that of the Common Spot-bill in being paler below than in the Chinese bird, *i.e.*, a pale buff or brownish buff, profusely spotted on breast and abdomen with circular spots of dark brown, whilst the Chinese Spot-bill has the colour of the breast and abdomen much darker, generally a fairly uniform brown, upon which the spots hardly show, and which contrasts quite strongly with the pale throat and chin.

The colouration of the lower parts is not, however, very constant, and there is a specimen of *zonorhyncha* from China (Canton) and another from Shanghai which are as pale below and as well spotted as any specimens of *pœcilorhyncha* from Western India.

Another difference in the colouration of the two original species *zonorhyncha* and *pœcilorhyncha* which is generally commented on, is the colour of the speculum which is blue in the former and green in the latter. This blue or green question is always a very difficulty one to decide, but I may say that the speculum of *pœcilorhyncha* looks green in whatever light you chance to hold it, though more blue and less green when held *tail* pointing to the light. In *zonorhyncha* the speculum is always a deep purple blue, though this too, when held *head* towards the light, is slightly suffused with green. If series of the two species are placed alongside one another *in the same light* and *pointing the same way* the difference is quite distinct.

*Haringtoni* has the speculum green like that of *pœcilorhyncha*.

Yet another difference which must be mentioned is the amount of white on the innermost secondaries. In the Indian birds nearly the whole of the outer webs are white whilst in the Chinese birds there is very little

white at all upon them, and in some individuals none. The Burmese birds are intermediate in this respect.

The range of the three sub-species would seem to be as follows:—

*pœcilorhyncha*. India as far as Western Assam, and in Cachar, Sylhet, Chittagong and possibly into Arakan.

*haringtoni*. The whole of Burmah, including Shan States and Chin Hills, Yunnan, Cochin, China and possibly South-Western China adjoining Burmah.

There is one typical specimen of *haringtoni* in the British Museum, said to have been collected by Reeves in China, but the exact locality is not given. It also extends into Assam in the extreme East, being met with in Lakimpur and Teypur and, more rarely, in the district of Sibsagar in that Province.

*zonorhyncha*. Southern and Eastern China from the borders of North and North-East Burmah as far as, and including, Japan.

In giving the measurements above I have not been able to discriminate between the sexes as a whole, so many of the skins in the British Museum not having been sexed but judging from those which are sexed the females are consistently smaller than the males in all three sub-species.

I still retain the generic name *Anas* for these ducks, as I can see no reason for separating them.

E. STUART BAKER, F.Z.S., F.L.S., M.B.O.U.

London,
*November* 1913.

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## No. XXIV.—BREEDING OF THE MARBLED TEAL (*MARMARONETTA ANGUSTIROSTRIS*) IN BALUCHISTAN.

In reply to your request for particulars regarding the breeding of the marbled teal in Baluchistan, I will let you know the little I was able to observe in this respect during the summer of 1913, on the Khushdil Khan Lake, near Peshin.

After the return migration of ducks in March and April, a few ducks were left on the Khushdil Khan Lake. The largest porportion of these were marbled teal which had apparently made up their minds to spend the summer here. About June, I observed a couple of birds, which had paired off frequenting a small island. These two remained together and did not stay with the other marbled teal. I did not find their nest. I think it was in August, though I do not recollect the date, that while in a boat on the lake, on rounding a point on the same island, I disturbed a duck which entered the water with 14 ducklings about a week old. I gave chase and the duck went through the well-known tactics of her kind by pretending that she was wounded and lagging behind her ducklings. She gradually made off in a direction away from her ducklings. However, as I wished to identify her I did not mind. This I was able to do as she let the boat come within a yard of her and was undoubtedly a marbled teal. When she thought her ducklings were a safe enough distance from us, she rose quite easily and went off. These were the only ducklings I observed at the Khushdil Khan Lake (5,000 feet above sea level) during the year. The probability is that more ducks would breed here if there was sufficient cover for their nests and if they were not disturbed by the numerous flocks of sheep which graze on the shores of the lake.

A. B. AITKEN.

Quetta, 19*th January* 1914.

## No. XXV.—OCCURRENCE OF THE SMEW (*MERGUS ALBELLUS*) IN THE UPPER CHINDWIN.

Whilst shooting with a party on December 11th, two birds were seen by myself and several others, which I have little doubt were Smews. Unfortunately, they were far out of shot, but the general appearance of the bird was white, and black markings on the head and wings were clearly visible. If they were not Smews, can any member suggest what they were likely to be?

CYRIL HOPWOOD, I.F.S.

KINDAT, U. CHINDWIN, BURMA,
17*th December* 1913.

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## No. XXVI.—THE COMMON AND SIND KRAITS (*BUNGARUS CÆRULEUS* AND *SINDANUS*).

### A CORRECTION.

On page 401 of Volume XXII of this Journal, I commented upon a krait that had been sent to me from our Secretary reported to have come from Jhelum. This specimen was one with 17 scale rows, and I remarked that it was the first that I had any knowledge of with 17 rows from the Punjab. I have now heard from the donor Captain F. L. Hughes that he captured it at Dera Ismail Khan, but omitted to specify the locality when sending a small collection of snakes from Jhelum to our Secretary. The correction is an important one in view of my remarks already alluded to, and I think further evidence is called for in regard to the distribution of 17 scale kraits before pronouncing the two supposed species *cæruleus* and *sindanus* identical. I may further remark that Captain Hughes tells me he killed several kraits at Dera Ismail Khan, and that all had 17 scale rows.

F. WALL, MAJOR, I.M.S., C.M.Z.S.

ALMORA, 14*th January* 1914.

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## No. XXVII.—SNAKE-CHARMER'S PERFORMANCE.

With reference to the Miscellaneous Note (No. XXXIII) in the current Volume (p. 636) by Captain Venning, I saw an almost similar performance in Minbu in 1911. The snake in my case was as nearly as could be measured just under 12 feet. The fangs had not been removed. As in Captain Venning's case, I noticed that it took a lot of noise and pulling about to rouse the snake. Also that when the snake did strike, it only partly opened the mouth or more often did not open it at all. The snake also appeared to have a very bad aim and to strike and move heavily and clumsily so much so that I came to the conclusion that it was heavily drugged. The snake charmer (?) denied this. After watching the performance closely for some time I took the snake myself and examined it close by examining its teeth and looking for any injury and particularly for the smell of opium, but could detect nothing wrong. The snake made no attempt at any active movement while I was handling it nor when quietly released did it attempt either to attack or escape. It took a good shake at its tail from its owner to rouse it again. My man did not lick the snake but once or twice struck the snake lightly on the point of the nose with his fingers.

I have always been firmly convinced that that snake was drugged probably by the administration of an opium pill and I am the more certain because the owner made no objections to my handling the snake, which I think he would have done if he had not been sure that the snake was harmless in its then condition.

A. G. FRERE, CAPT., I.A.

ST. THOMAS MOUNT,
MADRAS, *8th January* 1914.

## No. XXVIII.—FOOD OF TROUT (*SALMO FARIO*) IN KASHMIR.

With reference to cannibalism by trout, I would here note my observations in Kashmir on this point.

(1) I have never yet caught a trout with a trout inside it, though it is the commonest thing to find loaches and other small native fish in trout caught. Mr. Phelps tells me that his experience in this respect corresponds with mine.

(2) During the last few days we have been collecting the small trout cut off in parts from the rapidly drying bed of the lower Arran. In catching and bringing these into the ponds in the warm sun, a certain percentage generally die. Sodhama, when feeding the big trout in one of the ponds threw in 20 or 30 of these small dead trout. No doubt some of them were swallowed as they were thrown in as these big trout are accustomed to get native fish of about the same size, but most of them are still* lying untouched in the bottom of the pond. Sodhama says that some of these were ejected and they bear marks confirmative of this. The trout of the pond still* continue to take greedily any small Kashmiri fish thrown in. My attention was drawn to what had occurred by seeing so many small dead fish in the clear water of this pond. I think the above seems to indicate that cannibalism is not natural among *S. fario* and is only resorted to in special cases where other food is not available or possibly as in the case of man-eating tigers where the taste has been acquired during a period of starvation due to some special cause. When food of other species is available in sufficient quantities there appears to be little danger of the cannibalistic tendency developing.

F. J. MITCHELL,
*Director, Trout Culture.*

SRINAGAR,
*November 17th*, 1913.

## No. XXIX.—PERIODS OF FLIGHT OF CERTAIN BUTTERFLIES.

On page 26 of Vol. XIX of the Journal, in the series on Common Butterflies of India, it is stated that "the vast majority breed more or less all the year round. The matter of the number of broods seems to depend really altogether on the food-plant, if it is one that produces young leaves only once in the year and at a particular season, the butterfly whose larva feeds on those young leaves will be found only at that time; if it has eatable leaves all the year round, and if the caterpillar will feed upon other than young leaves also, then the butterfly will have broods following each other without intermission though the time between any two will always be shortest when the leaves are young and fresh."

* When this was written two or three days later.

As the words "all the year round" above, might by some be misunderstood to apply generally throughout India, rather than to the Plains of India and Hill Stations of the Bombay Presidency to which more especially Mr. Bell's paper refers, the following few notes may be of interest :—

Having made observations and notes as opportunity occurred, both in the hills and in the plains, during the past 5 years, it has struck me that the facts disagree with this statement, as regards the North-West of India at least. Of over 100 forms observed by me in the field the majority have their special season, or seasons ; and in a few cases it was remarkable how nearly to date the earliest observed examples appeared in the different years.

Taking a few examples from Mussoorie :—

*Aporia soracte.* 1910. Specimens in fresh condition taken on May 10.
1912. The earliest example was observed by me on May 6.
1913. do. do. do. May 4.

*Euaspa milionea*, was on the wing from 22nd May for about six weeks. A six weeks total period of flight for a brood seems to be common for many different forms which do not hibernate as butterflies.

*Aulocera padma*, "May" to June 26.
„ *brahminus*, "July" (not met with by me in the field).
„ *saraswati*, August 27th to October 10th, or later.
„ *swaha*, September 5th to October 10th, or later.

From notes of captures in freshly emerged state, and the accompanying seasonal chart, one can draw conclusions as follow regarding the broods of these forms for the district of Mussoorie :

*Callerebia annada*, } both double brooded.
„ *hybrida* }

*Lethe dyrta* (*röhria* Fabr.) Three broods.
„ *confusa*, probably the same, 2 broods at least.

*insana*, }
„ *verma*, } all double brooded.
„ *vaivarta*, }

*Neope yama*, one brood.
„ *pulaha*, two broods.

In the South of India where the difference between the seasons is less marked, the tendency for forms to breed all the year round may be marked ; but I think that such observations as the above for the Mussoorie district show that this is not applicable throughout India.

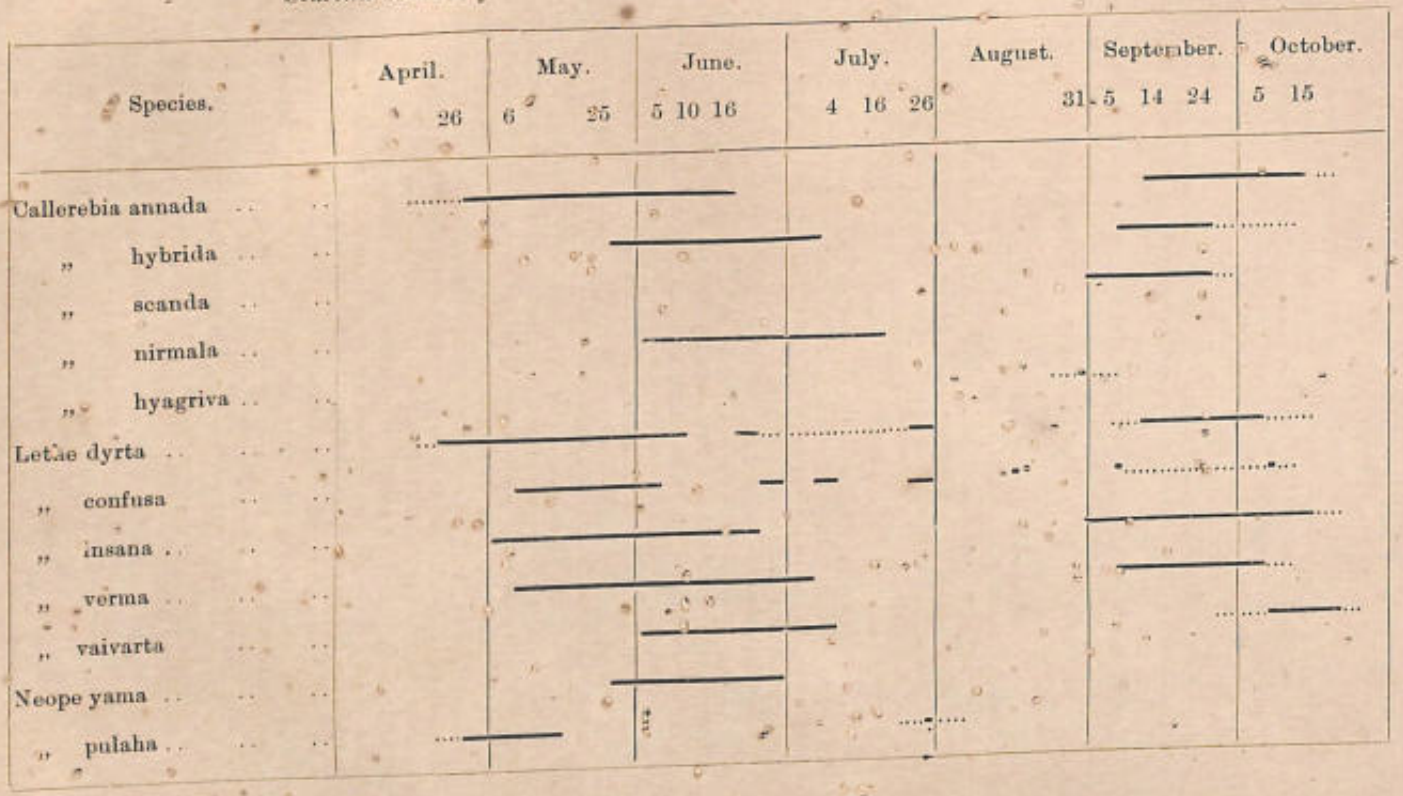
Incidentally the chart and captures of specimens in freshly emerged condition would seem to prove that *C. annada* and *C. hybrida* are distinct and not merely seasonal varieties of one form as given in most works on the subject, for they fly together, and I have not taken any examples truly intermediate between them.

H. D. PEILE.

*22nd January* 1914.

(*For Chart, see next page.*)

*Seasonal Chart of some Butterflies at Mussoorie, showing periods of flight.*



## No. XXX.—*OPPELIÆ TENUILOBATAE* (?) IN CUTCH.

In his work on "The Fauna of the Spiti Shales" (Pal. Ind. Ser. xv., vol. iv.) on page 38, Dr. V. Uhlig remarks " We should gain a clearer insight into this matter if a larger number of Tenuilobata happened to be known from the Katrol group of Cutch. Unfortunately, one species alone has been so far described from that group, namely, *Oppelia plicodiscus*, Waag." &c.

In the Katrol beds I have found several specimens or fragments of specimens of Tenuilobata (as I judge them to be) which are not *Oppelia plicodiscus*. I have placed several in our Museum, and I cannot at the present moment describe them, but I believe that there are more than two species. I have now in front of me a rather worn half specimen of one species, whose suture is brilliantly clear and is, I may say, identical with the suture of *Oppelia indopicta* as given in Fig. iii of Plate III in Uhlig's work. But though the suture seems so exact and the transverse section seems to me the same, the ornamentation somewhat differs. Another specimen with identical suture was recently found by Major R. S. Pottinger, a perfect gem, though it consists of the earlier stages only. This is in the Museum. My specimen too has no extant body chamber. The measurements of the two appear to me to be these.

| | Spec. No. 1. | No. 2. |
|---|---|---|
| Diameter | 37 mm. | 78 |
| Umbil Diam | 3 | 6 (?) blocked. |
| Height of whorl | 21 | 48 |
| Height of whorl from preceding periphery | 11 | 20 |
| Maximum breadth | 9 | 19. |

I will not vouch for absolute accuracy, but the figures are near enough. The widest part is about the middle of the whorl.

In *Indopicta* there are 8 broad low costæ: in this specimen before me I count 10 on the half whorl only. In *Indopicta* the costæ die away somewhere about the middle of the sides: in mine they run half way down the side, and then kink slightly backwards and die off beyond half way. In horizontal light a sort of faint ridge is seen running above the middle of the whorl through the ends of these ribs. Beyond this ridge is a smooth zone out of which rise imperceptibly numerous faint rounded ribs which climb up to the siphonal edge; among these numerous intercelary costæ, the main ribs reappear again, narrower than before but clearly more prominent than the intercelaries. In horizontal light these seem faintly continuous with the main ribs across the smooth zone, the backward band having righted itself again.

As I don't profess to be giving a scientific delineation of this species, I will not say more. I hope I have indicated enough to inform any expert who may be interested that Cutch can still provide material which may be useful in helping to clear up some of the many Ammonite problems. The coarse katrol sandstone plays havoc with many of its entombed relics. Some kinds in places are excellently preserved where there is more iron clay—especially *Perisphinctes*: but *Hybonote aspidoceras* and *Oppelia* are not often found in really good condition.

Of other probable Tenuilobates, one kind is much like the above but the main ribs end off in low flat tubercles. Another kind has an extremely narrow and graceful first Lateral Lobe. Of this the Museum has an admirable specimen—the only one I have found. But the former kinds are so not-uncommon that I am surprised that none were provided for Dr. Waagen's study.

BHUJ, *26th September* 1913. J. H. SMITH.

## No. XXXI.—*HOLCOSTEPHANUS*? IN CUTCH.

I should like to mention a rare find in the Athleta beds of the Fakirwadi Ridge near Bhuj—a find which I believe will be of no small interest to Palæontologists. From studying Dr. Uhlig's description of *Holcostephanus* (Pal. Ind. Ser. xv, Vol. iv) I do not think I am far wrong in believing my find to be of or related to that family, unless it should be a morphological equivalent in some other series. *Holcostephanus* has not been reported from Cutch, but the Spiti shales hold plenty: any connecting link between the Spiti shale fauna and those of Cutch needs very close examination. Not having found any one in India who has the leisure or expert knowledge to deal with the matter, I venture to write this, hoping that it may catch the eye of some one who would care to examine the specimen. My description does not pretend to be fully scientific.

I make out the measurements of the specimen to be:—Diam: 65 mm.; Umbil. diam: 22; Height from umbil. 26; Height from preceding periphery: 19 (?); Breadth across spines: 25 (?). The specimen is badly worn, the existing aperture especially so, but I believe it is not crushed. The inner whorls have been corroded by the soft clay of the Athleta beds: possibly a very careful handling might reveal some of the inner whorls, but I hesitate to try this myself: for the specimen is a rarity: during my constant exploration of these beds for over 3 years, I have only found this one specimen of this species. Now, as to its similarities to *Holcostephanus*, I give the following notes:—

Transverse section of outer whorl—very like Dr. Uhlig's figure of *Holcostephanus spitiensis* (Pl. viii, fig. *i b*). The preceding whorl is extremely depressed—very much broader than high—as agrees with the same figure and description. The specimen broke in washing and showed this very clearly. Row of spines along umbilical edge—12 in number, it seems, to the whorl. Dr. Uhlig's has more. In *Spitiensis* the edge is rounded: in mine it is acute, nor does it slope down to the umbilicus but falls sheer. But there is another point which seems to militate strongly against identity: viz., the fact that the spines do not seem to be tubercles raised on the ribs and directed in the rib-direction but are fairly round with an appearance of being pinched if at all contrary to the rib-direction; and they are absolutely on the umbilical edge not a bit above it. The ribs are low and rounded, and start out of the narrow level space which skirts the outer side of the row of spines: they number some four to each spine, as far as discernible. They are directed slightly but distinctly forwards and cross the siphonal in a bend, keeping the same thickness and height as on the outer part of the side. Yet again there is another fact in favour of the connection with *Hole. spitiensis*, viz., that the increase of height in the later part of the last whorl seems to coincide with a narrowing of the body chamber as Dr. Uhlig tells us of *spitiensis*. The very rapid development from a low depressed beginning of the whorl to a high conical end in a specimen so small cannot escape one's notice here. The transverse width of the earlier part of the last whorl seems greater than that of the later part. The spines being a good deal worn one cannot give the precise measurements.

The lobes are not visible. I hesitate to try to work them out, for the specimen already broken and cracked may fall to pieces.

I hope these few notes will attract expert attention to what I believe justifies the title of this letter. I have never seen a "*Holcostephanus*": but the similarity of my specimen to that figured and described by Dr. Uhlig makes me suspect a possible connection; and my specimen is quite

unlike any other species which I have as yet found in Cutch or has been recorded by Dr. Waagen.

J. H. SMITH.

BHUJ, 27*th September* 1913.

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## No. XXXII.—STRAY NOTES ON OLD INDIAN NATURAL HISTORY AND SPORTING PERIODICALS.

I think it may be of interest to recall some of the earlier publications in India which dealt with Sporting and Natural History subjects. The earliest in my possession is the Oriental Sporting Magazine which was published in Bombay in June 1828 and continued quarterly till June 1833. The Bengal Sporting Magazine was issued at Calcutta in March 1833 monthly at a subscription of Rs. 16 per annum raised to Rs. 20 in 1837 when its title was altered to the Bengal Sporting and General Magazine. It ceased to exist in 1846. The Calcutta Journal of Natural History, the first journal of the kind established in India, was published quarterly in 1840 or 1841 and consists of seven volumes and two numbers of the 8th volume; it ended in February 1848. The India Sporting Review began in March 1845, the last volume I have is the fourteenth in 1851; it was published quarterly. There are, no doubt, other publications of a similar character but I do not have them. The Oriental Sporting Magazine was republished in two volumes by Henry S. King & Co. in 1873 and is easily procured. This magazine in its first number contains the immortal song of "The next grey Boar we see" sung either to the tune "My love is like the Red Red Rose" or 'My Highland home where tempests blow." It was written by Captain Thomas D'Arcy Morris who appears to have been the principal contributor to this magazine. He did not always sign his effusions, but when he did he (as my father who knew him informed me) signed S. Y. S., these being the last letters of his three names. Morris's forte was parody and many of his pigsticking songs are parodies of Moore, *e. g.*, Tales of the Tuskers which enshrines "The Boar of Rarah Borah" is a parody on "the Loves of the angels." "Oh think not our spear blades are always as bright" a parody on "oh think not our spirits are always as light" and "the spear that once o'er Deccan Dust" a parody on "The Harp that once thro' Tara's Halls" to mention only some of them.

Captain Morris also wrote "Saddle, spur and spear" and many other songs which bear the signature S. Y. S., besides contributing several amusing prose papers. He seems to have been of the opinion of his own verse "Oh, who would change one hour of sport for a thousand hours with none." Major Morris, as he then was, died in 1835 from illness contracted in the campaign against the Bheels in Mahee Kanta. He was Quartermaster General of the Bombay Army. Pigs appear to have been numerous in the Bombay Presidency at this date. The Deal Table riders as mentioned in the Tales of the Tuskers were a detachment from the Poona Union Hunt established in 1815 and consisted of four members legs, as they were called, of the table who derived their title from the circumstance of their taking no furniture with them except a common deal plank which served them as a dresser and dining table. The names of three of them were Jeffries, Davis and Malet. I have forgotten the name of the fourth.

The huntsman mentioned in the Boar of Rarah Borah was Jeffries. The members of the Nagger Hunt used in those days 80 years and more ago to dine together in pink. I still possess the evening swallow tail coat of my father made of scarlet mohair with black velvet collar and cuffs. The buttons are brass showing in relief a galloping boar with a broken spear in his back surrounded by the legend "The Boar the mighty Boar".

The song in the third number of the Oriental Sporting Magazine "In that blest land of freedom from whence we all came" was written by a Col. Sheeldham. The initials H. W. R. to some papers on Hog Hunting are those of Harry Reeves of the Bombay Civil Service. He was afterwards a member of the Bombay Council and died about 1862. According to these accounts sows used to be speared as well as boars, though in Bengal such a proceeding was punished by a fine. I find the following rules were in force in 1835 in Bengal:—

Rule 1st.—Any person spearing a sow wilfully except in self defence to forfeit two dozen claret to the party and to ride no more that day.

2nd.—Any person spearing a sow accidentally to forfeit one dozen claret to the party.

3rd.—Whoever sees the boar first to give the Tally-ho before starting after him.

4th.—No person to pass another who is within spearing distance of the boar and waiting for the charge but to lay behind him and take his turn should the boar jink.

5th.—No one to spear a boar until he charges except close to jungle and there is a chance of the boar getting away if you do not.

6th.—Any person taking first spear is to remain with the boar till killed or disabled under penalty of losing his claims to the tusks.

7th.—When a sounder breaks covert not more than two persons to ride the same boar.

8th.—No person allowed to throw his spear on any pretence.

With reference to the last rule it appears from a book published in 1827, Sketches of Indian Field Sports, that throwing the spear (the Bengal one) was not only once allowed but enforced in fact, it is stated, it is not fair to job or spear the hog without quitting hold of the spear and full instructions are given with illustrations how to hold and throw the spear. The author of this book, Daniel Johnson, states in the preface that he left India in 1809, so his account of hog hunting refers to a period before that date. Captain Williamson in his Oriental Field Sports published early in the last century also mentions throwing the spear as the ordinary mode of attacking a boar, stabbing as he calls it, only being resorted to when throwing was not practicable.

The Calcutta Journal of Natural History was conducted very much on the lines of our own Journal. I find from it that the Thaming, Thamin or Eld's deer, *Cervus eldii*, was first discovered in 1838 in Manipur by Lieut. Eld, Assistant Commissioner of Assam, although it was first brought to the notice of the world by Capt. Guthrie. There are also excellent articles in this journal on the Bear *Ursus labatus* and *Ursus isabellinus*, on the Afghan wild-sheep and goats, on the Thibet wild-ass and wolf, on the Indian wild-dog and the four-horned antelopes which, I think, our journal should reprint, as the Calcutta Journal of Natural History is not easily got. Most of these articles are illustrated with curious lithographic prints of the animals or their horns and there is a very interesting note on the skeletons of the wild-dog, the pariah-dog and the jackall (sic). In the India Sporting Review, 1849, there are figured a pair of shed samber horns which weighed 25 lbs., an extraordinary weight. I have a thick single shed horn, 41 inches long and 8 inches thinnest part of the beam, which weighs 7 lbs. 13 oz. and the horns of one I shot with a small piece of the frontal bone weighs 19 lbs. The latter is figured in our journal, vol. 17, p. 24. The right horn of the pair that weighed 25 lbs. has each upper tine bifurcated, the left horn has the outer tine bifurcated. They measure 10½ inches immediately about (? above) the burr and 8 inches midway up the brain and are 12 inches in length. They are stated to have been obtained

from a batch of horns collected somewhere on the Cuttack coast or further south towards Madras. Two pairs of Black buck horns, 25½ and 24½ inches long, are stated to weigh 1 lb. 4 oz. and 1 lb. 11 oz., respectively. In the 6th vol. (1847) a description is given of a hybrid between a female jackal and Scotch terrier. It was a male and gathered two litters, the mothers being smooth English terriers. The 2nd cross being therefore one-quarter jackal and three-quarters dog, a female of this last lot was put to a Scotch terrier and had five pups who were one-eighth jackal and seven-eighths dog. The quarter jackal (2nd cross) and the half jackal No. 1 also bred, the result being 3 pups, five-eighths dog and three-eighths jackal. The writer also describes a cross between a female wolf and a pointer dog. He also mentions that he was informed that the Rampore Greyhound was crossed with the wild-dog, the offspring being called "Lall be bao" or "Priceless Red" which would grapple with a bear or hyæna.

This Journal in vol. 5 has a map of the Bombay Race Course as it existed in 1847.

J. D. INVERARITY.

BOMBAY, 28*th January* 1914.

# PROCEEDINGS

## OF THE MEETING HELD ON 6TH NOVEMBER 1913.

An 'At Home' of members and their friends of the Bombay Natural History Society took place on Thursday, the 6th November 1913, Lt.-Col. W. E. Jennings, I.M.S., presiding.

### NEW MEMBERS.

The election of the following 27 members since the last meeting was announced:—Capt. E. O. Lewin, R.F.A., Jubbulpore; the Principal, Ernaculam College, Cochin State; Mr. M. V. H. Collins, Simla; Mr. G. B. Walker, Hyderabad, Deccan; H. E. the Nawab Salar Jung, Hyderabad, Deccan; Mr. A. T. C. Sutton, Nizamabad; the Librarian, Imperial Library, Calcutta; Capt. A. Mactavish, Fatehgarh, U.P.; Mr. T. E. Tunnard, Ceylon; Mr. E. J. Bunbury, Bombay; Mr. C. H. E. Wilson, Vimramga; Mr. C. K. Hargreaves, Toungoo; Mr. H. D. Baskerville, I.C.S., Larkana; Mr. R. D. Thomson, I.C.S., Sialkot; Capt. E. C. Smith, Miranshah; Mr. H. Tessman, Andheri; Dr. D. N. P. Datta, M.D., Punjab; Capt. M. L. C. Irvine, I.M.S., Ahmedabad; Mr. E. B. Burke, Assam; Mr. N. J. Strachan, Travancore; Capt. W. J. Fraser, I.M.S., Chindwara; Lt.-Col. D. L. MacEwen, Bangalore; Mr. F. R. Roe, I.C.S., Patna; Lt. O. B. Foster, Ambala; Dr. J. J. F. Dunn, Mussoorie; Mr. J. G. Wakefield, Gaya, Bengal; Capt. J. F. Turner, R. E., Gilgit.

The Honorary Secretary acknowledged the following contributions to the Museum since the last meeting:—

| Contribution. | Locality. | Donor. |
|---|---|---|
| Skins of Brow-antlered Deer (*Cervus eldi*) and 3 skulls and one skin of Burmese Goral (*Nemorhedus griseus*), Binturong (*Arctictis binturong*), Hog Badger (*Arctonyx collaris*), Panther skull (*Felis pardus*) and 4 Butterflies. | Paletwa, Arrakan. | Mr. W. S. Thom. |
| Skins and skulls of 2 Common Mongooses (*Mungos mungo*), 3 small Indian Civets (*Viverricula malaccensis*), 2 Jackals (*Canis indicus*), 1 Indian Wolf (*Canis pallipes*), 2 Wild Pigs (*Sus cristatus*), 1 Lungur Skin (*Presbytis entellus*). | Saran, Bihar .. | Mr. M. M. Mackenzie. |
| 2 Oorial Heads (*Ovis vignei*) .. | Lower Sind Hills. | H. S. L. ence, I.C.S. |
| Mutjac skin (*Muntiacus vaginalis*), 6 skins of Wroughton's Freetailed Bat (*Otomops wroughtoni*) 29 Birds and a number of Insects. | Talewadi .. | Mr. S. L. Prater. |
| A small collection of Rats .. | Ootacamund .. | Surgeon-General W. B. Bannerman. |

| Contribution. | Locality. | Donor. |
|---|---|---|
| 1 Large Red Flying Squirrel (*Petaurista inornatus*). | Chitral .. .. | Capt. H. E. Stirling. |
| Eggs of Stilt (*Himantopus candidus*), Crested Grebe (*Podicipes cristatus*), Little Grebe (*Podicipes albipennis*) and Kentish Plover (*Ægialitis alexandrina*). | Quetta .. .. | Mr. A. B. Atken. |
| 5 Shrews .. .. .. | Goa .. .. | Mr. N. A. Baptista. |
| 2 Blood Pheasants (*Ithagenes sp.*) 2 Sclaters Monals (*Lophophorus sclateri*) and 1 Temmincks Tragopan (*Tragopan temmincki*). | Hypima, Burma | Mr. H. C. Lowis. |
| 1 Short-tailed Tropic Bird (*Phaethon indicus*). | Persian Gulf .. | Sir P. Cox. |
| 1 Yellow-legged Herring Gull (*Larus cachinnans*). | Chitral .. .. | Major Money. |
| 2 Horned Owls (*Bubo*) .. | Ahmedabad .. | Mr. R. H. Heath. |
| 17 Snakes .. .. .. | Pyawbwe .. | Capt. F. E. W. Venning. |
| Several Snakes .. .. .. | Larkana and Dhulia. | Capt. Gharpurey. |
| 8 Land Crabs .. .. .. | Chamba .. .. | H. H. The Raja of Chamba. |

Minor contributions from Lt.-Col. Wodehouse, Major Carlton, Drs. Suter and Bayley de Castro and Messrs. C. Rodgers, W. S. Thom, D. Remedios, M. Hussein, F. H. Sprott, C. H. Wilson, H. S. Northey, Wise, H. M. Dwane, and Lunatic Asylum, Poona.

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An 'At Home' of members and their friends of the Bombay Natural History Society took place on the 12th January 1914.

The election of the following 42 members since the last meeting was announced:—Mr. H. Garbett, P. O. Barahapjan, District Lakhimpur; Mr. A. C. Armstrong, Yeotmal, Berar; Mr. G. S. Hill, Balangoda, Ceylon; Mr. A. E. Zolinger, Amreoti Camp, Berar; Col. T. J. R. Lucas, C. B., Bangalore; Mr. H. L. Shuttleworth, I.C.S., M.A., F.R.G.S., Hoshiarpur, Punjab; Capt. S. Sarkar, I.M.S., Bombay; Mr. R. D. Scoble; Hodgins; Travancore; Capt. J. D. Venables, Mandalay, Burma; Mr. R. H. Young, Karachi; Dr. H. Dannehl, Bombay; Mr A. L. French, Karachi; Lt. H. R. Wilson, Shillong; Mr. W. S. Hamilton, I.C.S., Lahore; Mr. G. B. H. Fell, C.I.E., I.C.S., Rangoon; Mr. J. M. D. Mackenzie, I.F.S., Kindat, Burma; Mr. J. W. Ebden, Shillong, Assam; Mr. K. R. Rane, M.M. S.P., Juvem, *via* Andheri; Capt. H. R. Hadow, Loralai: Capt. J. Knowles, Bareily; Mr. E. F. Abraham, I.C.S., Jhelum; Lt. H. M. Heyder, Ambala; Mr. J. W. Powell, Bombay; Mr. Y. G. Nadgir, M.S., Bombay; The Professor of Biology, Canning College, Lucknow; Mr. M. S. Advani, C.S., Surat; Mr. A. R. S. Hayne, Bombay; Capt. J. Anderson,

Papun, Burma ; Mr. H. D. Baker, Bombay ; Mr. R. Forshaw, Bombay ; Dr. V. P. DeSa, L.M. & S., Goa ; Mr. Julius Graf, Dadar, Bombay ; Mr. F. Anderson, Papun, Burma ; Lt. H. F. Francis, R.G.A., Rangoon ; Mr. Y. K. Rane, Juvem, Andheri ; Major Frederic Harvey, R.A.M.C., Colaba, Bombay ; Mrs. D. W. Wilson, Bombay ; Mr. J. G. Dobbs, P. O. Hutti, *via* Raichur ; Mr. H. Emblen, Cachar ; Capt. J. F. Graham, I.M.S., Jhelum ; Mr. R. H. Bullen, Corgaum, and Mr. E. F. A. Graham, I.C.S., Punjab.

The Honorary Secretary acknowleged the following contributions to the Museum since the last meeting :—

| Contribution. | Locality. | Donor. |
|---|---|---|
| 6 Brow-antlered Deer (*Cervus eldii*), 1 Gaur head (*Bibos gaurus*), 1 Tsaing (*Bibos sondaicus*), 1 Buffalo head (*Bubalis bubalis*), 158 Bird-skins. | Burma .. .. | Mr. J. P. Cook. |
| 3 Heads of Marcopolo's sheep (*Ovis poli*.) | Pamirs .. .. | Capt. R. W. G. Hingston, I.M.S. |
| 1 Markhor (*Capra falconeri*) .. | Gilgit .. .. | Do. |
| 1 Suleman Markhor (*Capra falconeri jerdoni*.) | Tochi Agency .. | Capt. H. T. C. Ivens. |
| 1 Bengal Monkey skin (*Simia rhesus*), 1 Langur skull (*Presbytis schistaceus*), 3 small Mammals, 6 Snakes, 6 Toads. | Sibsla .. .. | Mr. P. T. L. Dodsworth. |
| 1 Tree Shrew (*Tupaia groughtoni*). | Khandalla .. | Dr. M. F. Suter. |
| 5 Mammals and several Birds' skins. | Tibet .. .. | Capt. F. M. Bailey. |
| 1 Golden Cat (*Felis temminckii*) .. | Upper Burma .. | Mr F. Atley. |
| 10 Birds' skins .. .. | Mishmi Country . | Capt. F. M. Bailey. |
| 3 Young Bar-headed Goose (*Anser indicus*.) | Chitral .. .. | Major E. D. Money. |
| 1 Swinhoe's Snipe (*Gallinago megala*.) | Burma .. .. | Mr. C. Gwyer. |
| Wigeon (pale variety) (*Mareca penelope*.) | Roorkee .. .. | R. G. Bagnell. |
| Painted spur Fowl (*Galloperdix lunulata*), Indian Otter (*Lutra nair*), and 3 Wild Dog (*Cuon dukhunensis*) skins. | Chikalda District. | Mr. A. A. Dunbar Prandar. |
| White-winged Wood Duck (*Asarcornis scutulatus*). | Burma .. .. | Mr. E. Jackson. |
| 1 Laughing Gull (*Larus rediundus*), 1 Brown-headed Gull (*Larus brunicephalus*), 1 Gull Billed Tern (*Sterna anglica*). | Bombay .. .. | Mr. S. H. Prater. |
| 2 Snakes (*Zamenis diadema*), 1 Chameleon (*Chameleon calcaratus*) (alive) | Ajmere .. .. .. | Mr. W. Shipp. |
| 30 Beetles .. .. .. | Burma .. .. | Mr. J. H. Lace, I.F.S. |

Minor contributions from—Messrs. R. W. L. Dunlop, C. H. Wilson, E. C. Reid, J. M. Cairns, A. M. D'Cruz, P. F. Gomes, G. Claridge, H. H. M. Spink, G. C. Shortridge, Dr. Bailey de Castro and Lt.-Col. G. H. Evans.

Mr. C. D. Mahaluxmivalla, Superintendent, Victoria Gardens, Bombay, exhibited the flowers of three kinds of Silk Cotton trees—the common red *Bombax malabaricum*, the white *Eriodendron anfractuosum* and the yellow flowered *Cochlospermum gossypium*: two *Dombeyas*, the white flowered *Mastersii* and the pink *acutangula*; the red-flowered *Kalanchoe kirkii* and the yellow *spathulata*.

## MAMMAL SURVEY.

The specimens exhibited numbering about 1,500, were collected by Messrs. Crump and Shortridge in Kumaon and Burma respectively, including many species not previously obtained by the Survey. The primates in the collections were represented by Macaques, probably of the same or very nearly related species from both countries, Langurs, the common Himalayan form from Kumaon and another species not yet determined from Burma and one Gibbon from the last-named country.

Of the smaller Cats there were Jungle Cats and single examples from each country of the beautiful little Leopard Cat, which, though widely distributed, is very local and not well known. From a former collection there were specimens from Coorg; and some years ago the Society presented two kittens from Castle Rock to the Victoria Gardens.

One skin of the small Indian Civet and a nice series of the Malayan Palm Civet, all from Burma, and two common Mungooses from Kumaon represented the Viverridæ or Civets and Mungooses. Of the Canidæ there was a skin of the Indian Wild Dog from Kumaon and one of the Malayan form from Burma, and several mountain and common Indian Foxes from the former country. The Malayan Wild Dog, which is found in parts of Burma, is a much paler animal than its Indian cousin, and it was interesting to compare the two. Though Martens are found in Burma, none have been obtained by the survey so far; but from Kumaon several skins of the common form have been sent in, as well as two beautiful little yellow-bellied Weasels which are about the size of the English stoat. One of the most interesting specimens in the collection on exhibition was the Burmese Ferret-badger, of which four specimens were obtained at Mount Popa, south of Mandalay. This animal, which is well described by its trivial name, is about the size of a large mongoose, but shorter in the body, of a greyish-brown colour with a prominent white stripe on the head and shoulders. Very little is known of the habits of this animal. From each district an Otter was sent in, apparently of different species, a point which will be decided when the collection is worked out.

## SHREWS AND BATS.

The Insectivora were represented by tree shrews, shrews and bats. Of the first-named a nice series of the Yunnan species from Burma. This little animal is frequently mistaken for a squirrel, but in India proper, there is no reason for this, as all the small squirrels are striped, and the tree shrew, has no stripes but is grizelled. In Burma, however, there are several squirrels, brown or greyish all over, very similarly coloured to the tree shrews and they are harder to distinguish. One species is not uncommon at Matheran and Khandalla and on the Madras side while another race is found in the Dangs, and still another in Orissa and parts of the C. P. The species found in the N. E. of India is probably the same as that found in parts of Burma and Assam.

Shrews were well represented from Kumaon, and both Collectors had sent in a tiny specimen each of what is probably the smallest Indian Mammal.

Of bats there were a good set of the common yellow bat from Kumaon and a large number of different species from Burma, amongst which might be mentioned the Indian Vampire and the small fruit bat. As is generally the case, the collections are strongest in rodents. There are Burmese hares ranging from very young animals to adults, common Indian hares or a species very similar from Kumaon, Bengal Porcupines from Burma and a large number of rats and mice. Of these probably the curious Bamboo Rat with its large incisor teeth attracted the most attention.

Squirrels are well represented from Burma, and apart from the flying squirrels of which there are three kinds, probably the bay squirrel, which is of a beautiful rich ferruginous red colour called for most notice. A Sambar and a Goral from Kumaon and a Mouse Deer and Muntjac from Burma represent the Game Animals in the collection, while the two beautiful kins of the Chinese Pangolin or Ant-eater interested many people more than any of the other species.

The presence of Miss K. C. Ryley, at the "At Home" added to the success of it, as Miss Ryley has been working at the British Museum (Natural History) for the last 18 months on the specimens which have been sent home by the Society in connection with the Mammal Survey. Miss Ryley is now visiting India and China on a holiday, but it is hoped that she will be able to resume her work at the British Museum later on. Fortunately for the Society, Mr. R. C. Wroughton returns from South Africa in May and will take up the Mammal Survey work at the British Museum once more.

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A meeting of members and their friends of the Bombay Natural History Society took place on the 19th February, 1914, Lt-Col. W. E. Jennings, I.M.S., presiding.

The election of the following 21 members since the last meeting was announced :—Mr. E. E. English, Bombay; Mr. G. W. Talbot, Bombay; Commander H. Kitson, R. N., East Indies Squadron; Mr. V. Wilcox, Ireland; Mr W Evans, Bombay; Mr. W. C. Shepherd, Toungoo, Burma; Miss A. Mac Ivaine, New Jersey; Mr. B. C. Rowlandson, Bombay; Major C. Gregory, Ootacamund; Mrs. A. D. Barr, Jodhpur; Capt. A. L. M. Molesworth, Shillong; Miss Olivia da Cunha, Bombay; Mr. S. A. H. Sitwell, Bombay; Lt. E. A. W. Lake, Poona; Mr. W. G. Wooster, Monywa; Mr. A. MacWilliam, Barisal, Eastern Bengal; Mr. A. B. Ritchie, Rangoon; Mr. Herbert A. Eltoft, Bombay; Mr. G. H. White, Bombay; Mr. R. R. Oakley, Ceylon; H. E. Lord Willingdon, G.C.I.E., Bombay.

## ELECTION OF THE COMMITTEE.

The following gentlemen were elected as office-bearers for the present year :—President, H. E. the Right Hon. Lord Willingdon, G.C.I.E.; Vice-Presidents, Mr. J. D. Inverarity, B.A., LL.B., Revd. F. Dreckmann, S. J., and the Hon. Mr. Justice N. C. Macleod; Managing Committee :—Revd. J. Assmuth, S.J., Mr. T. Bainbrigg Fletcher, F.E.S., Mr. T. R. Bell, I.F.S., Mr. C. L. Burns, Mr. E. Comber, F.Z.S., Lt.-Col. G. H. Evans, C.I.E., F.L.S., Capt. W. H. Evans, R. E., Prof. G. A. Gammie, Mr. F. Hannyngton, I.C.S., Mr. G. S. Hardy, I.C.S., Mr. N.B. Kinnear, Lt.-Col. K. R. Kirtikar, I.M.S. (Retd.), Major W. G. Liston, C.I.E., I.M.S., Mr. J. McNeill, I.C.S., Mr. F. M. Mackwood, Dr. A. Powell, Mr. E. L. Sale, I.C.S., Mr. R. A. Spence, Major F. Wall, I.M.S., C.M.Z.S., Mr. John Wallace, C.E.

Honorary Secretary, Mr. W. S. Millard, Honorary Treasurer, Mr. L. S. Savile.

The Honorary Secretary acknowledged the following specimens since the last meeting :—

| Contribution. | Locality. | Donor. |
|---|---|---|
| Skin of Striped Weasel (*Mustela strigidorsa*.) | Arrakan .. .. | Mr. W. S. Thom. |
| 4 Bird skins .. .. .. | Kanara .. .. | Col. H. Delme Radcliffe. |
| Herring Gull (*Larus fuscus*) .. | Karachi .. .. | Mr. T. M. S. Culbertson. |
| 2 Woodsnipe (*Gallinago nemoricola*), 1 Solitary Snipe (*Gallinago solitaria*), 1 Pintail Snipe (*Gallinago stenura*), 3 Snakes. | Tounggyi, Burma. | Mr. S. St. Lightfoot. |
| Ringed Plover (*Ægialitis dubia*) .. | Colaba, Bombay. | Mr. S. H. Prater. |
| Cobra (*Naia tripudians*) .. | Chin Hills .. | Capt. W. Massey. |
| Tibetan Wolf Skin (*Canis laniger*) | Chitral .. .. | Capt. H. F. Stirling. |
| Jackal skin (*Canis indicus*) .. | Hazaribagh .. | Major O. A. Smith. |
| Several Sea Snakes, Fish, Fossils, Slides of Snails' teeth. | Persian Gulf .. | Capt. F.W.Townsend. |
| Burmese Civet (*Viverra megaspila*). | Tounggyi, Burma. | Mr. S. St. Lightfoot. |
| Large Indian Civet (*Viverra zibetha*). | Siam .. .. | Mr. J. F. Keddie. |
| Skin and Skull of female Sambar. | Duars .. .. | Mr. W. P. Field. |
| 1 Smew (*Mergus albellus*) .. | Sind .. .. | H. E. Lord Willingdon. |
| 1 Whistling Teal (variety—*Dendrocygna javanica*). | Markali, Assam. | Mr. E. P. Burke. |
| 65 Butterflies .. .. | Various. .. | Mr. F. M. Mackwood |
| 1 Jungle Cat (*Felis affinis*) 2 Rooks (*Corvus frugilegus*), 1 Jackdaw (*Colaeus monedula*), 4 other Birds. | Jhelum .. .. | Mr. H. Whistler. |

Minor contributions from Messrs. W. R. LeG. Jacob and H. M. Dwane.

## THE ACCOUNTS FOR 1913.

Mr. L. H. Savile, the Honorary Treasurer, said in presenting the accounts for the year ending 31st December 1913:—The opening balance at the beginning of the year was Rs. 3,120-6-0, the closing balance being Rs. 2,198-3-10 showing a deficit on the year's working of Rs. 922-2-2.

The expenditure during the year amounted to Rs. 36,684, which is Rs. 755 less than last year. The receipts however only amounted to Rs. 35,763, which is Rs. 1,256 less than 1912.

The total amount received by subscription, including arrears and those paid in advance for 1914 and 1915, amounted to Rs. 24,142. The subscriptions paid for the present year, including those paid in 1912, (and allowing, say Rs. 1,000 still to come in) amounts to Rs. 24,040, which gives the

number of subscribing members at, say, 1,600, besides which we have 106 Life Members.

The number of new members who joined during 1913 was 143 as against 185 in 1912, which is a serious falling off.

The cost of printing and issuing the Journal during the current year amounted to about Rs. 25,000, so that, as pointed out last year, the subscription received from members does not cover the actual cost of the Journal.

As pointed out earlier, the year's working has shown an excess of expenditure over income of close on Rs. 1,000; and unless our membership can be further increased, the question of increased subscriptions will have to be considered, as it is unlikely that the expenses can be cut down without impairing the value of the work now being done by the Society.

## MAMMAL SURVEY FUND.

The opening balance of this fund was Rs. 15,517, while the closing balance is Rs. 14,848, an excess of expenditure over receipts of Rs. 669.

During the year Rs. 25,344 was received in donations to which, adding interest on money invested, made the total receipts for the year amount to Rs. 25,934. The expenditure during the year amounted to Rs. 26,603 which is nearly double that of last year, but we have now three Collectors at work on this Survey, namely, Mr. C. A. Crump, Mr. G. C. Shortridge and Major E. W. Mayor, working in India, Burma and Ceylon, and I think the reports that have appeared from time to time in the Journal, giving an account of the work accomplished, fully justifies this expenditure and it is hoped that sufficient further donations will be forthcoming to enable the Society to complete this important undertaking.

## THE MAMMAL SURVEY.

Mr. Crump is collecting near Philibhit, U. P. on the S. W. border of Nepal and is shortly proceeding to Behar and Orissa and Bengal.

Mr. Shortridge is doing well in Lower Tenasserim, and the first batch of his specimens will be arriving shortly.

Major Mayor is now in the hilly parts of Ceylon completing the Survey of this Island.

As regards finances, a very welcome contribution has been received from the Bombay Government in the shape of a grant of Rs. 10,000 towards the Survey and Rs. 2,500 has just been received for the same object from the Central Provinces Government.

## EXHIBITS.

The Superintendent of the Victoria Gardens exhibited specimens of the following flowering trees:—*Erythrina herbacea*, *Erythrina parcelli*, *Gliricidia maculata*, *Bauhinia heterophylla*, *Mimosa mexicana*, *Erythrochiettia microstachya* and *Ceasalpinia*.

## PAPER READ.

Some field notes on a collecting trip for Termites (White Ants) in Behar and Orissa was read by the Rev. J. Assmuth, S. J.

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