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ERRATA.

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Page 252, Title, line 2 from top, for "Afghaniston" read "Afghanistan."
Page 253, line 4 from bottom, for "Du" read "Dun."
Page 255, line 1, for "Jual" read "Jubal".
Page 256, line 3 from bottom, for "*incenitit*" read "*incenit*."
Page 257, line 3 from top, for "from" read "for on."
Page 257, lines 10 and 11, for "Thumb." read "Thumb."
Page 258, line 11 from top, for "F. B. T." read "F. B. I."
On Plate XXVI.—To note 9, add "enlarged."
Page 259, line 12 from bottom, "for Miguel's" read "Miquel's."
Page 260, about middle, for "*Diplozium*" read "*Diplazium*."
Page 260, line 14 from bottom at end of line, "*equami*" should be "*squami*."
Page 262, line 9 from bottom, "deta" should be "dela."
Page 262, line 2, "Inde" should be "l'Inde."
Page 265, line 16 from bottom, at end of the line, "frond" should be "fronds."
Page 287, line 13, for "*rufitarsis* of the second recurrent nervure," read "of the second recurrent nervure straight, oblique . . . *rufitarsis*"
Page 295, line 10, for "apical" read "anterior."
Page 297, line 23, for "simllar" read "similar."
Page 298, line 7, delete "Type placed in British Museum."
Page 298, line 15, for "*Scephanitidi*" read "*Stephanitidi*."
Page 301, line 5 from bottom of page, delete = "*P. poecilus*, H. Schäff, 1844, l. c. VII, fig. 699."
Page 302, line 14, for "*abelmoshus*" read "*abelmoschus*."
Page 303, line 6, delete "posteriorly" after "tritubereulate."
Page 303, line 15, for "Pl. X." read "Pl. A."
Page 303, line 7 from bottom of page, for "Berge" read "Bergt."
Page 304, line 15, after "due," read "due),"
Page 304, line 17, for "Lybantine" read "Hygüne."
Page 304, line 19, for "fig. 15" read "fig. 13."
Page 304, line 9 from bottom of page, insert semicolon after second.
Page 304, line 8 from bottom of page, for "nimacute" read "-ium acute."
Page 305, line 14, for "fig. 13" read "figs. 14 and 15."
Page 308, line 5, for "*Zauna dohrus*" read "*Zauna dohrni*."
Page 401, line 3, should read—"stated in Vol. IV of "Birds" of the *Fauna of British India* series to be probably fairly"——.
Page 436, line 12, from bottom of page for "*Pycnobræus*" read "*Pycnobracus*."
Page 459, line 15, for "Harrbàgh" read "Harrabagh."
Page 459, line 16, for "21,51" read "24351."
Page 464, middle of page, for "imordinate" read "inordinate"
Page 466, line 2, for "Hat" read "Hatu"
Page 466, line 3 from bottom, for "Macleod" read "MacLeod."

Page 469, line 15 from bottom, for "stalklets" read "stalkless."
Page 470, line 5 from bottom, for "II" read "11."
Page 470, line 2 from bottom, for "T" read "Y."
Page 470, line 4 from bottom, for "11" read "10", and alter the number of the succeeding species accordingly, down to the end of the genus.
Page 471, last line, for "a n w one" read "a new one."
Page 471, line 4, for "and" read "to."
Page 474, line 11 from bottom, for "Filicine" read "Filicinæ."
Page 561, line 12 from bottom of page, for "there" read "three."
Page 561, line 11 from bottom of page, for "*Katretar*" read "*Kabutar*."
Page 562, line 12 from bottom of page, for "*Phasianidaæ*" read "*Phasianidæ*."
Page 720, line 14, for "McDonel" read "McDonell."
Page 720, line 3 from foot, insert a full stop after "Hills."
Page 721, middle of page, after "Beddome" delete "has therefore."
Page 722, line 11 from top, for "had" read "have."
Page 722, line 11 from top, insert a comma after the first "have."
Page 724, line 11, middle of page, for "*prexilum*" read "*prolixum*."
Page 724, line 16 from bottom, for "n. sp.—Hope Plate VIII" read "n. sp. Hope :—Plate VIII."
Page 725, line 9 from top, for "affino" read "affine."
Page 725, line 15 from bottom, for "sub patent" read "subpatent."
Page 726, middle of page, for "fadyenoid" read "fadyenioid."
Page 727, line 2 from top, Desv. should be in italic.
Page 727, middle of page, for "Harris" read "Harriss."
Page 730, line 9 from top, *dele* comma at end.
Page 731, line 7 from top, for "crinate" read "crinite."
Page 731, line 15 from top, after "then" insert "to".
Page 732, middle of page, after "very" insert "marked."
Page 733, line 18 from top, for "var. ε" read "var. 6."
Page 733, line 17 from top, the Greek ν is too small.
Page 733, line 17 from bottom, for "Kharsoli" read "Kharsáli."
Page 734, line 12 from bottom, the Greek ν is too small.
Page 734, line 11 from bottom, for Greek ν read Greek ε.
Page 737, line 19 from bottom, for "Harris" read "Harriss."
Page 737, last line and word, for "Gambel" read "Gamble."
Page 740, line 16 from top, "Afghan" should be in caps.
Page 740, line 18 from top, for "Harris." read "Harriss."
Page 740, line 22 from top, after "valley" insert a comma.
Plate XXXII—in the description—for "Sovus" read "Sorus."
Page 741, line 3 from foot, for "Pilicum" read "Filicum."
Page 746, line 11 from top, for "(——)" read "[——]"
Page 746, line 4 from bottom, for "*mole*" read "*molle*."
Page 747, line 1, for "Sunw. der" read "Sw. under."
Page 749, line 21 from foot, for "1892" read "1872."

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Beaumont, T. L. F. ... ... Karachi.
Beechey, A. St. V. (I.F.S.) ... ... Khandwa, C. P.
Beg, Mirza Nazir ... ... Patan-Bori, Berar.
Bell, Dr. A. H. ... ... Sirsa, Punjab.
Bell, T. R. D. (I.F.S.) ... ... Dhulia.
Bell, W. M. ... ... Bombay.
Benjamin, Isaac ... ... Bombay.
Bennett, Douglas ... ... Bombay.
Benson, Miss A. M. (M.D.) ... ... Bombay.
Benson, J. J. B. (C.E.) ... ... Ahmednagar.
Benson, W. A. (C.E.) ... ... Chalisgaon.
Bernhardt, K. ... ... Karachi.
Berry, R. (C.E.) ... ... Arsikere.
Betham, Major R. M. ... ... Poona.
Betham, W. G. (I.F.S.) ... ... *Europe.*
Beveridge, E. W. (C.E.) ... ... Larkhana, Sind.
Bhatavadekar, Sir Bhalchandra Krishna ... Bombay.
Bhownagar, H. H. the Maharaja Bhaosingji Takht Singji of (Life Member) ... ... Bhownagar.
Bhurie Singh, Mean Saheb (C.I.E.) (Life Member)... Chamba.
Bickel, F. W. ... ... Bombay.
Bicknell, H. ... ... *Europe.*
Biggs, Major H. V. (R.E.) ... ... Rawal Pindi.

Bignell, R. ... ... Calcutta.
Bikaneer, H.H. the Maharaja Sir Gunga Singji Bahadoor of (Life Member) ... ... Bikanir.
Bingham, Col. C. T. (F.Z.S.) ... ... *Europe.*
Birdwood, H. M. (C.S.I.) ... ... *Europe.*
Birkinshaw, A. H. (C.E.) ... ... Calcutta.
Biscoe, W. Fraser (I.F.S.) ... ... Secunderabad.
Blanford, W. T. (F.R.S.) ... ... *Europe.*
Blathwayt, C. H. (I.C.S.) ... ... Karachi, Sind.
Bogle, Lt. J. S. ... ... Tougshan, N. China.
Bomanji, K. R. (I.C.S.) ... ... Bijapur.
Bombay Government, The Chief Secretary, Separate Department ... ... Bombay.
Bourdillon, H. H. the Hon'ble Mr. J. A. (I.C.S., C.S.I.) ... ... Calcutta.
Bourdillon, T. F. (I.F.S., F.L.S.) ... ... Quilon.
Bourke, Lt.-Col. G. D. (R A.M.C.) ... ... Peshawar.
Bourne, J. M. ... ... *Nellore.*
Bowen, J. C. G. ... ... Bombay.
Brand, J. ... ... Kalyan.
Branson, R. M. ... ... Bombay.
Brendon, B. A. (I.C.S.) ... ... *Europe.*
Brendon, C. R. ... ... *Europe.*
Bright, Geo. E. (C.E.) ... ... Bombay.
Brodie, Lt. L. C. ... ... Trimulgherry, Deccan.
Brodie, N. S. (I.C.S.) ... ... Bombay.
Brook-Fox, E. (C.E.) ... ... Bankipur.
Broughton, Lt. T. D. (R.E.) ... ... *Europe.*
Brown, Capt. H. R. (I.M.S.) ... ... Secunderabad.
Browne, Capt. S. D. (R.H.A.) ... ... Mhow, C. I.
Browne, Major C. A. R. (R.E.) ... ... China Field Force.
Brudenell Bruce, Lieut. H. R. ... ... *Europe.*
Buchanan, Capt. K. J. ... ... Banu.
Bulkley, H. ... ... Kharaghora.
Burder, H. C. (Life Member) ... ... *Europe.*
Burkill, J. H. (M.A.) ... ... Calcutta.
Burn, J. G. (I.C.S.) ... ... Madras.
Burn-Murdoch, Lieut.-Col. J. (R.E.) ... ... Dharwar.
Burness, T. ... ... Dibrugarh, Assam.
Burns, C. L. ... ... Bombay.
Burton, Major R. G. ... ... Jalna.
Burton, Capt. Richard W. ... ... Secundbd., Deccan.
Butler, A. L. ... ... Khartoum, Soudan, Egypt.
Bythell, Major W. J. (R.E.) ... ... *Europe.*

Cabell, W. H. L. (I.C.S.) ... ... Rangoon.

Caccia, A. M. (I.F.S.) (Life Member) ...	... DehraDun,N.-W.P.
Cadell, P. R. (I.C.S.)	... Ahmedabad.
Caine, L. S.	... Mombassa.
Calcutta, Hon. Secretary, Zoological Gardens	... Calcutta.
Cama, K. R. (Life Member)	... Bombay.
Cama, Dr. Maneckjee D. (Life Member)...	... Bombay.
Cameron, H. S.	... Ceylon.
Cameron, W. L. (C.E.)	... Belgaum.
Campbell, Lieut. D. (Life Member) ...	... *Europe.*
Campbell, Capt. Malcolm (R.A.) ...	... Quetta.
Campbell, Revd. W. Howard ...	... Gooty, Madras Presidency.
Cappel, The Hon'ble Mr. E. L. (I.C.S.)...	... Bombay.
Cappel, S. F. L. (I.F.S.)	... Taungoo, Burma.
Capper, Capt. A. S.	... Goona.
Carter, Capt. J. R. B. G.	... Jetalsar.
Carter, Lt. R. M. (I.M.S.)	... Dthala, S. Arabia.
Cassels, Mrs. Herbert	... Calcutta.
Cayley, Dr. C. H. (M.A., M.B.) ...	... Bombay.
Chaldecott, Lt. W. H. (R.E.)	... Quetta.
Chalmers, Allan M.	... Cachar.
Chalmers, H.	... *Europe.*
Channer, Lt.-Col. O. H. (I.M.S.) ...	... Poona.
Chapman, J. A.	... Bassein, Burma.
Chapman, Capt. P. F. (I.M.S.) ...	... Jabalpur, C. P.
Chichgar, Hormusjee M.	... Bombay.
Chico, J. R. (C.E.)	... Baroda.
Chitty, The Hon'ble Mr. Justice C. W.	... Rangoon.
Cholmondeley, E. C.	... Indore, C. I.
Christy, Dr. C.	... *Europe.*
Clark, J. (I.C.S.)	... Rangpur.
Clark, W. H.	... Kamptee, C. P.
Clarke, Lt. F. Stanley	... Tougshan, N. China.
Clarke, L. O. (I.C.S.) (Life Member) ...	... Ajal, Assam.
Clarke, Robt. L. H. (I.C.S.)	... Benares.
Clarkson, Lt.-Col. J. W. (I.M.S.) ...	... Poona.
Clements, E. (I.C.S.)	... Poona.
Cleveland, Major H. F. (I.M.S.) ...	... Poona.
Clifford, Lt. R.	... Myictyina, Burma.
Clifton, C. N. (C.E.)	... Poona.
Clutterbuck, P. H. (I.F.S., F.Z.S.) ...	... Kheri, Oudh.
Coates, Lt. E. C.	... Meerut.
Coates, Lt. Victor	... *Europe.*
Coen, W. W.	... Hubli, S. M. Ry.
Coggan, R. T.	... Calcutta.
Cogill, Dr. H. (M.R.C.S., L.R.C.P.) ...	... Sholapur.
Coles, Geo. E. (C.E.)	... Agra.
Collie, Lt.-Col. M. A. T. (I.M.S.) ...	... *Europe.*

Collie, R. A. ... ... *Europe.*
Collister, J. G. H. ... ... Bombay.
Colombo, The Librarian, Colombo Museum ... Colombo.
Coltart, Dr. H. N. ... ... Dibrugarh.
Comber, Edward (F.Z.S.) ... ... Bombay.
Conduitt, W. A. (C.E.) ... ... Jhilmili P. O.
Conley, Andrew ... ... Calcutta.
Constable, F. A. ... ... New York, U.S.A.
Cooch Behar, H.H. the Maharaja Sir Nripendra Narayen Bhup Bahadoor of (Life Member) ... Cooch Behar.
Coode, J. M. (Life Member) ... ... Jabalpur, C. P.
Cooke, Lt. A. St. John ... ... South Africa.
Cooke, Dr. E. H. ... ... Lanouli.
Cooke, J. V. ... ... *Europe.*
Coppinger, Lt. W. V. (I.M.S.) ... ... Meerut.
Corbett, P. J. (C.E.)... ... ... Karachi, Sind.
Corbett, Capt. W. F. ... ... Lucknow.
Cory, Rev. C. P. ... ... Port Blair.
Cosserat, L. (C.E.) ... ... Kalol, Punch Mahals.
Coventry, B. O. (I.F.S.) ... ... Lahore.
Coventry, E. M. (I.F.S.) ... ... Naggar Kulu, Kangra District.
Covernton, Professor A. L. ... ... Bombay.
Covernton, J. G. ... ... *Europe.*
Cox, Capt. P. Z. (F.Z.S., F.R.G.S., C.I.E.) ... ... Muscat.
Cox, S. (I.F.S.) ... ... Madras.
Craddock, W. H. (I.F.S.) ... ... Singapore, S. S.
Crawford, Leslie ... ... Bombay.
Crawford, W. M. (I.C.S.) ... ... Mundla, C. P.
Crofts, Lt.-Col. A. M. (I.M.S.) ... ... Gwalior, C. I.
Croly, Lt.-Col. A. E. J. (R.A.M.C.) ... ... *Europe.*
Crommelin, C. A. R. ... ... Bombay.
Cruddas, Lieut. H. W. ... ... Bakloh, Punjab.
Crum, W. E. ... ... *Europe.*
Crump, H. A. ... ... Pachmarhi.
Crump, L. C. (I.C.S.) ... ... Satara.
Cubitt, G. E. S. (I.F.S.) ... ... Kindat, Burma.
Cuffe, T. W. ... ... Bombay.
Cumming, W. D. .. .. Ormara, Persian Gulf.
Cumming, Major W. H. (R.G.A.) ... ... *Europe.*
Curreembhoy Ebrahim ... ... Bombay.
Currey, E. S. ... ... *Europe.*
Currey, Lieut. V. F. ... ... Karachi.
Currie, R. G. ... ... Calcutta.
Cursetji, Khan Bahadur C. M. (Life Member) ... Bombay.
Cutch, H.H. Shri Kengurji Sawai Bahadoor, the Rao Saheb of (Life Member) ... ... Bhuj, Cutch.

Daintrey, W. M. ... ... New York.

Dallaporta, J. N. ... ... Bombay.
Dalrymple-Hay, Mrs. L. ... ... Nellore.
Daly, W. Mahon ... ... Pitsunalok, *viâ* Bangkok, Siam.
Daniell, Lt.-Col. A. C. (R.A.) ... ... Bombay.
Danson, J. W. W. ... ... Rangoon.
Davidson, J. (I.C.S.) ... ... *Europe.*
Davidson, Norman ... ... Kalthuritty, S. I. Ry.
Davis, Major R. E. S. (I.M.S.) ... ... Rangoon.
Dawson, G. B. ... ... Rangoon.
Dawson, W. H. (I.C.S.) (Life Member) ... ... *Europe.*
Deane, Dr. A. H. ... ... Bombay.
Deane, H. H. (C.E.) ... ... Mhow, C. I.
De Carteret, St. G.... ... ... Partabgarh, Oudh.
Delmé-Radcliffe, Lieut. A. ... ... Kowloon, Hong-kong.
Delme-Radcliffe, Lieut. S. ... ... Kherwara.
Dempster, F. E. (C.I.E.) ... ... Calcutta.
Des Vœux, Capt. H. ... ... Bassein, Burma.
Desai, Dr. Manilal G. ... ... Kaira.
Dewar, D. (I.C.S.) ... ... Fyzabad, Oudh.
Dharampur, H.H. Maharana Baldeoji of ... Dharampur.
Dhargalkar, Dr. Luxumon ... ... Bombay.
Dhunjibhoy Bomanji (Life Member) ... ... Bombay.
Dick, Major A. R. ... ... Peshawar.
Dickinson, W. L. ... ... Sibsagar, Assam.
Dimmock, Lt.-Col. H. P. (M.D., I.M.S.) ... ... Bombay.
Dixon, R. M. ... ... Bombay.
Dodgson, James (I.F.S.) ... ... *Europe.*
Donald, C. H. ... ... Jeypore P. O., Vizagapatam Dist.
Donovan, Capt. C. (I.M.S.) ... ... Madras.
Douglas, D. ... ... Dibrugarh, Assam.
Drake-Brockman, C. B. ... ... Bankpura, Bengal.
Drake-Brockman, Capt. D. H. ... ... Lansdowne.
Drake-Brockman, Maj. H. E. (I.M.S.) (Life Member).. Bhurtpur.
Dreckmann, Rev. F. (S.J.) ... ... Bombay.
Druce, Herbert ... ... *Europe.*
DuBoulay, J. H. (I.C.S.) ... ... Ahmednagar.
Dudgeon, G. C. (F.E.S.) ... ... Palanpur, Punjab.
Duke, Lt.-Col. J. (I.M.S.) ... ... Kashmir.
Dumayne, F. G. ... ... Calcutta.
Dunbar-Brander, A. (I.F.S.) ... ... *Europe.*
Duncan, P. (M.I.C.E.) ... ... Ongole, Madras.
Dunsterville, Lt.-Col. K. S. (R.A.) ... ... Rawal Pindi.
Dunsterville, Major L. C. ... ... Mean Meer.
Dupuis, A. L. ... ... Ceylon.
Dwane, E. H. ... ... Secunderabad.

Dyson, Major T. E. (I.M.S.) ... ... Ahmedabad.

Eardley-Wilmot, S. (I.F.S.) ... ... Simla.
Ede, F. J. (A.M.I.C.E.) ... ... Silchar, Cachar.
Edlman, Capt. E. E. ... ... Abbottabad.
Edmiston, W. L. ... ... Kil-Kotagiri, S. India.
Edulji Nusserwanji, Dr. ... ... Bombay.
Eliot, Neville (B.A.) ... ... Rawal Pindi.
Elliot, Capt. W. H. W. (F.L.S., I.M.S.) ... ... Dharamsala.
Elliott, A. (C.I.E.) ... ... *Europe.*
Elliott, Dr. A. M. ... ... *Europe.*
Ellictt, C. F. (I.F.S.) ... ... Mombassa, East Africa.
Elmes, F. R. ... ... Dibrugarh, Assam.
Elsworthy, E. H. ... ... Bombay.
Elwes, H. J. (F.R.S.) ... ... *Europe.*
Emanuel, A. E. L. (I.C.S.) ... ... Satara.
English, A. E. (I.C.S.) ... ... Katha, Burma.
Enthoven. R. E. (I.C.S.) ... ... Poona.
Evans, Vety.-Major G. H. ... ... Rangoon.
Evans, Lt. W. H. (R.E.) ... ... Lucknow.

Fagan, H. R. ... ... Rangoon.
Fairclough, J. ... ... Bombay.
Falkiner, Dr. J. M. ... ... Panitola, Dibrugarh, Assam.
Farrington, H. A. (I.F.S.) ... . Jalpaiguri, Bengal.
Fawcett, C. H. (I.C.S.) ... ... Poona.
Fenton, Lt.-Col. L. L. ... ... *Europe.*
Ferguson, H. S. (F.Z.S., F.L.S.) ... ... Trivandrum.
Ferris, Lt.-Col. W. B. ... ... Bombay.
Few, H. W. ... ... Pakokku, U. Burma.
Field, Frank ... ... Gaya.
Finlay, C. Kirkman ... ... *Europe.*
Fischer, C. E. C. (I.F.S.) ... ... Chatrapur.
Fisher, W. F. D. (I.F.S.) ... ... Ahmednagar.
Fitz-Gerald, Col. H. S. ... ... Wellington.
Fitz-Gibbon, P. J. ... ... Belgaum.
Fitz-Hugh Lance, Lieut. F. ... ... Umballa.
Fleming, W. N. ... ... *Europe.*
Fletcher, F. E. ... ... Calicut.
Forbes, A. W. ... ... Secunderabad.
Forbes, C. H. B. ... ... *Europe.*
Forbes, Capt. G. F. R. ... ... Bombay.
Forbes, J. D. ... ... Jubbulpore, C. P.
Forbes-Sempill, The Hon'ble R. A. ... ... Bangkok, Siam.
Forel, Monsieur Auguste (Hon. Correspg. Member). *Europe.*
Forsyth, Dr. W. ... ... Calcutta.

Forteath, H. H. (I.F.S.) ... ... Pakokku, Burma.
Foster, Major L. M. ... ... Poona.
Foulkes, George F. F. (I.F.S.) ... ... Coimbatore.
Foulkes, Capt. H. D. ... ... Mean Meer.
Fountouklis, E. ... ... *Europe.*
Fox, Col. H. C. (R.E.) ... ... *Europe.*
Fraser, Major A. ... ... *Europe.*
Fraser, Capt. H. A. D. (R.E.)... ... ... Derah Dun.
Fraser, S. M. (I.C.S.) ... ... *Europe.*
Frenchman, Lt.-Col. E. P. (I.M.S.) ... ... Rangoon, Burma.
Friedlander and Sohn, Messrs. R. ... ... *Europe.*
Fry, T. B. (I.F.S.) ... ... Poona.
Fuller, Dr. Chas. A. ... ... Cawnpore.
Fulton, Hon'ble Mr. E. M. (I.C.S.) ... ... Poona.
Fulton, Capt. H. T. ... ... New Zealand.
Fulton, Lt.-Col. R. ... ... Dharamsala.

Gabbett, Capt. P. C. (I.M.S.) ... ... Coonoor.
Gadsden, F. O. (R.I.M.) ... . *Europe.*
Galloway, R. ... ... Secunderabad, Deccan.
Gamble, J. S. (F.L.S.) ... ... *Europe.*
Gammie, Prof. G. A. ... ... Poona.
Gaskin, L. E. P. (I.C.S.) ... ... Mundla, C. P.
Gaye, W. C. ... ... Secunderabad.
Geddes, Mrs. J. G. ... ... *Europe.*
George, C. P. ... ... Secunderabad, Daccah.
Gerhardt, Paul ... ... Bombay.
Ghosal, J. (I.C.S.) ... ... Ahmednagar.
Gibbs, H. M. ... ... Surat.
Gibbs, R. T. ... ... Dacca.
Gilbert, C. F. (M.I.C.E.) ... ... Bhamo, Burma.
Gilbert, Reg. ... ... *Europe.*
Gilbert-Cooper, W. J. (I.F.S.)... ... ... Moulmein.
Gill, H. ... ... Bombay.
Gillum, S. J. ... ... Bombay.
Gimlette, Lt.-Col. G. H. S. (I.M.S.) ... ... Hyderabad, Deccan.
Giro, C. G. ... ... Calcutta.
Glaeser, John ... ... Bombay.
Gleadow, F. (F.R.M.S., L.F.S.) ... ... Mauritius.
Godfrey, G. C. ... ... Calcutta.
Godwin-Austin, H. ... ... Bassim, Berar.
Goldsmid, F. L. ... ... Thana.
Goldthorpe, Capt. F. H. ... ... Kohat.
Gonsalves, Dr. J. F. ... ... Bandra.
Gordon, D. M. ... ... Taunggyi, S. Shan States.
Gore, F. C. ... ... Sibsagar Assam.
Gore, Col. St. G. C. (R.E.) ... ... Calcutta.

Gover, A. A. ... ... Cochin, Malabar.
Gracias, Dr. C. F. X. ... ... Silvassa, *viâ* Daman.
Graham, Lt. B. C. ... ... Tongshan, N. China.
Graham, D. N. ... ... *Europe.*
Graham, J. A. ... ... Coorg.
Gray, Chas. ... ... Coonoor.
Greany, Lieut.-Col. J. P. ... ... Aden.
Greaves, John ... ... Bombay.
Greaves, S. E. ... ... Bombay.
Green, E. Ernest (F.E.S.) ... ... Peradeniya, Ceylon.
Gregerson, Dr. J. D. ... ... Dibrugarh, Assam.
Greig, Joseph ... ... Cachar.
Griffiths, V. M. ... ... *Europe.*
Grubbe, Major E. A. ... ... *Europe.*
Gwyn, Capt. A. ... ... *Europe.*

Habibuddin, S. (C.S.) ... ... Hanumkonda, Hyderabad, Deccan.
Hale, A. ... ... Selangor.
Hall, William ... ... Ahmedabad.
Hampson, Sir George F. (Bart.) (F L.S., F.E.S.) ... *Europe.*
Hankin, A. C. (C.I.E.) ... ... Secunderabad.
Hannyngton, F. (I.C.S.) ... ... Ootacamund.
Hannyngton, W. O. ... ... Toungdwingyee, Burma.
Hanson, C. O. (I.F.S.) ... ... *Europe.*
Harcourt, Capt. J. S. M. ... ... *Europe.*
Hardinge, D. ... ... Maubin, Burma.
Harington, Capt. H. H. ... ... Taunggyi, Burma.
Harington, Lt.-Col. V. (I.M.S.) ... ... Mount Abu.
Harper, E. W. (F.Z.S.) ... ... Bombay.
Harris, Capt. E. W. ... ... Singapore.
Harrison, A. J. ... ... Lakhimpur, Assam.
Harter, R. W. ... . *Europe.*
Harvey, Capt. W. F. (I.M.S.) ... ... Bombay.
Harvey, W. L. (I.C.S.) ... ... Bombay.
Harwood, Lieut.-Col. J. G. (R.AM.C.) ... ... Bombay.
Haslope, Rev. L. M. ... ... *Europe.*
Hasted, H. R. G. ... ... Koraput, Vizagapatam District.
Hasted, W. A. ... ... Nellore, Madras.
Hatch, Capt. A. E. ... ... *Europe.*
Hatch, G. W. (I.C.S.) ... ... Ratnagiri.
Hatch, Lt.-Col. W. K. (I.M.S.) ... ... *Europe.*
Hatchell, D. G. ... ... Madras.
Hate, Vinayek N. ... ... Bombay.
Haughton, Samuel (C.C.S.) ... ... Colombo, Ceylon.
Hauxwell, T. A. (I.F.S.) ... ... Maymyo, Burma.
Hawkins, A. B. ... ... Parulia, B. N. Ry.

Hawks, Lieut. G. A. ... ... Allahabad.
Hayden, H. H. ... ... Calcutta.
Hayter, O. C. G. ... ... Ajmere.
Hearsey, T. N. (I.F.S.) ... ... Pollibetta, S. Coorg.
Heath, R. H. (C.E.) ... ... Bombay.
Heeckerenz, Le Baron Von (Hon. Corrpg. Member) Java.
Henderson, Lt. R. R. ... ... Sialkot.
Herbert, Major H. (I.M.S.) ... ... *Europe.*
Heygate, Major R. H. G. (D.S.O.) ... ... Thayetmyo, Burma.
Hickman, R. St. J. ... ... Cachar.
Hide, P. (Life Member) ... ... Karachi.
Higgins, J. A. ... ... Mundla, C. P.
Hill, Claude H. (I.C.S.) ... ... Poona.
Hill, F. J. A. ... ... Thana.
Hodgkinson, Capt. C. ... ... Lucknow.
Hodgkinson, Col. H. ... ... Bombay.
Hojel, Major J. G. (I.M.S.) ... ... *Europe.*
Hole, H. A. ... ... *Europe.*
Hole, R. S. (I.F.S.) ... ... Jabalpur, C. P.
Hollis, T. ... ... Bombay.
Holmes, Capt. G. V. ... ... Sirdarpur, C. I.
Holyoak, Bernard ... ... Bombay.
Hoosein Belgrami, The Hon'ble Mr. Syed Nawab Imud-ul-mulk Bahadoor (S. C. B. A.) ... Hyderabad, Deccan.
Hooton, Capt. A. (I.M.S.) ... ... Bijapur.
Hope, A. J. R. ... ... Myitkyina, Upper Burma.
Hope, C. W. ... ... *Europe.*
Hornidge, S. (C.E., I.F.S.) ... ... *Europe.*
Hotson, J. E. B. (I.C.S.) ... ... Rajkote, Kathiawar.
Howlett, Col. A. (I.S.C.) ... ... *Europe.*
Hudson, Capt. C. T. (I.M.S.) ... ... Satara.
Hudson, C. W. M. (I.C.S.) ... ... Kaira.
Hulbert, Capt. J. G. (I. M. S.) ... ... Naini Tal.
Humphrey, J. ... ... Bombay.
Hunt, C. B. Holman ... ... Munsar P.O., S. India.
Hutchinson, Lt. C. G. .. .. Thayetmyo, Burma.
Hutchinson, F. G. ... ... Bhaynder.
Hutchinson, F. T. ... ... Bombay.
Hutchinson, Capt. L. T. R. (I.M.S.) ... ... Bombay.
Hyam, Judah (Life Member) ... ... Poona.

Ichalkaranji, The Hon'ble Narayenrao Govind, *alias* Babasaheb Ghorpade, Chief of (Life Member) ... Kolhapur.
Ilbert, L. G. ... ... Sibsagar, Assam.
Imray, Robt. S. ... ... Peermaad, Travancore.
Indore, H.H. the Maharaja Holkar of ... ... Indore.

Ingle, F. A. ... ... Bombay.
Inglis, Chas. M. (Life Member) ... ... Durbhanga.
Inverarity, J. D. (B.A., LL.B.) (Life Member) ... *Europe.*

Jacob, G. (I.C.S.) ... ... Karachi.
Jamkhandi, Shrimant Parashram Ramchandra Patwardhan, The Chief of (Life Member)... ... Kolhapore.
Jamrach, W. ... ... *Europe.*
Jamsetji, M., Doctor ... ... Bombay.
Janjira, H.H. Sir Sidi Ahmed Khan, Nawab of (Life Member) ... ... Janjira.
Jardine, A. J. A. ... ... Rangoon.
Jardine, E. R. ... ... Bombay.
Jardine, M. R. ... ... Bombay.
Jardine, W. F. ... ... *Europe.*
Jayakar, Lt.-Col. A. S. G. (I.M.S.) ... ... Bandora.
Jeffrey, J. A. ... ... *Europe.*
Jellett, H. H. ... ... Calcutta.
Jennings, Major W. E. (I.M.S.) ... ... *Europe.*
Jermyn, Lt.-Col. T. ... ... Bellary.
Jesse, William ... ... Lucknow.
Jewett, Miss L. ... ... Dhubri, Assam.
John, H. C. (C.E.) ... ... Satara.
Johnson, S. M. ... ... Cawnpore.
Johnston, J. C. R. ... ... *Europe.*
Johnstone, J. W. D. ... ... Gwalior, C. I.
Jones, Major J. Lloyd (I.M.S.) ... ... Bombay.
Jones, Capt. M. D. Goring ... ... Nagpur, C. P.
Jowitt, John F. ... ... Bandarwella, Ceylon.

Kearns, A. S. ... ... *Europe.*
Keary, Lt.-Col. H. D. ... ... Rangoon, Burma.
Kellie, Col. R. H. ... ... Deolali.
Kelly, Capt. C. R. (R.G.A.) ... ... Roorkee.
Kelsall, Capt. H. J. (R.A.) ... ... *Europe.*
Kemball, H. V. (C.E.) ... ... Bombay.
Kemp, N. W. ... ... Bombay.
Kendall, Capt. C. J. (R.I.M.) ... ... Bombay.
Kennedy, R. M. (I.C.S.) ... ... Belgaum.
Kenny, S. D. (L.F.S.) ... ... Chikalda, Berar.
Kenyon, James ... ... Karachi.
Ker, L. B. ... ... Bombay.
Kergarion, Comte de ... ... Paris.
Kerkhoven, E. J. (Hon. Correspg. Member) ... Java.
Keys, H. W. (I.F.S.) ... ... Satara.
Khan, Muncherji Framji ... ... Colombo, Ceylon.
Khareghat, M. P. (I.C.S.) ... ... Satara.
Kinloch, A. M. ... ... Kil-Kotagiri, Nilgiris.

Kirtikar, Lt.-Col. K. R. (I.M.S.) ... ... Ratnagiri.
Kolhapur, H.H. the Maharaja Sir Shahu Chhatrapati of (Life Member) ... ... Kolhapur.
Kotah, H.H. the Maharaja Umed Sing Bahadoor (Life Member) ... . Kotah.
Kotewal, Prof. A. B. ... ... Bandora.
Kunwar Kushal Pal Singh ... ... Rais Kotila, Agra Dist.
Lace, John H. (I.F.S., F.L.S.) ... ... Darjeeling.
Laird-MacGregor, E. G. L. (I.C.S.) ... ... Karwar.
Lamb, Capt. Geo. (I.M.S.) ... ... Kasauli, Punjab.
Lamb, R. A. (I.C.S.) (Life Member) ... ... *Europe.*
Land Records and Agriculture, The Director of ... Poona.
Lane, Lt. W. H. ... ... Bombay.
Langham, Arthur ... ... Bombay.
Lawrence, Mrs. E. ... ... *Europe.*
Lee, Capt. A. W. H. ... ... With the Somaliland Field Force.
Leete, F. A. (F.C.H., I.F.S.) ... ... Naini Tal.
Lely, Hon'ble Mr. F. S. P. (I.C.S., C.S.I.) ... Ahmedabad.
Lennox, Lt. G. M. ... ... Bombay.
Leslie, A. K. ... ... Bombay.
Leslie, Major G. A. (R.E.) ... ... Peshawar.
Lester, Capt. C. D. ... ... Bombay.
Lewis, Fred. (F.L.S.) ... ... Colombo, Ceylon.
Light, Lt.-Col. R. H. ... ... Bombay.
Light, Lieut. W. A. ... ... Saugor, C. P.
Lightfoot, S. St. C. ... ... Mimbu, U. Burma.
Lincoln, Capt. C. H. (I.M.S.) ... ... Karwar.
Linnell, Fred. ... ... Rangoon.
Liston, Capt. W. G. (I.M.S.) ... ... Parel.
Little, F. D. ... ... Banmauk P.O., Katha, U. Burma.
Lloyd, Col. O. E. P. (V.C., R.A.M.C.) ... ... Ootacamund.
Loam, Mathew ... ... Berhampur.
Lock, Capt. F. R. E. (I.S.C.) ... ... Poona.
Logan, A. C. (I.C.S.) ... ... Broach.
Long, G. R. (I.F.S.) (Life Member) ... ... Mimbu, U. Burma.
Lory, F. B. P. ... ... Ahmedabad.
Loudon, Major J. A. ... ... Singapore, S. S.
Lovegrove, W. H. (I.F.S.) ... ... Kotedwara.
Lowndes, G. R. ... ... *Europe.*
Lowrie, A. E. (I.F.S.) ... ... Raipur, C. P.
Luard, E. S. ... ... *Europe.*
Lucknow, The Curator & Sec., Provincial Museum Lucknow.
Lumley, Major F. D. ... ... *Europe.*
Lye, Rev. S. L. ... ... Ahmedabad.
Lynch, C. B. ... . Bombay.
Lynn, G. R. (C.E.) ... ... Baroda.

Macaulay, L. A. ... ... Bombay.
Macaulay, R. H. ... ... *Europe.*
MacDonald, Dr. D. (Life Member) ... ... *Europe.*
MacDonald, J. ... ... Bombay.
MacDonald, K. C. ... ... *Europe.*
MacMillan, D. A. ... ... Keonjhar, Orissa.
Mackay, E. D. ... ... Sibsagar, Assam.
Mackenzie, Kenneth ... ... Kurnool, Madras.
Mackenzie, Lt. K. L. W. ... ... Fyzabad.
Mackenzie, M. D. ... ... Umarkot, Sind.
Mackenzie, M. M. ... ... Chapra, Bengal.
Mackinnon, P. W. (F.E.S.) ... ... Mussoorie, N.-W.P.
Mackwood, F. M. ... ... Colombo.
Maclaren, J. Malcolm (F.G.S.) ... ... Calcutta.
Macleod, N. C. ... ... Bombay.
Macpherson, John ... ... *Europe.*
Macpherson, Col. T. R. M. ... ... *Europe.*
Mactaggart, H. B. ... ... Negapatam.
Madras, The Principal Presidency College ... Madras.
Madras, The Librarian, Govt. Central Museum ... Madras.
Mahaluxmiwalla, C. D. ... ... Bombay.
Mair, A. ... ... Bombay.
Maitland, Lt.-Col. C. B. (I.M.S.) ... ... *Europe.*
Major, Capt. F. F. ... ... Jalna, Deccan.
Mallins, Major C. (I.M.S.) ... ... *Europe.*
Manders, Major N. (R.A.M.C.) ... ... *Europe.*
Mandlik, Narayan V. (Life Member) ... ... Bombay.
Mann, H. H. ... ... Calcutta.
Manners Smith, Major J. (V.C., C.I.E.) ... ... Neemuch, C. I.
Manson, Lieut. B. E. A. ... ... Belgaum.
Manson, C. E. F. ... ... Rangoon.
Manson, F. B. (I.F.S.) ... ... Rangoon.
Marryat, N. ... ... Bombay.
Marshall, Arch. McL. (Life Member) ... ... *Europe.*
Marshall, J. McL. (Life Member) ... ... *Europe.*
Marshall, Capt. T. E. (R.A.) ... ... Quetta.
Marston, G. D. (C.E.) ... ... Bombay.
Marten, James ... ... DehraDun, N.-W.P.
Martin, Lieut.-Col. Gerald (Life Member) ... *Europe.*
Masson, D. P. (C.I.E.) ... ... Lahore.
Masson, W. P. ... ... Darjeeling.
Massy, Major H. S. ... ... *Europe.*
Maxwell, F. D. ... ... Maubin, Burma.
Maxwell, Lt. W. F. (R.E.) ... ... Aden.
Mayne, Capt. H. B. (R.G.A.) ... ... Bombay.
McCarrison, D. L. ... ... Koraput.
McCormack, R. B. ... ... Nasik.
McDougall, E. ... ... Bassein, Burma.
McGlashan, John (C.E.) ... ... Calcutta.

McIntosh, Alex. (C.E.) ... ... Calcutta.
McIntosh, R. (I.F.S.) ... ... Dehra Dun.
McKay, Lt.-Col. H. K. (I.M.S.) ... ... Jabalpur, C. P.
McKenna, J. (I.C.S.) ... ... Bassein, Burma.
McKenzie, Alex. ... ... Bombay.
McLaughlin, Lt. H. D. ... ... Silchar, Cachar.
McLeod, Major-Genl. D. J. S. (C.B., D.S.O.) ... Meerut.
McMahon, Major A. H. (C.I.E., C.S.I.) ... ... Quetta.
McMullen, Dr. G. C. ... ... Kotri, Sind.
McNeil, J. (I.C.S.) ... ... Bombay.
Mead, Capt. H. R. ... ... Deolali.
Mead, P. J. (I.C.S.) ... ... Bombay.
Meinertzhagen, Lieut. R. ... ... Mombassa, British East Africa.
Menon, K. G. ... ... Trichor.
Merwanji Pallonji Talati ... ... Bombay.
Mess President, 34th Battery, R. F. A .. ... Campbellpore.
Mess President, 10th Bo. L. Infantry (Life Member) Hongkong.
Mess President, South Wales Borderers ... Mean Meer.
Mess President, Q. O. Corps of Guides ... ... Mardan.
Messent, P. G. ... ... Bombay.
Metcalfe, T. J. ... ... Rangoon.
Metge, Lt. R. ... ... Subathu.
Meyer, Major C. H. L. (I.M.S.) ... ... *Europe.*
Meyer, O. ... ... Bombay.
Millard, W. S. ... ... Bombay.
Millett, G. P. (I.F.S.) ... ... Belgaum.
Mills, J. D. (Life Member) ... ... *Europe.*
Milne, Capt. C. J. Robertson (I.M.S.) ... ... *Europe.*
Minniken, G. G. (I.F.S.) ... ... Simla.
Miraj, Shrimant Gungadharrao Ganesh, *alias* Baba-saheb Patwardhan, Chief of (Life Member) ... Miraj.
Mitchell, J. C. H. ... ... Tezpur, Balipara P.O., Assam.
Mitchell, Dr. W. ... ... *Europe.*
Modi, Bomanji Edulji ... ... Kaira.
Moggridge, C. B. ... ... Rangoon.
Mollison, J. ... ... Nagpur, C. P.
Monte, Mrs. Cecilia de (L.M. & S.) ... ... Bombay.
Monte, Dr. D. A. de ... ... Bandora.
Monteath, J. (I.C.S.) ... ... Dharwar.
Moore, Capt. H. M. (I.M.S.) ... ... Bombay.
Moore, W. (F.C.S.) ... ... Dibrugarh.
Morgan, V. G. (I.F.S.) ... ... Hoshungabad, C.P.
Morgan, W. de (C.E.) ... ... Waltair, Vizagapatam District.
Morison, W. T. (I.C.S.) ... ... Poona.
Morley, G. S. ... ... Nagpur, C. P.
Morris, Capt. A. H. (R.A.M.C.) ... ... Bombay.

Morris, Capt. D. O. ... ... Amraoti, Berar.
Morris, G. C. ... ... Ceylon.
Morris, Capt. G. M. ... ... Secunderabad, Deccan.
Morrison, Dr. W. ... ... Bombay.
Moscardi, E. H. (I.C.S.) ... ... *Europe.*
Mosse, Lt. A. H. E. (I.S.C.) ... ... Sadra Mahikantha.
Mowbray, Lt. J. L. ... ... Barrackpore.
Moylan, W. ... ... Calcutta.
Muller, Professor O. V. ... ... Bombay.
Mumford, E. G. ... ... Maubin, Burma.
Mumford, J. ... ... Bombay.
Mundy, N. S. ... ... Dibrugarh, Assam.
Munna Lâl, Dr. ... ... Banda, N.-W.P.
Murray, S. B. ... ... Ootacamund.
Muspratt, E. (Life Member) ... ... Sibsagar, Assam.
Mysore, The Superintendent, Mysore Government Museum ... . Bangalore.
Mysore, H.H. the Maharaja Krishna Raj Woodayar Bahadoor of (Life Member) ... ... Mysore.

Nagpur, The Curator, Central Museum... ... Nagpur.
Nangle, H. C. ... ... Kyaikto, Thaton District, Lower Burma.
Nangle, Capt. K. E. ... ... Aurungabad.
Nangle, Lt. M. C. ... ... Mandalay.
Naranji Dwarkadas (Life Member) ... ... Bombay.
Narrotumdas Morarji Goculdass (Life Member) ... Bombay.
Navanagar, H.H. Maharaja Shri Jaswat Singji, the Jam Saheb of (Life Member) ... ... Rajkote.
Nelson, Major H. S. (R.G.A.) ... ... Bombay.
Newnham, Major A. (F.Z.S.) ... ... Lucknow.
Nicholson, E. F. ... ... Bombay.
Nicholson, Major R. H. (R.A.M.C.) ... ... *Europe.*
Nicholson, Capt. W. C. ... ... *Europe.*
Nigel-Jones, M. E. ... ... Dibrugarh, Assam.
Nisbett, Capt. W. G. ... ... Katha, Upper Burma.
Northcote, H.E. Lord ... ... Poona.
Norvill, Dr. T. H. (M.D.) ... ... Lakhimpur.
Nurse, Major C. G. (F.R.G.S., F.E.S.) ... ... Quetta.
Nurse, Capt. H. H. ... ... Aden.
Nuttall, W. M. ... ... Dibrugarh, Assam.

Oakden, R. M. (I.C.S.) ... ... Meerut.
Oakes, George ... ... Ootacamund.
Oates, E. W. (Hon. Correspg. Member) ... *Europe.*
O'Brien, Capt. Edward ... ... *Europe.*

O'Brien, Hon'ble W. T. ... ... Karachi.
O'Leary, J. L. McCarthy (I.F.S.) ... ... Salem, Madras Presidency.
Ogilvie, Capt. E. C. (R.E.) ... ... Poona.
Okeden, W. P. ... ... Rangoon.
Oldham, Capt. L. W. S. (R.E.) ... ... Raipur, C.P.
Oliver, A. K. ... ... Bombay.
Oliver, J. W. (I.F.S.) ... ... Dehra Dun.
Olivier, Lt.-Col. H. D. (R.E., F.Z.S.) (Life Member)... Bombay.
Ollivant, Capt. A. H. ... ... Jutogh, near Simla.
Ollivant, Hon'ble Sir E. C. K. (I.C.S., K.C.S.I.) ... *Europe.*
Opiumwalla, Dorab E. ... ... Bombay.
Orr, J. P. (I.C.S.) ... ... Thana.
Osborn, Lt.-Genl. W. (I.S.C.) ... ... Hoshiarpur.
Osmaston, B. B. (I.F.S.) ... ... Darjeeling.
Osmaston, L. S. (I.F.S.) ... ... *Europe.*
Oxley, Lt. J. C. S., (I.M.S.) ... ... Rangoon.
Ozzard, Major F. R. (I.M.S.) ... ... Tongshan, N. China.

Packard, Capt. H. N. (R.A.)... ... ... Ootacamund.
Pam, Albert ... ... *Europe.*
Parrington, Lt. J. W. (R.A.) ... ... Karachi.
Parsons, H. J. ... ... *Europe.*
Partridge, Henry (Life Member) ... ... Pyinmana, Burma.
Patton, Lt. W. S. (I.M.S.) ... ... Bombay.
Pawalla, Jamsetji C. ... ... Bombay.
Payn, Capt. W. A. ... ... Ranikhet.
Pearless, S. H. ... ... Ceylon.
Pearson, R. S. (I.F.S.) ... ... Dhulia.
Pechey-Phipson, Mrs. (M.D.) ... ... *Europe.*
Peiniger, W. G. ... ... Chiengmai, *viâ* Moulmein.
Peirce, H. B. ... ... Bombay.
Perreau, Lt. G. A. ... ... Drosh, Chitral.
Pestonji Jivanji (Life Member) ... ... Karemnagar, Yelgundal District.
Peters, Lt.-Col. C. T. (I.M.S.) ... ... Bombay.
Petit, The Hon. Mr. Bomanji Dinshaw (Life Member) Bombay.
Petit, Dhunjibhoy Bomanji (Life Member) ... Bombay.
Petit, Jehangir Bomanji (Life Member) ... ... Bombay.
Phear, G. A. ... ... Nagpore, C. P.
Phelps, E. L. ... ... *Europe.*
Phillott, Col. D. C. ... ... Kareman, Persia.
Phipps, Henry ... ... *Europe.*
Phipson, H. M. (C.M.Z.S.) (Life Member) ... *Europe.*
Pilcher, Capt. A. J. (R.E.) ... ... *Europe.*
Pilcher, Col. J. G. (I.M.S.) ... ... *Europe.*
Pilkington, H. S. H. ... ... Calcutta.
Pinhey, Major A. F. (C.I.E.) ... ... Oodeypur.

Pink, H. F. L. ... ... Dehra Dun.
Pocock, Capt. P. F. ... ... Baroda.
Pollen, Dr. John (I.C.S.) ... ... *Europe.*
Polwhele, A. C. (C.E.) ... ... Agra.
Poncins, Baron Edmond de (Life Member) ... *Europe.*
Powell, Lt. A. E. (R.E.) ... ... Kirkee.
Powell, R. M. ... ... Cuddapah, Madras.
Prain, Major D. (I.M.S.) ... ... Calcutta.
Prall, Major S. E. (I.M.S.) ... ... Aden.
Pratt, F. G. (I.C.S.)... ... ... *Europe.*
Prentis, Capt. W. S. ... ... Mandalay.
Prescott, Lieut. C. W. ... ... Kasauli, Punjab.
Preston, F. J. ... ... Jubbulpore.
Prichard, G. M. ... ... Ramtek, C. P.
Priestley, Capt. C. E. N. ... ... Rangoon.
Primrose, Alex. M. ... ... Kullakambay P.O. Nilgiris.
Prior, Major W. ... ... Dilkusha, Oudh.
Proctor, H. E. ... ... Bombay.
Pundit Jwala Prasad (I.C.S.) ... ... Orai, N.-W. P.
Purkis, H. V. ... ... Bhadarwa, Jummoo State.

Raby Noble, W. ... ... Behali P.O., Assam.
Raikes, E. B. ... ... Bombay.
Rambant, B. R. R. (R.A.) ... ... *Europe.*
Ranger, G. O. ... ... Calcutta.
Rattray, Lt.-Col. R. H. ... ... Dehra Gazi Khan.
Ravenshaw, Lt.-Col. C. W. (Life Member) ... Nepal.
Rayment, Vet.-Major G. J. ... ... *Europe.*
Ready, Capt. B. T. ... ... Umballa.
Readymoney, N. J. ... ... Bombay.
Rees, H. C. ... ... Pegu, Burma.
Rees, W. E. ... ... Gaya, Bengal.
Reeve, R. ... ... Bombay.
Reid, Major L. H. ... ... Murree.
Reid, M. F. (C.I.E.)... ... ... Bombay.
Reid, W. J. (I.C.S.) ... ... Dibrugarh, Assam.
Rennie, Thos. ... ... Rangoon.
Renton, Capt. C. C.... ... ... Hingoli, Deccan.
Reynolds, L. W. (I.C.S.) ... ... Indore, C. I.
Reynolds, P. (C.E.) ... ... *Europe.*
Rhé-Philipe, G. W. de ... ... Allahabad.
Rhodes, T. M. ... ... Haflong, Cachar.
Rice, Lieut. B. A. ... ... Killa Drosh.
Richards, G. ... ... Bombay.
Richardson, Cecil ... ... Ahmedabad.
Richardson, Miss E. E. ... ... Bombay.
Richardson, Lt.-Col. W. St. John ... ... Rawal Pindi.

Richmond, R. D. (I.F.S.) ... ... Palamcotta, Madras Presidency.
Roberts, Lieut. A. S. B. ... ... Rangoon.
Roberts, Capt. M. B. (Life Member) ... ... *Europe.*
Roberts, R. ... ... *Europe.*
Robertson, B. (I.C.S., C.I.E.) ... ... *Europe.*
Robertson, The Hon'ble Col. Sir D. (C.S.I.) ... Bangalore.
Robertson, F. W. (I.C.S.) ... ... Waltair, Madras.
Robertson, J. H. (I.C.S.) ... ... *Europe.*
Robertson, Lt. W. (R.E.) ... ... Bangalore.
Robinson, Major C. T. (R.F.A.) ... ... Rangoon.
Rodger, A. (I.F.S.) ... ... Pegu, Burma.
Rodon, Major G. S. (F.Z.S.) ... ... Dharwar.
Rogers, C. G. (I.F.S.) ... ... Port Blair.
Rogers, Henry (M.R.C.V.S.) ... ... *Europe.*
Rogers, Rev. K. St. A. ... ... Mombassa.
Rogers, Capt. P. H. ... ... Bombay.
Rome, F. J. ... ... Bombay.
Roome, Capt. R. E.... ... ... Fort Sandeman.
Rose, C. ... ... Dibrugarh, Assam.
Routh, R. S. ... ... Chittagong.
Row, Dr. R. (M.D.) ... ... Bombay.
Rundle, Lt.-Col. C. S. (I.M.S.)... ... ... Thayetmyo, Burma.
Rushton, Kenneth C. ... ... Bhusawal.
Russell, J. B. ... ... Hanbalu, Mysore.
Russell, Hon'ble Mr. Justice L. P. ... ... Bombay.
Ryan, G. M. (I.F.S.)... ... . Thana.
Ryder, Major W. J. ... ... Dharamsala.
Ryves, A. E. ... ... Allahabad.

Sale, Edward L. (I.C.S.) ... ... Bandra.
Salkeld, Lt. R. E. ... ... Mombassa, East Africa.
Saone, G. Prier De ... ... *Europe.*
Sassoon, Mrs. S. D. ... ... Bombay.
Saunders, Capt. F. W. (R.E.) ... ... *Europe.*
Savile, P. B. ... ... *Europe.*
Scindia, H. H. the Maharaja Madho Rao (Life Member) ... ... Gwalior.
Scot, J. S. (I.F.S.) ... ... Madanapalle, Cuddapah District.
Scotson, J. T. (I.C.S.) ... ... Ahmedabad.
Scott, Venerable Archdeacon W. E. ... ... Bombay.
Scott, Edmund ... ... Ceylon.
Scott, G. C. ... ... Ceylon.
Scott, J. (M.I.C.E.) ... ... Calcutta.
Scroope, H. W. P. (I.C.S.) ... ... Tippera, Bengal.
Seal, Dr. C. E. B. ... ... Darjeeling.

Sealy, Capt. A. E. ... ... Bakloh, Punjab.
Seervai, Dr. Rustom F. ... ... Bombay.
Sewell, Lt.-Col. J. H. ... ... Myittha, Burma.
Sewell, Capt. R. A. D. ... ... Jalna, Deccan.
Sharp, Professor W. H. ... ... Bombay.
Sharpe, Genl. C. F. ... ... *Europe.*
Shaw, F. W. ... ... Bombay.
Shaw, Dr. W. S. J. ... ... Sholapur.
Sheppard, W. D. (I.C.S.) ... ... *Europe.*
Shipp, W. E. ... ... *Europe.*
Shoubridge, H. O. B. (C.E.) ... ... Bombay.
Shuttleworth, Lt. A. R. B. ... ... Karachi.
Simcox, A. H. A. (I.C.S.) ... ... *Europe.*
Simcox, Lt. C. T. ... ... Lucknow.
Simpson, J. Hope (I.C.S.) ... ... Lucknow.
Sims, E. Proctor ... ... Bhavnagar.
Sind Club, The Honry. Secretary ... ... Karachi.
Sitwell, Lieut. N. S. H. (R.A.) ... ... Dum Dum.
Skey, Capt. F. E. G. (R.E.) ... ... Jamaica.
Slade, H. (I.F.S.) ... ... Maymyo, Burma.
Sladen, J. (I.C.S.) ... ... Bulsar.
Slater, E. M. ... ... *Europe.*
Slater, J. Sanders ... ... Bombay.
Smales, Chas. B. (I.F.S.) ... ... Shwebo, Burma.
Smith, Capt. F. A. (I.M.S.) ... ... Ulwar.
Smith, Major Stanley (R.A.) ... ... *Europe.*
Souter, C. A. (I.C.S.) ... ... Nellore, Madras.
Span, Capt. H. J. B. ... ... Umballa.
Sparke, W. ... ... Bassein, Burma.
Spence, L. H. ... ... *Europe.*
Spooner, T. J. (C.E.) (Life Member) ... ... Jhansi, N.-W. P.
Stables, Major Alex. (R.A.M.C.) ... ... Karachi.
Standen, B. (I.C.S.) ... ... Betul, C. P.
Stanton, W. C. ... ... Bombay.
Stebbing, E. P. (I.F.S.) ... ... Calcutta.
Steel, Sergeant-Instructor Alex. ... ... Bolarum.
Stericker, Staff Surgeon W. (R.N.) ... ... *Europe.*
Stevens, Herbert ... ... Dibrugarh, Assam.
Stewart, Lt. J. Johnston ... ... Mauritius.
Stewart, R. B. (I.C.S.) ... ... Nasik.
Stigand, Lieut. C. H. ... ... *Europe.*
Stirling, G. C. B. ... ... *Europe.*
Stiven, J. ... ... Bombay.
St. John, Comdr. J. H. (R.I.M.) ... ... Akyab, Burma.
Stockley, Lt. J. P. ... ... Kherwara, Rajputana.
Stone, S. J. ... ... Lahore.
Storey, Thos. H. ... ... Oodeypur.
Storr, Henry ... ... *Europe.*

Stuart, Capt. A. G. (A.D.C.) ... ... *Europe.*
Stuart, C. J. ... ... Nellore.
Stuart, Major J. R. (R.A.M.C.) ... ... Kamptee, C. P.
Sturrock, Capt. G. C. (R.A.) ... ... Balasore.
Sulivan, Col. G. D. F. ... ... Bombay.
Summers, Thos. (C.E.) ... ... Karachi.
Surveyor, Dr. N. F. (M.D.) ... ... Bombay.
Sutherland, W. ... ... Karachi.
Swan, H. H. .. .. *Europe.*
Swayne, Herbert (Life Member) ... ... *Europe.*
Swinhoe, Col. C. ... ... *Europe.*
Swinhœ, R. C. J. ... ... *Europe.*
Sykes, C. M. (C.E.)... ... ... Jamnagar.
Symington, J. H. ... ... Bombay.
Symons, H. S. ... ... Bombay.

Talbot, W. A. (I.F.S.) ... ... Bandra.
Tanner, Capt. C. O. O. ... ... Karachi.
Tata, Dorabji J. (Life Member) ... ... Bombay.
Tata, Jamsetji N. ... ... Bombay.
Taylor, James H. ... ... Chakradharpur, Singbhum, Bengal.
Taylor, M. D. ... ... Kumargram.
Taylor, S. B. ... ... Karachi.
Tejpal, Goverdhundas Goculdas (Life Member) ... Bombay.
Temulji B. Nariman, Dr. ... ... Bombay.
Tenasserim Agri-Horticultural Society, The Honorary Secretary of the ... ... Moulmein.
Thanewala, Y. D. (M.A.) ... ... Bombay.
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Young, H. G.	... Waltair, Madras Presidency.
Young, John	... Rangoon, Burma.
Young, L. C. H.	... Bombay.
Young, W. E.	... Karachi, Sind.

BOMBAY NATURAL HISTORY SOCIETY.

STATEMENT of ACCOUNTS from 1st January 1901 to 31st December 1901.

RECEIPTS.				Rs.	a.	p.
Balance in Bank on 1st January, 1901	Rs.	1,996	2 0			
Cash in hand on 1st January, 1901	,,	126	0 0			
Petty Cash balance on 1st January, 1901	,,	37	11 8			
				2,159	13	8
Subscriptions for 1899 (in arrears)				45	0	0
Do. do. 1900 (do.)				285	0	0
Do. do. 1901				8,438	3	2
Do. do. 1902 (in advance)				520	12	0
Do. do. Life Membership				1,350	0	0
Do. do. Journal from Members residing out of India				114	4	0
Entrance Fees				760	0	0
Sale of Back Journals, &c.				1,076	15	6
Interest on Government Paper...				159	2	10
Total ... Rs				14,909	3	2

EXPENDITURE.				Rs.	a.	p.
Rent of the Rooms from 1st December 1900 to 30th November 1901				1,500	0	0
Salaries from 1st December 1900 to 30th November 1901				1,704	0	0
Library Account				54	8	0
Furniture Account				120	0	0
Printing and Stationery, &c....				361	13	6
Journal Account, cost of printing Journals and coloured plates from England				8,861	6	9
General Expenses				1,324	15	8
Balance in Bank on 31st December 1901 ...	Rs.	888	13 9			
Cash in hand on 31st Decanber 1901 ...	,,	91	14 0			
Petty Cash balance on 31st December 1901 ...	,,	1	11 6			
				982	7	3
Total ... Rs.				14,909	3	2

Examined and found correct.
R. A. SPENCE,
Hony. Auditor.

N. C. MACLEOD,
Hony. Treasurer.

BOMBAY, 1st *January*, 1902.

BOMBAY NATURAL HISTORY SOCIETY.

INVESTMENT ACCOUNT from 1st January 1901 to 31st December 1901.

	Rs.	a.	p.		Rs.	a.	p.
Balance of Rs. 4,800, 3½% Government Paper, deposited with the Bank of Bombay on 1st January 1901	4,800	0	0	Balance of Rs. 4,800, 3½% Government Paper, deposited with the Bank of Bombay on 31st December 1901	4,800	0	0
Rs. ...	4,800	0	0	Rs. ...	4,800	0	0

Examined and found correct.
R. A. SPENCE,
Hony. Auditor.

N. C. MACLEOD,
Hony. Treasurer.

BOMBAY, 1st *January*, 1902.

BOMBAY NATURAL HISTORY SOCIETY.

STATEMENT of ACCOUNTS from 1st January 1902 to 31st December 1902.

RECEIPTS.				Rs.	a.	p.
Balance in Bank on 1st January 1902	Rs.	888	13 9			
Cash in hand on 1st January 1902	„	91	14 0			
Petty Cash balance on 1st January 1902	„	1	11 6			
				982	7	3
Subscriptions for 1900 (in arrears)				75	0	0
Do. do. 1901 (do.)				460	0	0
Do. do. 1902				7,215	13	3
Do. do. 1903 (in advance)				325	0	0
Do. do. 1904 (do.)				7	0	0
Do. do. Life Membership				1,050	4	0
Do. do. Journal from Members residing out of India				396	0	6
Entrance Fees				740	0	0
Sale of Back Journals, &c.				1,157	11	9
Interest on Government Paper				159	2	10
Total ... Rs.				12,568	7	7

EXPENDITURE.				Rs.	a.	p.
Rent of the Rooms from 1st December 1901 to 30th November 1902				1,500	0	0
Salaries from 1st December 1901 to 30th November 1902				1,704	0	0
Furniture Account				72	12	0
Library Account				73	0	0
Printing and Stationery				353	6	6
Journal Account, cost of printing Journals and coloured plates from England				6,010	12	10
General Expenses				1,292	3	1
Balance in Bank on 31st December 1902 ...	Rs	1,436	6 9			
Cash in hand on 31st December 1902	„	125	0 0			
Petty Cash balance on 31st December 1902 ...	„	0	14 5			
				1,562	5	2
Total ... Rs.				12,568	7	7

Examined and found correct.
R. A. SPENCE,
Hony. Auditor.

N. C. MACLEOD,
Hony. Treasurer.

BOMBAY, 1st *January* 1903.

BOMBAY NATURAL HISTORY SOCIETY.

INVESTMENT ACCOUNT from 1st January 1902 to 31st December 1902.

	Rs.	a.	p.		Rs.	a.	p.
Balance of Rs. 4,800, 3½% Government Paper, deposited with the Bank of Bombay on 1st Jannary 1902	4,800	0	0	Balance of Rs. 4,800, 3½% Government Paper, deposited with the Bank of Bombay on 31st December 1902	4,800	0	0
Rs. ...	4,800	0	0	Rs. ...	4,800	0	0

Examined and found correct.
R. A. SPENCE,
Hony. Auditor.
BOMBAY, 1st *January* 1903.

N. C. MACLEOD,
Hony. Treasurer.

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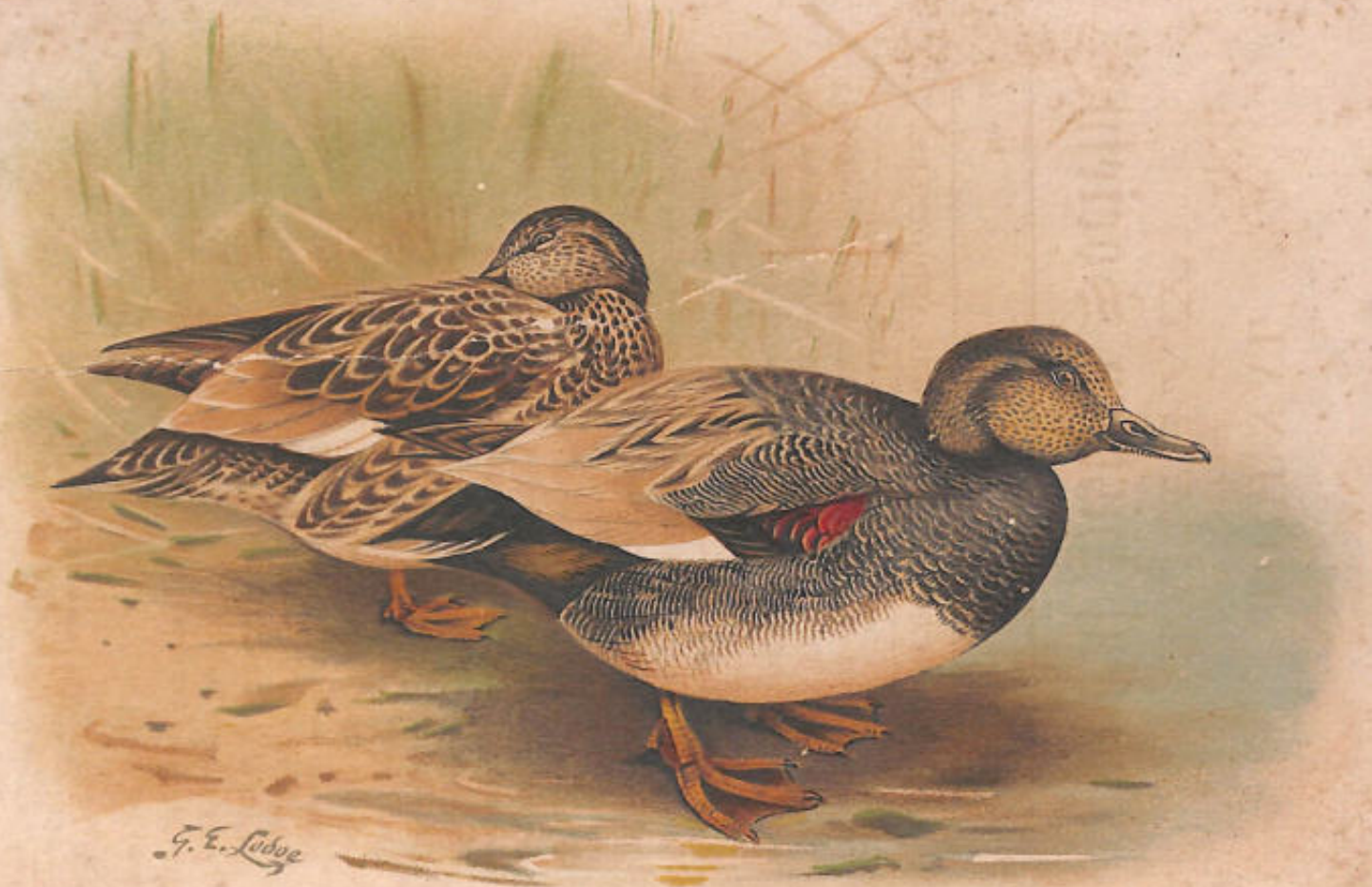
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THE LILIES OF MAHABLESHWAR AND OTHERS.

By W. P. Symonds, I.C.S.

(*Read before the Bombay Natural History Society on 20th August* 1901.)

The word "lily" surprises in himself, as Count Smorltork said, an interesting study of no inconsiderable magnitude. Botanists use the word to denote either a member of the order *Liliaceæ*, or a species of the genus *Lilium* of that order. If this paper were confined to the latter sense it would come to an abrupt end, like the chapter on Snakes in Ireland, as there are no true lilies in this Presidency. There is only one *Lilium* south of the Himalayas, the large white lily of the Nilgiris, *Lilium neilgherrense*. *Lilium longiflorum* is said by Firminger to flourish in gardens, and Mr. Woodrow says that *Lilium auratum*, the Golden-rayed lily of Japan, has been introduced into gardens in this Presidency, but seems to have died out. Lilies do not transplant well. The lilies of our gardens, like the wild lilies of Mahableshwar, are Amaryllids, members of the order *Amaryllideæ*, which is put by botanists in a different series from *Liliaceæ*. The word lily is commonly used to denote any lily-like flower, generally, but not always, white, of the monocotyledonous or endogenous class, which consists of plants usually with hollow stems, parallel-veined leaves, and parts of flower in threes. This leaves out of account the water-lilies which belong to a class totally different. Shakespeare makes Perdita say :—

> Bold oxlips, and
> The crown imperial ; lilies of all kinds
> The flower-de-luce being one.

The crown imperial is believed to be the imperial fritillary, which with the tulips is nearest to the true lily in botanical classification, but no one would ordinarily speak of a fritillary or a tulip as a lily. On the other hand, the flower-de-luce is a lily only in name. The fleur-de-lis or royal lily of France is believed to have been originally an Iris, probably *Iris pseudacorus*, the Yellow Flag, or rather a white representative of that flower. With Shakespeare the lily is always pure white, the type being *Lilium candidum* of English gardens. Harry V. could hardly have referred to a yellow flower when he said to Katherine: "Shall we not? What sayest thou? My fair flower-de-luce?" To which she very properly replied: "I do not know dat." The flower-de-luce was borne in the Arms of England for many years, and what is of more importance it still marks the north point of the compass-card. An old traveller writes: "But sailing further it veers its lily to the west," which is just what happens on the voyage from India to Europe. There are no representatives of the order *Irideæ* south of the Himalayas and very few in our gardens, the *Gladiolus*, that much mis-pronounced word of short syllables, being a notable exception. A little spotted flower, orange and red, *Pardanthus*, or *Belamcanda*, seems to have established itself on Singhar, a survival from the gardens that once flourished in that neglected spot. The place of the Iris is taken by the showy Canna belonging to the great tropical order *Scitamineæ*. A member of this order, *Kæmpferia scaposa*, is called the Rice lily. In the month of September the plateau between Lonauli and Karli, on either side of the railway, is white with these delicate three-petalled flowers. Belonging to the same order one of the wild turmerics or arrowroots, *Curcuma angustifolia*, probably with beautiful coma of pink bracts, is often called the Khandala lily, and the orchid men of Mahableshwar commonly give this name to the wild ginger with yellow coma, or the white arrowroot. Another well-known plant which has no claim to the name but the whiteness of its spathe is the Cobra lily, *Arisæma Murrayi*, a member of the order *Aroideæ*, like the English Cuckoo-pint or Lords and Ladies, to which it is nearly related. Another plant of the same order often seen in windows at home is *Richardia africana*, called the Arum lily or Trumpet lily or Lily of the Nile.

But it is time we come to the *Liliaceæ*. Perhaps the commonest plant of the order at Mahableshwar is the little Indian squill, *Scilla indica*, which springs up everywhere in May, even on the much-trampled Golf-ground. The uninitiated commonly refer to it as an orchid, probably confusing it with the white orchid *Habenaria*, which springs up a little later. It has an upright raceme of small pinkish flowers with long purple stamens, and looked at closely each flower can be seen to have six petals (perianth-segments more properly), each pink with a green stripe down the middle, turned back like a Turk's-cap or Martagon lily. The flower is a near relation of the wild hyacinth or blue-bell of England. The fleshy green leaves with black spots are used as food, and poor people may now be seen gathering them near Yeraoda. A little pinkish-white star-like flower, *Iphigenia indica*, may be seen at the same time or a little later, and later still, when visitors have mostly left the hills, appears a pretty white flower with yellow anthers, *Chlorophytum breviscapum*. It may be seen in July, in compounds in Kirkee and near Yeraoda Jail, carpeting the ground like snowdrops, which it much resembles though not so tall. A taller species, *Chlorophytum orchidastrum*, bears similar flowers on a scape two feet high. This appears at Mahableshwar in the rains, and may also be found at Sakharpathar. Another lily which, though not seen at Mahableshwar, must on no account be passed over is the grand climber, *Gloriosa superba*, fitly described by its name. The long reflexed waved petals are scarlet and yellow. The only other members of the order at Mahableshwar are both climbers and very unlike lilies. *Smilax macrophylla* has broad oval leaves with strong veins not parallel, insignificant greenish flowers, and conspicuous clusters of shining green berries, red when ripe. The Asparagus creeper, *Asparagus racemosus*, has pointed cladodes in place of leaves and racemes of small white fragrant flowers. A standard Asparagus, with no tendency to climb, is found near Poona and is perhaps *Asparagus Jacquemontii*. A lovely climber, *Myrsiphyllum asparagoides*, has lately been introduced into Bombay gardens.

The lily of Mahableshwar gardens is the Blue African lily *Agapanthus umbellatus*, which belongs to the same tribe as the homely necessary onion and the intrusive garlic. It does not do well in lower regions. *Hemerocallis fulva*, the Day lily, is sometimes seen. It

somewhat resembles the Tiger lily. The commonest flower of the lily order in our gardens is the absurdly-named Tube-rose, *Polyxena* or *Polyanthes tuberosa*, really the tuberous-rooted Polyanthes. It is largely grown in native gardens. The other lilies are mostly foliage plants, *Aspidistra*, *Phormium*, *Aloe*, *Yucca*, *Dracœna*, *Cordyline*. *Yucca gloriosa*, or Adam's needle, bears at intervals a magnificent spike of white flowers.

To arrive at the lilies of Mahableshwar we must again consider the lilies of the field. The well-known text has given a name to the Solomon's Seal, or *Polygonatum*, a little flower resembling the Lily of the Valley, a member of the lily order which however does not grow in Syria. The Greek word used is Krina, but Crina are not conspicuous in Syria, and no doubt the reference was to flowers generally. But the lilies of Mahableshwar are Crina, and though Amaryllids are well worthy of the name of lily. The commonest species is *Crinum brachynema*. The huge bulbs may be seen resting on the bare ground on the plateau beyond the old Mahableshwar temple and also just above Kate's Point. This lily may be distinguished from the larger one more commonly used to decorate dinner-tables by its shorter petals and stamens on the throat. The larger lily has perianth-tube 3 or 4 inches long, perianth-segments narrow, long-pointed, as long as the tube and protruding red filaments. After the publication of the Flora of British India, Mr. Woodrow discovered that this lily had never been properly identified, and sent specimens to Kew, where it was named *Crinum Woodrowi*. It had formerly been confounded with *Crinum asiaticum*, a coarser plant. *Crinum Woodrowi* may be found in great abundance on the slopes below Kate's Point, lower down than the window and to the west of it. What generations of picnickers have passed by and never seen where grow the lilies! Another beautiful lily, white tinged with red, *Crinum lalifolium*, is found near Panchgani. These three lilies have their own haunts and never seem to flourish anywhere else. *Crinum ensifolium* is common in the Poona river, and other Crina are seen in gardens. Practically all the lilies of Indian gardens are Amaryllids—Zephyranthes or Swamp lilies, one white, the other rosy; Hippeastrum or Knight's lily, red or white; the Jacobean lily (*Amaryllis or Sprekelia formosissima*); the Eucharis lily, Pancratium or Spider lily, and others. A little Pancratium,

identified at Kew as *P. triflorum*, is found at Mahableshwar. The filaments in this genus, as in Eucharis, Hymenocallis, Eurycles and others, are united to form a membranous cup within the perianth, resembling the crown of the Narcissi. A little yellow star-like flower, scarcely above the ground, is also found at Mahableshwar, which is *Curculigo orchioides*. Its root, called masli, is valued for medicinal virtues. Mr. Birdwood's catalogue gives *Curculigo malabarica* also, but this is probably the same. Larger male flowers appear by themselves and look like a different species. The only other plant of the order to notice is the common hedge agave, *Agave vivipara*, often wrongly called Aloe, which is a lily. The difference between the *Amaryllideæ* and the *Liliaceæ* is mainly in the position of the ovary. In flowers of the latter order the immature seed-vessel may be seen standing in the middle of the perianth. In the Amaryllids it is only perceptible as a thickening of the green pedicel or flower-stalk below the perianth. This is very conspicuous in the Crina, the Snowdrop and others. The *Irideæ* and the *Scitamineæ* have the same peculiarity and are placed in the same series with the *Amaryllideæ*. The Orchids have also the ovary inferior, but the seeds being microscopical, it is not conspicuous until the perianth falls off, though it is sometimes coloured like the perianth. *Dendrobium speciosum*, a near relation of the early orchid of Mahableshwar, is called in New South Wales the Rock Lily. But the *Liliaceæ* and the *Amaryllideæ*, though unimportant orders in India, provide us with sufficient flowers of great beauty and interest without going further afield in search of lilies.

A CATALOGUE OF THE *HETEROCERA* OF SIKHIM AND BHUTAN.

By G. C. Dudgeon, F. E. S.

With Notes by H. J. Elwes, F. E. S., F. Z. S., &c.,

and

Additions by Sir George Hampson, Bart., B. A., F. E. S., &c.

Part XI.

(*Continued from Vol. XIII, page* 674.)

Family HYPSIDÆ—continued.

Genus Macrobrochis, Herr Schäff.

1308. *M. gigas*, Wlk.

Sikhim and Bhutan. A very common species which may often be seen flying during the day. The form *leucospilota*, Moore, is perhaps the one most frequently met with, but *atrata*, Butl., and *albicans*, Butl., with their intermediate forms are not rare. It occurs in May, June and September. The top of the head in all specimens I have seen is invariably orange.

Family ARCTIADÆ.

Sub-family NOLINÆ.

Genus Neonola, Hmpsn.

N. mesosticta, Hmpsn.

Sikhim. 1800 feet up. Not common at the lower elevations. I obtained two specimens in July and August attracted to light.

Genus Celama, Wlk.

1532. *C. lativittata*, Moore. (Plate II, Fig. 11.)

Sikhim and Bhutan, 2500—3000 feet. I have four specimens which I took at Fagoo attracted to light in August and October. I never captured it in Sikhim. Three of my specimens are males and have the antennæ strongly pectinated.

1538. *C. encausta*, Hmpsn.

Sikhim, 1800 feet. This is rather rare and my only specimens were taken at Punkabaree at light in October.

1530. *C. fasciata*, Wlk.

Sikhim and Bhutan, 1800—3000 feet. A well marked species, not uncommon. A fresh specimen of a male in perfect condition in my collection has dorsal tufts of pale brownish scales on the first and second abdominal segments and the extremity of the abdomen with a

buff-coloured tuft of long hairs over the claspers. It occurs from June to November.

C. disticta, Hmpsn.

Bhutan, 2500—3000 feet. Common at light in May, June and August.

1526. *C. astigma*, Hmpsn.

Sikhim. I have not taken this. (The only Sikhim specimen I have seen, the type of the female, was taken by me at light at Darjeeling in July.—*H. J. E.*)

C. duplicilinea, Hmpsn.

Sikhim, 6800 feet. Rare in August in Darjeeling station.

1528. *C. internella*, Wlk.

Bhutan, 2500 feet. I took two males of this species at Fagoo at light in August.

1541*a*. *C. erythrostigmata*, Hmpsn. (PLATE II, FIG. 31.)

Bhutan, 3000 feet. I have only procured two specimens of this both taken at light in August at Fagoo. *Pisaramedioronata*, Hmpsn,, is synonymous.

1520. *C. tæniata*, Snell.

Bhutan, 3000 feet. Only one specimen, a female which I took in November 1894 at Fagoo. This may be referable to *C. mesomelana*, Hmpsn., but is pure white, not brownish-white.

C. suffusa, Hmpsn.

Sikhim, 7000 feet. I have not seen a specimen.

C. mesomelana, Hmpsn.

Sikhim. I have not received this unless the insect I have identified as *C. tæniata*, Snell, is a female of it. The male only is described by Sir Geo. Hampson. (A very distinct pale brownish species with prominent black medial band.— *G. F. H.*)

1534*a*. *C. marginata*, Hmpsn. (PLATE II, FIG. 27.)

Sikhim and Bhutan, 1800—3000 feet. I have several specimens of this from these two localities. I have also taken it in the Kangra Valley Punjab. It occurs in March, April, May, August, September and October. It is therefore probably double-brooded.

1527. *C. squalida*, Staud.

Sikhim and Bhutan, 2500 feet. Rather scarce in May and June at light.

1531. *C. pumila*, Snell.

Sikhim and Bhutan, 1800—2500 feet. Very common from March to July and again in September.

1523. *C. flexuosa*, Pouj.

Sikhim and Bhutan, 6800 feet. I am very doubtful concerning my identification of this species. I have one specimen marked *N. confusalis*, Dup., by Sir Geo. Hampson which I think may belong to this. (I took a specimen on Tonglo in July which has been identified with *Nola confusalis* by Snellen. I have one of Moore's types of *N. sikhima* which appears to me different, though Sir G. Hampson considers it a synonym. This form or species I took at Darjeeling on June 21st.—*H. J. E.*)

C. polia, Hmpsn.

Sikhim, 7000 feet. I have not seen a specimen.

C. phæochroa, Hmpsn.

Sikhim and Bhutan, 1800 feet up. This occurs in great numbers at the commencement of the rains at Fagoo, and is of the small suffused form.

Genus Nola, Leech.

1534*e*. *N. tenebrosa*, Hmpsn. (Plate II, Fig. 24.)

Sikhim, 1800 feet; Bhutan, 2500 feet. This is not rare at light in May and June. I have specimens also which I took in April, September and November.

N. loxoscia, Hmpsn.

Sikhim. I have not seen a specimen.

1537. *N. brunella*, Hmpsn.

Sikhim and Bhutan. I have one specimen which I am, however, not sure about, but which corresponds fairly well with Hampson's figure in Ill. Het. IX. My specimen was taken at Fagoo at light in June.

1524*a*. *N. punctilineata*, Hmpsn. (Plate II, Fig. 25.)

Bhutan. I obtained two females only at Fagoo at light, one of which bears the date July.

1535. *N. argentalis*, Moore.

Sikhim and Bhutan. Occurs not commonly in July. (I have twelve specimens varying somewhat of this, some of which I took at Darjeeling in August, others from Möller's, Knyvett's and Atkinson's collections. I should call it one of the commonest of the Nolinæ at

Darjeeling, perhaps some of them belong to the following, but only a specialist can name such insects with any certainty.—*H. J. E.*)

N. melanota, Hmpsn.

Sikhim and Bhutan. This species is so like the last that I do not think it is really separable. *N. argentalis* has the markings more clouded and is larger, but the same markings can be traced in *N. melanota* better defined. The postmedial line being punctiform is scarcely, I think, sufficiently characteristic. It is found from 1800 feet up to 7000 feet in Sikhim, and I have one specimen from Bhutan from 2500 feet. July to October are the months during which I have taken it. (Quite distinct; much smaller; antennæ with the branches shorter and paler than *N. argentalis*, patagia wholly white.— *G. F. H.*)

1533. *N. distributa*, Wlk.

Sikhim and Bhutan, 1800—3000 feet. This is a common species at light at Fagoo and is to be taken at light from May to September. I have a specimen from Kangra also, which differs from Sikhim specimens in having the forewing broader and shorter.

N. tristicta, Hmpsn.

Sikhim and Bhutan, 6400 feet. This species is apparently very nearly allied to *N. distributa* and *N. microphasma*. I have one specimen taken in September at Rissoom and another, which I am not quite sure belongs here, taken in June.

1534 *b*. *N. microphasma*, Butl. (PLATE II, FIG. 26.)

Bhutan, 2500 feet. I have taken this at light in July and August.

1520 *a*. *N. laticincta*, Hmpsn. (PLATE II, FIG. 28.)

Bhutan. The type which is now in the British Museum is the only specimen I have seen.

1534 *d*. *N. nigrisparsa*, Hmpsn. (PLATE II, FIG. 21.)

Sikhim and Bhutan. Five specimens have been taken by me at light at from 1800—3000 feet, in May, August, October and November.

Genus PŒCILONOLA, Hmpsn.

1541 *b*. *P. seminigra*, Hmpsn. (PLATE II. FIG. 30.)

Sikhim, 1800 feet; Bhutan, 2500 feet. I have eight specimens, six of which were taken by me at light at Fagoo and one at Punkabaree. Three of my specimens are males and differ only from the female in having the antennæ bipectinate, with the branches shorter towards the apex. It is on the wing in June, July and August.

Genus MELANOGRAPHIA, Hmpsn.

M. tympanistis, Hmpsn. (PLATE II, FIG. 22.)

Sikhim, 1800 feet. I obtained two specimens at light at Punkabaree, one of which bears the date August 1897. It is attracted to light.

Genus DIALITHOPTERA, Hmpsn.

1545 *a*. *D. gemmata*, Hmpsn. (PLATE II, FIG. 29.)

Sikhim, 1800 feet. I have nine specimens taken by me at light at Punkabaree in May, July, September and October. The fovea at the upper angle of the cell of the forewing in the male is partially hidden beneath a large tuft of metallic scales.

Genus RŒSELIA, Hübr.

1545 *b*. *R. lignifera*, Wlk.

Sikhim, 1800 feet; Bhutan, 2000 feet. I first met with this insect in the larval stage in 1894, having discovered a colony of them upon a felled tree at Fagoo. From these, six or seven perfect insects were obtained all emerging in December. The caterpillar has the appearance of a snowflake, as it is covered with a downlike easily detached substance similar to that found upon the larva of *Epicopeia*. The successive cast skins of the head are attached one above the other to a tuft of long hair behind the head. Subsequently at Punkabaree I obtained five more of the perfect insect in February, May, July, November and December.

1546. *R. scripta*, Moore.

Sikhim, 7000 feet. Occurs but not commonly in Darjeeling in July and August. (This pretty and distinct species occurs from April to July at Darjeeling at light.—*H. J. E.*)

1547. *R. strigivena*, Hmpsn.

Sikhim. I have only taken this on one occasion. It must be a rare species. (I never took this myself, the type came from Möller's collection and seems very distinct.— *H. J. E.*)

R. triangulalis, Leech.

Sikhim. There is one female in the British Museum from my collection, but I have never taken it again.

1544. *R. argyria*, Hmpsn.

Sikhim. I never obtained this. (A well marked species of which I have but one specimen and do not know its date or exact locality. —*H. J. E.*)

1549. *R. nitida*, Hmpsn.

Sikhim, 1800 feet; Bhutan, 3000 feet. I obtained three males at light in November 1894 and 1897 at Fagoo and Punkabaree. I have since taken one female in the Kangra Valley in September. The male has the antennæ bipectinated.

1540 *a*. *R. argentescens*, Hmpsn. (PLATE II, FIG. 32.)

Sikhim and Bhutan, 3000 feet. A rare species of which I only obtained two females at light, one of which bears the date August.

1545. *R. semirufa*, Hmpsn.

Sikhim. I have not received this species. (I have only one specimen, the type which I believe came from Knyvett's collection.—*H. J. E.*)

1547 *a*. *R. cuneifera*, Wlk. (PLATE II, FIG. 13.)

Sikhim and Bhutan, 2500 feet. In my figure of this species the abdomen is represented as partially dark-brown, this is incorrect. In the seven specimens in my collection it is greyish-white. My specimens were taken by me at light in April, May, June and August. I only once procured it at Badamtam, the others being all from Fagoo. *Selca ruficosta*, Hmpsn., is synonymous.

1522. *R. denticulata*, Moore.

Sikhim. I have not taken this. (My specimens were taken at Darjeeling in August and have been compared with the type in the collection of Atkinson. Snellen has the same insect from Java. —*H. J. E.*)

1548. *R. ascripta*, Hmpsn.

Sikhim, 1800 feet. I took one male of this in September at Punkabaree.

Sub-family LITHOSIANÆ.

Genus NEOBLAVIA, Hmpsn.

1379 *a*. *N. scoteola*, Hmpsn.

Sikhim, 2600 feet. The type in the British Museum is from Dr. Pilcher's collection. I have not met with the species.

Genus POLIOSIA, Hmpsn.

1381*c*. *P. muricolor*, Wlk.

Sikhim. I have not taken this.

1381*b*. *P. punctivena*, Hmpsn.

Sikhim, 1800 feet. Rare at Punkabaree where I obtained three specimens only in June, July and September.

1347. *P. brunnea*, Moore.

Sikhim and Bhutan 2500—6400 feet. I have only one pair of this obtained at light in June and September.

1353. *P. cubitifera*, Hmpsn.

Sikhim and Bhutan, 2500 feet. Occurs commonly at light from May to September at Fagoo.

Genus LEXIS, Wellgn.

L. fulveola, Hmpsn.

Sikhim, 2600 feet. Type in British Museum. Two specimens are recorded from Dr. Pilcher's collection.

Genus MITHUNA, Moore.

1372. *M. quadriplaga*, Moore.

Sikhim and Bhutan, 2500-6700 feet. A common insect with a great range of distribution in this locality. It occurs from June to October.

1372*b*. *M. strigifera*, Hmpsn.

Sikhim. I have not obtained this.

Genus ILEMA, Hübn.

1363. *I. tortricoides*, Wlk.

Sikhim and Bhutan, 2500 feet. Common in May, July, August and October. (Occurs at Mongpo in June.— *H. J. E.*)

1373. *I. tumida*, Wlk.

Sikhim and Bhutan, 2500 feet. I have taken this only in the latter locality from July to September. I have four males and four females in my collection all captured at light.

1374. *I. protuberans*, Moore.

Sikhim and Bhutan, 1800—3000 feet. I have often taken the female of this species, but only once have I found a male. It is attracted to light in May, June, August, September and November.

1336. *I. distorta*, Moore.

Sikhim and Bhutan, 3000 feet up. Common in June. Males scarcer than females.

1329. *I. tetragona*, Wlk.

Sikhim, 5000 feet. I have never taken this myself, but have two specimens brought in by collectors. (I have several from Möller's and Knyvett's collections taken in April, but never saw it alive myself. It varies much in size and it looks as though two species were confused under this name.— *H. J. E.*)

1331. *I. venosa*, Moore.

Sikhim and Bhutan, 3000—6800 feet. I have four specimens. This is either a variable species in markings or two of my specimens belong to another species. (I also think I have two species under this name but not enough of them to form an opinion upon. I have taken it in the Khasia hills in September at about 4000 feet.—*H. J. E.*)

1334. *I. plumbeomicans*, Hmpsn.

Sikhim, 4000 feet. I have not seen this. (I also have never seen this from Sikhim, the types are from the Naga hills.—*H. J. E.*)

1334*b*. *I. brunnea*, Moore.

Sikhim, 7000 feet. Number 1347 in Hampson's Moths of India is *Poliosia brunnea*, Moore, not this species.

1348. *I. auriflua*, Moore.

Sikhim and Bhutan, 3000 feet. I have only one pair taken in October.

1371. *I. vagesa*, Moore.

Sikhim, 1800 feet. I have only two females which I took at light in May and July. Both sexes are very common in the Kangra Valley Punjab, during the rains. (I have both sexes from Möller's collection but never took it myself.—*H. J. E.*)

1354. *I. oblitterans*, Feld.

Sikhim and Bhutan, 6400 feet. I took two specimens at Rissoom in April attracted to light. Numbers 1355 and 1354 are the same species.

1358. *I. conformis*, Wlk.

Sikhim and Bhutan. The neuration of the forewings of specimens from Sikhim differ from those from Kangra Valley. In the former veins, 10, 7, 8 and 9 are stalked in the order given with 6 from below the angle of the cell, but in the latter 10, 9, 8 and 7 is the arrangement with 6 close to the origin of them.

I. perdentata, Druce.

Bhutan. I have two males corresponding with the figure in Cat. Lep. Phal. There is a deep groove in the forewing from the base along the lower sides of vein 2 and another below vein 3. The Bhutan specimens agree with the figure of the female in Hampson's Plate, but the interspaces beyond the medial angled line are fuscous leaving the veins rather broadly ochreous. The neuration is as follows:—Forewing:

2 from middle of cell curved near the base, 3 and 4 on a long stalk, 6 from below angle, 7, 8 and 9 on a long stalk, 10 free, 11 and 12 anastomosing : hindwing normal. Taken at light in July and August, at Fagoo.

1352. *I. reticulata*, Moore.

Sikhim, 7000 feet. I have only one specimen in my collection which was taken by Dr. Pilcher in May. (I have two pairs of this distinct species but without exact indication of locality.—*H. J. E.*)

1362. *I. quadrisignata*, Moore.

Sikhim. I do not know this. (I cannot identify this from Moore's plate though I have one which Sir G. Hampson thought might be it.—*H. J. E.*)

1368. *I. terminalis*, Moore.

Sikhim. This also is not known to me. (I do not know on what grounds Sir G. Hampson treated *L. semifusca*, Elwes, P. Z. S., 1890 p. 20, fig. 204, as a form of *I. terminalis*. My type is most unlike Moore's figure.—*H. J. E.*)

1366. *I. cucullata*, Moore.

Bhutan, 2500 feet. I have one male taken in July which corresponds to this in the head and thorax being black and the forewing brown. There is no areole ; 10, 7, 8 and 9 are stalked and 6 is from just below the angle of the cell.

1348*a*. *I. chrysophleps*, Hmpsn. (PLATE II, FIG. 10)

Bhutan, 3000 feet. The type in the British Museum is the only specimen I have taken.

1342. *I. fumidisca*, Hmpsn.

Sikhim. I have never received a specimen. (I have two specimens so named by Sir G. Hampson from Möller's collection, one of which seems to me identical with what he calls *I. antica*, but I have not examined the venation. Whether mine are the same as the types from Tenasserim is, I think, doubtful.—*H. J. E.*)

1341. *I. vicaria*, Wlk.

Sikhim and Bhutan, 1800—3000 feet. Common in June, July and August. *I. antica*, Wlk., is a synonym of this species.

1343. *I. griseola*, Hübn.

Sikhim and Bhutan. I have taken this in May, June and November at Punkabaree.

1350. *I. xanthocraspis*, Hmpsn.

Sikhim. I have nothing to correspond with the figure given in Cat. Lep. Phal. Hampson. *I. nigripars*, Hmpsn., is a synonym.

1382. *I. basinota*, Moore.

Sikhim. I have only one specimen taken in April by Dr. Pilcher (I have one from Möller taken in May, another from Knyvett. It seems rare.—*H. J. E.*)

1356*a*. *I. nigripes*, Hmpsn.

Sikhim and Bhutan, 1800—2000 feet. The forewing of the male is broader and paler than that of the female. I have nine specimens, all taken in May at light.

1370. *I. nigripars*, Wlk.

Sikhim. I have never received this from this locality but have recently taken it in the Kangra Valley. *I. pallens*, Moore, is a synonym. (I have 8 specimens taken at Darjeeling in July and August referred to this by Sir G. Hampson. They vary a good deal and I cannot draw the line with certainty between some of them and *L. reticulata*, Moore, as identified by him and Mr. Butler, of which I have 4 from Möller's collection. A Khasia specimen is also intermediate. I think they require further study.—*H. J. E.*)

1338. *I. varana*, Moore.

Sikhim and Bhutan, 6700 feet. I have only one female which I took at Pasheteng. This was attracted to light in October. (This was not uncommon at light at Darjeeling during the rains of 1886.—*H. J. E.*)

Genus CHRYSORABDIA, Butl.

1327. *C. viridata*, Wlk.

Sikhim and Bhutan, 6000—7000 feet. I have taken this at light in June, July and September. (Taken by me at Darjeeling and at light on Tongloo, 1000 feet, in July and August.—*H. J. E.*)

1328. *C. bivitta*, Wlk.

Sikhim. I have not received this. (I have two males of *C. disjuncta*, Moore, from Möller's collection both taken in September and two females of what Sir G. Hampson has identified as *C. bivitta*, taken in May and June. I do not believe they are sexes of the same species; the patagia of the female being quite different, as are the markings of the forewings from those of *C. disjuncta*. As Walker says the

thorax of *C. bivitta* has a green spot on each side, these females cannot in my opinion belong to that species and may require a new name, if, as I suppose, they are not the females of *C. disjuncta*.—*H. J. E.*)

1328*a*. *C. aurantiaca*, Hmpsn.

Bhutan, 6700 feet. I took one male at Pasheteng in September attracted to light. (Walker's description of *C. bivitta*, I consider applies better to this species than to what Sir G. Hampson has identified with it, and I believe the name *aurantiaca* should be sunk as a synonym. The types were in Mr. Saunders' collection from "Hindostan." I have it from the Khasias whence many of Walker's types came.—*H. J. E.*)

1328*b*. *C. alpina*, Hmpsn.

Yatung, 10000 feet. This may probably occur at similar altitudes in Sikhim proper and Bhutan. The Chumbi Valley, in which Yatung lies, is situated on the Southern watershed of the Himalayas and possesses a similar fauna to that of N. Sikhim.

Genus CHRYSAEGLIA, Butl.

1325. *C. magnifica*, Wlk.

Sikhim, 7000 feet. I do not think this is uncommon in Sikhim, but I have only one specimen in my collection without date. (I have two pairs from Möller's collection. The females are much larger than the males. Mr. Knyvett told me he had taken it at Jor-pokri at about 7000 feet on the road to Tongloo.—*H. J. E.*)

Genus AGYLLA, Wlk.

1312. *A. apicalis*, Moore.

Sikhim, 5500 feet. I have only procured two examples at Tukvar. I do not think it is separable from *A. albifinis*, Wlk. The specimen remaining in my collection has the cilia of the hindwing white from the apex to vein 4. (I have one male and three females from Sikhim, of which two females only have some white on the cilia of the hindwing. A pair of *A. albifinis* from Sabathu, N.-W. Himalayas, have much more white, but I expect Mr. Dudgeon is right about their being varieties of the same species.—*H. J. E.*)

1320. *A. divisa*, Moore.

Sikhim. (A single specimen from Möller's collection is exactly like those I have from the Khasias.—*H. J. E.*)

1313. *A. beema*, Moore.

Sikhim, 7000 feet. Rather scarce in Darjeeling in June. Mr. Elwes remarks that he took it at 5000 feet in May and at Darjeeling in June, but did not find it uncommon.

1308*b*. *A. metaxantha*, Hmpsn. (*Plate II. fig.* 17).

Bhutan, 2500—3000 feet. The type in the British Museum is the only one I have procured.

1321. *A. rufifrons*, Moore.

Sikhim and Bhutan, 2500 feet. I took this at Fagoo in May at light.

1319. *A. albocinerea*, Moore.

Sikhim, 7000 feet. Occurs in August in Darjeeling. (Seems rare as I have only three specimens which resemble *A. sericeipennis* closely, but have not the orange colour of that species.—*H. J. E.*)

1309. *A. prasena*, Moore.

Sikhim and Bhutan. This species was included in the genus *Macrobrochis* in the Moths of India, Vol. II ; it resembles *M. gigas*, Wik., somewhat in markings. Not common from May to September.

1315. *A. ramelana*, Moore.

Sikhim and Bhutan, 5000—7000 feet. A common insect in Darjeeling down as far as Tukvar from June to September. (The females vary very much, in one, the spots of the forewing are absent, in another, they are almost obsolete on both wings. In the male the band of the forewing varies in size and shape.— *H. J. E.*)

1316. *A. bipars*, Moore.

Sikhim and Bhutan, 6700 feet. I have only one male from the last locality. It differs from the description given in that, the terminal half of the forewing is brown with a bluish metallic lustre. (I have a similar male from Atkinson's collection which is distinct from my only female which has the markings of a male of *A. ramelana*. I have a third one (sex doubtful) with yellowish hindwings, the same size and with similar markings to *A. ramelana*.— *H. J. E.*)

1314. *A. maculata*, Moore.

Sikhim and Bhutan, 1800—2500 feet. Rare, I have only obtained four males and two females in April, July and August. In one female only a small black spot remains on the hindwing. (I have three males and a female from Möller's collection, but never took it myself.— *H. J. E.*)

Genus LITHOSIA, Fabr.

1326. *L. quadra*, Linn.

Sikhim. Occurrence based upon one abnormal specimen in the collection of Mr. Elwes. (I hardly think this specimen can be the same as *L. quadra*, but it is hardly fit to describe and we must hope that others will be found to settle the question of its identity.—*H. J. E.*)

Genus AGRISIUS, Wlk.

1306. *A. guttivitta*, Wlk.

Sikhim, 7000 feet. Not common at light in Darjeeling. (I found this common in 1886, but there is evidently much difference in the abundance of some species in different seasons.—*H. J. E.*)

Genus STICTANE, Hmpsn.

1390. *S. fractilinea*, Snell.

Sikhim and Bhutan, 1800—3000 feet. I have taken this at light in June, July and October. In all my specimens the medial band on the forewing is continuous and unbroken. *Æmene multipuncta*, Hmpsn., is a synonym. (Probably this is what I have as *Oemene maculifascia*, but I should not like to identify it with certainty.— *H. J. E.*) *Æmene maculifascia*, Moore, is placed in the genus *Parasiccia* by Hampson.

Genus LOBOBASIS, Hmpsn.

1393*a*. *L. niveimaculata*, Hmpsn.

Sikhim and Bhutan, 2500 feet. The type is the only specimen I have taken.

Genus GARUDINIA, Moore.

1400*a*. *G. biplagiata*, Hmpsn.

Bhutan, 2500 feet. The type in the British Museum is the only specimen taken by me.

Genus EUCYCLOPERA, Hmpsn.

1394*a*. *E. plagidisca*, Hmpsn.

Bhutan, 2500 feet. I obtained two specimens only of this, one of which is in the British Museum. The one in my collection was attracted to light at Fagoo in July.

Genus PADENIA, Moore.

1401*a*. *P. duplicana*, Wlk.

Bhutan, 2500—3000 feet. I took one specimen of an insect which seems intermediate between *P. transversa*, Wlk. and *P. duplicana*, Wlk., in March 1895 at Fagoo. The forewing is yellowish white with

cupreous narrow bands, the antemedial one being slightly angled below the cell, and the postmedial one arising from just beyond the middle of the costa and running obliquely to vein 2 where it is sharply angled downwards and continues parallel to the outer margin.

Genus Oxacme, Hmpsn.

1393. *O. dissimilis*, Hmpsn.

Sikhim. I have not seen this. It is said to occur at 2800 feet. (I have the type female of this curious little species which must be very rare in Sikhim.— *H. J. E.*)

THE POISONOUS PLANTS OF BOMBAY.

By Lieut.-Colonel K. R. Kirtikar, I.M.S., F.L.S.,
Civil Surgeon, Ratnagiri.

Part XIX.

(With Plate U.)

(*Continued from page* 623, *Vol. XI.*)

DATURA FASTUOSA, *Linn.*

Natural Order—Solanaceæ.

Marathi:—धतूरा (*Dhatûrâ*), धुत्रा (*Dhûtrâ*), धोतरा (*Dhotarâ.*)

This is a herbaceous, coarse, rank-scented plant, with a colourless juice. Older parts of the plant, glabrous; younger and growing parts covered with evanescent whitish pubescence, otherwise known as "*silvery-down.*"

STEM.—it is irregularly zigzag; 1-2 ft. high, even 4 or 5 ft. sometimes; rather succulent from containing much pith.

Bark—polished, greenish generally, with a puplish tinge most marked at the nodes; at times slightly rough either with minute scattered hairs, or when without hairs, showing scars wherever any hair existed in the early stage of the bark.

Branches—divaricate; marked with scars of fallen leaves.

LEAVES—generally 3 to 6 inches long; triangular or ovate, but acuminate always, even if rounded.

Leaf-margin sometimes entire, oftener with a few large lobes; at times these large lobes have a few coarse short teeth. The leaves appear to the naked eye quite glabrous, but the magnifying-glass often shows a very minute pubescence on the upper as well as the under side of the leaf. The leaves, as a rule, are glaucous-green above, and paler beneath. The Mid-rib is prominent below, with a dash of purple; so are its main branches. The Veins are pellucid "sinuate and pinnate." The leaves, says Clarke, are "ovate entire or deeply toothed, glabrous." (Hooker's Fl. Br. Ind., Vol. IV, p. 242).

PETIOLE—1-2 inches long. Stipules—absent.

FLOWERS—hermaphrodite, very large, solitary, erect from the node, but not axillary. Hooker remarks that the flower-buds in early stage are puberulous; so they are under a magnifying-glass. Peduncles—short stout, purplish, solitary. Bracts—absent.



R.S. Sadhaverkar del

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THE POISONOUS PLANTS OF BOMBAY.

Datura fastuosa Linn Nat Ord Solanaceæ.

CALYX.—Tubular, free, 3 inches long, sometimes a little longer; very minutely adpressed-pubescent: circumsciss. SEGMENTS—5; often only 3 or 4; ¼-½ inch, wide; green, triangular, acuminate, acute. The lowermost portion ¼-½ inch, persistent and enlarged in fruit. Lobes at apex ¼ inch long, ovate-lanceolate, according to some writers.

COROLLA—tubular, funnel-shaped (otherwise called trumpet-shaped). TUBE—over 7 inches, generally, gradually widening upward. LIMB—recurved, 4 inches or more in diameter. LOBES—five; pubescent on the back; their plait or midrib terminating in a short linear or recurved acute tail. ÆSTIVATION—plicate or valvate in funnel-part of the corolla; and contorted at apex, *i.e.*, spirally twisted in bud, as also after the flower is fully open.

ANDRŒCIUM,

STAMENS—included; about as long as the corolla-tube.

FILAMENTS—filiform; adnate to the corolla-tube from base half-way up; free further on.

ANTHERS—linear; bi-lobed; each lobe nearly ¾ inch long. Dr. Trimen says they dehisce vertically, meaning of coarse—*longitudinally*.

CONNECTIVE—of the same length as the anther-lobes, filiform, less than half the thickness of the filament.

POLLEN—white.

GYNŒCIUM,

OVARY—papillose; the papillæ subsequently mature with progress of the pericarp of the fruit into sharp-pointed short prickles. Doubtless most of the papillæ are abortive. The ovary is superior, 2-celled, or imperfectly 4-celled; seated on a yellowish DISK, 1-12 inch broad, and burying as much of the ovary in its substance.

OVULES—numerous, on prominent peltate white placentas.

PLACENTATION—axile.

STYLE—linear, over six inches in length; at times half an inch longer than the stamens, at times half an inch shorter.

STIGMA—shortly two-lobed, often conical, mostly capitate; ¼ inch long, at times ⅓ inch.

FRUIT—A capsule sub-globose, 4-celled, 4-valved, nodding on a curved peduncle; supported at base on the reflected accrescent calyx. The pericarp is fleshy, green, covered with numerous scattered short

straight sharp conoid prickles, the base of the cone resting on the pericarp.

5 DEHISCENCE—irregular (Trimen). Clarke describes it thus:—"Capsule sub-indehiscent, or irregularly dehiscent near the apex."

SEEDS—very numerous, somewhat compressed, sub-reniform, close-packed; pale-brown when the fruit is mature and dry; albuminous. Trimen says that the seeds are "*nearly smooth.*" The general testimony, however, is that the outer coat or the cuticle of the seed-is "*rugose.*" It is so, not only when the seed is examined old and dry, but also when it is fresh. There is an excellent figure in Guy and Ferrier's Med. Jurisprudence (page 534, 5th Ed., 1881), of the rough honey-combed cuticle of the dry seed of D. stramonium, a congener of the plant I am describing, the seed of which latter is not far different from that of D. fastuosa. A detailed description of the seed will be given further, where the EMBRYO is also described in detail. It is enough to say here that the embryo is curved round the central endosperm, that is to say the embryo is peripheric. In this the seed of D. fastuosa resembles in structure the seed of D. stramonium.

GENERAL REMARKS.

The description given above is mostly based on that of Dr. Trimen's as published in Part III of his elaborate and exhaustive Flora of Ceylon, a work, which it is much to be regretted, he did not live to complete. The first part of his Flora of Ceylon was published in 1893. The second part appeared in 1894, and the third in 1895. The climate of Ceylon, where Dr. Trimen worked zealously from 1879 as the Director of the beautiful Gardens of Peradeniya, proved fatal to him. He died on the 16th October 1896 to the regret of the entire botanical world, without finishing his Flora of Ceylon. It was left to the venerable veteran botanist Sir Joseph Hooker to bring out the fourth and fifth parts of the work undertaken by Dr. Trimen. Dr. Trimen's Ceylon Flora must be considered an elaborate supplement to Sir Joseph Hooker's Standard Flora of British India. The latter is the conjoint work of several distinguished botanists, whereas the former is the work of a single hand, the product of the patient researches of a man possessed of a wide and marvellous capacity for original botanical work.

THE SYNONYMS of Datura fastuosa are numerous. I wish to devote a few lines to consider them with a view to show how the nomenclature of the Indian species of the Genus Datura has been determined by various European, American, and Indian botanists of note. It seems all the more necessary to do so, as it will be seen from Clarke's description of the N. O. Solanaceæ (Hooker's Fl. Br. India, Vol. IV), that under Genus Datura, (pp. 242, 243), there are queries and doubtful varieties referred to, which are somewhat perplexing. It would be useful, therefore, to study page 720 of Fasciculus I of Sir Joseph Hooker's Index Kewensis (1893), where we find the following synonyms for Datura fastuosa, *Linn.* :—

1. D. Ægyptica, *Vesl.* &c.
2. D. alba, *Nees.*
3. D. Bojeri, *Delile.*
4. D. dubia, *Rich.*
5. D. humilis, *Desf.*
6. D. hummatu, *Bernh.*
7. D. inoxia, *Mill.*
8. D. lævis, *Schkuhr.*
9. D. Metel, *Mill.*
10. D. muricata, *Link.*
11. D. Nilhummatu, *Dun.*
12. D. stramonium, *Thunb.*
13. D. Wagmanni, *Steud. Nom.* Ed. II ; I. 484.

The following are the synonyms of Datura Metel, *Linn.*, as given in Hooker's Index Kewensis :—

1. D. fruticosa, *Hornem*, &c.
2. D. guayaquilensis, *H. K. & B.*
3. D. timoriensis, *Zipp.*

Under this head I may mention the synonyms of Datura Meteloides, *D. C. ex. Dun.*, especially as Emeritus Professor Marshall Woodrow of Poona College of Science mentions D. Meteloides in his work on Gardening in India (p. 401, 3rd Ed. 1899, Bombay). They are as follows :—

1. D. Metel, Moç, and Sesse, ex *Dun.* D. C. Prod. xiii. 1.
2. D. Wrightii.

The following are the synonyms of Datura stramonium, *Linn.*, as given in Hooker's Index Kewensis :—

1. D. Capensis, *Bernh.*
2. D. ferox, *Nees.*
3. D. loricata, *Sieb.*
4. D. lurida, *Salisb.*
5. D. parviflora, *Salisb.*
6. D. pseudo-stramonium, *Sieb.*
7. D. tatula, *Linn.*
8. D. Wallichii, *Dun., D. C.*

Dr. Norman Chevers in his Medical Jurisprudence for India mentions a species of Datura under the name of D. ferox, on the authority of Dr. W. Palmer, as found in India. In Hooker's Index Kewensis, D. ferox is referred to China only. In Johnson's Gardener's

Dictionary also D. ferox is mentioned as a China plant, bearing white flowers. In Hooker's Index Kewensis the following synonyms are given for D. ferox :—

1. D. Bertolinii, *Parl*, &c.
2. D. lævis, *Birtol. Fl.:Ital* &c.

To sum up, although Clarke in Hooker's Fl. Br. India describes D. fastuosa and D. Metel as separate species as originally named by Linnæus, Dr. Trimen says that the two species are scarcely separable (Flor. Ceylon, p. 238-239, Pt. III, 1895). Flückiger and Hanbury hold the same view. They say that D. alba, *Nees*, appears to be scarcely distinct from D. fastuosa, *Linn.* D. alba and D. stramonium according to these writers are different, as they say "the seeds of D. alba are very different in appearance from those of D. stramonium being of a light yellowish-brown, rather larger size, irregular in shape and somewhat shrivelled." (Pharmacographia, p. 462, 2nd Ed., 1879).

The Datura plant is mentioned in Amarkosh, one of the oldest Sanskrit Dictionaries extant. Its author's name is Amarsinha. Horace H. Wilson, a celebrated Sanskrit scholar, in the preface to the first edition of his Sanskrit-English Dictionary (1819), has it that Amarsinha flourished in the fifth century A. D.; the same view is held by another eminent Sanskrit scholar, Professor Monier Williams of Oxford. He says that the Amarkosha of Buddha Amarsinha belongs to a period not later than A. D. 500. (See "Indian Wisdom," Monier Williams, p. 171, Lond., 1875). Thus it will be seen that the Datura plant has been known in India for several centuries. There are many synonyms in Amarkosh for Datura. We are chiefly concerned with two of them. They are as follows :—

1. उन्मत्त=(*Unmatta*). This Sanskrit word is changed by European writers into *Hummatu* through the Tamil word *Umattai*. The same Sanskrit word is adopted by some European writers as *Nil-hummatu* through the Telugu word *Nâllâ-ummitte*, or *Nalla-umetta*.

2. मातुल=(*Mâtula*). This Sanskrit word is changed by some European writers into *Metel*. I may here mention that the term *Meteloides*, which is used by some European writers, seems to be derived from the Sanskrit word मातुलुङ्ग=(*Mâtulunga*). It must be noted here that the three Sanskrit words mentioned above indicate the white-flowered plant. For in Râja Nighant and in Bhâv-Prakâsh there is

the term कृष्णधत्तूर=(Krishna-Dhattura)=Black Datura. It bears purple or violet flowers, single or double. Note, however, that the purple or violet colour is seen here and there on stems, nodes, and petioles, and *on the outside only*, of the single and double-flowered corollas. The inside of the corolla-tube is pure white, or cream-coloured. There is no Datura flower which is absolutely as black as charcoal.

I find in Roxburgh's Flora Indica (p. 188, Carey's Calcutta Ed.), that Ramphius gives D. rubra as a synonym of D. fastuosa of Willdenow. Moreover I find in Dr. Norman Chevers' Med. Jurisprudence (p. 179, Calcutta Ed., 1870) that the purple species named in Sanskrit as *Krishna-Dhattura* is known in Bengal as *kâlâ*, i.e., black Datura, or as *lâl*, i.e., red Datura. In Western India, especially in the Konkan from where I am writing this paper, the *kâlâ* Datura means the purple or violet variety. The red variety is unknown here. At least, I have not seen it, in the town and island of Bombay, in Salsette, in the Satara District (Dekkan), nor in the very heart of the Konkan —namely Ratnagiri District. I have been in the Ratnagiri District since 15th May 1898, examining the local flora. I have found no red-flowered variety of Datura.

The third variety of Datura mentioned in old Sanskrit works such as Râja-Nighanta, Bhâva-Prakasha and others is named राजधत्तूर (*Râja Dhattûra*)—the Royal Datura. Probably this included the double-flowered varieties in the olden days when the Sanskrit writers saw the plants actually growing before them. Under the common head राजधत्तूर (*Râja Dhattûra*) are included Datura plants which bear white, bluish, purple or violet, yellow, or red flowers. I give the Sanskrit terms *seriatim* indicative of these colours, as follows :—

1. सित (Sita)—White, single and double-flowered.

2. नील (Nila)—Blue or dark blue. Note that this Sanskrit word signifies blue or dark-blue in relation to animals, plants, clouds, minerals, etc. From this appellation the Telugu name Nâllâ-Ummité appears to be derived ; and thence the name Nilhummatu of those European writers who studied the plant on the Malabar Coast where Telugu is spoken. This is probably the same as the following variety :—

3. कृष्ण (Krishna)—Purple or violet-flowered variety. This is the same, I think, as Krishna-Dhattura—Datura fastuosa mentioned above, or perhaps, the double-flowered variety of it.

4. पीत (Pîta)—Yellow-flowered variety, single or double-flowered, or both. Both these varieties are found in India. I had them once in my garden in Thana. The single-flowered yellow varieties as named by European and American botanists and horticulturists are as follows :—

D. humilis (pale yellow) ; D. chlorantha and D. lutea (yellow).

5. लोहित (Lohita)—Red-coloured variety known in Bengal, according to Norman Chevers as लाल (Lâl) datura, *i.e.*, either of the colour of iron-rust, or that of blood. It may also mean "of the colour of copper." I have not seen such a variety on this side of India. But Firminger of Calcutta has mentioned a double-flowered and a single-flowered variety also of the red or scarlet-flowered Datura named *D. sanguinea* (*see* p. 531, Manual of Gardening, 4th Ed., Calcutta, 1890). Firminger says that the flowers of this variety are of a deep red colour. The plant "thrives well in Ootacamund," he adds. Nay, he says, this, that he obtained from Ootacamund plants of this deep-red-coloured variety of Datura for both the Calcutta Botanical Government Gardens and for his own private garden. But, says he, the plants soon perished seemingly unsuited to the climate of Calcutta. Note that the Calcutta Botanical Government Gardens, which I visited not long ago, are on alluvial soil on the banks of the Hooghly River in low-land regions; whereas the plants bearing blood-red flowers were taken by Firminger for growth in Calcutta from the high-land plateau of Ootacamund, which is 6,000ft. above sea-level. I do not know whether this red-flowered variety exists in the beautiful gardens of Bangalore. Dr. Cameron's elaborate catalogue of the plants growing or nursed in these gardens is just now not with me, or else I might have been able to say something more with regard to the prevalence of the red-flowered variety in Southern India. Practically the red-flowered variety is extinct in Western India. If it could not live in the lowlands of Bengal, it cannot possibly live, or if at any time it lived in the low-lands of the Konkan, it could not survive. In this connection I must add that in Roxburgh's Fl. Indica (*op. cit*, p. 188), D. rubra (*Rumph*) is mentioned as a synonym of D. fastuosa (*Linn*). I gather from Hooker's Index Kewensis (Fasc. I, p. 720) that in America, among the Columbian plants, there is the single-flowered D. coccinea and the single-flowered D. sanguinea of Peru. Then again, among the

double-flowered plants, there is the *D. fastuosa—rubra* of South America. The following note on D. sanguinea (Ruiz. et. Pav.) by M. Berthold Seeman, Naturalist, H. M.'s Herald, may perhaps interest my readers as an illustration of popular faith in the plant—a mere superstition—among the American Indians of Darien and of Chocò. These superstitious people of tropical America prepare from the seeds of the plant a decoction, which is given to children to produce a state of excitement in which they are supposed to possess the power of discovering gold. In any place where the unhappy children happen to fall down, digging is commenced ; and as the soil nearly everywhere abounds with gold-dust, an amount of more or less value is obtained (p. 170, Vol. XI., Pharm. Journal 1852). This passage I find particularly worth quoting, as in India the administration of datura seeds to unsuspecting victims is not for collecting gold likely to be found in Indian soil-dust, but for searching the pockets of travellers and shop-keepers and depriving them of the gold and silver that may be with or about them, after they are well stupified with Datura seeds administered in various articles of food and drink. This will be amply evident in my remarks to follow under the head of "Poisonous Properties."

I wish to dwell for a moment in naming the DOUBLE-FLOWERED varieties of the genus Datura, as in my experience I have found them of great garden-beauty, having grown them in my garden, in Thana and Ratnagiri. The double-flowered varieties have been named (by writers well worthy of recognition) as follows :—

I. WHITE { (*a*) Datura cornigera florepleno. (*b*) Datura Knightii.

II. PURPLE. Datura fastuosa—florepleno.

III. YELLOW. Datura chlorantha-florepleno.

IV. PURPLE-WHITE. Datura fastuosa—rubra (S. America).

Synonym—D. Wagmanii (Hooker's Ind. Kew.).

It must be noted here that in the double-flowers of Datura of all colours the anther-bearing stamens are changed into petals or perianth either antherless, or bearing anther-lobes more or less modified, on the extreme margin of the inner corolla-tube. "Indeed," says Kerner, "there are grounds for believing that all petals are originally modified from stamens." Be it noted here that double-flowers remain on the plant on which they grow, two or three days longer than the single-flowers.

I now proceed to say a few words about the SCENT of the flowers. Opinions on this point vary ; there is the old saying :—" *Quot homines, tot sententiæ*—as many men, so many opinions. This is the same as saying in the gustatory line, *de gustibus non disputandum.*" Lindley says that the flowers of Datura are sweet-scented, especially at night. Note that the flowers of Datura of all kinds open about sunset, or just after, and close about or soon after sunrise. Bishop Hebr's lines are well worth quoting here :—

> " The broad Datura bears her breast
> Of fragrant scent, a virgin white,
> A pearl amidst the realms of night."

These lines are somewhat differently worded in Rev. Mr. Nairne's " Flowering Plants of Western India" (p. 209, 1894), but the fragrance of the flowers is referred to. Mr. Donald McDonald says the Datura shrubs produce amidst a mass of elegant foliage large and fragrant trumpet-shaped flowers. " Those flowers that are lasting may be taken under glass to impart a delicate yet powerful scent throughout the green-house."*

As regards the odour of the leaves of Datura the general testimony is that they are rank, smoky. The odour is characteristically offensive ; herbivorous animals shrink from it, says Kerner. Lauder Brunton says that the leaves have a heavy odour, which is strongest while they are drying, and of a mawkish faintly bitter nauseous taste. Over four hundred years ago John Gerarde, of London, made the following remarks on the Thorn-apple plant in an elaborate and wonderfully accurate work entitled " The Herball" :—" The flowers are of strong ponticke savour offending the head when smelled unto. * * * The herbe itselfe is of a strong savour and doth stuffe the head and causeth drowsinesse." (P. 347). In Sowerby's later work first published about the middle of the nineteenth century, and entitled " British Poisonous Plants," it is said that the leaves of *D. stramonium* have a slightly fœtid odour, but the flowers are sweet-scented though producing stupor if their exhalations are breathed for any length of time. (P. 29, 2nd Ed., 1861, London). " The whole plant smells of bean meal." (P. 134, Loudon's Encyclopædia of Plants, 1829, London). The flowers, says Loudon, have an agreeable odour

* *See* p. 37, 1895, " Sweet-Scented Flowers."

first, but if smelt long they become less agreeable, and are narcotic. Whether the odour of this flower or that of the several species or varieties of the Datura genus be considered sweet or otherwise, fragrant or offensive, depends entirely on individual capacity to appreciate the differences or even the degrees of scents. Mr. J. Ch. Sawer, F.L.S., very wisely remarks, that "odours are differently appreciated by different people, and what pleases one person may have a reverse effect on another; thus the strong odour of *Tagetes patula* (French marigold) and *Tagetes erecta* is not unpleasant to some, while others consider it very objectionable." (Odorographia; Introduction, p. xvi, 1892, London.) The same remark may be applied to the Datura plants.

Apart from the fact that the Datura plants are rank weeds, growing amidst hedges, fields and dunghills, where no human hand has sown them, often prevailing where they are not wanted, it is unquestionable, that the Thorn-apple is artistically speaking, a plant of great beauty, and quite a garden-ornament. Dr. Christison of Edinburgh remarks in his work on Poisons (1845), that the Thorn-apple in his day had become quite an ornament of Edinburgh Gardens. Firminger of Calcutta, on the other hand, is quite of a different opinion, although he is an able writer on Gardening. He would destroy the Thorn-apple plants after their flowers cease to bloom. For, he says, "they take up much room and look unsightly." Evidently Firminger has not the artistic eye or talent of Ruskin, or even of Kerner. The latter observes, that in the Datura plant the various forms, and the distribution of the green leaves, young and old, on the surface of the stem is very characteristic. Their position and form afford much room for observation. The unequal size of adjoining leaves on the same branch or stem is quite an artistic phenomenon. Looking down upon a horizontally projecting branch of the Datura plant, the larger and smaller leaves will be found arranged in quite a peculiar and striking manner. The smaller leaves are seen in the gaps between the larger ones. This mosaic-like fitting-together of larger and smaller leaves appears to be combined with the want of symmetry of the leaf-base most marked in the old long-stalked leaf.* It requires an artistic eye to appreciate these observations. It is not always that

* *See* Kerner's Nat. Hist. of Plants, Oliver's English Version, Vol. I, p. 422, 1894.

a gardener's eye is artistic. It appears from Loudon (*op. cit*), that the Stramonium plant was known to the Greeks as the mad-apple. It is not mentioned by Professor Daubeny in his Oxford Lectures on the Trees and Shrubs of the Ancient Greeks and Romans.

POISONOUS PROPERTIES.

All the species or their varieties hitherto known of the Datura genus are decidedly poisonous. The purple or violet-coloured variety is more deadly. All writers, European, American, or old Indian, are agreed that every part of the plant is deleterious to human life. The seeds are the most poisonous of all parts of the plant, wherever it grows. A detailed description of the seed, therefore, may not be out of place here. I give it on the authority of Dr. William Palmer (Norman Chevers' Med. Jurisprudence for India, pp. 184—185, Calcutta Ed., 1870). It runs thus:—The seed is almost kidney-shaped; its outline, angular; its size is rather more than a quarter of an inch long, and rather less in width; its colour greenish-brown when fresh, changing to yellow, I may add deep brown, when dry; it is attached to the placenta by a large white fleshy mass, which separates easily, leaving a deep furrow along half the length of the concave border of the seed; the outer surface of the seed is scabrous, almost reticulate, except on the two compressed sides, where it has become almost glaucous from pressure of the neighbouring seeds; the convex border of the seed is thick and bulged, with a longitudinal depression between the bulgings caused by the compression of the two sides. When the seed is divided into two, by cutting with a knife placed in the furrow on the convex border, the testa is seen irregular and angular in outline, and the embryo is curved and twisted in a fleshy albumen.

The active principle of the plant is an alkaloid once known as Daturine. The seed contains it in larger proportions than any other part of the plant weight for weight. The alkaloid was also known at one time as Daturia. Sohn says that commercial Daturine is frequently a mixture of Hyoscyamine and Atropine or the former solely. Datura stramonium, he says, also contains Stramonine which is an alkaloid like Hyoscyamine and Atropine, but it is not bitter. Hyoscyamine has a sharp and disagreeable odour;

Atropine has a disagreeable metallic taste.* Erhardt and Poehl dispute the identity of Atropine and Daturine, says Sohn. Professor Dragendorff says† that "according to the more recent researches of Ladenburg, henbane contains two alkaloids, one of which Hyoscyamine, is isomeric with Atropine, and identical with Daturine and Duboisine." Ladenburg distinguishes Hyoscyamine from Atropine by the melting-points of the alkaloids, and their gold-salts. Professor Schmiedeberg of the University of Strassburg says‡ that Atropine occurs in Daturine of the Thorn-apple; Hyoscyamine, which is isomeric with Atropine is also said to be contained in the Thorn apple. But he doubts the identity of Duboisine with Hyoscyamine.§ Dymock and his collaborateurs who have carefully examined the plant, say that Prof. E. Schmidt and Mr. Schute have found, as the result of their researches, that the seeds of D. stramonium contain much Hyoscyamine, with small quantities of Atropine and Hyoscine (*Apoth. Ztg.*, 1890, 511). Stramonine is not mentioned along with these. But in Dymock's Ph. Indica it is stated that M. Gérard has prepared a new fat acid, *Daturic acid*, from the seeds, which yield 25 per cent. oil when extracted by ether. Purified with petroleum, this oil is of a peculiar greenish-yellow colour. M. Gérard places Daturic acid between Palmitic and Stearic acids. They have analogous properties. Daturic acid crystallizes by cold from 85 per cent. alcohol giving groups of fine needles. It is fairly soluble in cold alcohol and very soluble in ether and benzene. I have no comments to offer on the quotations I have given above from celebrated pharmacological investigators; but I have yet to place before my readers the most recent opinions expressed by Dr. Murrell‖ as regards the nature of the active principles found in the different species of the datura plant and some of its congeners such as Belladonna, Hyoscyamus and Duboisia myoporoides. Dr. Murrell says that according to the old classification the active principles were as follows :—

1. Belladonna contained Atropine.
2. Hyoscyamus—Hyosciamine and Hyoscine.
3. Stramonium—Daturine.

* *See* p. 14, Sohn's Dictionary of the Active Principles of Plants, 1894, London.

† Plant Analysis—English Translation by Greenish, p. 60, 1884, London.

‡ Elements of Pharmacology, Dixon's English Translation. Edinburgh, 1887.

§ Pharmacographia Indica, p. 588, Vol. II., 1891, Bombay, by Dymock, Warden, and Hooper.

‖ A Manual of Pharmacology and Therapeutics. Pages 430—452, London, 1896.

"Ladenburg," adds Dr. Murrell, "has *re-investigated* the matter and says there are only three natural mydriatic alkaloids,* They are as follows :—

1. *Atropine*—which occurs in Atropa belladonna, and in Datura stramonium. (I may add in the Indian Datura, varieties and species of all Datura plants. *K.R.K.*)

2. *Hyoscyamine*—which occurs in Belladonna, Datura, Hyoscyamus, and Duboisia myoporoides.

3. *Hyoscine*—which occurs in Hyoscyamus.

Duboisine is identical with Hyoscyamine; and *Daturine* is a mixture of Atropine and Hyoscyamine.

N.B.—I am all at sea here, for Sohn, whom I have quoted above, says that the Datura stramonium contains Atropine, Hyoscyamine, Hyoscine, and Stramonine. The reader may accept the views of any of the pharmacologists I have cited above.

The term "Atropa," says Murrell, "is derived from *Atropos* (Gr.), one of the evil destinies, whose mission in life was to destroy life, and it is supposed to be indicative of the fate of those who came under its influence." These "evil destinies"—so named by Dr. Murrell—were known as the *Parcæ* or the *Fates* among the ancient Romans. They were three :—(1) *Clotho*, or the spinning Fate ; (2) *Lachesis*, or the Fate assigning to man his fate ; (3) *Atropos*, or the Fate that cannot be avoided. (See Dr. William Smith's Classical Dictionary, p. 455, London, 1868). Reader mine, pray pardon this classical intrusion ! It is at times refreshing to fly to old classical literature, in considering the hard facts of this our scientific age.

Dr. Murrell says that Atropine, Hoscyamine and Hyoscine are isomeric, each answerable to the formula $C^{17} H^{23} N O^{3}$. They can all three be resolved thus :—

1. *Atropine* yields tropic acid and tropine (base);
2. *Hyoscyamine* yields the same, *i.e.*, tropic acid, and tropine (base);
3. *Hyoscine* yields tropic acid, and pseudo-tropine.

Note here, that, in chemical parlance, Atropine is a compound of a base called Tropine, and Tropic acid. Ladenburg calls the compound Tropeïne.

I pass on now to consider the action of the alkaloids hitherto recognized in the Datura plants and its congeners Atropa belladonna, Hyoscyamus niger and Dubosia myoporoides.

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* *N.B.*—Dr. Murrell does not give the date of the re-investigation made by Ladenburg, whose name has been mentioned in my quotations in the foregoing remarks—*K.R.K.*

I. ATROPINE.—The medicinal dose prescribed in the British Pharmacopœia is $\frac{1}{200}$ to $\frac{1}{100}$ grain. It is in comparison with this dose that the following remarks must be supposed to be made.

(1). *General action on man.*—A full dose (B. P.) produces great dryness of the tongue and roof of the mouth, extending down to the pharynx and larynx, giving rise to frequency and difficulty in swallowing, and exciting a hard, dry cough. The face becomes flushed, the eyes are bright and injected, the pupils are dilated, the sight is dim and hazy, whilst the power of accommodation for distant objects is lost. There is mental disturbance often amounting to decided delirium, the delusions, as a rule, being of a pleasant nature. The patient is extremely restless, and cannot be kept quiet. The skin is dry and a rash appears closely resembling that of scarlet fever. (Murrell.)

(2). *General action on the lower animals.*—Pigeons and rabbits are, according to Murrell, almost insusceptible to the action of Atropine; so are horses and donkeys. "As a rule," says Murrell, "vegetable feeders do not respond readily to its action, the most pronounced effect being observed in the class of flesh-eating animals."

(3). *Action on the Heart and Circulatory System.*—In most animals there is an increase in the frequency of the pulse. "The first effect in man," says Murrell, "is to increase the frequency, fulness, and force of the pulse to the extent of fifty to sixty beats in the minute." Atropine paralyses the pneumogastric nerve. This may be due to an action on the trunk of the Pneumogastric nerve (otherwise briefly called Vagus), or on its peripheral terminations, or on the intra-cardiac branches which terminate in the intra-cardiac ganglia. Lauder Brunton puts it briefly that Atropine paralyses the efferent Vagus-ends in the cardiac ganglia. Moreover, says Murrell, "Atropine stimulates the vaso-motor centre, and so contracts the blood-vessels, and heightens the arterial pressure."

(4). *Action on the Respiratory System.*—A large dose of Atropine accelerates respiration. This is due to the stimulation of the respiratory centre powerfully. In consequence, the chest-movements become deeper and more frequent. This effect is independent of blood-pressure. (Murrell). A large dose of belladonna, says Dr. Ringer, will sometimes induce dryness of the *Schneiderian* membrane, which

though nasal, forms a part of the respiratory, and not of the olfactory tract of the nose.

(5). *Action on the Nervous System.*—The delirium following Atropine-poisoning shows that Atropine acts on the cerebral cortex. Hence the symptoms noted above and others not noted,—*viz* :—"exhilaration of the mental functions, giddiness, restlessness, and automatic chorea-like movements. There is usually loud, disconnected talking delirium and raving. The delusions are of a pleasing nature, and weeping or lamentation is rare." (Murrell). With regard to the kind of delirium, Lauder Brunton says, that it is characterized by being very active and busy; the patient always wants to be doing something. At the same time, says Lauder Brunton, "this very business is accompanied by a great deal of languor and disinclination to move, because the peripheral ends of the nerves are weakened, and so there is difficulty in the way of the excited centres causing any movements in the muscles. It is only in very large doses that Atropine will paralyse the motor nerves completely, or at least the motor nerves going to the voluntary muscles."

(6). *Action on the Muscles.*—Read with the foregoing views of Lauder Brunton quoted above, that Murrell observes thus :—"The voluntary muscles are not affected." "The unsteady gait," says Murrell, "often noticed in man, is due to an action on the (spinal) cord or on the motor nerves, and not on the muscles." Murrell further observes that Atropine increases the contractile power of involuntary muscular fibre, (such for instance as is found in the heart and in the intestines of man—*K.R.K.*). "But," says Murrell, "it has been maintained that the increase in the persistaltic movements of the intestines is due to depression of the inhibitory branches of the splanchnics."

(7). *Action on the Glandular System.*—As noted above, "one of the earliest and most notable effects of Atropine is dryness of the mouth, from suppression of the secretions of the mucous and salivary glands." (Murrell.) This, says Lauder Brunton, is due to the paralysis of the salivary nerves. *Apropos* of this, Murrell makes the following remarks :—"According to Heidenhain's hypothesis with regard to the salivary glands, there are two kinds of secretory fibres, one, the *secretory*, the other, *trophic*, causing an increase in solubility in the stored-up gland-substance. On the assumption of the different

kinds of secretory fibres there is ground for supposing there is a *third* variety—*anabolic fibres*—causing the formation of fresh substance by the cells. After an injection of sulphate of Atropine there is no increase either in the percentage of salts in the sympathetic saliva produced by stimulation of the *chorda tympani*, as there would be if the trophic fibres of the *chorda* escaped paralysis. It would seem that atropine paralyses the trophic as well as the secretory fibres of the *chorda tympani*.* Atropine checks the sweat secretion, says Murrell, by paralysing the efferent sweat-fibres which accompany the vaso-motor fibres. Lauder Brunton corroborates these remarks, for he says, in small doses Atropine will paralyse the efferent nerves which end either in voluntary muscular fibres, in glands or in ganglia. Atropine paralyses the lacteal nerve-terminations in the mammary gland of the human female. The secretion of milk is consequently arrested. Atropine similarly arrests secretion of the pancreas. The action of the liver is also affected. The quantity of bile is lessened. Murrell says that the effect on the urinary system is somewhat doubtful.

(8). *The Rash on the Human Skin.*—Dr. John Harley affirms that generally it is nothing more than of a mere temporary kind ; " but in rare cases, and in persons who are liable to vascular irritation of the skin the redness remains, and its disappearance is attended by slight roughness and desquamation." He mentions two cases, in one of which " the patient was scarlet from head to foot," and another in which after the fourth dose, there was a scarlatinous tint of the skin." Dr. Gillespie has met with a case in which after injection of a small quantity of extract of belladonna into the urethra of a patient, the patient became " as red as a lobster " in less than five minutes (Murrell).† Lauder Brunton also notes that a red rash appears on the skin like that of scarlatina.‡ Schmiedeberg says, " the redness of the skin resembling scarlet fever *so often observed*, especially in the upper part of the body, and the similar colour with turgescence of the features, are probably connected with increase of the frequency of the pulse, with the increase of blood pressure caused thereby, and with the simultaneous dilatation of the vessels of the skin." §

* Murrell, *op. cit.*, p. 437. † Murrell, *op. cit.*, p. 438.

‡ Text Book of Pharmacology, p. 904, 2nd Ed., 1885, London.

English Translation, pp. 53-54 (Edinburgh, 1887), by Dixon of Sydney University, N.S.W.

I have said above that Atropine checks perspiration and causes dryness of skin. But in one case of poisoning, says Schmiedeberg, "the burning hot skin was here and there covered with perspiration (Gerson). The perspiration that comes in this manner has the same origin as that in the death-agony." Such sweats, cold and clammy, are the precursors of death. In contrast with this case, it may be noted that Lauder Brunton says that the temperature of the human body is increased by small doses of Atropine and lessened by large ones.

(9). *Action on the Eye.*—When Atropine is applied topically to only one eye, it dilates the pupil of that eye alone, and not of the other eye. When Atropine acts indirectly, *i.e.*, through the circulation of blood, both the eyes have dilated pupils ; the eye becomes bright, dry, and injected both by topical application and through circulation. "The power of accommodation is lost, and after large doses intraocular accommodation is lost. When Atropine is applied locally so as to affect the pupil of one eye only, the large amount of light entering through the dilated pupil produces contraction of the pupil of the other eye." (Murrell.) The pupil is normally under the control of two antagonistic mechanisms :— (*a*) The *contracting* mechanism, reflex in nature, of which the *Third Nerve* acts as an *efferent*, and the *Optic Nerve* as the *afferent* tract. (*b*) The *dilating* mechanism, tonic in nature, of which the cervical sympathetic nerve is the *efferent* channel. Murrell says that when the *Third Nerve* or the *Optic Nerve* is cut, the pupil dilates from the action of the *Sympathetic*. When the *Sympathetic* is cut, the tonic dilating influence ceases, and the pupil contracts. On stimulating the *Third Nerve*, or the *Optic Nerve*, the pupil contracts. On stimulating the *Sympathetic*, the pupil dilates. The dilatation of the pupil produced by the local application of Atropine might, at first sight, be attributed to paralysis of the *Third Nerve*. This view is untenable, says Murrell, for when the *Third Nerve* is cut and the pupil dilates under the influence of the Sympathetic nerve fibres, the application of Atropine, still further, dilates the pupil. From this it follows that Atropine says Murrell, exerts an action on some local mechanism. This mechanism, says Murrell, is probably situated in the *Iris*, or in the *Choroid*, where ganglionic cells are abundant. The paralysis of accommodation is due to the paralyzing action of Atropine on the Oculo-motor

Nerve-terminal-ends. Note that Ringer observes thus :— "A large dose of Atropine will sometimes induce dryness of the Schneiderian membrane. This does not necessarily mean loss of the sense of smell." It must be observed here, that the foregoing observations are mainly intended for such of my readers as have a fair knowledge of Human Anatomy and Physiology.

Murrell observes that of all the tropine alkaloids, Atropine is the slowest in inducing its effect on the eye, but it lasts a long time, even many days. Homatropine induces its effects rapidly, but they disappear in a few hours. Hyoscyamine, in this respect, occupies an intermediate position.

This leads us on to consider the special actions of Hyoscyamine, which is one of the alkaloids found in Datura plants.

II. *Hyoscyamine* or Hyoscyamia is found in several Datura plants. Murrell says "it is *isomeric* with Atropine and Hyoscine. It is *identical* with Duboisine, and mixed with Atropine constitutes what is known as Daturine. It may be split into tropine and tropic acid." When pure it is in snow-white minute crystals, soluble both in spirit and water. A substance is sold under the name of *Amorphous hyoscyamine*, which is a mixture of Hyoscyamine and Hyoscine. It is a dark brown substance looking like an extract, and has a strong disagreeable odour.

The following observations are curtailed from Murrell, as regards the active principle Hyoscyamine. Hyoscyamine dilates the pupils (but moderately, *K. R. K.*); dries the mouth, and arrests secretions; flushes the face and produces a rash on the skin. It gives rise to a drunken gait, and excites delirium and hallucinations, but more frequently acts as a narcotic, inducing comatose sleep—the very sleep of death. As a rule, says Murrell, the raging delirium is not present, but there is a desire for rest and sleep, probably due to the *Hyoscine* it contains. As noted above, it is a less powerful mydriatic than atropine—midway between atropine and homatropine. Schmiedeberg quotes the following remark from V. Schroff :—"Hyoscyamine acts on the brain somewhat differently from Atropine. In men, after the administration of the *Amorphous modification*, the raging delirium is as a rule not present, but even after small doses a hankering after rest and sleep predominates."

III. *Hyoscine.*—This is the second alkaloid found in Hyoscyamus. It is also found in Datura. It is a syrupy liquid alkaloid. It is largely found in the substance spoken of above as *amorphous hyoscyamine.* In man Hyoscine produces dryness of the mouth, flushing of the face, and deep sleep, associated with semi-delirious muttering and giddiness. Mydriasis is usually, though not always, pronounced. The respiration is slow and full, and is sometimes of the character known as "Cheyne-Stokes." The skin, so far from being abnormally dry, is often bathed in perspiration. It is asserted that there is a rise in temperature. There is sometimes paralysis of the pharynx, and of the muscles of the larynx. The mydriatic effect is associated with paralysis of accommodation and the maximum effect is produced in a third of the time required by atropine. Its influence in producing sleep is very marked. Nausea, constipation, and other disturbances of the stomach and alimentary canal are rarely witnessed. These remarks are based by Murrell on the authority of H. C. Wood of Philadelphia.

Just a word about Duboisine referred to in my foregoing observations. It is an alkaloid contained in Duboisia myaporoides, a tall shrub growing plentifully in the forest lands of Eastern Australia. It contains an alkaloid known as Duboisine identical with Hyoscyamine. The general action of Duboisine, says Murrell, is the same as that of Atropine. The former is so powerful, says Ringer,* that a 1 in 120 solution specially applied to the eyes often excites great giddiness, weakness, and a *drunken gait.*

IV. *Daturine.*—Lauder Brunton says that this alkaloid is a mixture of atropine and hyoscyamine.† He does not mention Hyoscine as a component of the Daturine—an "impure alkaloid" as he calls it. Fifteen years ago, Hyoscine was not determined. Ringer does not mention it in his Therapeutical work just referred to. Murrell even does not mention Hyoscine as a component of Daturine. In speaking of Daturine he only says "it is not a simple body," but a mixture of Atropine and Hyoscyamine. "The physiological action of Datura is identical with that of Belladonna, whilst Daturine has the same

* A Hand Book of Therapeutics, p. 539, 8th Ed., London, 1880.

† A Text Book of Pharmacology, Therapeutics, &c., p. 909, 2nd Ed., London, 1885.

action as Atropine, says Murrell. The symptoms of poisoning by Stramonium differ in no respect from those of poisoning by Belladonna. "The same accelerated pulse, the same elevation of temperature, the same wild delirium, the same increased frequency of respiration, the same widely dilated pupils, the same red efflorescence on the skin, the same restlessness or convulsions occur in both cases, and when the dose has been sufficiently large, end alike in abolition of the functions of circulation, respiration and innervation—stupor, general paralysis, weak rapid thready pulse, threatened asphyxia constituting the phenomena of the closing scene in poisoning from either narcotic (H. C. Wood).

Having so far, and so freely dwelt on the pharmacological effects of the alkaloids found in Datura, it is time I considered the clinical evidence to be gathered from works on Medical Jurisprudence, chief among which stands the work of Norman Chevers. It is not my intention to dwell on the nefarious deeds of the infamous *Dhaturiâs*—who were known, in days gone by, as professional poisoners of travellers and tired wayfarers, poisoned because they were unsuspecting. The deeds of such professional poisoners will be best seen in Chevers' work. I therefore pass on to show instances wherein the above-mentioned physiological effects were confirmed by various clinical observers, in cases of poisoning by Datura. Dr. Morehead of J. J. Hospital, Bombay, so far back as 1860 says, that in cases of Datura poisoning, the symptoms are in many respects allied to those of *delirium tremens*. The delirium is more muttering, not so busy as that of *delirium tremens*; but there is the same rambling of the mind on subjects not present to the senses. There is the same power of controlling the thoughts for a few moments, the same desire to appear rational, and above all, the same picking at small objects, as if they were indistinctly seen, which is often observed in the advanced stages of *delirium tremens*. Where the quantity of the poisonous stuff taken is large, there is coma with agitated movements of the hands and lips, and picking movement of the fingers: in fact, the same class of deranged nervous actions which characterize the third stage of *delirium tremens*. There is, however, this great difference in these latter phenomena when caused by Datura,—they are very generally recovered from, not by a return from coma to a state of health, but the coma ceases,

and then succeeds the delirium, and the other phenomena which attend those slighter cases which have never passed into coma.

Dr. H. Giraud's papers on cases seen by him at the J. J. Hospital, Bombay, namely one contributed to the Bombay Medical and Physical Society, and another cited in Appendix C of Dr. Norman Chevers' Ind. Med. Jurisp. (p. 838, 3rd Ed., 1870, Calcutta) are well worth studying. Dr. Lyon quotes in his Medical Jurisprudence, Bombay, Dr. Giraud's remarks.

It must not be supposed that it is always that the Datura plant is used for criminal purposes; even when so used, it is generally not with the intention of causing death, although Norman Chevers cites cases where such was the intention. There are instances of persons having died from eating the leaves by mistake, while more than one little child has either died or suffered very severely from swallowing its seeds. (Anne Pratt.) When the first settlers arrived in Virginia, says Sowerby, some ate the leaves of Datura and experienced such strange and unpleasant effects therefrom, that the colonists called it the 'Devil's Apple' a name by which it is still known in the American States. In most cases it has been eaten by children in mistake for some other wild plant. Dr. H. Cleghorn, of the Madras Medical Service, notes a case, (quoted by Norman Chevers),* in which fragments of 3 or 4 leaves were found in the stomach of a poisoned Indian child 2 years old. "The mother of the child was reaping in a *raggy* field, when it was discovered that her two children were eating the leaves of Datura. A leaf was found convulsively grasped in the hands of one of them. It was the leaves of D. fastuosa that the children had been eating. One of the many species of Thorn-Apple possessing the poisonous properties mentioned above, is said to have been used in ancient days by the Priests of Delphi "to produce those semi-delirious paroxysms which they palmed off on the multitude as the results or manifestations of divine inspiration. The seeds of another species of Datura were similarly employed by ancient Peruvians." (Sowerby.)

I have at present under my care, in the Ratnagiri Lunatic Asylum, an inmate named Dhondnak Kannak. He admits to have been an inveterate smoker of Datura leaves, and believes he is an "inspired

* Page 194, Ind. Med. Juri-prudence, Ed. 3rd, 1870, Calcutta.

being". He never smoked the leaves for committing suicide as some persons are known to have eaten them, or the seeds for self-destruction. He has for a long time smoked the leaves to find relief from the asthmatic fits to which even now he is a subject as an inmate of the Ratnagiri Lunatic Asylum. Of course he gets no Datura smoke in the Asylum.

Professor Robert Christison, of Edinburgh University, says that the cases of poisoning from Thorn-Apple which occurred in his country (Scotland) up to the time he published his work on Poisons (1845), were all accidental. There are several such instances of accidental poisoning in other countries. Thus for instance, in America, in 1765, when some of the British troops under Sir John Sinclair were stationed in the vicinity of Elizabeth Town (New Jersey), three of the soldiers collected some quantity of the Datura plant which they mistook for the safe simple table-green food named *Chenopodium album*, dressed it, and ate it."* One of these soldiers became furious and ran about like a madman; the second was seized with genuine tetanus and died; what happened to the third is not mentioned. Beck on the authority of Orfila, cites a case in which a man after having been poisoned with the Thorn-Apple survived, and was cured of an intense long-standing headache. Even the bruising of the leaves of Datura in a mortar is known to have caused dilatation of the pupil. The application of bruised leaves of Datura on raw abraded human skin is known to have produced dangerous symptoms of poisoning. The empyreumatic oil of Stramonium is said to be poisonous to animals. (Beck.)

Taylor says that the seeds of fruit scarcely ripe are not very bitter, Children, therefore, eat them taking the fruit for some other fruit, not knowing its poisonous nature.† The seeds retain their poisonous properties notwithstanding exposure to heat. Mr. Lobo met with the case of a child aged five who ate more than a drachm of the seeds slightly roasted. In about an hour poisonous symptoms appeared. (Taylor on Poisons, p. 784, Ed. 1848). Dr. Chevers mentions a case of non-criminal poisoning from the leaves of Datura which is very remarkable. In March 1866,

*This case is recorded by Dr. Barton and mentioned in Beck's Med. Jurisp., p. 910, 1836, London.

† I was once very nearly eating the fruit myself when barely five years old with my little brother, aged three years. I took the Thorn-apple for custard apple. *K. R. K.*

somewhere near Midnapore, a whole family consisting of father, mother and children ate the cooked young shoots of Datura as '*greens*' by mistake, supposing them to be harmless. The parents died, but the children recovered.* The stomachs of the parents were sent to Calcutta for chemical examination. The analysis was scientifically made. The active principle which caused death was physiologically tested on a puppy. The essence obtained from the stomach-contents of the deceased parents was injected into the stomach of the puppy. Vomiting set in immediately afterwards; very soon after that the puppy performed a few antics and fell over on his side into a deep sleep from which tickling failed to rouse him. He, however, recovered after six hours, but the pupils were exceedingly dilated and they continued more or less so the whole of the next day. Lucky puppy! He did not die !!

Chevers describes another case which is well-worth reproducing. In this case it is a kitten that is experimented on. In the Midnapore District, in September 1866, a sub-inspector of police died while he was in custody. It was reported he had taken opium. His stomach was sent to Calcutta for chemical examination. No opium-trace was found, but particles were found in the stomach which had the appearance of Datura seeds. A decoction of these particles and the whole stomach was made, and half of it was given to a kitten at noon on 27th September. "The little cat soon began to breathe with difficulty, and to froth at the mouth; in ten minutes her pupils were dilated, and they continued to remain so, only to a still greater extent, the rest of the day, never for a moment being contracted, or even less dilated even when exposed to a strong sun-light. After 20 minutes the kitten was placed in the middle of the room, and encouraged to walk but she staggered and fell on attempting to do so. In half-an-hour from the time of administration, she was quite unconscious; up to this period she had felt pain when pinched with forceps, but now a severe

* Some years ago I had a similar case of poisoning of a whole family under treatment at the Thána Civil Hospital. It was accidental, and not criminal. A father, mother with a baby in arm, and two other children were brought to hospital, reeling and staggering, trying to catch imaginary objects in air. The infant nursed by the mother did motions of hands as if to brush off something from its face. This shows that before the mother's milk was arrested the infant was poisoned. They all recovered. I have a photo-group of them, but it is not handy just now. (*K. R. K.*)

pinch only caused a slight movement of the limb, without any expression of pain. The respiration was laboured ; she continued to froth at the mouth, and the pupils remained very widely dilated. Consciousness began to return at two o'clock; she then got up, sat staring wildly and commenced to perform a series of grotesque actions, uttering a slow moan from time to time. When pinched, she felt pain, but not yet very acutely. She appeared very irritable, almost wild, but was neither vicious nor bad-tempered. At 3 p. m., the pupils were dilated extremely, the iris being a mere thread. By 4 p. m., she had recovered so far as to come when called, and to feel acute pain when pinched, the pupils continuing as large as ever." (P. 190. Chev. *op. cit.*). Fortunate kitten ! She did not die !! From this experiment, and from a similar one, confined only to the eye of another kitten, it was evident that the sub-inspector of police referred to above had died in the lock-up, not from self-administered opium as was suspected, but from Datura poisoning. Herein is the triumph of Western learning and scientific chemistry and chemical analysis over Eastern ways of crime and misadventure !

The motives for administering Datura seeds or leaves—seeds especially —are various. They do not necessarily mean a desire to kill the victim to whom they are administered in various forms,—in drink, in common bread, or sweetmeats. They are given for instance, says Chevers, to a shopkeeper, to rob him, when intoxicated, of his articles of merchandize ; to a Fakir, to make him yield up the contributions of the pious ; the drug again is given frequently through jealousy to secure revenge ; it is likewise given out of pure fun. Dr. Ralph Moore, says Chevers, was once sent for suddenly to the jail Dr. Moore was in charge of, (somewhere in Bengal), where he found the entire jail-guard scattered about on the floor, under the influence of Datura. As there was no attempt on the part of the prisoners to escape, it would appear that this wholesale intoxication of the jail-guard was probably *a mere practical joke*, without any the slightest intention of committing a crime. In one case mentioned by Chevers, the intention of administering Datura poison was not crime, but the mere desire on the part of a widow to stupify three persons from whose company she wanted to escape ! One of the three victims was a man who admired her for her good looks, but he did not know that she had sense enough to

escape from one she had no regard for. I can add many more instances like those mentioned above regarding the non-criminal use of Datura, but I must consider the space I can reasonably claim in this journal.

Dr. Norman Chevers dwells a great deal on the criminal use of the Datura plant by the natives of India, namely, for stupifying the victims and then robbing them of their money, by the administration of either Datura leaves or pounded Datura seeds in bread, sweetmeats or drink. But I must add here that the practice of poisoning for criminal purposes is well known to have been followed even in European countries, as testified to by European writers. It only means that human criminal nature is alike, all over the world, where gain by sordid means is concerned. Dr. Christison has it, in his work on Poisons cited above, that the Thorn-apple in his day was being used in Germany to cause loss of consciousness and lethargy, preparatory to the commission of various crimes. It is known to have been used in France also for making men *insensible* with wine, in which *Thorn-apple seeds had been steeped*. Note that thereafter the insensible and helpless men were robbed of their personal effects. Vicat in his treatise on the Poisonous Plants of Switzerland mentions a case of poisoning by the Thorn-apple plant.

Dr. Chevers cites cases in which Datura is used for *suicidal purposes*. (*See* p. 203, *op. cit.*). Dr. Shortt of Madras has recorded that a middle-aged Brahmin returned as usual in the morning from his field, and fell, admitting, on being questioned by the women of the house, that he had eaten Datura leaves. Dr. Shortt says, that the suicide of this Brahmin was imitated by two girls who lived not far off, and who poisoned themselves with Datura while the sensation caused by his death prevailed. It is a well-known fact that suicide is often a contagious infirmity of the human mind. Dr. Norman Chevers' work is replete with many more instances of accidental or non-criminal, as well as criminal intentional poisoning with Datura. But I must say *Buss* after having so largely quoted him in the foregoing remarks.

DESCRIPTION OF PLATE U.

Note that the name of the plant is *Datura fastuosa*, and not *D. fastusa* as printed on the plate.

No. 1 denotes an open flower and two small flower-buds at the apex of a flowering branch reduced $\frac{1}{3}$ in size.

No. 2 denotes the full-blow top of the tubular corolla, showing partly some stamens reduced $\frac{1}{3}$.

No. 3 is the capsule, normal size almost.

No. 4 horizontal section of fruit (normal size). The brown part shows the seed arrangement ; the white part shows the fleshy axile placentation.

No. 5 shows the brown seed, with a part of the white placenta.

MEMOIRS ON ORIENTAL RHYNCHOTA.

By G. W. Kirkaldy, F.E.S.

With Plates A, B and C.

(*Read before the Bombay Natural History Society on* 19*th Nov.* 1901).

The present memoir consists principally of notices of a portion of the miscellaneous material from Ceylon sent to me for study by my friend, Mr. E. Ernest Green, Government Entomologist of Ceylon, to whom my best thanks are due. I am indebted to this Society for defraying the cost of the coloured plate; the other has been prepared from drawings made by myself, except the homopterous tegmina which have been photographed by a friend.

Species of which I have recently examined the types are marked with a dagger (†).

Homoptera.

Family—*Fulgoridæ*.

Sub-family—*Fulgorinæ*.

Modern authors have restricted the genus *Fulgora*, Linn., to the species of which *Cicada candelaria*, Linn., may be considered as the type, *Laternaria*, Linn., being employed for *Cicada laternaria*, Linn, and *Pyrops*, Spin., for *Tettigonia tenebrosa*, Fabr., and its congeners. This does not appear to be correct. *Laternaria* was erected by *Linnæus* in 1764 for some species of his original genus *Cicada*, but as no generic description was adjoined, I have not considered it valid (1). Three years later the same author included these species in his new genus *Fulgora laternaria* being fixed as the type by Lamarck in 1801. In 1839 *Spinola* monographed the family (Ann. Soc. Ent. France, VIII, pp. 133-454, Pls. 10-17), founding nineteen new genera, of which *Pyrops* embraced a heterogeneous assemblage of species for which no type was then fixed. A preliminary notice, however, in which all these genera were diagnosed and types fixed (1839, Revue. Zool., pp. 199-206), has been overlooked apparently by later authors; in this the type of *Pyrops* was stated to be *candelarius* (Linn.), a certainly

(1) *phosphorea*, Linn., is usually quoted as the type of *Laternaria*, but *L. phosphorea*, Linn., 1764 (not *Fulgora phosphorea*, Linn., 1767, which is not a Fulgorid) is the *Cicada laternaria*, Linn., 1758, so that if *Laternaria* be considered valid as a genus, its type must be known as *Laternaria laternaria* (Linn.). In any case the specific name ought not to be altered. It is to be noted that the restoration of *Laternaria* as a genus ought not to interfere with the application here given of *Pyrops* and *Zanna*, for *Fulgora* is syntypical with *Laternaria*.



Horatio Knight del. et lith.

Mintern Bros. Chromo London.

more suitable exponent of the genus than *tenebrosus* (Fabr.), subsequently selected by Amyot and Serville (1843, Hémiptères, p. 491), who at the same time proposed *Hotinus* for *candelarius*. The following synonymy will, therefore, be necessary:

1. FULGORA, Linn., 1767; Am. Serv., 1843.
= *Laternaria* (Linn., 1764, haud descr.), Stål, 1866, et auctt.
Type *laternaria* (Linn.), Lam., 1801.
2. PYROPS, Spin., 1839.
= *Hotinus*, Am. Serv., 1843.
= *Fulgora*, Stål, 1866, et auctt.
Type *candelarius* (Linn.), Spin., 1839.
3. ZANNA, n.n.
= *Pyrops*, Am. Serv., 1843, et auctt.
Type *tenebrosa* (Fabr.), Kirk., 1900.

PYROPS.

This genus, as now restricted, is entirely Oriental in its distribution, the majority of the species being more or less local. There are three Sinhalese species, all of which appear to be confined to the island. (2)

P. MACULATUS (Oliv.)

is represented on Pl. A, fig. 1, and of this *Hotinus fulvirostris*, Walker, is doubtless an insignificant variety. The only precise locality I have is "Kandy, June, '97 (*E. E. G.*)."

† P. COCCINEUS (Walker),

perhaps the handsomest species of the genus, is shown on Pl A, fig. 2; I have examined specimens from Kandy (July and Nov.), Dambu and Putlam (*E. E. G.*).

† P. INSULARIS (Kirby)

is somewhat similar to *coccineus* but differs abundantly by the shape of the cephalic process (which is much broader and more parallel-sided, as seen laterally) and by the colour of the tegmina and abdomen. I have seen only the imperfect unique type (in the British Museum) which is figured in Journ. Linn. Soc. Lond., XXIV, Pl. vi, fig. 4.

† P. GIGANTEUS (Butler) and † P. SULTANA (Adams and White.)

Gerstäcker (1895, MT. naturw. Ver. Neu.-Vorp. Rügen, XXVII, p. 19) remarks: "Wodurch sich..... *Fulgora gigantea*, Butler, von *Hotinus*

(2) *P. maculatus* is recorded by Westwood (T. Linn. Soc. Lond., XVIII, p. 140) from India, but this has not been confirmed.

sultana, Adams and White, unterscheiden sollen, ist weder aus de Abbildung noch Beschreibung zuersehen."

The types of both species are, however, in the British Museum, and the species, although very closely allied, are sufficiently distinct.

giganteus.	*sultana*.
Larger—	Smaller—
A number of pinkish spots on the basal half of the tegmina.	No pinkish spots on the basal half of the tegmina.
No whitish spots on the apical half of the hindwings.	A number of whitish spots on the apical half of the hindwings.
Basal half of tegmina yellowish rather than blackish.	Basal half of tegmina black.

These slight differences are constant in the 10 ex. of *giganteus* and 3 examples of *sultana* which I have seen. Butler's figure of *giganteus* does not give a good idea of the colouring of the tegmina (1874, P. Z. S., Pl. 15, fig. 2), in which the yellow nervures are sufficiently pronounced to afford a yellowish rather than a blackish appearance to the basal half. I possess a small specimen of *sultana* from Kina Balu, *Borneo*.

ZANNA

occurs in the Ethiopian and Oriental Regions; the species are usually local and scarce. The two Sinhalese are closely allied, but while the upper surface of the abdomen is blackish in AFFINIS (Westw.), it is pale flavous in DOHRNI (Stål). The latter is figured on Pl. 1, fig. 3.

Z. TERMINALIS (Gerst.)

= *Pyrops terminalis*, Gerst., 1895, MT. Naturw. Ver. Neu.-Vorp. Rügen, XXVII, p. 19.

I have seen specimens from British Borneo, Sarāwak, Singapore and Penang. It is closely allied to *Z. nobilis* (Westw.) and differs from the typical section by the very long, curved, tuberculate, strongly carinate capital process and by the somewhat feebly carinate scutellum. The neuration of a specimen in Mr. Stanley Edwards's collection is abnormal in the right tegmen, the interior basal nervure of the clavus bifurcating near its apex, the interior veinlet meeting the apical nervure of the clavus apical to the junction of the latter with the exterior veinlet.

POLYDICTYA KRISNA, sp. nov.

Pl. A, fig. 4.

Head not produced anteriorly, rostrum reaching to middle of abdomen, posterior tibiæ with 6-7 spines.

Head, pronotum, and scutellum greenish-testaceous, metanotum and abdomen sanguineous, genital segments luteous. Femora brownish, tibiæ and tarsi black, the former banded with brownish at base and in the middle. Rostrum fuscous. Ocelli stramineous. Eyes and antennæ brownish-testaceous. Tegmina: basal two-thirds ivory-white, nervures greenish; apical third brownish; whole surface plentifully spotted with black. Hind wings sanguineous, apical third brown, with sanguineous or brownish nervures.

Long. 11½ mill., Exp. tegm. 35½ mill.

CEYLON: Kandy [type] Dec. '97 and Pundaluoya, Dec. '97 (E. E. Green—collns. Green and Kirkaldy). I think a poor specimen from INDIA (British Museum) belongs to this species.

Probably closely allied to *P. pantherina*, Gerst., l. c., p. 26., from Ceylon, but smaller and different in colour.

KALIDASA SANGUINALIS (Westw.)

Aphana sanguinalis, Westw., Ann. Mag. Nat. Hist. (2), VII, p. 208 (1851).

Phoronis sanguinalis, Stål, 1863, Stett. Ent. Zeit., *Kalidasa sanguinalis*, *Kirkaldy*, 1900, Entom. XXXIII, p. 243.

As this species was not included in any of Atkinson's papers, or, indeed, lately, anywhere else (to my knowledge), except a reference in Kirby's Catalogue (l. c., p. 133), I reproduce the original description which is contained in a now scarce Journal. "Sanguinea, capitis rostro (3) filiformi recurvo supra prothoracem recumbenti, nigro; alis anticis nigro maculatissimis, costa maculis circa 10 majoribus quadratis, apicibus castaneis immaculatis; alis posticis albofarinosis, maculis apicibusque pallide albidis; abdomine supra dense albofarinoso, corpore toto subtus cum promuscide sanguineo; tibiis tarsisque 4 anticis nigris. *A discolori*, Guér. proxima, Exp. al. 2½ unc., CEYLON.

(3) *Rostrum*, Westw.=*cephalic process* mod. auctt; *promuscis*, Westw.=*rostrum* mod. auctt.

Sub-family DICTYOPHARINÆ.

DICHOPTERA, Spin.

Stål's figure of the tegmen (1866, Hem. Afr., IV, Pl. 1, fig. 3) is incorrect, the transverse claval nervure (by the presence of which the Swedish Master distinguishes this genus and its allies from *Dictyophara*, Germ., etc.) not being represented. Brongniart (4) has figured beautifully the flight organs in *D. hyalinata* (Fabr.), and a tegmen is also correctly enough represented in Spinola's Monograph (Pl. 13, fig. 3), but as both these works will be inaccessible to a large number of workers, the neuration of the tegmina of the allied *D. hampsoni*, Distant, is portrayed on Pl. 2, fig. 1.

D. HAMPSONI, Dist.

D. hyalinata, Kirby, 1891, J. Linn. Soc., XXIV, p. 133 (nec. Fabr.)

D. hampsoni, Dist., 1892, Trans. Ent. Soc., p. 278.

The true *hyalinata* does not apparently occur in Ceylon; *hampsoni* is separable at once by the distinctly longer cephalic process.

PIBROCHA, gen. nov. (5)

Dictyopharæ affinis, capite processu longo producto; clavo inter nervuram interiorem et clavi suturam nervula transversa instructo, præterea nervulis transversis destituto; costa haud dilatata, stigmate opaco, binervi; Tegminibus apicem versus nervulis transversis instructis. Pedibus longiusculis, tibüs posticis 3- aut 4-spinosis, tibüs anticis femoribus multo longioribus. Typo *Dictyophara (?) egregia*, Kirby.

Head porrect, eight times as long as pronotum (medianly), basal third of dorsal part not much narrower than the two eyes together, finely and closely rugulose transversely, carinate medianly and laterally, the latter sinuate; somewhat superficially carinate transversely behind the central line of the eyes, the head above behind this carina being produced laterally, and as wide at the base as the anterior margins of the pronotum. At about one-third of its length the head is suddenly contracted, the central carina of the dorsal part becoming quite obsolete on the basal half, *i.e.*, of the contracted portion, and somewhat superficial on the apical half; the lateral carinæ are subparallel up to a short space from the apex, when they suddenly diverge

(4) Recherches surles Insectes fossiles des Temps Primaires (1893) 1894, Vol. I, p. 275 Vol. II, Pl. 28, figs. 8 & 9.

(5) *Pibroch*, English corruption of the Gaelic *Piobaireachd*, gathering music performed on the pipes.

at an obtuse angle; apex truncate, carinate transversely. Frons quadricarinate, the lateral carinæ meeting the lateral carinæ of the dorsal surface at the apex in a subacute angle, the two central carinæ continuing to the apex where they meet fornicately, much elevated above and beyond the rest of the frons. The space between the two central and two lateral, frontal carinæ is transversely carinate near the apex, the apical portion concave and its apical margin rounded. Clypeus laterally carinate. Ocelli large and distinct. Rostrum reaching to middle of abdomen. Antennæ: 1st segment of peduncle very short, second long, stout, subglobular, covered with sensory organs, armed extero-laterally with a long acute spine. Pronotum and scutellum longitudinally tricarinate. Tegmina reaching far beyond the apex of the abdomen; furnished with a number of transverse nervures towards the apex; clavus with a short transverse nervure between the claval suture and the interior claval nervure, otherwise without transverse nervules. Costa not dilated, stigma opaque, with two nervures; longitudinal nervures of the apical half of tegmina spinulose. Anterior and posterior tibiæ much longer than their respective femora, posterior tibiæ 3- or 4-spinose, connexiva very narrow, carinate on both sides, and in the depression thus formed lie the large spiracles. (6)

The genus is closely allied to *Dictyophara*, Germar, but, beyond other differences, is readily recognisable by the transverse nervure in the clavus, which thus allies it to *Dichoptera*, Spin. I know only one species, the type, *viz.*:

P. EGREGIA (Kirby)

Pl. B, fig. 2.

= † *Dictyophora* (?) *egregia;* Kirby, l.c., p. 135, Pl. v, fig. 4. I have examined the type and specimens from *Pundaluoya* and *Harragam* (Ceylon, *E. E. G.*).

Sub-family ISSINÆ.

= Eurybrachyinæ auctt.

EURYBRACHYS CRUDELIS, Westw.

Ann. Mag. Nat. Hist. (2) vii, p. 208 (1851).

This is another species which has not, to my knowledge, been described or referred to, except in Kirby's Catalogue (l. c., p. 133), since its original publication half-a-century ago.

(6) I would have liked to figure the weird head and the connexiva, etc., but these insects do not dry well and the delineation of the parts has been postponed till I can examine fresh or alcoholic material.

"Pallide fusco-albida, alis anticis dilatatis margine anticis sinuato, venis obscurioribus, strigis punctisque numerosis minutissimis nigris; alis posticis niveis, dimidio basali coccineo, maculisque 3 nigris rotundatis, prope marginem apicalem; pedibus corpore concoloribus, tibiis dilatatis, nigro parum irroratis, posticis interdum nigris; promuscide ad pedes intermedios tantum extensa. *E. insigni* Westw., proxima. Exp. 2 unc. Ceylon."

Sub-family ASIRACINÆ.

= Delphacida, Stål.

PUNDALUOYA, gen. nov.

Antennis sat brevibus, plus minus incrassatis, non autem dilatatis, segmento secundo primo longiore; pronoto capite latiore; genis haud parallelis. Scutello tricarinato. Tegminibus planiusculis. Pedibus anterioribus haud dilatatis. Typo *Delphaci ernesti*, Kirby.

Dorsal part of head very short, hemispherical, medianly longitudinally carinate, anterior and lateral margins carinate. Eyes large and oblique, ocelli distinct. Frons hexagonal, about one-third longer than wide, with a median longitudinal carina which forks close to the base; all the margins carinate. Clypeus carinate laterally and medianly. Antennæ: second segment of peduncle one-half longer than the first, subtuberculate furnished with short spiny hairs. Pronotum very short, transverse, hexagonal, medianly longitudinally carinate, the antero- and postero-lateral margins carinate, the three carinæ entire and subparallel. Scutellum much longer than pronotum, tricarinate. Tegmina longer than the whole body; clavus subgranulate, the granulations piliferous; nervures on apical half of tegmina sparsely furnished with hairs. Posterior tibiæ with a single spine. Not very closely allied to any other genus, though apparently belonging near the *Ugyops* Guérin group.

Type P. ERNESTI (Kirby).

Pl. B, fig. 3.

† *Delphax ernesti*, Kirby, l. c., p. 140, Pl. v, fig. 14.

N.B.—In Kirby's description, the length "4-5 lin." is a misprint for "4-5 mill."

Sub-family POEKILLOPTERINÆ.

= Flatida + Ricaniida, Stål.

POCHAZIA ANTIGONE, sp. nov.

Brunnea, tegminibus margini apicali leviter convexo, margini costali leviter sinuato, membrana costali albomaculata. Long. corp. 8½-9¼ mill., long. (tegm. inclusis) 14 mill., exp. 31½ mill.

CEYLON: Kandy (July. 1897); Haragam (Aug. 1897); collns. Green and Kirkaldy.

Frons with strong lateral carinæ, the central carina apically obsolete; apical margin of tegmina slightly, but noticeably, convex; costal margin slightly sinuate. Brownish- or reddish-testaceous; tegmina dark-brownish, basal half of costal membrane black a long-isosceles white spot on costal membrane about the middle; apical margin widely infuscate, two narrow transverse cloudy lines nearer the middle of the tegmen. Hind wings of the general ground colour of the tegmina.

Allied to the variable *P. obscura* (Fabr.), but differs by the sinuous costal margin, the apically obsolete central carina and the strong lateral carinæ of the frons; the brownish- or reddish-testaceous abdomen, and the noticeable white spot on the costal membrane.

RICANIA MELICHARI, n. n., for *R. subfusca*, Mel., 1898, Verh. Zool-bot. Ges. Wien., p. (*nec* Stål, 1865, O. V. A. F., p. 162).

FLATA OCELLATA (Fabr.)

Pl. A, fig. 5.

As this well distributed species is the type of the genus and has not been accessibly figured, a coloured representation is now given. The size and number of the tegminal spots varies somewhat.

FLATA CORNUTIPENNIS, n. n.

= † *Phylliphanta acutipennis*, Kirby, 1891.

nec † *Cromna acutipennis*, Walker, 1851.

PHROMNIA MARGINELLA (Oliv.).

Fulgora marginella, Oliv., 1791, and Enc. Meth, VI., 566.

Phromnia marginella, Ind. Mus. Notes, 1891, II, p. 95, Pl. XVI.

Phronima (7) *marginella* and *deltotensis*, Kirby, l. c., p. 155.

P. deltotensis appears not to differ structurally from the greenish *marginella*.

HANSENIA, gen. nov.

Cerynieæ, Stål, affinis; antennis pedunculi segmentis primo ultra genarum margini laterali multo extendenti, secundo primo circa ⅓ plo longiore. Tegminibus maxime decumbentibus, serie una regulari nervularum instructa; membrana costali dilatata, basi angustata. Abdomine compresso. Typo *Pæciloptera glauca*, Kirby.

(7) Walker & Kirby spell this Phronima, which is, however, a crustaceous genus.

Frons longitudinally convex, genæ anteriorly rotundate, neither (frons nor genæ) produced in the middle. Ocelli distinct. Antennæ ; segments of the peduncle elongate, first extending considerably beyond the lateral margins of the genæ, second about one-fifth longer than the first. Tegmina very greatly decumbent, very ample, sensibly widened towards the apex, rotundate, with a single regular series of transverse nervures towards the apex ; corium, etc. (except at the base) with numerous transverse nervures ; many of the longitudinal nervures furcate. Costal membrane dilated, basally narrowed more than twice as long in the middle as the costal area. Posterior tibiæ with one spine. Abdomen compressed.

I have great pleasure in dedicating this genus to my friend, Dr. H. J. Hansen, to whom Homopterists are indebted for the essay upon the more minute structure of the auchen norrhyncha. It is allied to *Cerynia*, Stål, but differs abundantly in the neuration, etc. It is superficially exceedingly like *Copsyrna*, Stål, as represented by *C. tineoides* (Oliv.) [= *C. stollii* (Spin.)], but in the latter the neuration of the tegmina is quite different, there being no regular row of transverse nervures near the apex, while the head is much wider and the first segment of the peduncle very short. *C. tineoides* is at once distinguishable (beyond the structural characters) by the curved whitish streak and the whitish specks on the tegmina. The only species of *Hansenia* known to me is

H. PULVERULENTA (Guér.) (7 *a*)

= *Pœciloptera pulverulenta*, Guérin (? 1843), Icon. Règne Anim., p. 361.
= † *Pœciloptera glauca*, Kirby, 1891, l. c., p. 154, Pl. VI, fig. 14.

Apparently confined to Ceylon. "It sometimes covers the leaves of certain *Eugenia* trees upon which the larva feeds, and when disturbed flies out in clouds." (*E. E. G.*, Dec. 13, '99.)

Family CICADIDÆ.

DUNDUBIA LELITA, sp. n. (8)

♀ Obscure brownish-castaneous, with golden yellow pubescence ; ocelli rubid. Head (except the anterior and posterior central parts)

I had commenced the figuring of the details of neuration, etc., of several Sinhalese Poekilopterinæ, but as I find, since this paper was in proof, that my friend Dr. Melichar of Vienna is monographing the group, these details have been omitted here.

(8) *lelita*, one of the thirty-six musical keys mentioned in the holy Hindu book 'Soma.'

and pronotum (except some obscure markings and two submedian longitudinal black stripes) ochraceous, posterior margin wholly ochraceous; three longitudinal black lines and two yellow incurved raised lines on the mesonotum. Underneath obscure brownish-castaneous; rostrum pale (except apical segment). Costa brownish-castaneous, basal cell ochraceous. Apex of exterior ulnar area narrower than in *D. mannifera* (Linn.), Dist.

Opercula short, not reaching apex of 2nd abdominal segment, subtriangular. Anterior femora with two strong spines.

Long. 30 mm., exp. 89 mm.

BRITISH BORNEO (colln. Edwards and Kirkaldy).

This species seems to belong to the typical subgenus by the short rostrum which just passes the intermediate coxæ, but it differs from its consubgeners by the less swollen and narrower frons and by the ocelli being about twice as far from the eyes as from one another; unfortunately, I have seen three females only.

CRYPTOTYMPANA EDWARDSI, sp. n. (9)

Belongs to Distant's Section F. (Monogr. Orient. Cic., p. 88.) ♂. Shining blackish; eyes, a central longitudinal line on the head and anterior part of pronotum, a sublateral wedge and the posterior margin of pronotum (except in the middle), an undulatory line on mesonotum, cruciform elevation, etc.—ochraceous; tympanal coverings ochraceous; soiled with blackish laterally. Beneath (including the opercula) ochraceous; head and rostrum, basal abdominal segment, a spot at apex of penultimate and whole of ultimate segment, anterior and intermediate femora outwardly, anterior tibiæ tarsi and all the claws—black. Tegmina and wings hyaline; costa (except ochraceous basal part), basal cell, base of anal area, etc.—blackish; nervures, ochraceous. Head rather swollen in front; anterior femora armed with two strong spines (basal one the larger), and two minute spines before the anterior large spine; opercula long, reaching to the middle of the 4th segment, their inner margins contiguous for about their basal half, then diverging curvedly, incurving about the middle of the second segment, apices remote, subacute.

Long. 46½ mill., lat. 28 mill., exp. 115 mill.

'INDIA' (coll. *Edwards*).

(9) Named after Mr. Stanley J. Edwards, F.L.S., who kindly entrusted me with some interesting material from India and Borneo.

Apparently very different from the other species of the genus by the form of the opercula.

HETEROPTERA.

Artificial Group Cryptocerata.

I had hoped to include in this memoir a synoptical revision of the Oriental species of the Notonectidæ and Corixidae, but I have had to defer this, owing to my present inability to fix the specific limits of several species of *Enithares*, Spin., *Anisops.*, Spin., *Nychia*, Stal, etc. It appears almost impossible to deal satisfactorily with these genera without alcoholic material, which has been available in a few cases only.

Family Miridæ.

=Capsidæ auctt. (10)

Thaumastomiraria, divis. nova.

Head vertical, transverse as seen from above, transversely depressed near the base between the eyes. Pronotum with a narrow apical collar, posteriorly elevated, lateral margins sinuate, antero- and postero-lateral angles obtuse. Cuneus somewhat indistinct except at the lateral margins. Membrane with a single entire longitudinal nervure. Hindwings without a hook in the cell. Legs simple, tarsi with 3 segments, apical the thickest, with long curved claws and large aroliæ. Abdomen short, not reaching nearly to the apex of the elytra.

Not at all closely allied to any other divisions of the Miridæ known to me, and at once distinguished by the entire longitudinal nervure in the membrane.

Thaumastomiris, gen. nov. (11)

Head vertical, transversely depressed between the eyes, transverse as seen from above, not longitudinally sulcate. Eyes large, together almost equal to the width of the head at base. Antennæ : 1st segment longer than head above, 2nd three-eighths longer than the first, 3rd slightly longer than first, 4th slightly longer than the second ; fourth thinner than third, both much thinner than 1 and 2 ; second thinner than first. Rostrum reaching almost to posterior coxæ. Pronotum densely punctured, narrowly collared in front, callose submedianly immediately behind the collar ; posterior half subconvex ; anterior

(10) *Miris*, Fabr., 1791, is the oldest genus in the family, *capsus*, dating 1803.

(11) The component '*Miris*' does not infer a close relationship or resemblance to the genus *Miris*, Fabr., but refers to its affinity to the Miridæ as a family. As it is the only known genus the division, I reproduce the divisional characters in the generic description.

margin roundly excavated, lateral margins sinuate, posterior margin truncate and slightly sinuate; anterior and posterior angles obtuse. Scutellum not sulcate. Elytra extending far beyond apex of abdomen, subrugose with short, somewhat close, hairs (not pubescence); cuneus not distinctly separated from corium, except at the lateral margin, in shape very long triangular, apex curved round to nearly the apex of the membrane, which is ovoid with a single strong nervure running longitudinally (slightly exterior to the median line) and terminating at the cuneus: slightly behind the apex of the latter. Wings without a hook in the cell. Legs simple, femora slightly incrassate. Arolia large, round, widely separated; claws long, curved. Underside and legs with somewhat long, pale hairs. Anterior coxæ rather more than twice as long as wide. Tarsi with 3 segments, the apical one thickest.

T. SANGUINALIS, sp. n. (type).

Pl. A, fig. 6 & Pl. B, fig. 4.

Sanguineous, membrane infuscate. Eyes deep-crimson; antennæ blackish, 1st segment more or less reddish; tarsi blackish. Wing nervures more or less infuscate, except the costa which is sanguineous.

Long. 5 mill.

Frequents *Crinium asiaticum*, Peradeniya, CEYLON (E. E. Green). The types (♀) have been placed in the British Museum.

Division Laboparia.

BERTA, gen. nov.

Pilose, head very small, almost roundly perpendicular. Antennæ: second segment subincrassate, thickest *towards* (but not *at*) the apex, two-fifths longer than the first, two and-a-half times as long as the third, which is a little slenderer than the first and somewhat curved; third and fourth subequal in length, fourth thinnest. Rostrum reaching to intermediate coxæ. Pronotum and prosternum very convex, the former not constricted anteriorly, and margins rounded, not sinuate nor reflexed, posterior margin very slightly sinuate. Scutellum large. Type *Capsus lankanus*, Kirby. Not closely allied to any Laboparian known to me.

B. LANKANA (Kirby).

Pl. A, fig. 7 & Pl. B, fig. 5.

= † *Capsus lankanus*, Kirby, l. c., p. 107.

Of this very pretty myiophanous bug, I have examined two females from Ceylon, *viz.*; the type from Nitagala (British Museum,

E. E. Green) and a specimen from Pundaluoya (*E. E. Green*, Feb. 1899) from which the figures are taken.

Division Capsaria.

HYALOPEPLUS, Stål.

This genus seems to be well represented in the Oriental and Polynesian Regions. To it should be referred CAPSUS RAMA, Kirby, l. c., p. 106, which is now delineated on Pl. 1, fig. 8 and Pl. 2, fig. 6. I have seen *H. rama* from CEYLON, Pundaluoya ; and Morowa, Korale (Feb. 1900) Reg. No. 127 Tea, *Peradeniya* Oct. 1898 (E. E. G.) and INDIA, Sikkim.

Capsus lineifer, Walker, from Malacca belongs either to this genus or to a new one very closely allied, while for *C. discoidalis*, Walker, rom Malacca and Singapore, a new genus, closely allied to *Hyalopeplus*, will be necessary.

ISABEL., n. g.

Hyalopeplo affinis sed a forma pronoti, antennarum, membranæ arearum, facillime distinguenda.

Antennarum segmento secundo primo fere triplo longiore, tertio duplo longiou, primo cum quarto subæquali ; primo crassissimo sed haud maxime incrassato quam apud *Hyalopeplum*. Rostro fere ad apicem coxarum posticarum attingente. Pronoti angulis posterolateralibus prominentibus, acutis. Elytra quam apud *Hyalopeplum*, sed membranæ cellula interiore perlongo, ultra cunei apicem extendeus, angulo apicali acuto ; cellula exteriore maiore quam apud *Hyalopeplum*. Alæ posterioris cellula sine hamo. Typo *Capso ravana*, Kirby.

Head triangular subhorizontal ; rostrum reaching almost to apex of posterior coxæ ; antennæ : second segment nearly three times as long as first, and twice as long as third, first and fourth subequal ; first the thickest but not greatly incrassate. Pronotum collared in front, constricted a little before the middle, transversely rugose, postero lateral angles salient, acute. Elytra as in *Hyalopeplus*, but the exterior cell of the membrane is much larger and the interior cell much longer, and is acute-angled apically. Wing cell without a hook.

ISABEL RAVANA (Kirby).

Pl. A, fig. 9 and Pl. B, fig. 7.

This beautifully sculptured little insect is superficially very like *Hyalopeplus rama*, but differs considerably in detail.

(*To be continued.*)

THE EARWIGS OF CEYLON,

By Malcolm Burr.

With Plates A. B.

(*Read before the Bombay Natural History Society on 19th November*, 1901.)

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PREFACE.

The following account of the *Forficularia* known to occur in Ceylon is written to encourage entomologists residing in or visiting that island to pay attention to this interesting, but neglected, group of insects.

Earwigs form a very compact and well-defined suborder of *Orthoptera*, and, roughly speaking, about four hundred species are known to Science. For some reason they have met unjustifiable neglect at the hands of orthopterists, and almost all workers who give their attention to this fascinating order have passsd over the earwigs, contenting themselves, from time to time, with describing a few novelties.

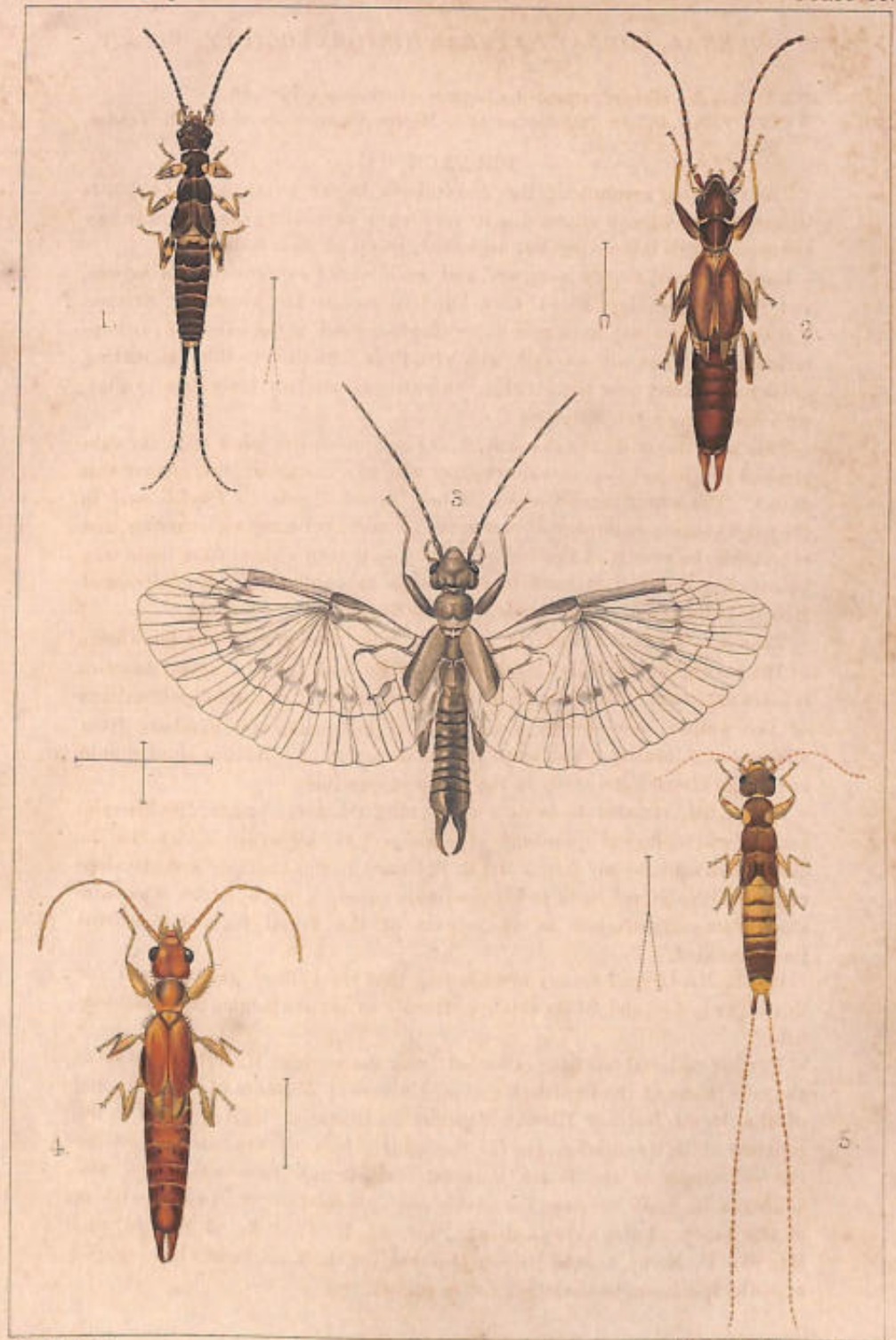
This is no doubt due to the lack of any comprehensive work upon the subject and it is hoped that this short paper will, to a certain extent, remove this defect. The writer hopes that by its help entomologists in Ceylon and in the neighbouring regions will commence to make collections of earwigs, and to publish the results of their observations, so that in a short time there may be sufficient material at hand to compile an account of the *Forficularia* of British India, if not of the whole Oriental Region.

Thanks to M. deBormans, the authority upon the group, our knowledge of the earwigs of the Malay Archipelago, of Burmah and of Central America is more extensive. But in spite of the numerous and valuable publications of this author, new species come to hand in considerable numbers from almost every locality. The scope for the discovery of novelties alone should encourage interest and study in the group in question.

Much, too, remains to be done concerning the development, life-histories and general biological questions of earwigs. As an example, we cite the discoveries made by my friend Mr. E. E. Green in the anatomy and development of *Diplatys*, set forth in his admirable paper, a work which is as valuable for its suggestiveness as on account of the actual facts and observations recorded.

It is to Mr. Green's energy in collecting that the bulk of the material for this paper is due, and I take this opportunity of acknowledging my indebtedness.

Further material has been afforded from the work of H. Dohrn, and from the collections of the British Museum, University Museum of Oxford and of the Royal Natural History Museum of Brussels. I am indebted to the courtesy of M. George Severin for the opportunity of examining at leisure the collections of the latter museum, and to my esteemed friend and colleague M. A. de Bormans for advice and information in the preparation of this paper. I also have to thank Prof. E. B. Poulton, of Oxford, and Mr. W. F. Kirby, of the British Museum, for their kindness when engaged with the specimens in their respective collections.



E.E. Green. del.

Mintern Bros. Chromo lith. London.

CEYLON FORFICULARIA.

INTRODUCTION.

The HEAD, in the *Forficularia*, is more or less flattened and heart-shaped. It offers few characteristics which are of any value for specific distinction except the number and form of antennal segments. These may vary from 9 to 30 in number, and form a useful generic character. The segments are usually pear-shaped, or abruptly conical. Green has detected an oval glandular (?) body on the under surface of each segment, its presence indicated by a depression and a minute pore. This organ is visible from the earliest stages and are most probably a sense organ of some kind.

The PRONOTUM is small, either narrower or broader than the head, more or less square in shape. The angles may be either rectangular or rounded, and sometimes the anterior border of the pronotum is rounded, sometimes straight, as also the posterior border. A small SCUTELLUM is visible between the elytra and the base in certain genera. The MESO and META-NOTA are visible when the elytra are absent or rudimentary.

The ELYTRA are sometimes absent, and sometimes rudimentary, in which case they are cemented to the thorax, and usually more or less triangular in shape; when they are perfectly developed they are small, oblong, shining and veinless; they may be rounded, emarginate or truncated at the apex.

The WINGS are voluminous and very delicate; they are shaped like an ear, and veined from the basis of a hard horny scale which occupies the basal half of the anterior margin. From the apex of this scale the small veins radiate fanwise, being crossed by a curved vein which runs completely round the outer border, parallel with the outer margin itself. In repose the wings are folded fanwise from the apex of the scale and then again at right angles, being thus folded up extremely neatly into a very minute and compact flap, which is covered by the small elytra, although these are about half the size of the wings, or less; when these organs are closed the horny scale is exposed, and is often of the same colour as the elytra. In appearance they resemble a second pair of elytra, and in repose they perform similar functions. When wings are mentioned in descriptions it is this hard scale that is meant, unless it is expressly stated otherwise. In very many cases the wings are entirely absent.

The STERNA are flattened plates.

The ABDOMEN is the most conspicuous part of an earwig. The segments are imbricated together in a beautiful and delicate manner. When the abdomen is distended, and the uniting membrane drawn taut, the minute spiracles are visible in the membrane. In some cases the second and third dorsal segments bear at each side a small fold, or "stink-gland," which is a useful character. In the male there are nine segments, excluding the last or anal segment; in the female there are seven visible. Some species are armed

with strong lateral spines on the first segments. (*Forcipula*), and sometimes the sides of the segments are laterally produced into strong recurved hooks (*Ancistrogaster.*) The form of the anal segment, which varies considerably with the species, is an important character. There is no exserted ovipositor. The subanal plates bear a small projection between the legs of the forceps called the *pygidium* which is a useful specific character.

The FORCEPS are homologous with the cerci of other *Orthoptera*. They are horny and unsegmented, of varying shape, which differs even in individuals of the same species; they are always more simple in form in the ♀ than in the ♂. In the genus *Diplatys*, Green has shown that these organs are long and segmented in the larval stages. In the penultimate stage they are lost, except the basal segment, which becomes transformed into the well-known forceps. The process very probably takes place in other genera, but in very young *Pygidicrana*-larvæ there is no visible trace of segmentation in the already formed, though simple, forceps. The forceps of the larvæ usually resemble those of the adult ♀. Their function is uncertain.

The LEGS are formed for running, and offer few characters. The second tarsal segment is very small, and may be simple and cylindrical, as in many genera, or produced into a long lobe beneath the third segment, as in *Chelioches*, or simply lobed or heart-shaped, as in *Forficula*, etc., etc. In some cases, however, the first segment is no longer than the second (*Apachys*), but this is said not to be very constant.

There is a pulvillus between the tarsal claws, but this contracts and shrivels on drying, and so is useless as a character.

The EGGS are simple leathery bags, and are all laid separately, *i.e.*, not in an ootheca, as in *Blattodea*, etc. It is a remarkable fact that the mother earwig shows a certain degree of interest in her eggs, and even in the young larvæ after they are hatched. The eggs are usually deposited under a large stone for protection.

The LARVÆ are always more lightly coloured, the integument is softer, the forceps more simple, than in the imago, but it is often difficult to distinguish them from the adult in the apterous forms. The larvæ, however, shrivel up on drying, while the harder and horny imagines retain their shape. In the winged forms the sculpture of the wings is visible upon the notal plates at an early stage.

The phenomenon of GYNANDROMORPHISM* is not unfrequent in earwigs and has been recorded in several species. The asymmetry of the forceps is at once noticeable.

* More frequently it is probable that the so-called cases of Gynandromorphism are merely males with one branch of the forceps undeveloped, *i.e.*, simple and resembling those of the female. In all the instances that I have seen, there have been nine abdominal segments visible, as in the normal male.

Earwigs feed chiefly upon animal or vegetable refuse, but also devour ripe fruit, the petals of flowers, etc. They are nocturnal insects, and in daylight take shelter under bark, under stones, in holes and crevices, etc. They can be found almost everywhere, and are often attracted into the houses by light. The flattened forms are said to live chiefly under bark, and *Brachylabis* and *Opisthocosmia* under dried leaves or in very ripe fruit. In Europe only *Labia minor*, L., is known to make any use of its wings, but in the Oriental Region crowds are often taken at light.

Little is really known in detail of their habits and economy, and careful observation would be of inestimable value. Of their development and economy all that is known we owe to Mr. Green's paper quoted above.

The chief characters that are used to discriminate the various species and genera of earwigs are as follow:—

In the head it is important to notice the number of segments in the antennæ; these are naturally fragile, and liable to be incomplete, and so it is as well to note the number as soon as possible after capture before they are broken; even in the living insect they are frequently mutilated. In some genera there are more than thirty segments, in other there may be as few as nine. It is also important to notice the shape, especially of the first few segments. In those species in which the antennæ are dark, with certain segments white, no great reliance is to be put upon which actual segment is thus coloured, as this is a very variable character. The head offers no other characters of much note.

It is useful to observe the shape of the pronotum, and whether it is broader or narrower than the head. The presence of a small scutellum at the base of the elytra is characteristic of *Neolobophora*, *Pygidicrana* and *Diplatys*.

The elytra are most characteristic when rudimentary, in which case the shape differs very considerably; this is a most important point in the genera *Neolobophora* and *Anisolabis*. The wings are of little use for distinctive purposes.

The small tubercles which are present on the second and third abdominal segments are useful characters, but sometimes they are small and difficult to distinguish. This is especially the case in *Carcinophora*, where they are present, but barely distinguishable, and in *Diplatys*, where they are difficult to observe as being covered by the wings in repose.

The shape of the last abdominal segment and of the penultimate ventral segment is also to be noted. The legs do not offer many points; the form of the second tarsal segment is important. This is simple and cylindrical in many genera, and heart-shaped or lobed in others. This is a noteworthy character, and specimens should be set in such a manner as to make the tarsi easily accessible with the magnifying glass.

The form of the forceps, although very variable, is also an extremely useful character, as well for separating species as genera.

Earwigs may be mounted according to the fancy of the collector. It is, perhaps, most satisfactory to pin them with long slender pins, upon which the label with full data may be fixed. The pin may be inserted in the suture between the elytra, or through one of the elytra themselves. With the smaller species it is better to fix them with a drop of cement upon a small triangular card, which may be pinned. In dried specimens the abdomen is very brittle, and often the different segments drop off, and are very difficult to replace in their proper position. It is, therefore, advisable to cement a narrow strip of card along the undersurface, upon which the abdomen may be fastened. The wings are so delicate that it is a matter of considerable difficulty to expand them. It is, however, not very important, though in some species, *e.g.*, of *Anechura*, they are brightly coloured. Unless done with the greatest care and skill they are almost certain to tear and be spoilt. Care should be taken that the specimens dry with the legs extended, so that the second tarsal segment may be readily examined.

For packing earwigs to send through the post, ordinary triangular papers may be used, or they may be packed between layers of velvet. In any case, of course, fullest data should be given. In spirits the bodies become distended and liable to drop off or fall to pieces.

LITERATURE.

In the way of literature there is but little to recommend. Dohrn's great work, *Versuch einer Monographie der Dermapteren*, published in the *Stettiner entomologische Zeitung* in 1863—67, is long out of date, though still indispensable to the student of exotic forms. It is, however, very difficult to obtain though it may be found in entomological libraries. I do not think it was ever issued in separate form. There has been no systematic work since published, but very many species have been described by various authors in different journals. De Bormans gives an account of the earwigs of Burmah from the collections made by Fea, in the *Annali del Museo Civico di Storia Naturale di Genova*, second series, Vol. XIV, pages 371—409, but it is a paper that is chiefly of use to the specialist.

A highly important work upon the development of *Diplatys* is the well-known paper by Mr. E. E. Green, *Further Notes on Dysceruna*, Westw., in the *Transactions of the Entomological Society of London*, 1898, pp. 381—387. It is a work of high value, the result of very careful and exact observation.

By the time this article is published a complete monograph of the earwigs of the world, by M. de Bormans, the great authority upon the group, should appear. It will, however, be in German, and only include species known up to 1898.*

* This has since appeared in Das Tierreich, under the title Orthoptera *Forficulidæ* and *Hemimeridæ*, von A. de Bormans and H. Krauss, Berlin 1900.

CATALOGUE OF *FORFICULARIA* KNOWN TO OCCUR IN CEYLON.

Neolobophora, Scudd—
1. tamul, n.

Pygidicrana, Serv.—
1. picta Guer.
2. marmoricrura, Serv.
3. nietneri, Dohrn.
4. cumingi, Dohrn.
5 angustata, Dohrn.
?6. dilaticauda (Motsch.).

Diplatys, Serv.—
1. gerstæckeri (Dohrn.).
2. nigriceps (Kirb.).

Platylabia, Dohrn—
1. thoracica, Dohrn.

Echinosoma, Dohrn—
1. parvulum, Dohrn.

Psalis, Serv.—
1. femoralis (Dohrn).

Labidura, Leach—
1. riparia (Pall.)
2. bengalensis, Dohrn.
3. dufourii (Desm.).

Anisolabis, Fieb.—
1. greeni, Burr.
2. kudagæ, n.
3. annulipes (Luc.).
?4. brunneri (Dohrn).

Brachylabis, Dohrn—
1. philetas, n.

Forcipula, Bol.—
1. quadrispinosa (Dohrn).

Labia, Leach.—
1. mucronata (Stål.).
2. curvicauda (Motsch.).
3. pilicornis (Motsch.).

Chelisoches, Scudd.—
1. morio (Fabr.).
2. pulchella, Gerst.

Carcinophora, Scudd.—
1. dohrni (Kirb.).

Apterygida, Westw.—
1. arachidis (Yers.).
2. bipartita (Kirb.).
3. cingalensis (Dohrn).

Opisthocosmia, Dohrn—
1. humeralis, Kirb.
2. simplex, Borm.
3. ceylonica (Motsch.).
4. neolobophoroides, n.

TABLE OF GENERA.

1. Scutellum distinct.
2. Antennæ with 12 segments ; elytra rudimentary ; wings absent ..... *NEOLOBOPHORA.*
2·2. Antennæ with more than 12 segments, elytra and wings well developed.
3. Large species ; antennæ with more than 25 segments ..... *PYGIDICRANA.*
3·3. Small species ; antennæ with less than 25 segments ..... *DIPLATYS.*

1·1. No scutellum visible.
2. Second tarsal segment simple, cylindrical.
3. Second and third abdominal segments with no lateral tubercular folds.
4. Elytra and wings well developed.
5. Body depressed ..... *PLATYLABIA.*
5·5. Body convex.

6. Body pubescent, short, broad ..... *ECHINOSOMA.*

6·6. Body not pubescent, long, not particularly broadened.

7. Forceps stout, the branches contiguous, simple, denticulated but not toothed..... ..... *PSALIS.*

7·7. Forceps more slender, with the branches remote at the base ..... *LABIDURA.*

4·4. Elytra rudimentary or absent; wings absent..... ..... *ANISOLABIS.*

3·3. Second and third abdominal segments furnished with lateral tubercular folds or spines.

4. Wings absent; elytra abortive..... *BRACHYLABIS.*

4·4. Elytra always, wings usually well developed.

5. Large species; lateral tubercles of the abdomen developed into spines. Forceps very long..... *FORCIPULA.*

5·5 Size small or medium; folds of the abdomen very small. Forceps very short (long in one or two species not occurring in Ceylon) .... *LABIA.*

2·2. Second tarsal segment lobed or heart-shaped.

3. Second tarsal segment produced into a lobe beneath the third ..... *CHELISOCHES.*

3·3. Second tarsal segment simply lobed.

4. Forceps with the branches depressed or dilated, contiguous, or nearly so, at the base, at least in the ♂.

5. Forceps dilated at first, then simple, always depressed..... *FORFICULA.*

5·5. Forceps stout, the branches contiguous, or nearly so, throughout their length, conical .... *CARCINOPHORA.*

4·4. Forceps with the branches remote at base, slender and cylindrical.

5. Abdomen cylindrical; forceps simple or toothed on the inner margin only ..... *APTERYGIDA.*

5·5. Abdomen more or less dilated in the middle; forceps, very slender, armed with a knob and two teeth in the ♂, on any margin... ..... *OPISTHOCOSMIA.*

Neolobophora and *Opisthocosmia* are practically the same genera, divided by the presence or absence of wings. In *Carcinophora* the lateral tubercles

are very faint or almost obsolete, and sometimes extremely difficult to distinguish; they are simply *Psalis* without wings, or *Anisolabis* with well developed elytra. They are always shining-blackish in colour. *Psalis* is barely distinguishable from *Labidura*. The forceps of *Psalis* are conical as a rule, and never so varied in shape as in *Labidura*. The females of *Apterygida* and *Forficula* cannot be distinguished. The males differ in the shape of the forceps alone. *Labia* is very difficult to distinguish from certain species of *Spongophora*—a genus that is not represented in the island as far as we know yet. *Platylabia* is only discriminated from *Sparatta*, another genus not yet recorded from Ceylon, by the absence of lateral folds. *Anisolabis* are invariably black, are very dark-brown in colour. In *Echinosoma* the body is either quite round or nearly so, that is, cylindrical and not at all depressed. Small specimens of *Echinosoma* and *Brachylabis* are very much alike to look at, but the former genus has always the elytra and wings well developed. *Forcipula* can be recognised at a glance by its great size, and the very long and slender toothed forceps, as well as by the prominent spines upon the sides of the abdomen.

NEOLOBOPHORA, Scudd.

Medium-sized insects. Elytra rudimentary, wings absent; forceps of the ♂ long and slender; abdomen cylindrical, convex. Tubercles of second and third segments developed. Small scutellum visible between the elytra at the base.

Neolobophora, Scudd., 1875, Ent. Notes., IV., 36, Proc. Bost. Soc. N. H. xvii., 202. Form, 1900, Forf. 22.

This genus may be recognised by its slenderness, elongated forceps, absence of wings and rudimentary elytra. It is very closely allied to *Opisthocosmia*. On the strength of the scutellum it is often removed to the neighbourhood of *Pygidicrana*, but it more naturally falls in near the first-mentioned genus.

NEOLOBOPHORA TAMUL, sp. n.

Fusco-testacea, glabra, nitida. Elytra longiora quam latiora, parallela, formam efficientia triangulorum duorum, apicibus truncatis attingentibus, sicut in quibusdam *Chelidoris*; scutello patente. Alis nullis. Abdomen convexum, ultra medium paullo dilatatum, segmento ultimo valde attenuato, declivi, segmento penultimo dorsali inermi. Forcipis crura, ♂, basi contigua subdeplanata, dehinc divergentia, ovatoarcuata, gracillima, intus medio, denticulata. ♂.

Long. corporis ..... 9 mm.
„ forcipis..... 5 mm.

HEAD convex, darkish-testaceous, eyes black, not very prominent. Antennae with nine segments, pale, testaceous near the base, becoming darker towards the apex, all the segments being elongate and pear-shaped, each segment, after the first, being somewhat longer than the last.

PRONOTUM slightly narrower than the head, almost square, but slightly broader than long; the anterior and posterior borders are straight.

ELYTRA are small, formed as in certain *Chelidurœ*, parallel, obliquely truncated posteriorly, the anterior border also being oblique to reveal the scutellum; the form of the elytra is like two equilateral triangles, with the apices truncated, being placed together, this truncated part of each being contiguous with that of the other. Near the base of each elytron there is a small oblong depression.

WINGS absent.

FEET slender, testaceous.

ABDOMEN smooth and slender, slightly dilated beyond the middle, the last dorsal segment being strongly attenuated and narrowed. The second dorsal segment bears a faint, the third a prominent lateral tubercle; the penultimate dorsal segment is unarmed. The last segment is furnished with a small tubercle at each posterior angle.

FORCEPS are very slender and elongated; the branches are very slightly dilated near the base; at the base itself they are remote, but become contiguous almost immediately for a short part of their length, then diverging, to form an elongate oval, the apices just meeting; the inner margin is armed beyond the contiguous part with two minute teeth.

The ♀ is unknown.

Habitat.—Ceylon (Thwaites, in coll. Hope, ex-coll., Westwood).

This species is closely allied to *N. asiatica* (Borm.), but may be distinguished by the shape of the forceps, which are quite straight, seen from the side, and not undulating; the penultimate dorsal segment is also unarmed, and the elytra are different in shape, as is also the pronotum.

There is a doubtful winged species of the genus known from Madagascar, but it is otherwise confined to the Neotropical Region.

Genus 1.—*PYGIDICRANA* (Serville.)

Large insects. General colour yellowish-brown, varied with black or yellow. Antennæ with more than 25 segments. Pronotum scarcely as broad as the head, oval-round, or more or less rectangular in shape. The elytra are well developed, rounded at the apex. The scutellum is triangular, always distinct. The wings are developed, and in most species project more or less beyond the elytra. The abdomen is long and cylindrical, without tubercular folds on the second and third segments; the last segment large, broadened in the ♂. The forceps are stout, the branches usually more or less conical in the ♂ and incurved, armed with strong teeth at the base, more or less flattened; in the ♀ they are simple, straight and unarmed. The feet are short; the femora broad and flat, the first tarsal segment is scarcely as long as the third, the second is small and cylindrical.

Pygidicrana, Serville, 1831, Rev. Meth., 4 id., 1839, Orth. 19.

Borm., 1900. Forf. 15.

Dohrn, Kirb., Karsch., Burr., Scudd.

This genus may be recognised by its large size, general colouration, long antennæ and distinct scutellum. It contains a little less than thirty species, of which five are known to occur in Ceylon.

PYGIDICRANA.

1. Head broader than pronotum.
   2. Wings showing beyond elytra.
      3. Head testaceous above, the borders black, with a black median line.... 1. *PICTA*, Guérin.
      3·3. Head black above, with a central testaceous star-shaped mark. 2. *MARMORICRURA*, Ser.
   2·2. Wings not showing beyond elytra.
      3. Elytra unicolorous ..... 3. *NIETNERI*, Dohrn.
      3·3. Elytra yellow, edged with brown. 4. *CUMINGI*, Dohrn.
1·1 Head narrower than pronotum..... 5. *ANGUSTATA*, Dohrn.

PYGIDICRANA PICTA, Guérin.

Medium sized.

Head yellowish, with black borders, and a black central line; mouth parts varied with black. The antennæ have more than thirty segments, which are brownish. Pronotum slightly narrower than the head, yellowish, with two black longitudinal bands; the corners are rounded. Scutellum, small, plain-yellow. Elytra brown, with three pale lines, the middle one broken obliquely truncated at apex. Wings well developed, yellow, with the suture darker and the outer margin darker. Sternum uniform yellow. Feet yellow, the femora banded with black, the tibiæ with a few indistinct black marks. First tarsal segments longer than the third. Abdomen reddish-brown, smooth, the last segment broadened, darker in colour, granulated, the hinder border rounded, slightly emarginate at the corners, which end in a sharp point. Forceps black, flat beneath, keeled above, the branches stout, straight, gradually converging, to form a small narrow oval, granulated on the inner margin at the part meeting near the apex, and then contiguous until the apex itself, where the points decussate. In the ♀ the branches are contiguous their whole length, and toothed on the inner side. The whole body is pubescent.

Length of the body..... ♂ ♀ 27 mm.

„ „ forceps ..... ♂ 7 mm. ♀ 3-5 mm.

Pygidicrana picta Guérin., Magasin de Zoolog., 1838, VIII 70, tab. 236, fig. 1.
Dohrn, 1863, Stett. Ent. Zeit., xxiv., 50.
Borm. 1900. Forf. 18.

Habitat.—India, Madras (Guérin); Ceylon (Dohrn), Ceylon (Mus. Brux.).

PYGIDICRANA MARMORICRURA, Serv.

Large. General colour dull-black, the different organs varied with light-testaceous. The head is dark-fuscous, with a testaceous patch in the centre

of the occiput. Antennæ with more than thirty segments. The pronotum is oval, narrower than the head, pale-testaceous, with two parallel fuscous bands. The scutellum is distinct and testaceous. The elytra are large and broad, fuscous, with a testaceous spot. The visible part of the wings is testaceous. The feet are light-testaceous, with fuscous spots and markings. The body is cylindrical, black and shining, the last segment large and somewhat dilated, especially in the ♂. The forceps are, in the ♂, stout, the branches contiguous at the base, dilated and flattened, but almost immediately diverging, forming a somewhat elongate oval, the branches meeting a little short of the apex, where there is a tooth. The branches are then contiguous to the apex itself, where they decussate. In the ♀ the branches of the forceps are cylindrical, and straight, contiguous, unarmed, the apices slightly decussating.

The amount and depth of the colouration varies very considerably. The forceps are usually black, but sometimes brownish, and often covered with golden hairs.

	♂	♀
Length of the body	23-28 mm.	23-29 mm.
„ „ forceps	8-10.	7-8·5

Pygidicrana marmoricrura, Serv., 1839, Orth., p. 20.
Dohrn, 1863, Stett. Ent. Zeit., xxiv., 51.
Scudd., 1876, Ent. Notes, V., p. 69.
(nec Dubr., 1879, Ann. Mus. Civ. Gen., xiv., p. 351=*P. finschi*; Karsch.).
Borm. 1900, Forf. 19.

Pygidicrana marmoricauda, Sharp, 1895, Insects, I, 215. (Cambridge Nat. Hist.)

This species appears to be extremely common in Java. There is a specimen in the Hope Collection, Oxford, labelled, "Thwaites, Ceylon," and I have received from Mr. Green a single female that I refer with some doubt to this species, from Matale, VI., 97, from beneath loose bark on the stems of cocoa-trees.

PYGIDICRANA NIETNERI, Dohrn.

"Yellowish-fuscous, the antennæ, feet and pectus testaceous, the latter with a dark spot in the middle of the segments; the head yellow markings; the forceps reddish, with a yellow spot at the base; hairy. Length of body 20, breadth 3, length of forceps 4½mm.

Pygidicrana nietneri, Dohrn, 1863, Stett. Ent. Zeit., xxiv, 53, Borm. 1900, Forf. 21.

Head brownish-yellow, the frontal and occipital sutures bright-yellow, as also, parallel with these, two short stripes, like the underside and antennæ. The hinder border is slightly rounded. Pronotum longer than broad, with parallel sides; in the centre is a clear yellow furrow, on each side of which is a small dimple, brown, the narrow border clearer, with stiff hairs.

Scutellum broad, short, coloured and pubescent like the pronotum. Elytra somewhat longer than the pronotum, uniform-brown, with stiff hairs. Pectus bright-yellow, with a brown spot in the middle of each segment. Feet uniform-yellow, with long hairs, the first tarsal segment longer than the third. Abdomen somewhat clearer than the elytra, especially the hinder borders of the segments, clothed entirely with fine grey hairs; the last dorsal segment is truncated in the middle of the hinder border, on the sides strongly (*ausgebuchtet*), slightly puckered up at the corners. Forceps straight, the underside flat and smooth, the upperside flat at the base, keeled towards the point, hairy, toothed on the inner side as far as the apex, reddish-brown, with a yellow spot at the base."

Habitat.—Ceylon (Nietner, Dohrn, B. M.).

PYGIDICRANA CUMINGI, Dohrn.

This is one of the smaller species of the genus. The head is dark, with a pale central spot; the pronotum is narrower than the head, oval, pale, with two parallel pale bands. The elytra are ample, with a black border on each margin, broadest on the outside. The wings are not visible. The feet are uniform-testaceous in colour. The abdomen is black, broadening towards the apex. The last segment is large, each posterior angle being furnished with a small warty ridge in the ♂. In the ♀ the angles are simple. The forceps of the ♂ are stout, the branches flattened and dilated, subcontiguous, with a stout tooth on the outer margin near the base, the inner margin being unarmed; near the apex the branches become more slender, and are curved upwards; at the apex the points meet, but the branches are curved asymmetrically, the left branch outwards, the right inwards, but the left branch is curved inwards strongly at the apex itself to meet the point of the right branch. In the ♀ the branches of the forceps are stout and flattened, but simple and unarmed, contiguous throughout their length, decussating at the apex.

	♂	♀
Length of the body.....	19·5-21 mm.	19-21 mm.
„ „ forceps...	5.....	4

Pygidicrana cumingi, Dohrn, 1863, Stett. Ent. Zeit., xxiv., 54.

Borm.-1900. Forf. 21.

This species was described by Dohrn from specimens from Ceylon, where it appears to be common. I have received numerous examples from Mr. Green from Punduloya. There is one specimen in the British Museum labelled "Ceylon." The insect is adult in May, September to November, and I have larvæ from June and July. It is to be found under stones, loose bark, etc., and often comes in buildings.

PYGIDICRANA ANGUSTATA, Dohrn.

I have not seen this species myself, and therefore give a translation of Dohrn's description.

Reddish-black, the head marbled with yellowish, the antennæ greyish, a median line and the margins of the pronotum, the scutellum, the suture of the elytra to the base and a median spot on the elytra, the apices of the wings, and the feet yellow, the femora spotted with black, the margins of the abdominal segments reddish.

Length of body 17, breadth 2½, length of forceps 3 mm. ♂.

Pygidicrana angustata, Dohrn, 1863, Stett. Ent. Zeit., xxiv., 56.

Borm. 1900. Forf. 23.

Habitat.—Ceylon (Neitner).

Head with shallow sutures, yellowish-grey, marbled; underside pale-yellowish-grey; antennæ grey, with thirty-seven segments. Pronotum longer than broad, the sides parallel, brownish-black, the median line pale-yellow with a narrow furrow; near the hinder border the line is broadened out into a yellow triangle with a black central line; the sides are yellow with a somewhat dilated spot near the shoulder. The body is bristly. Scutellum narrow, elongated pale-yellow. Elytra somewhat longer than the pronotum, brown, with a long yellow central spot, and the basal half of the suture is yellow. Wings but slightly projecting, clear-yellow. Sternum yellow, with brown spots on the centre of the segments. Feet greyish-yellow, femora with two black stripes on the anterior side, with one black spot beneath; tibiæ with a black ring at the base, and a black line in front, first tarsal segment longer than the third. Abdomen brownish-black, clothed with silky hairs, with the exception of the last segment; this is shining, finely punctulated, the hinder border convex. Forceps smooth beneath, keeled above, curved to the points inwards, reddish-brown, with a yellow spot above at the base. ♀ in the Berlin Museum.

The most noticeable point in this species is that the head is narrower than the pronotum. The only other species in which this is so is *P. liturata*, Stål., an African form.

PYGIDICRANA (?) *DILATICAUDA* (Motsch.)

Elongated, depressed, shining-black; last ten antennal segments, the edges of the abdominal segment, the forceps and cheeks more or less reddish-yellow; head subtransverse, subbilobed behind, transversely subimpressed, with three foveolæ; fourth antennal segment equal to the third; thorax slightly narrower than the head, somewhat elongated, depressed, anteriorly with three faint longitudinal impressions, the hinder border arcuate, the margin slightly sinuate in the middle, the sides slightly elevated, with a distinct triangular scutellum. Elytra broader than the head, quadrate, posteriorly excised triangularly at the suture, the shoulders rounded; wings produced well beyond the elytra, coriaceous, shining-blackish, abdomen as broad as the elytra, scarcely dilated in the middle, depressed, sparsely punctulated, last segment broad, with a punctulation on each side, with a foveola in the middle, at the hinder margin with two impressions and two tubercles;

forceps a little longer than half the abdomen, laminiform, with a strong tooth at the base on the inner margin, dilated into an angle in the middle with three teeth, arched at the apex ; femora oval, stout.

Long corp. 3 1, lat. $\frac{1}{2}$ 1, long forcip. $\frac{3}{4}$ 1, Des Montagnes de Nura Ellia.

Forfiscelia dilaticauda, Motsch., 1863, Bull. Soc. Imp. Nat. Moscou. xxxvi., 3, pp. 3 and 4.

Labia dilaticauda, Scudd., 1876, Proc. Bost. Soc. N. H., xviii., p. 319.

Platylabia dilaticauda, Borm. 1900, Forf. 75.

This species is totally unknown to me. Scudder places it in the genus *Labia*, but the presence of a distinct scutellum shows nearer affinity to *Pygidicrana*, as well as the complicated and strongly toothed forceps. I have translated Motschulksy's description word for word. He does not mention the sex.

de Bormans places it in *Platylabia* as a "sehr zweifelhafte Art" and considers it related to *Platylabia Major*, Dohrn.

Dohrn makes no mention of it in his Monograph.

DIPLATYS, Serville.

Body more or less depressed. Eyes very prominent. Antennæ with 15-16 (occasionally 17) segments. Pronotum narrower than the head, nearly semicircular, the angles rounded. Scutellum small. Elytra ample, more than twice as long as the elytra, obliquely rounded at the apex. Wings projecting well beyond the elytra, the membraneous folds showing at the suture, the exposed part being about half as long as the elytra. Abdomen cylindrical, in the ♂ dilated more or less near the apex. Second and third segments bearing a lateral fold, often difficult to distinguish. In the ♀ the abdomen is attenuated nearer the apex. Forceps with the branches short and simple, in the ♂ slightly dilated at the base, contiguous or subcontiguous, unarmed, the apices meeting. In the female the branches are contiguous, conical, short and unarmed.

Diplatys, Serville, 1831, Ann. Soc. Nat., xxii., 33. id., 1839. Orth., 50.
Borm. 1900. Forf. 8.
Scudd., Kirb., Burr.

Nannopygia, Dohrn, 1863, Stett. Ent. Zeit., xxiv., 60 (nec Kirb.)

Dyscritina, Westw., 1881, Trans. Ent. Soc., London, p. 601, pl. xxii., fig. 1 Green, 1898, Trans. Ent. Soc. London, 381.

Cylindrogaster, Kirb. (partim).

This remarkable genus is not likely to be confused with any other, except perhaps *Cylindrogaster*, Stål., from which it may be distinguished by the presence of the lateral folds on the second and third abdominal segments.

I have not examined the type of Dohrn's *Nannopygia*, but the description of his *N. gerstæckeri* corresponds exactly with *D. longisetosa*, Westw., and I cannot refrain from regarding them as identical. Westwood described the

larva under the name *Dyscritina*, being unable to place it, owing to the extraordinary caudal segmented setæ, which have since been explained by Mr. Green's observations.

Mr. Green's work upon the life-history and development of the two Ceylonese species has since become historic, and should be consulted by everybody interested in the subject.

1. Colour red, varied with fuscous .....1. *GERSTÆCKERI*, Dohrn.

1. 1. Colour black, varied with brown-and-white.....2. *NIGRICEPS*, Kirb.

DIPLATYS GERSTÆCKERI (Dohrn.)*

Colour reddish-testaceous, varied with brown. Head testaceous, sometimes darker anteriorly; eyes prominent, black. Pronotum reddish, sometimes varied with brown. Elytra red, with an occasional brownish patch in the centre. Wings with the scale reddish, brownish on the outer border. Abdomen darker-reddish, shining. Feet testaceous: the tubercles of the second and third segments are small and difficult to distinguish. Branches of the forceps stout, simple.

♂♀

Long. corporis.....10·5-14·75 mm.

„ forcipis .....1-1·25 mm.

This species varies is colour from a uniform bright-red to a dull-brown in colour; the elytra may be plain-red or dull-brown. The whole body is pubescent.

Nannopygia gerstæckeri, Dohrn, 1863, Stett. Ent. Zeit, xxiv., p. 60.
Scudd., 1876, Ent. Notes, V., 66.
Kirb., 1890, Linn., Soc. Journ. Zool., XXIII., p. 508
Borm., 1894, Ann. Mus. Civ. Gen. (2), xiv., 372, id. 1900. Forf. 11.

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* As to the identity of *Nannopygia gerstæckeri*, Dohrn, and *Diplaty longisetosa*, Westw., I am indebted to Herr Dr Möbius, Director of the Königl. Museum für Ndtaurkunde of Berlin for the following notes, made by Herr Dr. Kuhlgatz, of the same museum. Dohrn's type of *Nannopygia gerstæckeri* is in the Berlin collection. "*Diplatys longisetosa*, Westw., is very closely allied to this species, but not actually identical with it. *Nannopygia gerstæckeri* is entirely bronze-coloured with black eyes; in *Diplatys longisetosa* the head is black. The forceps increase a little more in thickness from the apex to the base than in *Nannopygia gerstæckeri*. The elytra of the latter are uniform in colour and broader than in *D. longisetosa*, in which on the two posterior third of the elytra there is a long blackish shadowy streak (at least in the two specimens in the Berlin Museum). Both forms probably belong to one and the same genus (?). In structure they scarcely differ at all."

From this it will appear that I was perfectly justified in rejecting Dohrn's genus *Nannopygia*, as identical with the earlier *Diplatys*, but apparently the two species are distinct, though very closely allied: it is possible that they may be dimorphic forms of one species, which is doubtless more variable in size and colour

De Bormans separates them by the form of the last abdominal segment, which is square in *Diplatys* and scarcely or not at all produced in *Nannopygia*; in the former the head is narrower behind, the second tarsal segment is broader in the latter. I still prefer to regard the two as one genus making *N. gerstæckeri* identical with *D. longisetosa* and moving *N. dohrni* Kirb, to *Carcinophora*, q. v.

Dyscritina longisetosa (larva), Westw., 1881, Trans. Ent. Soc., London, 601, pl. xxii., fig. 1.

Green, 1896, Trans. Ent. Soc., London, 229, id. ibid., 1898, 381. pl. xviii., figs. 4, 5, 16, pl. xix., figs. 9—14.

Diplatys longisetosa, Burr., 1898, Trans. Ent. Soc., London, 388.

Borm. 1900. Forf. 10.

Patria.— Ceylon (Dohrn); Punduloya, Ceylon (Green), Ceylon (Thwaites in coll. Hope.)

Mr. Green tells us that this species is not uncommon in the district of Punduloya; in the larval stage, at least, it is to be found under stones, or under moss on rocks, or under loose bark on trees. It is extremely active, and the adult insect flies by night, and may be taken at light.

DIPLATYS NIGRICEPS (Kirb.)

General colour dull-black, palpi testaceous. Elytra slightly paler in the ♀ than in the ♂. Scale of wings blackish, shorter than in the last species; membraneous part ample, iridescent. Femora blackish, tibiæ paler, blackish at the base, tarsi paler. Abdomen, in the ♂, slender, dilated at the apex; in the ♀ shorter, attenuated towards the apex. Branches of the forceps, ♂ simple, remote, gradually incurved to meet at the apex; of the ♀ simple, straight, conical.

	♂	♀
Long. corporis	8·5	7 mm.
„ forcipis	1·5	75.
Expanse of wings	19.	

Cylindrogaster nigriceps, Kirb., 1890, Linn. Soc. Journ. Zool., xxiii., 507.

Diplatys nigriceps, Burr., 1898, Trans. Ent. Soc., London, 389, pl. XVIII. fig. 1—3; pl. XIX., figs. 6—8 and 15.

Borm. 1900. Forf. 11.

This species is quite distinct from the former, being very different in colour. The two species may also be separated in the larval stages by the colour; this species being considerably darker, with shorter caudal setæ.

Patria.—Hong Kong; Bombay (Kirb., B.M.); Ceylon, Punduloya, Ceylon (Green).

The type from Hong Kong has the pronotum varied with white.

PLATYLABIA, Dohrn.

Body strongly depressed. General colour bright-reddish-testaceous and shining-black. Antennæ with 11-12 oblong segments; pronotum narrower than the head; second tarsal segment simple; abdomen without the lateral tubercles on the second and third segments. Elytra and wings well developed.

Sides of the abdomen parallel. Branches of the forceps remote at the base in both sexes, more or less depressed.

Platylodia, Dohrn, 1867, Stett. Ent. Zeit., xxviii, 347.
Kirb.
Borm. 1900. Forf. 73.

Labidophora, Scudd., 1876, Proc. Bost., X. c. N. H., xviii, 297.
Ent. Notes V., 37.

Scudder proposed to change the name of this genus, as there already existed a genus *Platylabus*, Wesmael, in *Hymenoptera*, 1845, but his suggestion was not adopted. He still maintains that it is desirable.

This genus closely resembles *Sparatta*, and in the form of the antennæ it approaches *Labia*, but it may be distinguished from either by the absence of the lateral folds on the second and third abdominal segments.

PLATYLABIA THORACICA, Dohrn.

Head dark-red-brown, the antennæ paler; pronotum yellowish-brown. Elytra and wings black, well developed; sternum and feet yellow; abdomen and forceps yellowish-brown, darker near the apex, the anal segment with the hinder border straight; the pygidium in the ♂ is square, with a small point in the middle; the forceps are flat, straight, with a tooth in the middle of the inner margin in the ♂, curved gently in at the apex; the forceps of the ♀ are the same as in the ♂, but without the median tooth.

In Dohrn's description the forceps are "*deutlich zweikantig*" on the inner margin, but I am uncertain whether this may apply to the actual edges, or to two projections.

Length of body, 4-5 mm, of the forceps 1-5 mm. (after Dohrn).

Platylabia thoracica, Dohrn, 1867, Stett. Ent. Zeit., xxviii., 348.
Borm. 1888, Ann. Mus. Civ. Gen. (2), vi., 436, id., 1894., op. cit. (2), xiv., 380, id., 1900. Forf. 73.

Labidophora thoracica, Scudd., 1876, Ent. Notes, V., 61.

Habitat.—Ceylon (Nietner, Dohrn).

The specimens which I refer to this species are from Ceylon (Mus. Brussels), and Punduloya, X.97, and V., 97, and Peredeniya, VI., 98, (Green. in. coll. mea.).

The species also is recorded from Penang (Dohrn), Aru Is, and Ternat (Durb), Burmah, Tenasserim (Borm.), Lombok and Java (coll. mea.).

I have seen no specimens which correspond exactly with the above description, which is taken straight from Dohrn, but have examined a number of specimens which appear to belong to this species, in which the head and pronotum are both shining-black. The forceps are not exactly toothed on the inner margin, but are slightly dilated about the middle, which gives the appearance of two small teeth. The colouration of the head and pronotum

is certainly very variable. The specimens which I have seen approach nearer to *Pl. gestroi*, Dubr., except in size. I cannot regard them as distinct from *Pl. thoracica*.

ECHINOSOMA, Dohrn.

Small, convex, pubescent. Antennæ with nearly thirty segments, of which the first and third are of equal length, and the remainder very short, scarcely longer than broad. Pronotum barely as broad as the head. Elytra twice as long as the pronotum. Wings well developed. Abdomen short and broad, broadest in the middle. Forceps short, simple and incurved, almost semicircular; in the ♂ straight, or gently incurved in the ♀. Feet short, not very slender.

Echinosoma, Dohrn., 1863, Stett. Ent. Zeit., xxiv., 63.
Borm. 1900. Forf. 26.

This genus may be recognised by the small, rounded, fully-winged, hairy insects.

ECHINOSOMA PARVULUM, Dohrn.

Dark; the mouth parts, segments 2 and 16 of the antennæ, and wings sternum and feet pale; the wings have a dark spot at the apex, and the femora and tibiæ are dark at the base. The body is covered with yellowish pubescens. The head has the occipital suture very distinct, and is blackish-brown in colour; the antennæ are dark with the exception of the second and sixteenth segments which are pale; pronotum dark with a pale central line and pale sides. The elytra are about twice as long, and are thickly granulated. Abdomen granulated and warty, dark-brown with indistinct reddish-brown specks.

Length of the body 7 mm.
" " forceps 1 mm. ♀.

Echinosoma parvulum, Dohrn, 1863, Stett. Ent. Zeit., xxiv., 66.
Borm. 1900. Forf. 29.

This is the smallest species of the genus, and the only one known to occur in Ceylon; I know of no specimen other than the type of Dohrn in the Berlin Museum except one in the B. M. The male is unknown.

PSALIS, Serv.

Body stout, antennæ less than half the length of the body, with less than twenty segments, the first segment as long as segments 4-5-6 inclusive. Elytra and wings well developed. First tarsal segment equal to the other two. Abdominal tubercles absent. Forceps simple, somewhat stout, arcuate, remote at the base in the ♂; in the ♀ stout, conical, subcontiguous, incurved at the tip.

Psalis, (part) Serv., 189, Orh., 1831, Ann. Sci. Nat., xxii., 34.
Borm. 1900. Forf. 36.

This genus approaches more nearly to *Labidura*. It may be distinguished by its shorter antennæ and shorter, simpler ♂ forceps.

PSALIS FEMORALIS (Dohrn.)

Dark-brown; head black; antennæ fuscous or testaceous, very variable in colour, with at least 16 segments. Mouth pale; eyes black; pronotum chocolate-brown, very slightly narrower than the head, the anterior border straight, the hinder border rounded. Elytra ample, chocolate-brown, shining, rounded at the apex; wings projecting well beyond the elytra, of the same colour, but slightly paler at the base and along the suture. Feet pubescent, testaceous, sometimes banded with black. Abdomen dark-brown, not shining, with extremely fine granulations; anal segment square in the ♂, attenuated in the ♀ Forceps, in the ♂, with the branches stout, not distant at the base, flat beneath, convex above, reddish-brown, denticulated along the inner margin, straight, slightly incurved at the apex, where they decussate; the right branch is incurved considerably more strongly than the left. In the ♀ the branches are stout, straight, subcontiguous their whole length, the apices curved in and meeting. ♂ ♀.

	♂	♀
Length of body	10 mm.	9-11·5 mm.
Length of forceps	3	2

Labidura femoralis, Dohrn, 1863, Stett. Ent. Zeit., xxiv., 321.
Scudd., 1876, Ent. Notes, V., 62. (nec Dubr.)

Psalis femoralis, Borm., 1888, Ann. Mus Civ. Gen. (2). VI., 434, id., 1894, op. cit., xiv., 378, id., 1900. Forf. 38.

Habitat.—Ceylon (Dohrn); Ceylon, 1872 (Thwaites, in Mus. Hope); Punduloya, Galagedara, VII., 97 (Green, in coll. mea.).

Occurs also in Burmah (Borm.)

Dohrn only describes the female, and the male has not been described before. The colour varies to some extent in density, but the general appearance of the insect is dark-brown, shining brightly; the legs and antennæ vary very considerably in colour. The insect referred to as *Labidura femoralis*, Dohrn, by Dubrony, 1879, Ann. Mus. Civ. Gen., XIV., 353, is really *Nannopygia dohrni*, Kirb., q. v.

(*To be continued.*)

NEW SPECIES OF INDIAN HYMENOPTERA.

By Major C. G. Nurse, 13th Bombay Infantry.

(*With a Plate.*)

In my short paper on Sport and Natural History in Northern Gujarat, published in Vol. XIII., No. 2, of this journal, I promised to write a paper describing new species of Hymenoptera collected by myself during the past four years. This promise I am only able to partially redeem personally, as owing to the unexpected curtailment of my leave to Europe, I had not the opportunity of comparing my specimens with those in other collections. I took home with me some 3,000 specimens, the result of about 3½ years collecting, and among them it appears there were some 10 new genera, and over 100 new species. The following paper contains, therefore, descriptions of a few only of the new species contained in my collection, but it will be followed by papers by Mr. P. Cameron, a well known authority on Hymenoptera, describing the new genera and the remaining species.

I have described below only species of the families dealt with by Colonel Bingham in his Vol. I. of Hymenoptera of the Fauna of India Series, which appear to be undoubtedly new. Mr. Cameron's paper will include a considerable number of new species of the same families, as well as of Hymenoptera Parasitica, Tubulifera, &c.

The present paper does not include the Apidæ, which will be dealt with later on.

Mutilla sonata, n. sp.

♂ Head, pronotum, mesonotum, and abdomen finely, median segment coarsely, punctured; eyes emarginate, three shallow groves on the front, each terminating in an ocellus; median segment rounded and somewhat depressed posteriorly; first abdominal segment rather short. Jet black; head, thorax, and legs with sparse greyish pubescence; abdomen with bands of tawny pubescence on apical margins of segments 1-5; apical segment with black pubescence. Wings fusco-hyaline tegulæ black, nervures dark fuscous.

Length 11 *mm.*; *exp.* 16 *mm.*

Habitat: Simla.

Nearest to *M. discreta* (Cam.)

MUTILLA KALLALA, n. sp.

♂ Head, thorax, including tegulæ, and first two abdominal segments somewhat coarsely, remaining abdominal segments finely, punctured; head narrower than thorax, the portion near the ocelli somewhat raised, eyes small, and not emarginate; median segment rather short, rounded; first abdominal segment long and sub-petiolate. Head, scape of antennæ, thorax, legs, basal portion of first, and the whole of abdominal segments 5-6 black; apical portion of first, and the whole of second (sometimes also of third and fourth) abdominal segments more or less orange red; flagellum of antennæ black variegated with red, above, red below; the head, thorax, legs, abdomen, and scape of the antennæ covered with a somewhat sparse greyish pubescence. Wings hyaline at base, apical portions fuscous; the radial, cubital, and second discoidal cells more or less hyaline; tegulæ black, nervures dark testaceous.

Length 12 *mm. exp.* 20 *mm.*

HABITAT: Deesa.

Near *M. argenteomaculata*, in A. *a. b*^{2}. of Bingham's Key.

MUTILLA EKKA, n. sp.

♀ Head and thorax somewhat finely, abdomen very finely, punctured; head rather wider than basal portion of thorax, the latter widening posteriorly; first abdominal segment very short. Black, the thorax and abdomen, especially the latter, with a dark reddish tinge, the whole covered with a sparse greyish pubescence; second abdominal segment with two lateral ovate spots of cream-coloured pubescence, the spots diverging apically; third segment with two smaller spots of snow-white pubescence, converging apically.

Length 7 *mm.*

HABITAT: Deesa.

In group C. of Bingham's Key, forming a new section.

MUTILLA CHOTA, n. sp.

♀ Head and thorax closely and regularly, abdomen much more finely, punctured; head very large, rounded above, half as wide again as thorax; thorax rounded posteriorly, with a medial carina along apical portion. Black, thorax bright red; mandibles, scape of antennæ and front darker red; pubescence sparse, greyish; two lateral spots, converging apically, of somewhat sparse greyish pubescence or pile or apical portion of second abdominal segment.



West, Newman lith.

HYMENOPTERA FROM DEESA & SIMLA

Length 5 *mm.*

HABITAT : Simla.

In group B of Bingham's Key ; *a* d^1.

TIPHIA CONSCIA, n. sp.

♀ With the exception of the median segment, which is smooth, the whole of the head, thorax, and abdomen are more or less punctured, the punctures somewhat sparse and shallow except on the pronotum ; median segment truncate posteriorly, with three longitudinal carinæ. Black, apical segments of abdomen testaceous, pubescence white but very sparse ; forewing flavo-hyaline, hindwing clear hyaline, nervures and tegulæ testaceous, stigma dark brown.

Length 7 ; *exp.* 10 *mm.*

HABITAT : Deesa.

This species comes nearest to *T. hirsuta* (Smith), but is a smaller insect, and differs in the sculpturing.

TIPHIA NERVOSA, n. sp.

♂ The punctures as in Tiphia conscia, but it differs from that species in the following respects : the tibiæ and tarsi are more or less testaceous, both wings are clear hyaline, and the pubescence on the apical portion of the abdomen has a golden tinge.

Length 8 ; *exp.* 12 *mm.*

HABITAT : Deesa.

Near to *T. conscia* above, and it may be the ♂ of that species, but I do not like to describe it as such without more evidence than identity of habitat, as it differs considerably in general appearance.

MYZINE HORTATA, n. sp.

♀ Head and apical portion of mesonotum with scattered punctures, pronotum closely and more deeply punctured, basal portion of mesonotum smooth, median segment with very minute, and abdomen with fine but somewhat sparse, punctures ; a shallow groove from between base of antennæ to anterior ocellus, median segment with a deep longitudinal groove, narrowing posteriorly, not quite reaching the apex Black, with a sparse white pubescence, the spines on the legs testaceous ; forewing light flavo-hyaline, hind wing clear hyaline, nervures and tegulæ dark testaceous.

Length 10 ; *exp.* 16 *mm.*

HABITAT : Deesa.

This species is nearest to *M. claripennis* (Bingh.), and would fit thus into Bingham's Key.

A.

b

b[1]

b[2]

a[3] Median segment smooth and shining, with a short triangular longitudinal impression at base .....*claripennis*

b[3] Median segment opaque, finely rugose, with a longitudinal furrow in the middle ....*hortata*.

SCOLIA PILA, n. sp.

♂ Head, thorax, and abdomen somewhat sparsely punctured; the portion of the front between the bases of antennæ raised, a deep groove, widest posteriorly, from the anterior ocellus towards, but not reaching, the bases of antennæ; median segment short, broad, and truncate at apex. Black; the mandibles, except their tips, the centre of the clypeus, the antennæ, legs, and apical abdominal segment, light red; the clypeus, except the centre, a triangular spot above it, the portion of the head round the eyes, the pronotum, lateral margins of the mesonotum, the scutellum, postscutellum, and broad lateral maculæ, covering nearly the whole of the dorsal portions of abdominal segments 2—5 (sometimes also 1st segment), yellow, the ventral portions of abdominal segments 2—5 have obscure yellow spots towards their apical margins laterally; wings with two cubital cells, bright flavo-hyaline at base, apical portions fuscous, nervures and tegulæ light red.

Length 10; *exp.* 20 *mm.*

HABITAT: Deesa.

This species would come in Bingham's Key near *S. elizabethæ* (Bingh.), having antennæ light red, but it is abundantly distinct, and has quite a different general appearance.

POMPILUS PAULUS, n. sp.

♀ Head, thorax, and abdomen smooth; clypeus short and broad, its anterior margin slightly rounded, a deep groove from base of antennæ to anterior ocellus, scutellum much raised, long and narrow; legs stout, anterior tarsi ciliated, intermediate and posterior tibiæ and tarsi spinose. Head and thorax black, abdomen, femora, tibiæ, and tarsi of legs bright red, antennæ dark red or reddish black; a line along both the inner

and outer orbits of the eyes, the posterior margin of the pronotum and sometimes a spot on the scutellum, pale yellow; head and thorax covered with sparse silvery pile, first abdominal segment with golden pile; wings hyaline, infuscated at apex, tegulæ red, nervures black.

Length 8; *exp.* 14 *mm.*

HABITAT: Deesa.

Nearest to *P. acceptus* (Bingh.).

POMPILUS CERTATOR, n. sp.

♀ Head and thorax pruinose, giving it the appearance of being very minutely striate, abdomen smooth; clypeus transverse anteriorly, head about twice as broad as pronotum, thorax narrow, median segment long, depressed and roundly truncate posteriorly, first abdominal segment subpetiolate, second ventral segment with a transverse furrow, legs extremely long and slender, almost destitute of spines. Black, the basal three abdominal segments red; wings hyaline, forewing narrowly infuscated at apex, tegulæ black, nervures testaceous. The wings when seen in certain lights have a bluish tinge.

♂ Similar, the sides of the clypeus and front, a line on the pronotum, a spot on the scutellum, and the apex of the median segment, yellowish white; anterior tibiæ and tarsi, and intermediate tibiæ red.

Length 8; *exp.* 13 *mm.*

HABITAT: Deesa.

This species, having a ventral furrow on the second segment, comes into the Ferreola group of Pompilidæ, near to *P. pedestris* (Smith).

POMPILUS ARRESTUS, n. sp.

♂ Head, thorax, and abdomen smooth; clypeus transverse anteriorly its sides rounded, pronotum much depressed anteriorly, median segment rather short, roundly truncate posteriorly; legs moderately stout, but not very long. Black, the base of the mandibles, sides of the clypeus and front, a line behind the eyes, the apex of the pronotum, a quadrate spot on the mesonotum, a smaller one on the scutellum, and a band at base of second, third, and fourth abdominal segments yellowish white; the antennæ and legs more or less red, tibial calcaria of intermediate and posterior legs, and base of posterior tibiæ whitish. Wings hyaline, narrowly infuscated at apex, tegulæ red, nervures blackish. This species seems somewhat variable. One of my specimens has the median segment covered with silvery, and the first

abdominal segment with greyish, pile. The third cubital cell seems to vary considerably in size; in one specimen this cell is petiolate on one side, and very much narrowed above on the other.

Length 7-9; *exp.* 12-16 *mm.*

HABITAT: Deesa.

This species would come in Bingham's Key after *P. capitosus* (Smith).

POMPILUS BRUTUS, n. sp.

♂ Head, thorax, and abdomen smooth, clypeus broad, slightly emarginate anteriorly, the sides rounded, eyes very slightly emarginate, an impressed line from between bases of antennæ to anterior ocellus; pronotum short, its posterior portion slightly depressed, scutellum much raised, median segment rather long, with a median longitudinal groove posteriorly, first abdominal segment long, about half as wide at base as at apex, intermediate and posterior legs stout and very long, all tibiæ and tarsi with minute spines. Red, the median segment, posterior coxæ, and base of first abdominal segment, black, the median segment with sparse silvery pile; wings sub-hyaline, infuscated at apex and across recurrent nervures, tegulæ red, nervures black.

Length 12; *exp.* 22 *mm.*

HABITAT: Deesa.

POMPILUS CASSIUS, n. sp.

♀ Head, thorax, and abdomen smooth, clypeus broad, emarginate anteriorly, an impressed line from base of antennæ to anterior ocellus; pronotum short, its posterior portion slightly depressed, median segment long, rounded and steeply sloped posteriorly and transversely striate, with a median longitudinal groove; first abdominal segment subpetiolate, with a transverse furrow; legs long and slender, tibiæ and tarsi sparsely spinose. Red, the median segment, intermediate and posterior coxæ, and extreme base of first abdominal segment black; a little silvery pile on coxæ; forewing sub-hyaline, hind wing hyaline, both wings infuscated at apex.

Length 11; *exp.* 18 *mm.*

HABITAT: Deesa.

POMPILUS HORATIUS, n. sp.

♂ Resembles *P. cassius*, above, but is smaller, and differs as follows: clypeus transverse anteriorly, median segment smooth and pilose, not

transversely striate, no furrow on second ventral segment, intermediate and posterior tarsi black, except at base; both wings hyaline, infuscated at apex.

The three species—*P. brutus*, *horatius*, and *cassius*—herein described have a strong superficial resemblance, but in my opinion and that of Mr. Cameron they are distinct. They would come into Bingham's Key as follows:—

A. c. d[1].

a[2] Apex of scutellum incised in the middle .....*horatius.*

b[2] Apex of scutellum not incised.....*brutus.*

a[3] First cubital cellule more than twice the length of Second; median segment not transversely striate. *brutus.*

b[3] First cubital cellule not twice the length of second; median segment transversely striate ..... *cassius.*

CEROPALES JUDICATRIX, n. sp.

♀ ♂ Vertex of head and mesonotum somewhat sparsely punctured, median segment and abdomen slightly pruinose; clypeus very slightly concave at apex, the sides rounded; head considerably wider than thorax, pronotum anteriorly with two lateral tubercles; scutellum and postscutellum very much raised, median segment compressed above, rather wider at apex than at base, steeply sloped, with a deep median longitudinal groove, the apex of the segment roundly truncate; posterior legs remarkably long, the apex of the femora reaching as far as the apex of the abdomen; eyes distinctly emarginate. Black; the labrum, clypeus and face below the base of antennæ, the scape and first joint of the flagellum below, the emarginations of the eyes, the tubercles, the posterior margin of the pronotum, apical margin of scutellum, the postscutellum, irregular apical bands, more or less medially interrupted, on abdominal segments 1—4, and the apical abdominal segment pale yellowish white; first and second abdominal segments except at apex, and the legs, red, the latter with a few pale yellowish white markings; antennæ dark red below; wings hyaline, with a very slight fuscous or flavo-fuscous tinge at apex; tegulæ red, with a yellow spot, nervures black, reddish at base.

Length 6-8; *exp.* 12—16 *mm.*

HABITAT: Deesa.

This species would come after *C. Claripennis* in Bingham's Key.

GORYTES CAPITATUS, n. sp.

♀ Clypeus smooth, front sparsely punctured, thorax and abdomen, more closely and deeply punctured, enclosed space at base of median segment longitudinally striate; eyes slightly convergent below, clypeus convex, transverse anteriorly, with a tooth at each angle below; a deep groove from the base of the antennæ to the anterior ocellus, median segment short, rounded at apex, first abdominal segment short, but not sub-petiolate, the margins of the abdominal segments slightly constricted. Black; the mandibles except at apex, the clypeus, scape of the antennæ, a line along the inner orbits of the eyes, the apex of the pronotum, sides of the mesonotum, the episternum, scutellum and postscutellum, a large oval spot on each side of the median segment, broad bands on the first, second, fourth, and fifth abdominal segments above, and of second ventral segment, yellow; base of the first abdominal segment, and the coxæ, trochanters and femora of the legs, red; tibiæ and tarsi yellow at base, black at apex; wings hyaline, with a subapical fuscous spot, tegulæ red, nervures reddish black.

Length 9; *exp.* 13 *mm.*

HABITAT: Deesa.

This species would come in Bingham's Key after *G. amatorius* (Smith).

PHILANTHUS PUNJABENSIS, n. sp.

♀ Head somewhat sparsely, thorax more closely, punctured; base of median segment and abdomen smooth and shining, clypeus bisinuate anteriorly, eyes sub-emarginate, converging above, median segment somewhat short, steeply sloped posteriorly, first abdominal segment sub petiolate. Black; the mandibles, except their tips, the clypeus sides of the face, scape and first two joints of the flagellum of the antennæ, an irregularly oval spot on the front behind the bases of the antennæ (absent in some specimens), a spot behind the eyes, a line on the pronotum posteriorly, a line on the scutellum (sometimes the whole scutellum), the postscutellum, broad lateral oval spots, sometimes meeting and forming sub-marginal bands, on first and second abdominal segments, a narrow medially interrupted band on third, and broader bands on fourth to sixth segments bright yellow; legs with the tibiæ and tarsi yellow; the greater part of the coxæ, trochanters,

and femora, black ; a little greyish pubescence on head and thorax and on abdomen below.

Length 8—10 ; *exp.* 15—18 *mm.*

HABITAT : Ferozepore.

This species, which is very variable as regards the amount of yellow in different specimens, is nearest to *P. sulphureus* (Smith).

PHILANTHAS SCRUTATOR, n. sp.

♀ ♂ Head and thorax closely, abdomen sparsely, punctured ; clypeus arched anteriorly, eyes sub-emarginate, the bases of the antennæ situated in hollows, a very faint impressed line from between them to the anterior ocellus, median segment with a median longitudinal line. Black ; the clypeus, except a large spot in the centre anteriorly, the labrum, a broad mark along the inner orbits of the eyes below their emarginations, a narrower line along the outer orbits, not reaching the vertex, spots behind the base of antennæ, a narrow line from the anterior ocellus reaching about half way to the base of antennæ, a line on the pronotum posteriorly, narrowly interrupted above, a spot on the tegulæ, another below the base of the wings, the postscutellum, irregular oval spots on the lateral margins of first abdominal segment, narrow subapical bands on the second, third, and fourth segments above, and two large irregular maculæ on each below, pale yellow ; flagellum of antennæ at base, and base of first abdominal segment, red ; legs red, except the coxæ and the tibiæ above, which are pale yellow ; wings hyaline, with a faint fuscous spot at apex, tegulæ red, nervures testaceous.

Length 9 ; *exp.* 16 *mm.*

HABITAT : Deesa.

This species would come in "A" section of Bingham's Key, after *P. avidus* (Bingh.)

CRABRO PULVERIS, n. sp.

♀ Head, thorax, and abdomen smooth, opaque ; enclosed space at base of median segment with divergent striæ ; head very large, an impressed line from the base of antennæ to anterior ocellus, a longitudinal line bisecting the pronotum posteriorly, and continued on to the mesonotum, petiole of about the same length as remainder of abdomen ; clypeus, front, and cheeks with silvery pile, thorax with very sparse greyish pubescence. Black ; the mandibles, except

their tips, the scape and first joint of the flagellum of the antennæ, the pronotum posteriorly, two large contiguous spots on the scutellum, lateral ovate spots on the first and second abdominal segments, and usually the greater part of the fourth abdominal segment, yellow; legs yellow above, red below; wings hyaline, tegulæ red, nervures reddish black.

Length 7; *exp.* 12 *mm.*

HABITAT: Deesa.

This species comes after *C. brookii* (Bingh.)

CRABRO PETIOLATUS, n. sp.

♀ ♂ Head, thorax, and abdomen smooth, the two former opaque, the latter shining; an impressed line from the base of antennæ to anterior ocellus; median segment convex, narrowed posteriorly, with a few longitudinal striæ at extreme base, and a median longitudinal furrow; abdomen petiolate, first segment nearly as long as the rest of the abdomen, its apex constricted; posterior tibiæ very much dilated; clypeus and cheeks with silvery pile. Black; the antennæ and tarsi dark red; wings hyaline.

Length 6-7; *exp.* 10-12 *mm.*

HABITAT: Simla.

Near *C. flavopictus* (Smith), but quite distinct.

CRABRO ASWAD, n. sp.

♂ Head, thorax, and abdomen smooth, the two former opaque, the latter polished and shining; an impressed line from base of antennæ to anterior ocellus, median segment narrowed at apex, almost triangular, with a few longitudinal striæ at base; abdomen petiolate, the first segment much narrower than the second about half the length of the remainder of abdomen; clypeus, front, and median segment with sparse silvery pile. Black; wings sub-fuscous, a little lighter at base, nervures and tegulæ black.

Length 5; *exp.* 9 *mm.*

HABITAT: Matheran.

Next to the preceding species.

CRABRO TRADUCTOR, n. sp.

♂ Head and thorax opaque, very minutely punctured, abdomen smooth and shining; a narrow groove from base of antennæ to anterior ocellus, a median longitudinal impressed line on pronotum,

terminating in a slight incision at its apex ; enclosed space at base of median segment smooth and shining, with a broad median furrow ; abdomen petiolate, clypeus with dense silvery pile, thorax and median segment below with sparse greyish pubescence. Black ; the scape of the antennæ below yellow ; a line on the pronotum posteriorly, the lateral angles of the scutellum, and ovate lateral spots on the first, third, and fifth abdominal segments, red ; the mandibles rufo-ferrugineous, the "knees" of all the legs more or less red ; wings fusco-hyaline, nervures and tegulæ black.

Length 11 ; *exp.* 22 *mm.*

HABITAT : Simla.

CRABRO EQUES, n. sp.

♀ Head with minute scattered punctures, thorax opaque, smooth, median segment longitudinally striate at base, abdomen smooth and shining ; vertex of head large, almost flat, the front steeply sloped from the vertex, and forming an angle with it : an impressed line from base of antennæ to anterior ocellus, and another along the centre of pronotum and mesonotum ; median segment rounded and steeply sloped at apex, with a medial groove, abdomen subpetiolate, first segment about half the length of the remainder of abdomen, second segment narrower than the third ; posterior tibiæ very much dilated ; clypeus with somewhat dense, cheeks and median segment with sparse, silvery pile. Black ; the anterior tibiæ above, base of intermediate tibiæ, first two joints of intermediate tarsi, and a spot on posterior tibiæ at base above, yellow ; anterior tarsi testaceous ; wings hyaline, nervures and tegulæ black.

Length 7 ; *exp.* 12 *mm.*

HABITAT : Simla.

CRABRO SIMLAENSIS, n. sp.

♀ Head and thorax minutely and closely punctured, abdomen smooth and shining, clypeus bisinuate anteriorly, the central portion projecting, a median impressed line from the base of antennæ to anterior ocellus ; median segment rounded, somewhat steeply sloped at apex, longitudinally striate at base and sides, leaving a central portion, divided into two parts by a median groove, smooth and shining ; abdomen sub-petiolate, increasing in width to the third segment, first segment less than half the length of the remainder of

abdomen; clypeus and cheeks with dense silvery pile. Black; the scape of the antennæ, pronotum posteriorly, scutellum, anterior tibiæ, and base of intermediate and posterior tibiæ, yellow; mandibles and tarsi more or less testaceous; wings hyaline, tegulæ dark red, nervures reddish black.

Length 6; *exp.* 10 *mm.*

HABITAT: Simla.

These three species, which appear to be quite distinct, should follow *C. nitidus* (Cam.)

MONTEZUMIA GUJARATICA, n. sp.

♀ Clypeus with minute and sparse punctures, head, thorax and first abdominal segment closely and coarsely punctured, remaining abdominal segments more finely punctured; clypeus convex, its anterior margin notched; median segment concave posteriorly, the sides produced; first abdominal segment with two small tubercules on each side at base; head, thorax, and abdomen more or less covered with sparse greyish pile. Black; two spots on the anterior margin of the clypeus, the scape of the antennæ in front, a spot between and just behind the bases of antennæ, two spots on the pronotum posteriorly, two minute spots behind the tegulæ, a line on the anterior tibiæ above, and the apical margins of the first two abdominal segments pale yellow, or yellowish white; the mandibles, antennæ beneath and anterior tarsi, more or less red; wings hyaline, a fuscous spot in the radial cell, tegulæ testaceous, nervures black.

Length (to end of second abdominal segment) 9—11; *exp.* 16—18 *mm.*

HABITAT: Deesa.

This species should come after *M. burmanica* (Bingh.)

ODYNERUS HOSPES, n. sp.

♀ Clypeus with shallow and somewhat sparse punctures, remainder of head, thorax, and first abdominal segment coarsely punctured, the other abdominal segments minutely and somewhat sparsely punctured; clypeus deeply emarginate anteriorly; a raised spot behind the base of antennæ, with a short carina connecting it with the clypeus; two parallel longitudinal impressed lines on the mesonotum, and one on the cutellum, median segment with a deep groove, its sides rounded;

first abdominal segment much narrower than the second segment. Black; the clypeus and scape of the antennæ in front light yellowish red, all the tibiæ and tarsi more or less light red; two spots on the pronotum, and a narrow apical line on each abdominal segment darker red, or reddish testaceous; wings subfuscous, nervures and tegulæ black.

Length (to end of second abdominal segment) 8; *exp.* 18 *mm.*

HABITAT: Simla.

Next to *O. punctum* (Fabr.)

ODYNERUS PUNJABENSIS, n. sp.

♂ Head, thorax, and abdomen closely punctured, the punctures on the second and (probably following) segments much shallower than those on the remainder of the body; clypeus very deeply emarginate anteriorly, the projections on each side of the emargination forming blunt teeth; antennæ set in deep hollows; thorax rounded anteriorly, pronotum with a median groove, median segment with a deep ∧ shaped hollow, the sides rounded; first abdominal segment much narrowed. Yellow; the vertex of the head, the mesonotum, epimeron, a broad line dividing the scutellum from the postscutellum, a narrow line dividing the latter from the median segment, the ∧ shaped hollow, a subapical broad line on first abdominal segment, the base and a median transverse band on the second segment, the latter continued below, black; (the remaining abdominal segments are withdrawn into the second in the type specimen, and therefore cannot be fully described, their apices are yellow, the apical segment being entirely black); flagellum of antennæ black above, red below; posterior femora red, except at apex; wings hyaline, a faint fuscous cloud in radial cell, tegulæ yellow, nervures black.

Length (to end of second abdominal segment) 5; *exp.* 11 *mm.*

Near to *O. fistulosus* (Saauss.) but a much smaller species.

HABITAT: Ferozepore.

In describing the Eumenidæ I have followed Bingham in giving the measurements to the end of second abdominal segment only, the remaining segments being generally withdrawn telescopically into the second segment after death.

EXPLANATIONS OF PLATE.

1. Mutilla kallala ♂
2. „ sonata ♂
3. „ chota ♀
4. „ ekka ♀
5. Scolia pila ♂
6. Myzine hortata
7. Philanthus scrutator ♀
8. „ punjabensis ♀
9. Pompilus cassius ♀
10. „ horatius, wing.
11. „ certator ♀
12. „ arrestus ♂
13. Crabro pulveris ♀
14. „ petiolatus ♀
15. Ceropales judicatrix ♂
16. Montezumia gujaratica

THE DISTINGUISHING CHARACTERISTICS BETWEEN POISONOUS AND NON-POISONOUS SNAKES.

By Capt. F. Wall, I.M.S.

With Plates A, B, C & D.

(*Read before the Bombay Natural History Society on* 11*th Dec.*, 1900.)

Perhaps no section of the study of snakes is of such universal interest to those who have to reside in tropical countries as that which deals with the distinctions between the poisonous and non-poisonous varieties. Many who do not care to enter the subject of ophiology deeply nevertheless show keen enough interest in this particular direction, and I have been led to believe that some easy and reliable guide, by which even those ignorant of the subject might with certainty discover for themselves the poisonous nature or otherwise of any snake, would be welcomed, and I have endeavoured in this paper to supply this guide.

There have been at least 270 varieties of snakes hitherto described as inhabiting India (with which is included Assam, Burmah and Ceylon), and of these no fewer than 61 are poisonous, and this fact alone must convey to any thinking individual the complexity of the question, and serve to dispel a somewhat common belief that the matter is an easy one which can easily be settled by a single hard and fast rule.

The methods adopted by many are full of fallacies, and I will point out some of these.

1. Perhaps one of the commonest guides in use and one considered by many an absolutely certain one is *the presence or absence of a fang*. This test in the case of some of the larger vipers may be a fairly easy point to determine, as the fangs are particularly large in this class of snakes.

Fallacies.—(*a*) In many poisonous snakes with less developed fangs, and especially in the Kraits (*Bungarus*) in which fangs are proverbially small, it is extremely easy to overlook them concealed as they usually are to a more or less extent in folds of mucous membrane. (*b*) In all the small varieties of the poisonous kinds with which I may include the young of the larger species it is often a difficult matter to see, much less investigate accurately, the characters of a supposed fang. (*c*) It must not be lost sight of, too, that fangs may be broken off

as a result of accident, or even be wholly absent during the shedding process which occurs periodically. (*d*) Certain harmless snakes, notably members of the *Lycodon* and *Dipsas* genera, are peculiar in having in their maxillæ a lengthened fang-like tooth in the identical situation in which a true fang is placed, and unless this be broken off and carefully examined beneath a lens, it is often impossible to decide whether this is a solid tooth contained in the maxilla of a harmless variety, or a grooved, or canaliculate one, the characteristic lethal weapon of a poisonous species.

2. Another favourite rule which is applied by many, and one provocative of many erroneous conclusions, is with reference to *the presence or absence of a loreal scale.*

Fallacies.—(*a*) Now a very great deal of confusion has been occasioned with regard to this scale by the fact that various writers on the subject hold different views, and some regard as a loreal what others of equal repute and authority designate by some other appellation. It follows, therefore, that where a difference of opinion exists in the minds of experts it must necessarily be conveyed to the minds of those who have had to acquire their knowledge in the first place from works written by these experts. For this reason I have carefully refrained in my appended key from making any allusion to the loreal, though at the same time its significance with the aid of other points has by no means been lost sight of.* (*b*) At best, the presence or absence of a loreal, such as I have represented it in the footnote, is an uncertain guide, as poisonous snakes are met with possessing a

* The median of three or more scales intervening between the eye and the nostril lying above the labials in a more or less horizontal direction and distinct from any of the scales situated on the crown of the head constitute loreals (*see l.* fig. 3). If more than one scale occupies this median position all are called loreals (*see* fig. *b*). Should scales occupying this position be a continuation of any scales from the top of the head on to the face as often occurs in the whipsnakes (*Dryophis*) they are not loreals (*see* I, Prf. fig. 4). Again, if only two scales intervene between the eye and the nostril a loreal cannot exist (*see* figs. 1 and 2). Where the nostril is situated in the middle of a scale (as in figs. 4 and 6) that scale must always be counted in. It appears to me unreasonable to consider it possible for a loreal either to touch the eye or the nostril as some authors describe. In the first case such a scale has every claim to be considered a præ-ocular, and in the latter a nasal, and in both cases the term loreal should be discouraged as a misapplication. It is inconsistent and confusing to call identically situated scales, in one instance, a præ-ocular, and in another (only on the plea of being somewhat lengthened) a loreal. To simplify is the first step towards popularising a subject, to confuse on the other hand is to breed disgust and discouragement.

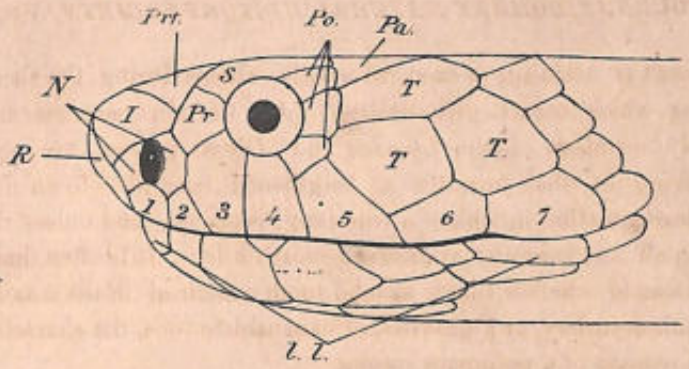


Fig. 1.

Naia tripudians (x 1½)

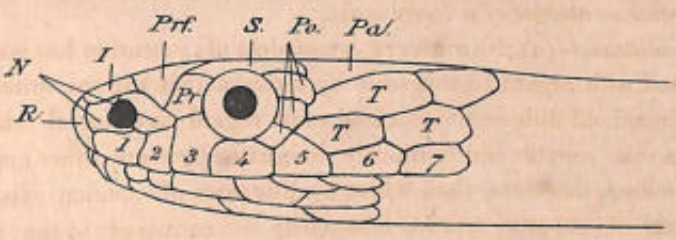


Fig. 2.

Naia bungarus (Enlarged from young specimen)

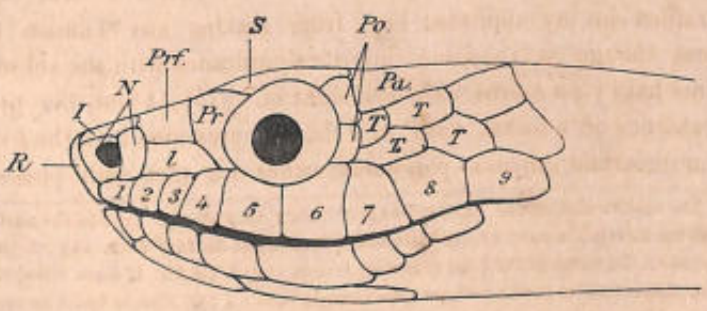


Fig. 3.

Dendrophis pictus (x 3)

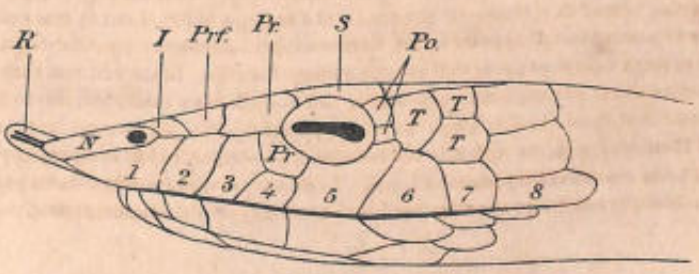


Fig. 4.

Driophis mycterizans (x 3)

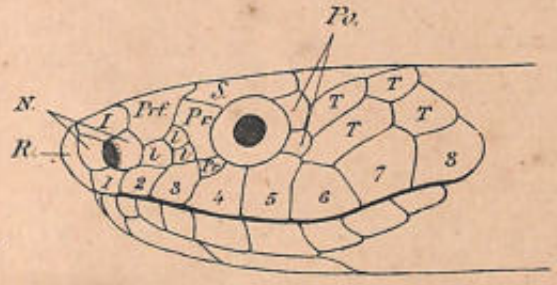


Fig. 5.

Zamenis mucosus (x 1½)

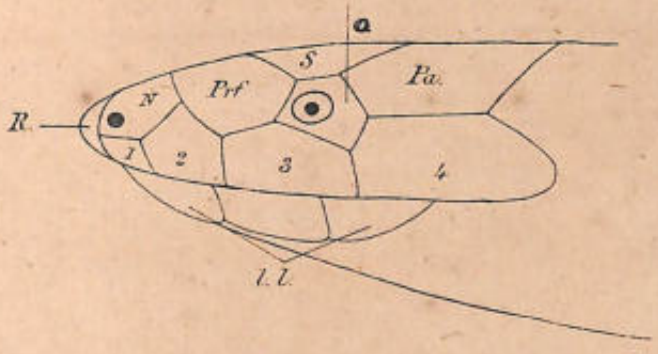


Fig. 6. Silybura brevis (x 4)



Fig. 7.

Trimeresurus gramineus (x 1)

F.....Frontal Pa.....Parietal R.....Rostral V.....Vertebrals.
I.....Internasal Prf.....Præfrontal S.....Supraocular C.....Costals.
Oc.....Occipital T.....Temporal D.....Dorsals.

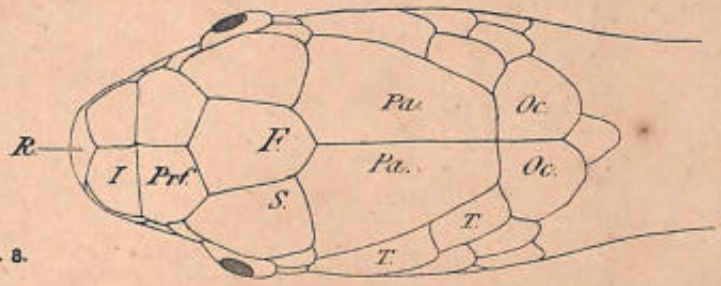


Fig. 8.

Naia bungarus (Enlarged from young specimen)

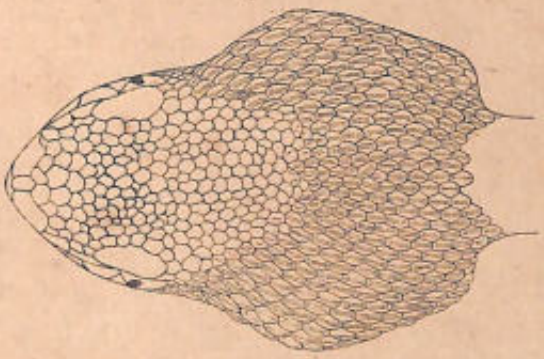


Fig. 9.

Trimeresurus gramineus (x 1½)

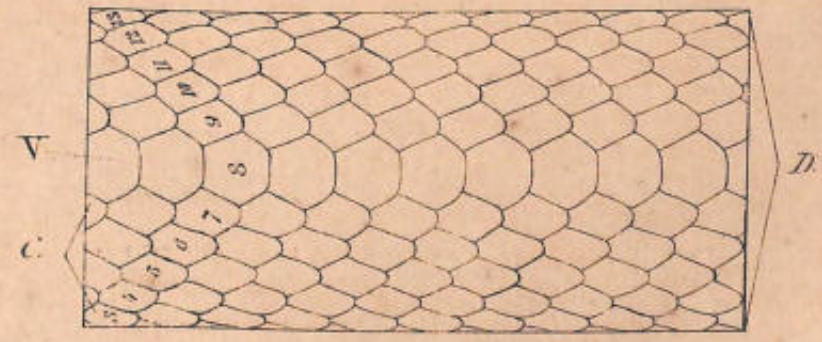


Fig. 10.

Bungarus caeruleus (x 2)

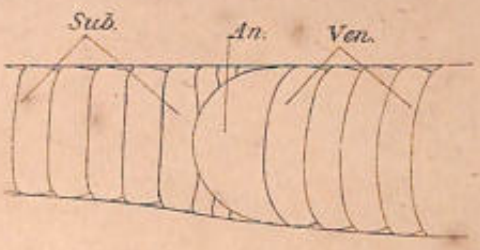


Fig. 11. Bungarus fasciatus (x 1)

Sub.....Subcaudals.
An.....Anal Ven.....Ventrals

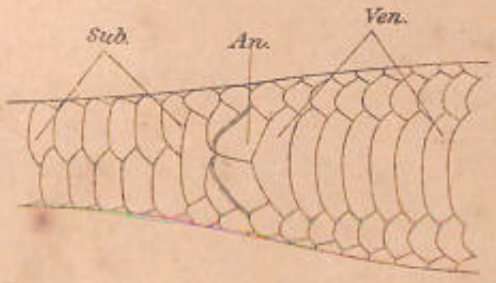


Fig. 12. Xenopeltis unicolor (x 1)

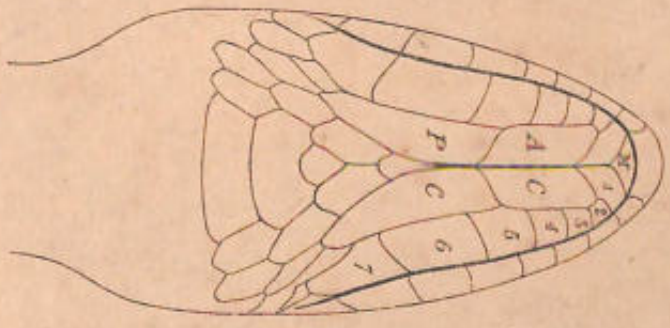


Fig. 13. Tropidonotus piscator (x 2)

A. c... Ant. chin shields
P. c... Post chin shields
M.....Mental
1-7.....Lower labials

loreal, whilst others have none, and in the same way whilst the majority of harmless snakes possess a loreal, many do not. It is a character, therefore, when taken by itself, of no weight in one direction or the other.

3. Other methods, such as shape of head, characteristic contour of body and peculiarities of tail, etc., which some affect to be able to judge by, are of still less value than the foregoing, and must lead many, except those of more than ordinary knowledge of the subject, into frequent mistakes.

4. A note of warning should here be offered to those who attempt to learn to recognise snakes solely by their colour and markings, for of all the methods employed this is perhaps the most faulty.

Fallacies.—(*a*) Even supposing the colour and markings were invariably the same in the same species, it is highly improbable that any ordinary man will carry away so perfect a mental picture of these, that they would be of any use to him, say six months later, when he happened to kill a somewhat similar specimen. (*b*) It happens, however, that the colour and markings vary considerably in different specimens of the same species. The young, in very many instances, are so different from the adult as to preclude the possibility from colour alone of being recognised. Even adult specimens are often so different that various colour varieties in many species have received special names. A snake before casting its slough is often very different in appearance from what it is after this process, when fresher and brighter hues and well defined marks replace dingy colouring and obscure markings. Colours alter and fade, some more than others, in spirit, and fresh specimens by comparison may appear very different. For the above reasons also even the best coloured plates are of very doubtful value, for though they may assist one very often, they undoubtedly mislead one at times.

It will be readily appreciated after the foregoing remarks that none of the usual rules made use of are trustworthy, and that this being so other methods must be sought if positive information is to be gathered, and the only methods that will yield satisfactory results, and permit of accurate conclusions being drawn, consists in a study of the arrangement and variations of the scales of different parts. By the aid of the appended outlines I hope to make this matter not only comprehensible

but easy. These methods have to commend them, firstly, the wonderful constancy of arrangement of scales in individuals of the same species ; secondly, the fact that reliable information can often be gathered from badly mutilated specimens, by careful ablution, and restitution of the parts, where other points, such as shape of head, presence of fang, etc., have been hopelessly crushed out of recognition ; thirdly, by pursuing this course, one is equally enabled to identify a snake from its slough alone, and acquaint oneself with the nature of the tenants of one's bungalow and compound which may happen to shed their skins there.

Before entering further on the discussion it would be as well to specify what snakes are here considered as poisonous and what harmless.

The 61 varieties of snakes that are included here as poisonous are all endowed with a perfect poison apparatus, *i. e.* (1) a gland in which poison is secreted and stored for use ; (2) a duct to convey the poison to the fang ; and (3) a fang situated in the front of the mouth furnished with either a canal or groove through which the poison gains access to the wound after penetration. Many of these snakes, it is true, even in their mature form, attain such small dimensions that a fatal issue is not likely to supervene from their bite in healthy adult man. In others the poison has a comparatively moderate virulence, causing, perhaps, slight or severe constitutional symptoms, but rarely or never death. Others are of such rarity that the effects of their poison on man are as yet little or unknown. One class of snakes which possess a poison apparatus, and which are endowed with a fang situated at the *back* of the mouth, and whose bite is known to be harmless to man, is for this reason excluded from the poisonous and incorporated with the harmless varieties.

Perhaps it will be as well to consider first the characters by which the commonest and most deadly of the poisonous snakes may be recognised, and I will begin with the cobra. The technical names of the scales hereafter mentioned will be easily understood by a reference to the appended figures.

Cobra—*Naia tripudians* (including the anocellate, monocellate and binocellate varieties).

The majority of people, I have no doubt, think the identification of a cobra an easy matter, but though it is usually easy to diagnose if

seen during life, it is sometimes a difficult matter, and this arises through basing one's opinions upon the presence of a hood, or one of the characteristic marks on the back of the hood (*viz.*, the spectacle in the binocellate variety, and the saturnine mark, *i.e.*, a black ellipse round an elliptical black spot, on the monocellate variety).

Fallacies.—These creep in in many ways. (*a*) During life the hood is seen in other snakes, *viz.*, in the Hamadryad, *Naia bungarus*, and in some harmless snakes. Most of these, however, can only dilate the neck to a moderate degree, but one in particular, *Pseudoxenodon macrops*, according to Günther, dilates its hood to such an extent as to simulate, and consequently be mistaken for, the cobra. (*b*) When a cobra is dead the hood collapses and the neck presents a contour similar to the rest of the body, and when the stiffness of *rigor mortis* has set in, it is difficult and often impossible to detect the hood at all. (*c*) The loose skin on snakes permits the neck being drawn out with ease in a lateral direction, and one may imagine a hood to exist where in reality none is present. (*d*) With regard to the characteristic marks on the back of the hood above referred to, though usually one or other is present, it is not unusual to find specimens with absolutely no mark at all and many with marks modified, and hence misleading. I have myself had ocular proof of these last three fallacies, which were demonstrated to me unwittingly by intelligent men who had been years in India. The only reliable means of recognising a cobra will be seen by referring to fig. 1, in which it will be noticed that the præ-ocular scale (Pr.) touches the inter-nasal (I). Compare fig. 1 with figs. 2, 3, 4 and 5. This little point will distinguish this snake from all other snakes but one, *viz.*, *Xylophis perroteti*, some specimens of which share this peculiarity. In *Xylophis*, however, there is only one pair of chin shields, in the cobra there are two (as in fig. 13).

Hamadryad—*Naia bungarus* vel *Ophiophagus elaps*, etc., etc.

This in its younger days might be easily confused with the monocellate variety of cobra, and the same fallacies mentioned under cobra are equally applicable here. The only certain test lies, in the presence behind the parietals, of a pair of large scales which are in contact with one another (see Oc. fig. 8). In almost all snakes small scales begin on the head immediately behind the parietals. One other snake is peculiar in having large scales behind the parietals, *viz.*, *Xenopeltis*

unicolor, but this can easily be distinguished by the parietal scales being quite separated, and not in contact as in the hamadryad (see Pa. fig. 8).

Kraits—(*Bungarus*).

There are at least six varieties of these poisonous snakes within our limits, but as all these possess common characters by which they may be separated from other snakes they had best be included together for our purpose.

Probably more confusion exists with regard to identifying kraits than over anything else. The characters as usually assigned to them by the general public, *viz.* (*a*) being small, and (*b*) killed in the bungalow, I need hardly remark are insufficient! In the first place, my longest common Indian krait (*Bungarus cæruleus*) was four feet two inches, and I have seen a skin measuring four feet six and-a-half inches, but though specimens approaching these lengths are not often met with, three feet and over is a common length. Almost any snake may come into the house at times, including tree snakes and water snakes.

The points which separate these snakes from everything else are the following:—

1. A row of enlarged, hexagonal scales down the middle of the back (see fig. 10).
2. * A single anal scale (see An. fig. 11, and compare with fig. 12).
3. † A round pupil (see figs. 1, 2 and 3, and compare with figs. 4 and 7.)

All these three things must co-exist in the same specimen.

Many are aware of the hexagonal row of median back scales (vertebrals) and still go wrong in their conclusions because they lose sight of the fact that these must be distinctly enlarged as compared with their adjacent back scales as well as being hexagonal. If this

* This scale, lying in front of the anus or vent, denotes the boundary between the body and the tail.

† In certain snakes notably "Bungares cæruleus" and "Lycodon aulicus", the iris is as black as the pupil and hence the shape of the pupil cannot be discerned. Where this is the case the head should be immersed in any alcoholic solution for an hour or two. This renders the lens opalescent and the shape of the pupil is then readily discovered.

sign is not present the snake cannot be a krait, if this is present it *may* be a krait; but since a few other snakes and harmless ones share this peculiarity, notably *Xenelaphis hexagonotus*, many *Dipsas*, some *Amblycephalus* together with *Dendrelaphis* and *Dendrophis*, signs Nos. 2 and 3 must co-exist to clinch the diagnosis.

Vipers—

Fallacies of methods in common use. (*a*) The characters frequently taken as a guide to differentiate these snakes and found in many books, *viz.*, triangular head, contracted neck, stout body, and short rapidly attenuating tail, must prove uncertain guides to those unfamiliar with these creatures. It is manifestly impossible for the ordinary man to appreciate what neck is considered contracted, what body stout, and what tail short, unless there are other specimens at hand with contrary peculiarities with which to compare any given specimen; (*b*) all these characters may be found either singly or conjointly in other snakes of a harmless kind, so that these guides must be considered as very unsatisfactory. Vipers may be divided into two classes. One of these the *Crotalinæ*, including twelve varieties, is very easy to recognise, because all the species are provided with an opening or pit in the side of the face between the eye and the nostril (see fig. 7).

These vipers from this peculiarity are called "Pit Vipers."

The second class, the *Viperinæ* or true vipers, includes at least four varieties, of which two are common. They are not quite so easy to distinguish as the last, but may readily be recognised by—

1. Absence of large scales on the head (see fig. 9, and compare with fig. 8).
2. Ventrals stretching right across the belly (see fig. 11, and compare with fig. 12).

In all the harmless snakes that have no large head scales *Eryx*, *Gongylophis*, etc., when laid on the back, a complete row or more, of scales will be evident on each side of the ventrals *simultaneously* (see fig. 12).

(*N.B.—Xenopeltis* is not one of these snakes, and this figure is only given to illustrate this particular point).

The two vipers that share these peculiarities which concern us at present are Russell's Viper *Vipera* vel *Daboia russellii*, etc., and the little Indian Viper *Echis carinata*.

These may be distinguished by the former having the scales beneath the tail (subcaudals) divided (as in fig. 12) and the latter undivided (as in fig. 11).

For the sake of completeness I have framed a key by which all the poisonous may be separated from all the harmless varieties, but care must be taken in employing this to take each point in the sequence therein laid down, or wrong conclusions will be arrived at, and it must be distinctly understood that this key will only hold good so far as the snakes of India and the limits referred to above are concerned.

A. Eye in a single shield (as in fig. 6.) ..... *Harmless.*

B. Eye surrounded by many shields (as in figs. 1, 2, 3, 4 and 7.) .....

a^1. Tails distinctly flattened.....

a^2. Head with large scales (*see* fig. 8.)... *Poisonous.*
Includes all the sea-snakes except one, 29 varieties .....

b^2. Head with small scales (*see* fig. 9) ... *Harmless.*
The only exception to the rule that sea-snakes are poisonous, *viz.*, *Chersydrus granulatus* .....

b^1. Tails round or nearly round .....

a^2. A pit in face between eye and nostril (as in fig. 7). Includes all the pit vipers, "Crotalinæ" 12 varieties. *Poisonous.*

b^2. No pit in face between eye and nostril. (*See* figs. 1, 2, etc.).....

a^3. No large scales on top of head (*see* fig. 9) .....

a^4. Ventrals broad (as in fig. 11). Includes the true vipers "Viperinæ" 4 varieties ..... *Poisonous.*

b^4. Ventrals, so narrow as to allow a complete row or more of scales to be seen on each side simultaneously when snake laid on back (*see* fig. 12). Includes the sand-snakes *Eryx* and *Gongylophis* ..... *Harmless.*

b^3. Large scales on head (as in fig. 8.)

a^4. 3 scales or more in a horizontal direction between eye and nostril (*see* figs. 3, 4 and 5). Includes a host of the commonest varieties and constitutes one of the most important rules. *Exception* 1, which for all practical purposes may be ignored, *viz.*, *Azemeops feæ*. Only one specimen has hitherto been recorded, and that from the Kachin Hills, Upper Burma.. *Harmless.*

b^4. Only two scales between the eye and the nostril (as in figs. 1 and 2) .....

a^5. Inter-nasals in contact with præ-oculars (as in fig. 1).

a^6. Scales 13.—Count the rows of scales from one side of the ventrals over the back to the other side in the middle of the body, *i.e.*, exclusive of tail (as shown in fig. 10.) ... *Harmless.*

b^6. Scales 19-23 (separates the cobra)..... *Poisonous.*

b^5. Vertebral row of scales enlarged and hexagonal, (*see* fig. 10), and round pupil (*see* fig. 1) includes the Kraits (*Bungarus*), 6 varieties *Poisonous.*

c^5. Two large scales in contact behind the parietals, and parietals also

	in contact (as in fig. 8) separates. Hamadryad (*Naia bungarus*)	*Poisonous.*
d^5.	Scales more than 13—count as before (as shown in fig. 10)	*Harmless.*
e^5.	Scales 13 only.....	
a^6.	2 pairs of chin shields (as in fig. 13 A. C. and P. C.).....	
a^7.	Round pupil (as in fig. 1). Includes the genera *Callophis* and *Adeniophis*	*Poisonous.*
b^7.	Vertical pupil (as in fig. 7, but not so pronounced, so look carefully) ...	*Harmless.*
b^6.	One pair of chin shields only (compare with fig. 13).....	*Harmless.*

Before closing these remarks I would point out that fright will produce symptoms so serious, and so closely resembling the toxic effects of snake poison that even medical men may find it impossible to say how far the condition of collapse is due to fright or poison, and therefore should the key lead one to the opinion that a harmless snake has inflicted a bite and serious symptoms supervene, it must not be taken that the key has misled. I have known several instances of this kind, in the most notable of which a man bitten by a *Tropidonotus piscator*, or common paddy field snake, at 7 a.m. on the morning of the 9th June, 1899, at Rangoon, shortly became moribund, and remained so till about 12 noon on the 10th June (17 hours). The snake was captured alive and identified by me, and the man as was to be expected, recovered.

HONGKONG, *4th November* 1900.

THE MOTHS OF INDIA.

SUPPLEMENTARY PAPER TO THE VOLUMES IN "THE FAUNA OF BRITISH INDIA."

SERIES II. PART V.

By Sir G. F. Hampson, Bart., F.Z.S., F.E.S.

(*Continued from page* 591, *Volume* XIII.)

Sub-family Nolinæ.

Key to the Genera.

A. Forewing with veins 7·8 stalked.
  a. Forewing with veins 9·10 absent.
    a^1. Hindwing with vein 5 from lower angle of cell ..... *Neonola.*
    b^1. Hindwing with vein 5 from well above angle of cell or middle of discocellulars.
      a^2. Forewing with veins 3·4 stalked ..... *Pisara.*
      b^2. Forewing with veins 3·4 from cell ..... *Celama.*
  b. Forewing with vein 9 absent; 10 stalked with 7·8.
    a^1. Hindwing with vein 4 absent.
      a^2. Forewing with vein 7 from 8 after 10... *Pœcilonola.*
      b^2. Forewing with vein 7 from 8 before 10 *Nola.*
    b^1. Hindwing with vein 4 present.
      a^2. Forewing with vein 7 from 8 after 10... *Melanographia.*
      b^2. Forewing with vein 7 from 8 before 10. *Dialithoptera.*
  c. Forewing with veins 9·10 present.
    a^1. Forewing with vein 10 stalked with 7·8·9 ... *Rœselia.*
    b^1. Forewing with vein 10 from the cell ..... *Zia.*

B. Forewing with veins 8·9 stalked, 7 from cell.
  a. Forewing with vein 10 absent ..... *Melaleucia.*
  b. Forewing with vein 10 from the cell ..... *Pexinola.*

Genus Neonola.

Type.

Neonola, Hmpsn., Cat. Lep. Phal. B. M., II. P. 4 (1900). *mesosticta.*

Proboscis fully developed; palpi porrect, extending about the length of head and thickly scaled above and below, the 3rd joint short; frons with projecting tuft of scales; antennæ of male ciliated, the basal joint with tuft of scales. Forewing with veins 3·4 stalked; 5 from angle; 6 from upper angle; 7·8 stalked; 9·10 absent; 11 free. Hindwing with veins 3 and 5 from angle of cell, 4 absent; 6·7 from upper angle; 8 from middle of cell.

Neonola mesosticta, Hmpsn., Cat. Lep. Phal. B. M., II. p. 4 (1900).

Grey, more or less suffused with white; head whitish. Forewing with brownish patch at base of costa bounded by a short dark antimedial line from costa; a tuft of dark scales at middle of cell with a line from it to inner margin, angled below the cell; a triangular brown spot on middle of costa with some dark scales on its inner edge and with a more or less prominent dark waved line from it to inner margin, angled on vein 2; the postmedial line waved from costa to vein 2 where it is obtusely angled, then oblique, a diffused patch of brownish suffusion beyond it from middle to apex; an irregularly dentate subterminal line. Hindwing whitish, suffused with fuscous, especially towards costa and apex.



Neonela mesosticta ♂ ⅔.

Habitat.—Sikhim, 7000'; Ceylon, Pattalam; Borneo, Sandakan; Pulo Laut. *Exp.* 16 mill.

Genus PISARA.

	Type.
Pisara, Wlk., Journ. Linn. Soc. Zool., VI., p. 117 (1862)	*opalina.*
Necla, Wlk., XXVII, p. 99 (1863).	

1519. PISARA OPALINA, Wlk., Journ. Linn. Soc. Zool., VI., p. 118 (1862); Swinh., Cat. Het. Mus. Oxon., p. 131, pl. 4, f. 14.



Pisara opalescens ♂ ⅔.

Necla cautoralis, Wlk., XXVII, p. 100 (1863).

Nolo basimicans, Hmpsn., Moths Ind., II., p. 139 (1894).

Habitat.—Burma; Borneo.

Genus CELAMA.

	Type.
Celama, Wlk., XXXII, p. 500 (1864)	*bifascialis.*
Aradrapha, Wlk., XXXIV, 1182 (1865).	
Epizeuctis, Meyr., Trans. Ent. Soc., 1889, p. 463.	
Deltapterum, Hmpsn., Moths Ind., II., p. 138 (1894).	

Sect. I. Antennæ of male pectinated.

A. (*Deltapterum*). Forewing of male with elongate foveal depression in cell; hindwing with fold on inner area containing a tuft of hair, the tornus produced to a point.

1518. CELAMA PEGUENSIS.

B. (*Epizeuctis*). Hindwing of male with patch of rough scales on underside at tourns.

1528. CELAMA INTERNELLA, Wlk., XXXII. (1864).

Rœselia pascua, Swinh., P. Z. S., 1885, p. 293, pl. 20, f. 6.

Habitat.—Natal ; Formosa ; Bhutan ; Calcutta ; Bombay ; Nilgiris ; Ceylon ; Borneo ; N. Guinea ; N. S. Wales. *Exp.* 16—18 mill.

C. (*Celama*). Wings of male normal.

a. Forewing with broad black medial band angled at middle and conjoined to a wedge-shaped patch on terminal area.

*a*¹. Forewing with the medial band arising from base of costa ..... 1532. *lativittata.*

*b*¹. Forewing with the medial band arising from costa near middle ..... 1534*c*. *tesselata.*

b. Forewing rufous from near base to the subterminal line ..... *rufa.*

c. Forewing with brown band on inner side of postmedial line ..... 1520. *tæniata.*

d. Forewing with erect medial band and no wedge-shaped patch on terminal area ... 1538. *encausta.*

e. Forewing without medial band.

*a*¹. Forewing with large oblique eliptical brownish antemedial and medial costal stigmata.

*a*². Forewing with black points on the postmedial line and prominent spot at vein 2.

*a*³. Forewing with the antemedial line angled on median nervure ..... 1530. *fasciata.*

*b*³. Forewing with the antemedial line angled below median nervure..... 1529. *tumulifera.*

*b*². Forewing without black points and spot on the postmedial line ..... *disticta.*

*b*¹. Forewing without large oblique brown antemedial and medial stigmata on costa.

*a*². Forewing with the antemedial line strongly defined by black..... 1526. *astigma.*

*b*². Forewing with the antemedial line not defined by black.

*a*³. Forewing with the small blackish tufts of raised scales in cell on antemedial line and at upper angle.

*a*⁴. Forewing with the postmedial line continuous ..... 1539. *cingalesa.*

*b*⁴. Forewing with the postmedial line double and punctiform ..... *duplicilinea.*

*b*³. Forewing without tufts of black scales in cell ..... *streptographia.*

1534*f*. *Celama rufa*, Hmpsn., Cat. Lep. Phal. B. M., II., p.8, pl. 18, f. 2 (1900).

♀. Head, thorax and abdomen white, palpi at sides, pectus, legs and abdomen tinged with rufous. Forewing white, rufous from near base to the subterminal line ; the tufts of scales very large and tipped with white ; some fuscous suffusion below cell on medial area ; a black point above the tuft at upper angle of cell ; the postmedial line white, erect, slightly excurved at middle ; the subterminal line trisinuate with some black in its upper sinus and large black patches in the two lower ; the terminal area white with some black at middle ; the cilia fuscous. Hindwing pale-fuscous, whitish towards base and costa.

Habitat.—Ceylon, Pundaloya (Green). *Exp.* 16 mill.

1520. CELAMA TÆNIATA, Snell., Tijd. v. Ent., xvii, p. 65, pl. 6, f. 1 (1874).

Nola candida, Butl. Ill. Het B. M. III. p. 9, pl. 43, f. 3 (1879).

Rœselia fragilis, Swinh., Trans. Ent. Soc., 1890, p. 184.

Sorocostia mesogona, Lucas., Proc. Linn. Soc., N. S. W. (2), iv, p. 1075 (1890).

Habitat.—Japan ; China ; Punjab ; Ceylon ; Burma ; N. S. Wales.

1538. CELAMA ENCAUSTA, Hmpsn., Cat. Lep. Phal. B. M., II., p.8, pl. 18, f. 3 (1900).

Rhynchopalpus fasciatus, Hmpsn., Moths Ind., II., p. 144 (nec. Wlk.).

Habitat.—Sikhim ; Naga Hills.

1530. CELAMA FASCIATA, Wlk., XXXV, 1903 (1866) ; Swinh., Cat. Het. Mus. Oxon, p. 99, pl. 4, f. 20.

Nola nigrifascia, Hmpsn., Moths Ind., II., p. 141.

Habitat.—Sikhim ; Nilgiris ; Ceylon ; Borneo ; Sula.

1530*a*. CELAMA DISTICTA, Hmpsn., Cat. Lep. Phal. B. M., II., p. 11. pl. 18, f. 5 (1900).

♂. Grey ; head and tegulæ white ; genital tufts ochreous. Forewing with oblique eliptical brown antemedial and medial stigmata on costa, the former with the oblique fuscous antemedial line from it to inner margin ; the postmedial line excurved from below costa to vein 2 on which it is angled inwards ; an irregularly sinuous subterminal line. Hindwing white, tinged with fuscous towards termen.

Habitat.—Bhutan, Ceylon. *Exp.* 16 mill.

1530*b*. CELAMA DUPLICILINEA, Hmpsn., Cat. Lep. Phal. B. M., II., p. 12, pl. 18, f. 8 (1900).

Grey ; head and thorax slightly irrorated with fuscous ; abdomen tinged with fuscous. Forewing slightly irrorated with fuscous and tinged with brown to the postmedial line ; a blackish antemedial line strongly angled on median nervure ; tufts of brown scales at middle and end of cell ; a double punctiform black postmedial line, excurved from below costa to vein 2 where it is angled inwards ; an irregularly sinuous subterminal line strongly

bent inwards to costa and with slight black streaks on it at the veins. Hindwing whitish, tinged with fuscous towards apex ; a discoidal point.

Habitat.—Sikhim, 7000′. *Exp.* 22 mill.

1530*c*. CELAMA STREPTOGRAPHIA, Hmpsn., Cat. Lep. Phal. B. M., II., p. 13, pl. 18, f. 10 (1900).

♂. Head whitish ; palpi and antennæ brown and fuscous ; thorax whitish ; tegulæ and meta-thorax brown irrorated with fuscous ; abdomen whitish. Forewing whitish, largely suffused with brown and irrorated with black ; the costal area brown to beyond middle ; a fine black line from vein 5 beyond the cell to origin of vein 2 where it is angled, then to inner margin ; an oblique postmedial series of black points bent outwards between veins 5 and 2 ; the terminal area suffused with fuscous except towards apex ; traces of an irregular subterminal line. Hindwing white tinged with brownish towards apex.

Habitat.—Ceylon, Puttalam. *Exp.* 14 mill.

Sect. II. (*Aradrapha*). Antennæ of male with fascicles of cilia.

A. Forewing with prominent blackish band or suffusion on inner side of postmedial line.

a. Forewing with antemedial dark wedge-shaped band from costa.

*a*¹. Forewing with the whole area between the ante- and postmedial bands filled in with fuscous ....1521. *erythrostigmata*.

*b*¹. Forewing with whitish area beyond the antemedial band .....1541. *lucidalis*.

b. Forewing without antemedial wedge-shaped band.

*a*¹. Forewing suffused with fuscous from base to the postmedial line..... *suffusa*.

*b*¹. Forewing with band of black suffusion before the postmedial line ..... *mesomelana*.

B. Forewing without prominent blackish band on inner side of postmedial line.

a. Forewing with large fan-shaped medial and postmedial tufts of scales .....1534*a*. *marginata*.

b. Forewing with the tufts of scales small.

*a*¹. Forewing with the tufts of scales at middle and end of cell placed at extremities of more or less distinct oblique costal spots.

*a*². Forewing with the antemedial line strongly defined by black.....1525. *angulata*.

*b*². Forewing with the antemedial line not strongly defined by black.

a^3. Forewing with the postmedial line entire ..... *fraterna.*

b^3. Forewing with the postmedial line punctiform.

a^4. Forewing with the postmedial line very oblique towards costa..... *cretacea.*

b^4. Forewing with the postmedial line slightly bent inwards to costa... *squalida.*

b^1. Forewing without oblique costal spots at middle and end of cell.

a^2. Forewing with the postmedial line strongly excurved from below costa to vein 3.

a^3. Forewing with the ground colour brownish.....1523. *sikkima.*

b^3. Forewing with the ground-colour white.. ..... *polia.*

b^2. Forewing with the postmedial line angled at middle..... *phaeochroa.*

1521. CELAMA ERYTHROSTIGMATA.

1541*a*. *Pisara mediozonata.*

Habitat.—Bhutan ; Naga Hills ; Borneo.

1541. CELAMA LUCIDALIS.

Nola dimidiata, Snell., Tijd. v. Ent., xvii, p. 66, pl. 6, f. 2 (1874).

Habitat.—Ceylon ; Borneo ; Java.

1520*b*. CELAMA SUFFUSA, Hmpsn., Cat. Lep. Phal. B. M., II. p. 18, pl. 18, f. 13 (1900).

Fuscous grey ; head and thorax irrorated with black ; palpi blackish at sides ; tuft on basal joint of antennæ black ; abdomen tinged with fuscous. Forewing strongly suffused with black to the postmedial line and irrorated with a few leaden scales, especially at end of cell ; slight tufts of scales near base and at middle and end of cell ; the postmedial line oblique from costa to vein 4, then strongly incurved ; the terminal area irrorated with black and brown and with traces of an irregularly waved subterminal line. Hindwing pale-fuscous.

Habitat.—Sikhim, 7000′. *Exp.* 18 mill.

1520*c*. CELAMA MESOMELANA, Hmpsn., Cat. Lep. Phal. B. M., II. p. 19, pl. 18, f. 14 (1900).

♂. Head and tegulæ white ; thorax and abdomen brownish-white. Forewing brownish-white ; a medial black band suffused with silvery leaden-grey scales, bounded by the ante and postmedial waved lines, the former angled in cell, the latter bent outwards from below costa to vein 3, traversed by a waved medial black line and with tufts of scales on it at middle and end of

cell ; an irregularly sinuous subterminal fuscous line ; termen brown expanding towards apex and with some white spots on it. Hindwing white with fuscous discoidal spot.

Habitat.—Sikhim. *Exp.* 20 mill.

1525*a*. CELAMA FRATERNA, Moore, P. Z. S. 1898, p. 393.

Sorocostia desmoter, Turner, Trans. R. Soc. S. Austi, 1899, p. 15.

Hab. Simla ; Kulu ; Kangra ; Ceylon ; Queensland. *Exp.* 14-16, mill.

1525*b*. CELAMA CRETACEA, Hmpsn, A. M. N. H. (7), viii. p. 177 (1901).

♀ White tinged with reddish brown ; palpi rufous at sides ; tarsi banded with rufous. Forewing with the costal edge towards base and some spots on costa rufous ; the tufts of scales rufous ; a fine dark antemedial line, angled outwards to the tuft in middle of cell, then sinuous ; the postmedial line punctiform, bent outwards below costa, acutely angled outwards at vein 4, then strongly incurved ; an indistinct irregular subterminal line, angled outwards at vein 6 and excurved at middle. Hindwing white slightly tinged with brown towards termen. *Hab.* Bombay. *Exp.* 14 mill.

1531. CALAMA SQUALIDA. Stand. Bqrl. Ent. Leit. XIV. p. 102 (1870), Mill Scar Lep. III. p. 407, pl. 150, ft. 15-16.

Nola pumila, Snell., Tijd. v. Ent., xvii, p. 68, pl. 6, f. 4 (1874).

Nola musculalis, Saalm, Ber., Senete, Gis., 1879, p. 261, (1880), id. Lep. Madag. I. p. 171, pl. 6, f. 85.

Nola spreta, Butl., P. Z. S., 1880, p. 671.

Sorocostia tetrophthalma, Meyr., Trans. Ent. Soc., 1889, p. 463.

Nola minuta, Hmpsn., M. Het. B. M., viii, p. 48, pl. 139, f. 14 (1891).

Nola van hasseltii, Heyl. C. R., Soc. Ent. Belge. XXXVI., p. 44 (1892).

Nola ceylonica, Hmpsn, Ill., Het. IX. p. 88, pl. 158, f. 13 (1893), id. Moths. Ind., II., p. 141.

Nola hampsoni, Kirby, Cat. Het., p. 376 (1893).

Habitat.—Spain ; Syria ; W. Africa ; Madagascar ; Japan ; Shanghai ; Formosa ; Sikhim ; Khasis ; Bombay ; Nilgiris ; Burma ; Borneo ; Celebes ; N. Guinea ; Australia ; Tonga.

1523. CELAMA SIKKIMA, Moore, Lep. Atk., p. 287.

Nola confusalis, Hmpsn, Moths. Ind., II., p. 140 (nec. H. S.)

1523*a*. CELAMA POLIA, Hmpsn., Cat. Lep. Phal. B. M., II., p. 28, pl. 18, f. 22 (1900).

Greyish white ; palpi tinged with fuscous at sides ; tarsi ringed with fuscous. Forewing irrorated with pale-fuscous ; some black points on costa ; small tufts of fuscous scales at middle and end of cell ; a punctiform black postmedial line strongly bent outwards from below costa to vein 3, then incurved and with traces of a line parallel to its inner edge ; an irregular subterminal line angled outwards below apex and at middle ; obscure fuscous spots on termen and cilia. Hindwing white, tinged with fuscous towards apex ; a discoidal point.

Habitat.—Sikhim, 7,000′. *Exp.* 18-20 mill.

1523*b*. CELAMA PHÆOCHROA, Hmpsn., Cat. Lep. Phal. B. M., II., p. 29, pl. 18, f. 24 (1900).

♀. Grey; head and thorax strongly irrorated with fuscous; abdomen banded with fuscous. Forewing irrorated with fuscous; a diffused blackish patch at base of costa; small tufts of blackish scales near base and at middle and upper angle of cell; an oblique antemedial series of black points arising from a blackish patch at middle of costa; then oblique and ending in a blackish patch on inner margin connected with a patch on costa by some obscure points; an irregularly sinuous subterminal line with slight dark streaks on it at the veins; a terminal series of black points. Hindwing white tinged with fuscous towards apex.

One specimen is more evenly suffused with fuscous.

Habitat—Sikhim, 7,000′; Java, Mt. Arjuno. *Exp.* 21-23 mill.

Genus NOLA.

Type.

Nola, Leach, Edinb. Encycl., IX., p. 135 (1815)..... *cucullatella.*
Dimona, Wlk., XV., 1650 (1858) ..... *porrigens.*
Selca, Wlk., XXXIV., 1218 (1865) ..... *latifascialis.*
Tribunta, Wlk., XXXIV., 1506 (1865) ..... *scabralis.*
Rhynchopalpus, Hmpsn., Moths Ind., II., p. 142 (1894)..... *argentalis.*

Sect. I. (*Selca*). Antennæ of male bipectinate with long branches, simple towards apex.

A. Forewing with the ground colour red-brown strongly suffused with fuscous to middle. 1534*e*. *tenebrosa.*

B. Forewing with the ground colour greyish.

a. Forewing suffused with red-brown to the postmedial line; black streaks on veins and an oblique fascia above inner margin. *laxoscia.*

b. Forewing with reddish-brown suffusion before the postmedial line and on termen ..... 1537. *brunella.*

c. Forewing without red-brown suffusion.

a^1. Forewing with the ante and postmedial lines represented by prominent oblique series of black spots .....1524*a* *punctilineata.*

b^1. Forewing with the lines continuous or punctiform.

a^2. Forewing with blackish subbasal and medial patches on costa.

a^3. Forewing with the blackish patches subquadrate, large.

a^4. Ground-colour dark fuscous grey ..... *phœa.*

b^1. Ground-colour without grey.

a^5. Forewing with the postmedial line continuous, dentate. *Exp.* 36 mm. 1535 *argentalis.*

b^5. Forewing with the postmedial line punctiform. *Exp.* 24 mm. ..... *melanota.*

b^2. Forewing with the blackish patches subtriangular, smaller.

a^4. Forewing without black spot on inner margin at postmedial line .... 1533. *distributa.*

b^4. Forewing with black spot on inner margin at postmedial line ..... *tristicta.*

b^3. Forewing without blackish patches on costa ..... 1534*b*. *microphasma.*

1534*b*. NOLA LOXOSCIA, Hmpsn., Cat. Lep. Phal. B. M., II. p. 33, pl., 18, f. 33 (1900).

Head and thorax pale reddish-brown; palpi blackish at sides; tegulæ and metathorax with black bands; metathorax with black patch; abdomen fuscous with dark dorsal tuft at base. Forewing pale suffused with red-brown to the postmedial line; small tufts of scales near base and at middle and end of cell; the subcostal and median nervures and bases of veins 3·4 streaked with black; an oblique black shade from vein 2 to inner margin before middle; the postmedial line reduced to a curved series of black points; an interrupted irregularly sinuous subterminal line strongly retracted to costa; the termen rufous. Hindwing whitish suffused with fuscous towards termen, especially in female.

Habitat.—Sikhim, 7000′. *Exp.* 22 mill.

1533*a*. NOLA PHŒA, Hmpsn., Cat. Lep. Phal. B. M., II., p. 35, pl. XIX. f. 2 (1900).

♀ Greyish fuscous irrorated with black. Forewing with blackish patch at base of costa; traces of a curved antemedial line; are ill-defined subtriangular blackish patch on middle of costa; an indistinct oblique postmedial line, dentate between veins 5 and 2; traces of a sinuous subterminal line.

Habitat.—China, Ichang; N. W. Himalayas, Kulu. *Exp.* 20-24 mill.

1535*a*. NOLA MELANOTA, Hmpsn., Cat. Lep. Phal. B. M., II., p. 35, pl. 19, f. 3 (1900).

Head and thorax white, palpi blackish at sides, meso- and meta-thorax with black patches; abodmen tinged with fuscous. Forewing greyish-white irrorated with some silvery scales, the medial area tinged with brown; small tufts of black scales near base and at middle and upper angle of cell; large blackish patches on costa near base and at middle and on inner margin at the postmedial line; a minutely dentate antemedial black line angled inwards on vein 1; the postmedial line punctiform, curved, angled inwards on submedian fold, then with obscure line parallel to its inner edge; an

indistinct irregularly sinuous subterminal line with some slight black streak, on the veins at middle ; termen suffused with fuscous with a series of black points ; some fuscous spots on cilia. Hindwing white, tinged with fuscous towards termen, especially in female.

Habitat.—Sikhim, 7000′ ; Khasis. *Exp.* 22-24 mill.

1533. NOLA DISTRIBUTA, Wlk., Journ. Linn. Soc. Zool., vi, p. 113 (1862).

Nola major, Hmpsn., M. Het. B. M., viii, p. 48, pl. 139, 13 (1891).

Habitat.—Shanghai ; Sikhim ; Bhutan ; Calcutta ; Canara ; Nilgiris ; Burma ; Borneo ; Bali.

1533*a*. NOLA TRISTICTA, Hmpsn., Cat. Lep. Phal. B. M., II., p. 37, pl. 19, f. 4 (1900).

White ; palpi black at sides ; thorax, legs, and abdomen slightly tinged with fuscous. Forewing slightly irrorated with fuscous ; small tufts of scales near base and in and beyond upper angle of cell ; a prominent black streak at base of costa and spot at middle ; faint traces of an antemedial line ; the postmedial line reduced to points, slightly curved from costa to vein 3, then oblique and with prominent black spots on inner margin ; a very indistinct sinuous postmedial line with short black streaks on the veins ; a terminal series of black points. Hindwing slightly tinged with fuscous towards termen, more strongly in female.

Habitat.—Sikhim, 7000′ ; Khásis. *Exp.* 18-20 mill.

Sect. II. (NOLA) Antenna of male bipectinate to apex with fine short branches ..... 1540*b*. *fuscibasalis*.

Sect. III. Antennæ of male ciliated.

A. Forewing of male with the cell very short, the lower angle produced and the discocellulars approximated to veins 3-4-5 for some distance..... 1520*a*. *laticincta*.

B. (*Dimona*). Forewing with the cell normal.

a. Forewing with oblique fuscous bar from costa before the postmedial line ..... 1534*d*. *nigrisparsa*.

b. Forewing without oblique bar from costa before the postmedial line ..... 1524. *grisalis*.

Genus PŒCILONOLA. *Type*.

Pœcilonola, Hmpsn., Cat. Lep. Phal. B. M., II., p. 47 (1900). *plagiola*.

Proboscis fully developed ; palpi obliquely upturned, the 2nd joint moderately scaled, the 3rd minute ; frons with tuft of scales ; antennæ of male ciliated, the basal joint with tuft of scales ; tibiæ with the spurs long. Forewing short and broad ; vein 3 from before angle of cell ; 5 from well above angle ; 6 from below upper angle ; 7-8 stalked from 10 ;



Pœcilonola plagiola ♂ ♀.

9 absent ; 11 oblique. Hindwing with vein 3 from angle of cell ; 4 absent ; 5 from near middle of discocellulars ; 6·7 shortly stalked ; 8 from middle of cell.

A. Forewing with the basal half white.
  a. Forewing without medial black patch on costa ..... 1541*b*. *seminigra*.
  b. Forewing with medial black patch on costa *chionobasis*.
B. Forewing with the inner area white tinged with orange ..... *ochritincta*.
C. Forewing brown with white patches at base of inner area and before the postmedial line ..... 1550*a*. *plagiola*.

1541*c*. PŒCILONOLA CHIONOBASIS, Hmpsn., A. M. N. H. (7) viii p. 178 (1900).

♂ Palpi and pons black, vertex of head and thorax pure white, the antennæ towards tips and a patch on metathorax fuscous ; pectus, legs, and abdomen tinged with fuscous, tarsi mixed with white. Forewing pure white, a large triangular black patch on middle of costa with a few silvery scales on it, its apex extending to median nervure, its outer edge strongly indented ; the terminal area fuscous black, its inner edge waved and angled inwards to cell at vein 3 ; a subterminal irregular series of black marks. Hindwing with the basal half white, the terminal half fuscous.

Habitat.—Kangra Valley, 4500′. *Exp*. 14 mill.

1541*d*. PŒCILONOLA OCHRITINCTA, Hmpsn., A. M. N. H. (7) viii, p. 178 (1901).

♂ Head, thorax and abdomen white ; palpi, antennæ and legs fuscous. Forewing with the basal area white tinged with ochreous, its outer edge oblique from costa before middle to tornus ; short dark streaks on and below vein 1 just beyond middle, the apical half greyish fuscous with a diffused whitish patch extending from apex to discocellulars ; some minute white specks on apical half of costa ; an obscure irregularly trisinuate subterminal whitish line with some rufous on its inner side and a tuft of black scales below vein 3. Hindwing white tinged with fuscous.

Habitat.—Ceylon, Haputale. *Exp*. 16 mill.

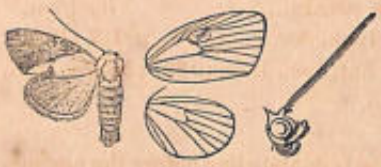
Genus MELANOGRAPHIA. *Type*.

Melanographia, Hmpsn., Cat. Lep. Phal. B. M., II., p. 48 (1900). *flexilineata*. Proboscis fully developed ; palpi obliquely upturned, the 2nd joint moderately scaled, the 3rd moderate ; antennæ of male ciliated ; tibiæ with the spurs long. Forewing with vein 5 from well above angle of cell ; 6 from below upper angle ; 7·8 and 10 stalked ; 9 absent ; 7 from 8 after 10 ; 11 oblique Hindwing with veins 3·4 stalked ; 5 from near middle of discocellulars ; 6·7 from upper angle ; 8 from middle of cell.

Sect. I. Frons and basal joint of antennæ with tufts of scales ; forewing with vein 3 from angle of cell approximated to vein 4 for some distance ; a large fovea at upper angle of cell on underside with a clubbed

corneous process in it from veins 7·8, which are much curved round the fovea at base.

1534. *h.* MELANOGRAPHIA TYMPANISTIS, Hmpsn., Cat. Lep. Phal. B. M., II., p. 49 (1900). Dudgeon, J. Bomb. N.H. Soc. 1899, pl. II. f. 22



Melanographia tympanistis ♂ ⅔.

♂. Head and thorax white ; palpi and lower part of frons deep-black ; legs black, grey, and white ; abdomen fuscous with segmental white lines. Forewing white from costa near base to tornus ; the apical half brown irrorated with black with tufts of leaden scales on its inner edge ; some tufts of black and leaden scales on costal area above end of cell ; a small triangular blackish patch on inner margin beyond middle ; some dark marks forming traces of an irregular postmedial line ; a subtermenial line retracted to costa, angled at veins 6 and 4, and obsolete towards inner margin. Hindwing fuscous, the inner area whitish.

Habitat—Sikhim, 1800'. *Exp.* 20 mill.

Sect II. Frons smooth ; antennæ without tuft on basal joint ; forewing with veins 3 from near angle of cell ..... 1534*f. flexilineata.*

Genus DIALITHOPTERA.

Type.

Dialithoptera, Hmpsn., Cat. Lep. Phal. B.M., II. p. 56 (1900). ..... 1545*b. gemmata.*

Proboscis fully developed ; palpi oblique, extending about the length of head, the 2nd joint roughly scaled above and below, the 3rd minute ; frons with tuft of scales ; antennæ bipectinate in both sexes, the apical fourth serrate, the basal joint with tuft of scales ; tibiæ with the spurs long. Forewing with vein 3 from close to angle of cell ; 5 from just above angle ; 6 from below upper angle ; 7·8 and 10 stalked ; 9 absent ; male with a fovea covered on upperside by a scale flap above base of vein 10 ; 11 oblique. Hindwing with veins 3·4 stalked from angle of cell ; 5 from near middle of discocellulars ; 6·7 from upper angle ; 8 from middle of cell.



Dialithoptera gemmata ♂ ⅔.

Genus RŒSELIA.

Type.

Rœselia, Hübn., Verz, p. 397 (1827) ..... *togatulalis.*
Sarbena, Wlk., Journ. Linn. Soc. Zool, VI., p. 137 (1862) . *lignifera.*
Mimerastria, Butl., A. M. N. H. (5), VII., p. 236 (1881) ..... *mandschuriana*
Callinola, Butl., Ill. Het., VII., p. 33 (1889) ..... *scripta.*
Proneca, Swinh., Trans. Ent. Soc., 1890, p. 193..... *fola.*
Cyphotopsyche, Hmpsn., Trans.Ent. Soc., 1895, p. 297..... *lignifera.*

Sect. I. Antennæ of male bipectinate, the apical fourth serrate.
(*A. Sarbena*). Tegulæ held projecting forwards so as to form a hood over head

a. Forewing with oblique dark fascia from termen below apex, widening to inner margin. 1545*b*. *fola*.

b. Forewing with longitudinal dark streaks..... *lignifera*.

1545*b*. RŒSELIA LIGNIFERA, Wlk., Journ. Linn. Soc. Zool., VI., p. 137 (1862). *Cyphotopsyche ustipennis*, Hmpsn., Trans. Ent. Soc., 1895, p. 297; Moths. Ind., IV., p. 506. Bhutan; Ceylon; Borneo.

B. (*Rœselia*). Tegulæ normal.

a. Forewing with a prominent irregularly dentate line before the postmedial line.

a^1. Forewing with the postmedial line double, angled inwards on vein 2... .....1546. *scripta*.

b^1. Forewing with the postmedial line single.

a^2. Forewing with the postmedial line angled inwards on vein 2 .....1547. *strigivena*.

b^2. Forewing with the postmedial line almost straight .... *triangulalis*.

b. Forewing without prominent dentate line before the postmedial line.

a^1. Forewing with the ground colour silvery-white

a^2. Forewing with prominent black spot below middle of cell..... .....1544. *argyria*.

b^2. Forewing without prominent black spot below middle of cell.

a^3. Forewing with the terminal area tinged with rufous, the subterminal line connected with the termen by streaks below apex and at middle.....1549. *nitida*.

b^3. Forewing with no rufous tinge on terminal area, the subterminal line not connected with termen .....1540*a*. *argentescens*.

b^1. Forewing with the ground colour not silvery.

a^2. Forewing with the apical half bright-rufous .....1545. *semirufa*.

b^2. Forewing with triangular rufous patch from costa to lower angle of cell .....1547*a*. *cuneifera*.

c^2. Forewing without rufous patch on middle of costa.

a^3. Forewing with the basal area yellowish, the terminal area rufous except at costa..... ..... *flav basis.*

b^3. Forewing with the basal area not yellowish, the terminal area not rufous.

a^4. Forewing with the whole medial area suffused with black .....1522. *denticulata.*

b^4. Forewing with the medial area not suffused with black.

a^5. Forewing without fuscous fascia from cell to termen.....1550. *indistincta.*

b^5. Forewing with fuscous fascia from cell to termen.....1548. *ascripta.*

1547*b*. RŒSELIA TRIANGULALIS, Leech., P. Z. S., 1888, p. 608, pl. 31, f. 12.

Grey; head and thorax largely mixed with black; abdomen tinged with fuscous. Forewing irrorated with fuscous; large tufts of scales near base and at middle and upper angle of cell; a blackish patch at base of costa; a large blackish triangular medial patch on costa with its apex on vein 2; the post-medial line straight except that it is very slightly angled at vein 4, a fine line on its inner side, sinuous from costa to vein 3, then highly dentate; a subterminal line retracted to costa, angled at veins 6 and 3 and bent outwards to tornus; a terminal series of black points. Hindwing fuscous; vein 4 stalked with 3.

Habitat.—Japan; Sikhim; Khasis. *Exp.* 22 mill.

1547*a*. RŒSELIA CUNEIFERA, Wlk., xxxii., 338, Swinh., Cat. Het. Mus., Oxon., p. 132, pl. 4, f. 22.

Selca ruficostata, Hmpsn., Moths Ind., IV., p. 507.

Habitat.—Sikhim; Bhutan; Borneo.

1522*a*. RŒSELIA FLAVIBASIS, Hmpsn., Cat. Lep. Phal. B. M., II., p. 63, pl. 20, f. 3 (1900).

♂. Head and thorax white irrorated with a few black scales; palpi at sides and antennæ brown; tegulæ with blackish band; abdomen brownish. Forewing white irrorated with black scales and tinged with pale yellow towards base; the tufts of scales small; costa rufous; the antemedial line represented by an oblique striga on costa and a very oblique fine black line from cell to inner margin with some diffused rufous between it; a very oblique post-medial dentate series of black marks on the veins; the terminal area broadly rufous except at costa and traversed by a sinuous black subterminal line obsolete towards inner margin. Hindwing brownish; vein 4 stalked with 3; palpi about twice length of head.

Habitat.—Ceylon; Colombo. *Exp.* 22 mill.

Sect. II. (*Mimeresia*). Antennæ of male ciliated...1539*a*. *discisignata.*

Genus ZIA.

Type.

Zia, Wlk, xxvii. 109 (1863) nec. Kock, Crust, (1834) non descr. *tactalis.*
Aquita, Wlk. xxvii. 200 (1863) ..... *tactalis.*

Proboscis well developed; palpi porrect, projecting about the length of head, the 2nd joint roughly scaled above and below; frons with tuft of scales; antennæ of male fasciculate; the basal joint without tuft of scales; tibiæ with the spurs long. Forewing short and broad; vein 3 from before angle of cell; 5 from above angle; 6 from below upper angle; 7-8-9 stalked; 10-11 from cell. Hindwing with veins 3-4 stalked; 5 from just above angle of cell or near middle of dicocellulars; 6-7 from upper angle; 8 from middle of cell.

A. Forewing with dark triangular patch on costa from base to end of cell.....1540. *acontioides.*
B. Forewing with dark triangular patch from medial part of costa to below angle of cell...1543. *laminata*
C. Forewing without dark patches; grey with a lunulate black spot at upper angle of cell ...1534*g*. *lunisigna.*

1543. ZIA LAMINATA (♀) = 1542 *rufescens* (♂).

Genus MELALEUCIA.

Type.

Melaleucia, Hmpsn., Cat. Lep. Phal. B. M., II., p. 78, (1900). 1532*a*. *obliquifasciata*. Proboscis well developed; palpi oblique, projecting about the length of head, the 2nd joint roughly scaled above and below, the 3rd naked acuminate; frons smooth; antennæ of female simple, the basal joint not tufted; tibiæ with the spurs well developed. Forewing with vein 3 from before angle of cell; 4-5 from angle; 6 from below upper angle; 7 from angle; 8-9 stalked from before angle; 10 absent; 11 oblique. Hindwing with vein 3 from angle of cell; 4 absent; 5 from middle of discocellulars; 6-7 stalked, or from middle of cell.



Melaleucia obliquifasciata ♀ ¾.

THE FERNS OF NORTH-WESTERN INDIA.

Including AFGHANISTAN, the TRANS-INDUS PROTECTED STATES and KASHMIR arranged and named on the basis of Hooker and Baker's *Synopsis Filicum*, and other works, with New Species added.

BY C. W. HOPE.

(*Continued from Volume XIII, page* 671.)

PART III.—THE GENERAL LIST—(*continued*).

20. *A.* **macrocarpum**, Blume; Syn. Fil. 227 and 489; C. R. 488. *Athyrium macrocarpum* Bl., Bedd. H. B. 165.

PUNJAB:—*Chamba*: Chatri Forest 7000', McDonell.; 5-9000', J. Marten; *Simla Reg.*—"Syree" Edgew; Simla 55-7000', seven stations, Gamble, Bliss, Blanf., Trotter; Bhajji State, Bliss.

N.-W. P.: *D. D. Dist.*—Sowárna Nála 4-5000', Mackinnons; *Brit. Garh*—above Guinji 9000', Duthie (once); *Kumaun*—Binsar and Pindar 7-7500', Strachey; near Naini Tal, Hope 1861; Gori Valley 7-8000', Duthie 1884; Dhankuri Pass, Trotter 1891; Shama 8000', Gori Ganga Valley 8,000'—11,000', Rachpula Pass, 6750' MacLeod 1893.

DISTRIB.—*Asia*: N Ind. (Him.).—Sikkim and Bhotan 2-9000', very common; Assam—Khassi Hills 2-6000', very common. S. Ind.—"very common on the W. Mts. above 3000'" (*Beddome*). Ceylon, Burma, Malay Penins, and Isles. N. China—Shantung *Dr. Maingay*. Japan.

Beddome and Clarke do not mention this species as being found to the westward of Garhwál. Some of the Simla and Kumaun specimens have been ticketed *var. Atkinsoni*, Clarke, and being small and sharply cut look distinct; but there are intermediate forms of all sizes and textures. MacLeod's specimens from the Rachpula Pass, Kumaun, are large, tripinnate, stiff, with very little lamina in the frond: possibly they are *A. foliosum*, Wall. (No. 32, *infra*), with sori larger than usual. Blanford says of the type, at Simla—"very rare, I have never met with it myself. But it was collected last year by a Simla resident a little below the Simla bazar, I believe, about 7000', or rather lower." And of *var. Atkinsoni* he says—"also very rare. I have found it only at the Chadwick Falls at 5820 ft., and not at all during the last two or three years." In 1886 Mr. Bliss gave me a specimen collected by himself in Simla: this habitat was new to Mr. Blanford. Mr. Bliss's diligence since then has proved that *A. macrocarpum* is to be found in several places all over Simla. Much of the N.-W. Indian material is very simply cut and membranous, and looks very different from the stiffer and more compound N.-E. Indian plant; but the sori are always much the same. Clarke's variety 1-*pinnata*, from Assam, I should make a separate species.

21. **A. nigripes** Bl. MSS., *Aspidium nigripes* Bl. Enum., p. 162. *Aspl. nigripes* Mett., in Miquel's Annales, Vol. II., 240, and Vol. IV., 169; Syn. Fil. 227; Cl. Rev. 490. *Athyrium nigripes* Mett., Bedd. H. B. 166.

Blume's description, at p. 162 of his "Enumeratio," is as follows:—

"A. fronde bipinnata membranacea glabri-scula, pinnis petiolatis oblongo-lanceolatis acutis, pinnulis subdecurrentibus cuneato-oblongis obtusiusculis, infimis sub-petiolatis profunde pannatifid, is superioribus inciso-serratis confluentibus, soris costulis approximatis, rachi glaberrima stipite trigono inferne paleaceo nigro."

"Crescit in paludibus inter mortes Burangrang et Tankuwan—Prahu Javæ insulæ."

Mattenius, after giving the reference to Blume's "Enumeratio," says:—

"*Folia* cum petiolo basi præsertim dense paleato quadripedalia; *pinnæ* inferiores 8 poll. longæ, *pinnulæ* infimæ 2-3 poll., pinnatifidæ, segmentis ovalibus serrato-pinnatifidis. Prostat lusus *foliis* tri nec quadri-pinnatis oblongioribus augustioribus, pinnularum segmentis ovalibus, mucronato-denticulatis *Allantodia paludosa* (Zipp.)"

The type specimen in the Kew Herbarium, which has Blume's ticket—Herb. Lugd. Batav. *Asplenium nigripes*, Java, Blume,"—is a small plant with erect black or dark-brown candex, black roots, and bases of stipes clothed with small brown scales: it has 8 fronds, with stipes 6-7 in. long, as long as or longer than the fronds, straw-coloured, and naked except at base, bipinnate, pinnæ few, secondary rhachises winged, lowest pinnæ as long as any but frond not deltoid, pinnæ not acuminate, pinnules narrowest at base, blunt, rounded, very setulose.

Some specimens from the Khasi Hills in Assam, 4-5000′, from Clarke and Mann, agree with Blume's type specimen, and are also somewhat like my next species, especially in having *setæ* on the upper side of the costa; but they have much longer stipes than *A. tenellum* has, and the pinnæ are short and not much acuminate. Mr. Mann has named one of these *A. solenopteris* Kze., but except for having more lamina it is identical with another he has named *A. nigripes* Mett. and some high-level plants got in Sikkim, for which Mr. Clarke has (in MSS) suggested a variety name, *alpina*, may be the type plant. But the bulk of the material in herbaria from the north-east and south of India as well as from the north-west, ticketed *A. nigripes*, is quite different from Blume's plant. The type plant has not been got west of Nepál, that I know of. Most of the N.-W. India specimens I originally had in my *A. nigripes* wrapper I have removed to *A. Mackinnoni*, Hope; and only five remain, of which only one, from Kumaun, somewhat bears out Blume's name and description by

having very dark-coloured scales which extend some inches up the stipe; but the rhachis and costa are not setulose, and there are other material differences. These five N.-W. Indian specimens agree generally with the bulk of material in herbaria which is named *A. nigripes*, but which seems to me not to belong to Blume's plant; and I leave them here only to keep a place open for the species which has yet to be described and named. I cannot find a place for them under any other named species. They are—

1. PUNJAB: *Hazára Dist.*—Changlagali 7500', Trotter No. 547, 1890.
2. KASHMIR: Gulmarg 75-8000', Trotter 1888.
3. & 4. PUNJAB: *Chamba*, McDonell? *Simla Region*—ridge east from Simla. 8300', Hope 1886.
5. N.-W. P: *Kumaun*—Gori Ganga Valley—Bugdiar 10500', MacLeod 1893.

22. **A. tenellum**, n. sp. *Allantodia tenella*, Wall. in Herb. 1821, under *Asplenium tenuifrons*, Wall. Cat. No. 206. Plate IV. (See Part II., p. 529.)

23. **A. tenuifrons**, Wall. Cat. 206. *A. tenuifrons*, Wall, Blanford in Journ. Asiat. Soc., Bengal, 1888. *A. Filix femina*, Bernh., Syn. Fil. 227. *A. Clarkei*, W. S. Atkinson, MS., Cl. Rev. 489. *A. nigripes*, Mett., *var.* β *Clarkei*, Bedd., Bedd. H. B. 166. *A. nigripes*, Mett., *var. tenuifrons*, Wall., Bedd. Suppt. H. B. 33. Plate XXII.

The following is Beddome's description of this fern, given in the Supplement to his Handbook. Except in two particulars—"very like the type", and—"not rooting at the apex"—it applies to the plants I call *A. tenuifrons*, which are the same as Wallich's tpye specimens in the Linnean Society's Herbarium:—

> "Very like the type" (*A. nigripes*) "but fronds gradually attenuated towards the base, intermediate between the type and *Clarkei*, not nearly so narrow or elongated as the latter, and not rooting at the apex; the channelled secondary rhachis, the channelled midrib of the pinnæ" (pinnules?), "and sometimes the veins furnished with weak *setæ* on the upper surface, as in the type and in Clarkei (which distinguishes this species easily from some of the varieties of *Filix-femina*). Referred in the synopsis to *Filix-femina*, and by Clarke as a synonym of *Clarkei*. Considered as a species by some pteridologists."

PANJAB: *Chamba*.—Kalatop Forest 6000', McDonell; *Kullu* 6-7000', Trotter; *Simla Region*—Simla 7000', Hope 1871 and 1886, at the same station; Gamble 6000', 1878; 55-6000', Blanford 1886; Trotter 1887; Bliss 1890-92.

N.-W. P.: *D. D. Dist.*—Jaunsar 5-8000, 1894; *T. Garh*, 7000', Mackinnons 1875; 7500', Gamble 1893; *Kumaun*, Davidson 1875; 4-7000', MacLeod 1893.



A. C. Mukerjea lith.

ASPLENIUM TENUIFRONS, Wallich.

1. Portion of lower part of a frond, nat. size.
2. Apex of same frond, proliferous.
3. Caudex of another plant, nat. size.
4. Pinna from middle of a frond, nat. size.
5. Pinnule of No. 4 × 4 diams, upper side.
6. Under side of pinnule, × 4 diams.
7. Portion of costa, enlarged 12 diams.
8. Portion of secondary rhachis, × 2 diams.

DISTRIB,—*Asia* : N. Ind. (Him,) Nepál, *Wallich* ; Sikkim' (*A Clarkei*) *T. T.*; 6-7000' *W. S. Atkinson* and *C. B. Clarke* ; Assam (*A. Clarkei*)—Naga Hills 5500', *Clarke*.

Both Beddome and Blanford say *A. tenuifrons* does not root at the apex, as *A. Clarkei* normally does ; but I think it probable that sometimes it does so root, for not unfrequently the fronds bear buds or bulbils near the apex, just as *A. Clarkei* does, which produce young plants ; and if late in the season, from decay, such fronds should bend downwards the buds or plants would have a chance of taking root, or—the young plants may drop off and take root. I have a large frond collected by Mr. McDonell in Chumba, stipe 12 in., frond 27½ in. l., which has produced a young plant at two inches from its apex, one inch in length, stipe and frond together,—an aerial growth. Another plant, collected in Kullu by Mr. Trotter, with five fronds, has two buds on each of three fronds, and two of these have produced aerial plants about half an inch long. There are two minute buds on Gamble's No. 6311 from Simla ; and some very large fronds got in Tehri Garhwal by the Messrs. Mackinnons are proliferous, one having four buds. A frond from Kumaun (Colonel Davidson) has two buds, both of which have thrown out minute fronds. And, finally, Wallich's specimens of this plant, in the Herbarium of the Linnean Society have bulbils and young plants : one plant has five or six young plants on it. These are named—some *Asplenium tenuifrons*, Wall., and some—*Allantodia denticulata*, Wall. in Herb. 1823.

Mr. Clarke gives *Asplenium tenuifrons*, Wall., Cat. 206 (part of type sheet) as a synonym of *A. Clarkei* (and also *Allantodia denticulata* Wall.), but there are such differences in the shape of the fronds and of the pinnules that I hesitate to say that they are the same specifically. Both seem to like a moist soil. Clarke writes of the rhizome of Atkinson's plant—"stout, tufted, standing 2 inches out of wet sand, with a cluster of stipes at the top, radiating round and rooting in a circle, at a radius of about 2 feet from the central rhizome : the sub-terminal rooting bud seems always present in well-developed fronds ; rarely are there two rooting buds." At my Simla station *A. tenuifrons* grows in the bed of a torrent, and the caudex must often be under water in the rainy season. To make *A. Clarkei* a var. of *A. nigripes* seems to me, unreasonable ; but as it is not a North-West Indian fern, I am not here concerned in advocating its claims to be a species.

I have already indicated some of the principal features of *A. tenuifrons*. It is stiff and upstanding, though young plants approach *A. tenellum* in habit. If plants of the latter species should be found much longer than I have seen (one or two large ones, *e. g.*, Mr. Duthie No. 3634 from Kumaun, the frond

of which, without the stipes, is 21½ in. l. by only 4 in. br.) and with a thick erect caudex, I might be disposed to unite the species, but—"as at present advised"—I must consider them distinct plants. Perhaps the most decided difference between both of these species on the one hand, and *A. nigripes* on the other, at least after the shape of the fronds, is the absence in the first-mentioned pair of the mass of long, narrow, light brown scales at foot of stipes, which is a prominent feature of *A. nigripes*. The scales in *A. tenuifrons* are dark brown, tapering to a hair point from a broad base; and though they clothe the stipes of young fronds before the fronds unfurl, they soon drop off, leaving the stipes quite glabrous, except for one or two inches at the base, which are sparingly clothed. A large specimen of *A. tenuifrons* in Mr. Bliss's collection is quite diplazoid; and I see a tendency to that form of *sorus* in other specimens also.

Mr. Blanford evidently formed a strong opinion as to the specific difference between *A. tenuifrons* and *A. nigripes*, and his remarks seem worth quoting in full; but most of what he called *A. nigripes*, in the Simla Region, was my *A. Mackinnoni*:—

"Mr. Clarke regards this as merely a form of *A. nigripes*. In this view I cannot agree with him; differing as it does so greatly in habit and habitat, while neither exhibits a great range of variation. It is restricted to well shaded ravines, growing in the beds of streams at elevations below 7000 ft. The fronds, numbering 4 or 5 or more, form a circular tuft on the short erect rhizome. They vary in form from ovate-lanceolate to acute-lanceolate, and the width of my broadest specimen is less than half the length of the frond; in the narrowest it is less than one-fourth. The texture is thin and the upper surfaces of the partial rhachises and costæ bear long-glandular filaments. The colour of the frond in the fresh state is bright green, forming a beautiful contrast with the delicate pink tint "(purplish sometimes)" of the rhachis and stipe. It is no doubt near *A. Clarkei*, and apparently grows in similar situations, but the fronds are broader and never root at the ends."

What Mr. Blanford styles long glandular filaments, and Colonel Beddome—weak *setæ*, are called in the "*Synopsis Filicum*"—firm yellow spines or strigillæ. They seem to me to be quite soft, broadening at the base, and decurrent on the veins. Their function seems to me to be—to bother pteridologists.

24. **A. Mackinnoni** Hope, in Journ. Bot. March 1896, p. 124:

"*Rh.* quasi-erect, clothed, as is also the base of the stipe, with bright castaneous filiform scales. *St.* tufted, straw-coloured or pale brown, glabrous except near the base, or with a few scattered scales for some inches upwards, 8-20 in. long. *Fr.* sub-deltoid or almost rhomboidal (lowest pair of pinnæ slightly shorter than next pair above), 13-23 in. l. (average of sixteen measured—18¾ in.) by 8-18 in. br. (average of twenty measured—12¾ in.), bipinnate,



N. E. Brown delt. A. N. Banerjee lith.

ASPLENIUM MACKINNONI, Hope, in Journ. Bot. March 1896.

1. Rhizome, natural size.
2. Portion of frond, slightly reduced.
3. to 5. Pinnules from different size fronds, natural size.
6. & 7. Fragments of pinnules, showing a straight & a curved sorus with indusium, X10.
8. Scale from stipes, X3.
9. Portion of Scale from stipes, X10.

glabrous. *Pinn.* about 20 pairs, rarely more or less, distant, subpatent or ascending at an angle of less than 45°, lowest few pairs sometimes widest at one-third from main rhachis, others hardly diminished towards base, and with lowest pair of pinnules sometimes elongated, always accuminate, 6-11½ in. l. by 1½—3¾ in. br. *Pinnls.* 20 or more pairs on longest pinnæ of large fronds, cut away at the base on the inferior side, and slightly auricled on the superior side, ⅜—½ in. br. at base, cut down two-thirds towards costa into 6-12 lobes with two or more teeth each, gradually narrowing and sometimes blunt at apex, decurrent on rhachis with sometimes a broadly winged base. *Texture* herbaceous. *Colour*, when dried, pale olive-green. *Ven.* of pinnules pinnate, and veinlets forked in the lobes, pinnate in the lowest. *Sori* mostly one on superior veinlet of each lobe, near to or at some distance from costa of pinnule, but more numerous in lowest lobes of large pinnules; *involucres* large, straight, athyrioid, or hippocrepiform, and sometimes severed at the curve. Plate XXIII.

"Hab. *Asia*: Trans-Indus Protected States:—Baraul 8500, Harriss 1895; *Kashmir*, W.: 6-10,000', Trotter 1888, MacLeod 1891, McDonell 1892-93 Duthie (several stations) 1893. *Punjab*: *Chamba*—7-9000', Baden-Powell 1879, McDonell: *Simla Region*, 8200' and upwards, Blanford 1885, Hope 1886, Bliss 1890-91. *N.-W. Provinces*: Mussooree or neighbourhood, Herschel 1878; *Tehri Garhwál* State 8000', P.W. and V. A.; Mackinnon 1879; 10,000'. Davidson 1875,; 3-9000', Duthie 1883 7500, Gamble 1894; *Kumaun*: 9-10,000', Duthie 1884. *Bengal*:—Sikkim, Phulloot 11,500', Levinge 1880 (Gamble's No. 8528).

"A large broad-spreading fern, with a long stipe, and when dried reminding one of *Nephrodium marginatum* Wall., and me sometimes of *N. ramosum*, Hope. The scales at base of stipe are like those of *A. nigripes* Mett., but pale in colour, as is the frond. The sori do not lie in rows parallel to and near the costa, like those of *A. nigripes*, but are generally apart from it, curving outwards, and the involucres are generally much more curved. No doubt specimens of this fern are to be found in *herbaria* mixed with *A. nigripes*, but I think they ought to be separated. I erroneously entered it in the Saharanpur catalogue as *A. selenopteris*, Kze., but I must now separate them, and I name the species after the brothers Mackinnon of Mussooree, in whose collection I first saw it, and whose specimens are the largest I have seen, and also because they have largely added to the

number of species of ferns found westward of Nepál, and have found species which are absolutely new."

The above-quoted description was written in India for my paper on the "Ferns of the Chitral Relief Expedition," which was published in *The Journal of Botany* in March 1896. Since coming from India I have verified my surmise that specimens would be found in *herbaria* mixed with *A. nigripes*: those so found, and with other species also, in the Kew Herbarium, have now been separated. Earliest in date of collection is a sheet from Kashmir, *Winterbottom* No. 349, 5th June 1847; and next comes one with a ticket—"Ind. Or., Hook. fil and Thomson, Coll. T. T. 28th August 1849," which has been marked by Mr. Clarke *Aspl. nigripes* Mett. Sir W. J. Hooker had pencilled on the sheet—"*V.* A. decipiens, Mett. Aspl., p. 195, t. 6, figs. 9 and 10, quite accords." These figures are like bits of my fern. There is another specimen of Dr. Thomson's, dated 2nd June 1848, and one—"Kashmir, W. S. Atkinson, September 1874, com. C. B. C. No. 24177." In the British Museum Herbarium, among *A. umbrosum*, Sm., and *A. anstrale*, Brack., is another frond—"Kashmir—Winterbottom." In Kew I also found two specimens from the Simla Region, of my own collecting in 1886, named by me *A. nigripes*; and one from Hattu Mt. 9000′, Collett 1885. In so naming this fern I then followed Blanford, who I believe followed precedent. It is, in greater part at least, his No. 42 (in List) *Asplenium* (*Athyrium*) *nigripes* Mett., of which he says—"The typical form of this fern is common in the partially shaded banks and hill sides, on the northern face of Kamalhori and Hatu, at elevations between 8000 and 9500 ft., but not nearer Simla. There are rarely more than 2 or 3 fronds on the rhizome, and they are firm in texture and, in general, nearly as broad as long." The position and shapes of the *sori* and involucres, together with the total absence of *setæ* on the secondary rhachises and costæ, are quite sufficient to separate this fern from typical *A. nigripes*. Other records of this species, which have come to light since I returned to Great Britain are—The Kagán Valley, to the westward of Kashmir, 5000′, Duthie's native collector 1896, and Chamba 7-8000′ (3 sheets), J. Marten 1897, both in the Saharanpur collection.

25. **A. Filix-femina** Bernh.; Syn. Fil. 192. A. Filix-femina, Bernh., C. R. 491, var. 1, *dentigera* only. *Athyrium Filix-femina* Bedd. H. B. 168, and Suppt. H. B. 35, *var* 1 *dentigera* Wall. only. *Polypodium dentigerum* Wall. Cat. 334.

Forma typica.

AFGHAN: 9-10,000′, J. E. T. Aitchison, No. 330, 1880.

KASHMIR: Sarpat 9500′ McDonell 1891; near Gumis and near Gulmarg 8-9000′, Duthie 1892.



J.N. Fitch del.

S.C. Mondal lith.

ASPLENIUM FILIX-FEMINA Bernh.
forma DENTIGERA (sp) Wall.

1. Portion of a frond, from middle.
2. Rhizome and portion of Stipes from same frond.
3. & 4. Scale from base stipes, natural size & enlarged.
5. Portion of do. enlarged 30 diam.
6. Base of Pinna of another frond, enlarged 3 diam.

PUNJAB: *Chamba*.—Dalhousie 6000′, Clarke No. 22540, 1874; Sára 10,000′, Clarke No. 24111, 1874: Herb. Hort. Calcutta; near Langera 6000′, and below Sabrundi 9500′, McDonell 1882; *Simla Reg.* Hattu Mt. 9-10,000′, T. Thomson 1847.

N.-W. P.: Kumaun—J. R. Reid 1886, in Herb. Saharanpur and Kew (Duthie's Nos. 6242 and 6285).

NEPAL W.: Opposite Budhi Village 10-11,000′, and Nampa Gadh 12-13,000′, Duthie 1886.

Forma dentigera.

(sp.) Wall., including probably *var.* 3, *attenuata*, Clarke. Plate XXIV.

AFGHAN.: 9-10,000′, Aitch., No. 330, 1880, in Herb. Saharanpur: *var. attenuata*, on ticket.

TRANS. IND. STATES: Baraul 85-10,000′, Harriss 1895.

KASHMIR: 6-12,000′, T. T., Clarke, Trotter, MacLeod, Gammie, McDonell, Duthie: common.

PUNJAB: *Hazára*—Trotter, in list of Punjab Ferns; Siran and Kagán Vys. 10,200′, Chor. 10,000′, and Nila—Duthie's Collector 1896-97. *Chamba*—Rávi Valley, 8-10,000′, McDonell: frequent?; 10,000′, J. Marten; *Kullu* 6-8000′, Coventry, *Simla Reg.*—north face of Kamalhori and Hattu Mts. 83-10,000′, Blanford, Hope: Bliss.

N.-W. P.: *D. D. Dist.*—Jaunsar—Chachpur Peak 10,000′, Gamble, and Herschel in Herb. Hort. Sahar; *T Garh.*—9-14,000′, Duthie; *Kumaun*—Milam 11,500′ S. and W. 1848; Rálam Vy. 11-13,000′, and Byans—Napálcha 12,000′, Duthie.

DISTRIB.—(*Forma typica*), *America*: Sitka and Labrador to Canada, British Columbia, and United States; Cuba, Caraccas, and Venezuela. *Europe*: Throughout the continent from Lapland, Russia and Scandinavia to Spain, Portugal, Italy, Greece, Crete, and the Caucasus. *Asia* (*forma dentigera*) Sikkim 10-13,000′, rare: collected there by *J. D. Hooker* and *C. B. Clarke*. Kamschatka, and Japan. *Afr.*: Azores and Macaronesia; Algeria; Kamerun Mts; Abyssinia; Natal.

In the *Synopsis Filicum* it is not expressly stated that the European form of *A. Filix-femina* has been got in the Himalaya, and the following Indian names are given as synonyms, namely, *A. pectinatum*, Wall., *A. tenuifrons*, Wall., *A. gracile* Don., *A. stramineum*, J. Sm., *A. tenellum*, Wall., and *A. proliferum*, Moore. Agreeing, as I do, with Clarke and Beddome, that the two first of these plants do not belong to *A. Filix-fœmina*, and observing that in his Supplement of 1892 Beddome has put *A. stramineum* under *A. nigripes*, and *A. tenellum* under *A. pectinatum*, I find that there are left in the "Synopsis", as Indian representatives of *A. Filix-femina*, only *A. gracile* Don. and *A. proliferum*, Moore, of neither of which have I seen specimens in India, collected there. Until a few years ago I agreed with Mr. Clarke that exactly the typical form had not been found in India. But latterly, while I was still there, a comparison of the specimens from Kashmir, Chamba, Kumaun, and West Nepál, enumerated above, with my British specimens mostly collected by myself, compelled a change of opinion, and I decided to count typical *A. Filix-femina*

as an Indian fern, though a rare one. I have since found other Indian specimens of the typical plant at Kew. Most of the seven varieties which Clarke adopted or set up have already been upset or reduced to other species of *Athyrium*, and his var. 1, *dentigera* (*Polypodium dentigerum*, Wall. Cat. 334), I cannot distinctly separate from the type, the only real differences being in the shape of the pinnules, which are more equal-sided and less pointed than are those of the type, and in the cutting of the segments, which in *dentigerum* are always sharply toothed. I have seen the latter plant growing in the Simla Region, and at first I thought it was distinct; but I had no living specimens of the type with which to compare it. The type plant has not yet been found in the Simla Region by me or by any other collector in recent times; though there is a specimen of Dr. Thomson's in Kew marked as from Hattu Mountain. Without taking into account sports and cultural varieties, there is so much variation in individuals of *A. Filix-femina* found in Europe, that I could not expect European pteridologists to agree with me were I to separate *A. dentigerum*; but the fact remains that it is the common Himalayan plant, and that it does not vary, except in size. The smaller, and sometimes narrower-fronded, plants are Clarke's *var. attenuata* of the type.

26. **A. rupicola**, n. sp. PLATE V. (See Part II., p. 531.)

27. **A. Duthiei**, Bedd. in Journ. Bot. vol. XXVII., No. 315, Mar. 1889, p. 72; Baker in Ann. Bot. Vol. V., No. XVIII. Bedd. Suppt. H. B. 24, under *Athyrium*. Plate XXV.

I quote Colonel Beddome's description :—

> "*Athyrium Duthiei* Bedd. Rhizome wide-creeping, black, nearly naked; stipe 3—4 in. long, furnished with a few ovate or lanceolate deciduous scales, glabrous, pinkish; fronds narrow, ovate-lanceolate, about 12 in. long by 3—4 in. broad; pinnæ lanceolate, alternate, about 20 on each side; lower ones gradually reduced, the central ones 1½—2 in. long, ½—¾ in. broad, pinnatified nearly or quite to the rhachis into sharply-toothed obovate or lanceolate lobes about two lines broad; texture herbaceous; rhachises glabrous, pinkish, furnished with a few deciduous large lanceolate scales; both surfaces glabrous; veinlets forked; sori asplenioid or hippocrepiform, 6—8 to each pinnule or lobe, *i. e.*, 3—4 on each side on the lower veinlets midway between the edge and the midrib.
>
> "Collected by Dr. Duthie in the N.-W. Himalayas, No. 389, Gangotee" (Gangotri ?), near the source of the Ganges, No. 392 under Srikanta 12-13,000'. No. 3667, at Rálam Glacier, Kumaun, 12-13,000'.



J.N. Pitch del. A.C. Chowdhary lith.

ASPLENIUM DUTHIEI Bedd.

1. Lower half of Frond, nat. size.
2. Rhizome, natural size.
3. Rhizome of another frond.
4. & 5. Scale from rhachis, nat. size, and enlarged 8 diam.
6. Portion of same scale, 30 to 1.
7. 8 & 9. Scale from Rhizome, and enlargements 6 & 30 diams.
10. Portion of Pinna, enlarged 3 diam.

"It is very similar in cutting to *Lastrea Brunoniana*. Dr. Duthie's three specimens had been sorted into that packet at Kew, where they were detected by Mr. Hope."

The entries in the Saharanpur Catalogue are :—

N.-W. P. : *T. Garh.*—Ganges Valley, Duthie No. 389, Aug. 1883; Lekhun Gádh under Srikánta 12-13,000', Duthie No. 393, Aug. 1883; *Brit. Garh.*—"amongst bushes", near Kuari Pass 12-13,000', Duthie No. 5165, Sept. 1885; *Kumaun*—near Bálam Glacier 12-13,000, Duthie No. 3667, Aug 1884 (Specimens from Tehri Garhwá, and Kumaun were contributed by Mr. Duthie to the Kew Herbarium).

DISTRIB. (as now known)—*Asia*: N. Ind (Him.) Sikkim Ta-ne-doo Dr King's Collector, No. 4464, Aug 1877, 2 sheets—no rhizomes, and Go mthang 12,000' Dr King's Collector, July 1888, 2 sheets. Bhotán—Jongri, Dr King's Collector, Aug. 1887, 1 sheet, with rhizome.

I "detected" this *Athyrium* some years before I showed it to Colonel Beddome in the Kew Herbarium; but I had not then begun to write about Ferns. The creeping rhizome is a very characteristic feature of the plant. The frond diminishes in width from the middle very gradually to the tip: *N. Brunonianum* maintains its middle width of frond to within a few pinnæ of the apex, and is then suddenly rounded off. *A. Duthiei* is glabrous except for a few scattered scales on the main rhachis: *N. Brunonianum* is shaggy on stipe and main rhachis almost to the tip. It has been thought that the shagginess of the last-mentioned fern and its congener, *N. barbigerum*, Hook. is a natural protection against the cold of the high altitudes at which they grow; but *A. Duthiei* grows as high up, and yet is remarkably glabrous. If it always grows among bushes, as in one instance at least Mr. Duthie found it growing, the scaly clothing is not so necessary.

To the instances in which *A. Duthiei* has been collected I have now to add the following :—

Kumaun—R. Blinkworth 1827 : 2 fronds, with incomplete stipes, and no rhizome : one with a Wallich's ticket "*dentigerum*, Wall." and another sheet 1 frond, marked by Bentham "Polypodium dentigerum, Wall., Kumaun, Wall. 1829." These are two more specimens on a sheet in the Kew Herbarium which was among *A. Filix-femina*, and has on it also an incomplete frond of *forma dentigera*, Wall., with Wallich's ticket.

(*To be continued.*)

NOTES ON SOME OF THE PLANTS INTRODUCED INTO THE VICTORIA GARDENS, BOMBAY, DURING THE PAST 8 YEARS.

By Cavasji D. Mahaluxmivala.

Part I.

(*Read before the Bombay Natural History Society on 9th July* 1901.)

1. Schinus molle,* *L.* (Anacardiaceæ), commonly known as the Australian Pepper tree or Peruvian Mastic tree. It is a South American tree, remarkable for its gracefully drooping branches of numerous pinnate leaves somewhat of a glaucous hue, and for its beautiful rose-coloured fruits of the size of peas resembling the ripe berries of pepper from which it has probably derived its common name of pepper tree. The flowers are minute, pinkish white, appearing in March and April, the fruits forming a month later. A few seedlings were obtained in exchange in 1894 from Professor H. Page, of the College of Science, Poona, but they all died soon after receipt. Another young plant, however, was afterwards obtained in 1897 from Bangalore. It has been propagated by layering. A few seeds collected from one of the plants in May 1900 were sown, but did not germinate. It is suitable for planting as a single specimen on lawns and in mixed shrubberies. It does not seem to bear much moisture at the roots, as some of the plants planted in the Victoria Gardens, the subsoil of which generally contains stagnant-water, died in the rains. It is said to grow to a height of 20 feet.

The leaves of this plant contain a fragrant resinous fluid which when the leaflet is cut into pieces exudes with such force that the cut pieces thrown on the surface of water move about in jerks in consequence of the recoil, having an appearance of spontaneous motion.

2. Fatsia (Aralia) papyrifera,† *B. and H.* (Araliaceæ), Rice-paper tree. It is a Chinese shrub, about 8 feet high, with very large seven-lobed gracefully hanging leaves which are covered on the back with a cream-coloured down. The plant was purchased from the Botanical Garden attached to the College of Science, Poona, in 1894. It seems to thrive only in partial shade and in dry open soil, stagnant water at the roots being injurious to it. Several plants planted in the ground in the Victoria Gardens died owing to their being exposed to the sun and to the water-logged condition of the subsoil. It is not only an ornamental foliage plant, but is interesting as the source of the rice-paper of the Chinese, which is prepared from its pith. It is propagated from the offshoots thrown up from the ground around it.

* The name is derived from *Schinos*, the old Greek name for the Mastic tree (Pistacia lentiscus), and from *molli*, the Peruvian name for this plant.

† The name *Fatsia* is derived from the Japanese name of one of the species (F. Japonica) and from *papyrus*, a rush-like plant (Cyperus papyrus) from the stem of which the Egyptians made a kind of paper, and *fero*, to bear.

3. RUSSELIA ROTUNDIFOLIA* (floribunda) (SCROPHULARINEÆ). This is a Mexican shrub like the other species *Russelia juncia* so common in Bombay gardens. Its habit is not gracefully pendulous like that of *Russelia juncea* and the branches are clothed with much larger leaves, while the flowers are smaller but of a darker red colour. The plant was introduced in the Victoria Gardens in 1894 by purchasing it from the College of Science Garden, Poona.

4. SANTALUM ALBUM,† *Linn.* (SANTALACEÆ), Sandal-wood tree, *Chandan*. It is common in the Deccan Peninsula on dry hills ascending to 3,000 feet. Several attempts were made to grow it in the Victoria Gardens, plants being obtained from Poona in 1894 and 1896, and from Baroda in 1896, and seeds from Madras in 1895, and again in 1898 from Poona. The seeds germinated well, but all attempts to grow the plants failed entirely, the moist climate of Bombay appearing to be quite fatal to them.

5. GYMNEMA SYLVESTRE,‡ *Br.* (ASCLEPIADEÆ), *Wákhandi*. Is is an evergreen woody climber indigenous in the Deccan Peninsula. It is in no way a garden plant, having neither ornamental leaves or flowers, the latter being small and yellowish, appearing in May and June. It is, however, very interesting on account of the peculiar property possessed by its leaves. If the leaves are chewed thoroughly so that the juice comes in contact with the whole of the lining membrane of the mouth and then some sugar is put in the mouth, no sweet or any taste whatever is felt for some time, the sugar feeling like so much sand put in the mouth. The plant was purchased in 1894 from the College of Science Garden, Poona, and seems to thrive well in Bombay.

6. MACADAMIA TERNIFOLIA,§ *F. V. M.* (PROTEACEÆ), Queensland Nut tree. It is an ornamental small evergreen tree about 30 feet high, from Eastern Australia. The leaves are shining, leathery, dentate, oblong-lanceolate and whorled. The fruit is described as a kind of drupe, with a fleshy exterior, encircling a hard shell, like a walnut, containing at maturity a white firm kernel as crisp as that of the hazelnut with a remarkable rich and agreeable flavor resembling but much superior to that of the filbert. The plants were obtained in exchange in 1894 from Mr. Walter Hill of Brisbane, Australia. They are growing very slowly and the one planted out in the ground in an exposed position seems to suffer from the effects of the hot noon sun, the leaves appearing burnt and stunted. It should, therefore, be planted in a situation protected from the noon sun. It has not yet

* It is named after Alexander Russel and from *rotundus*, round, and *folium*, leaf.

† The name is derived from its Persian name *chandal*, Sanscrit *chandana*, and from *albus*, white, the colour of the wood of a variety of this plant.

‡ The name is derived from *gymnos*, naked, and *nema*, a filament, owing to the staminous corona being absent in the genus, and from *sylvestris*, growing in woods.

§ It is named after John Macadam, M. D., of Victoria, and from *terni*, by threes, and *folius*, leaf, from its leaves being in whorls of three.

flowered here. It is said to bear fruit in from 7 to 8 years after sowing the seed.

7. GLOXINIA MACULATA,* *L'Herit* (GESNERACEÆ). A South American bulbous plant of a more hardy growth than the beautiful garden varieties of Ginningia commonly known as Gloxinias. The leaves are shining green above and reddish beneath and the flowers are large, tubular and purplish blue. It thrives very well in Bombay in a greenhouse or in partial shade. The bulbs started in the beginning of the rains begin flowering at the end of the monsoons. The bulbs were got in exchange in 1894 from the Superintendent of the Baroda Gardens.

8. STROBILANTHES DYERIANUS† (ACANTHACEÆ). A beautiful shrub, native of Burma. The leaves of this plant are very ornamental, the upper surface being dark green with bright purple bands between the ribs which become whitish as the leaves become old, the lower surface being entirely bright purple. It thrives well in Bombay in conservatories or in partial shade. The plant was obtained in exchange in 1894 from the Superintendent, Baroda Gardens.

9. PENTAS CARNEA‡ *Benth.* (RUBIACEÆ). A handsome dwarf herbaceous shrub from South Africa growing to a height of only about a foot and a half, with soft bright green hairy leaves and beautiful heads of lilac or pale lavender-coloured flowers. It flowers chiefly in the cold weather, occasionally flowering afterwards throughout the year. It is easily propagated by cuttings and from seeds. The plant was got in exchange in 1894 from Professor Page of Poona.

10. BUDDLEIA LINDLEYANA,§ *Fortune* (LOGANIACEÆ). A very ornamental Chinese shrub of a graceful habit, with angular branches and ovate, serrate leaves and long spikes of pale-pink or violet flowers. This plant was also obtained in 1894 from Professor Page of Poona and thrives well in Bombay, flowering from February onwards throughout the hot and the rainy seasons.

11. STRYCHNOS NUX-VOMICA,‖ *Linn.* (LOGANIACEÆ), *Kájra* or *Kuchla*. This is a tree about 40 feet high found throughout tropical India. The seeds of this tree are a well-known commercial product which yields one of the most powerful of poisons, *viz.*, strychnia. The plants were grown in the Victoria Gardens from seeds obtained from Goa in 1895. They

* It is named after Benj. Petr. Gloxin, a botanist of Colmar, and from *macula*, spot, the stem of the plant being spotted.

† The name is derived from *strobilos*, a cone, and *anthos*, a flower, from the form of its inflorescence in a young state.

‡ The name is derived from *pente*, five, referring to the generally pentamerous arrangement of the flowers, and *carneus*, of flesh or flesh-coloured.

§ It is named after Adam Buddle, an English botanist, and after the celebrated botanist Lindley.

‖ The name is derived from *strychnos*, an old Greek name of some solanaceous plants now applied to this genus of Loganiaceæ, and from *nux*, a nut, and *vomere*, to vomit.

appear to be making very slow growth here, the largest plant in the pot being now only about 2 feet high. Several plants planted in the ground have died here. This seems very peculiar, as the tree is said to be very common in the Konkan in moist forests. It is said to flower in from 10 to 12 years' time. There is an old large tree about 30 feet high in the compound of the Hindu temple in Love Lane in Byculla, probably the only one in Bombay. It is growing against the wall of a house there partly overhanging it, and does not appear to be in a very thriving condition. It is said not to have flowered and fruited yet.

12. MIMUSOPS HEXANDRA,* *Roxb.* (SAPOTACEÆ), *Rànjan*, *Ràyan* or *Khirny*. It is a large evergreen tree common in the Deccan Peninsula. The ripe yellow berry though very astringent is eatable and sold in the Bombay market in the hot months under the name of *Amdávádi Mevá*. The trees is in the Victoria Gardens were raised from fruits purchased in the Bombay Market in March 1895, and though slow growing appear to be doing well.

13. DODONÆA VISCOSA,† *Linn.* (SAPINDACEÆ), called the Switch sorrel in Jamaica from the sour, bitter taste of the leaves, "*Jakhmi*" or "*Lutchmi*." An evergreen stiff-looking rounded shrub found throughout India and in all warm countries, having more or less viscid shining leaves, insignificant flowers and winged capsules. It thrives in open situation in the driest districts and is only useful in the garden for making hedges or fences on dry stony ground. The plants have been grown in the Victoria Gardens from seeds obtained in 1895 from the Inspector of the Bhandarwada Reservoir, Mazagon, where it has been grown as a hedge.

14. MYROXYLON (Myrospermum) TOLUIFERUM,‡ *H. B. K.* (LEGUMINOSÆ-PAPILIONACEÆ), Tolu Balsam tree. It is a South American evergreen tree about 40 feet high with bright shining green, pinnate leaves marked with pellucid dots. Its spreading habit and bright shining leaves makes it suitable as a road-side tree or for forming avenues. An incision into the bark yields the drug known as Tolu Balsam, similar to the Balsam of Peru. The seeds were obtained in 1895 from the Garden of the Agri-Horticultural Society of Madras, and the plants seem to thrive well in Bombay. One large tree was subsequently found to exist in the compound of the Sir J. J. Hospital.

15. SOLANUM JASMINOIDES,§ *Paxt.* (SOLANCEÆ). It is a small creeper from Brazil with small white flowers. The plant was presented to the Gardens in 1895 by Mr. C. Maries, Superintendent of the State Gardens, Gwalior. It appears to thrive well in Bombay.

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* The name is derived from *mimo*, an ape, and *opsis*, a face, on account of the form of the corolla, and from *hexandrous*, with six stamens.

† The name is derived from Dodonæus (Rembert Dodoens), a Belgian botanist and physician of the 16th century, and from *viscidus*, clammy.

‡ The name is derived from *myron*, myrrh, and *xylon*, wood, as the wood is resinous, and from *tolu*, tolu balsam, and *fero*, to bear.

§ The name is derived from the old Latin name *solanum* used by Pliny and from *jasminoides*, jasmin-like.

THE BIRDS OF THE MADHUBANI SUBDIVISION OF THE DARBHANGA DISTRICT, TIRHUT, WITH NOTES ON SPECIES NOTICED ELSEWHERE IN THE DISTRICT.

By C. M. Inglis.

Part II.

(*Continued from Vol.* XIII, *page* 631.)

Family *Muscicapidæ*.

(50) Siphia parva.—The European Red-breasted Fly-catcher.

Oates, No. 561 ; *Hume*, No. 323 bis.

Common in the cold weather. First arrival noted and shot on the 24th September. They leave about the beginning of April.

(51) S. albicilla.—The Eastern Red-breasted Fly-catcher.

Oates, No. 562 ; *Hume*, No. 323.

Mr. Baker identified a bird I sent him as this species. All that I have shot with red-breasts, I have, however, identified as *parva*.

(52) Cyornis superciliaris.—The White-browed Fly-catcher.

Oates, No. 568 ; *Hume*, No 310.

A single male of this species was shot at Narhar on the 14th March 1898. At first I took it to be *C. astigma*, but afterwards noticed the white on the tail which distinguishes the species. I never came across it before nor have I seen it since and think it must be very rare here. This is, as far as I am aware, the first record of its being got in this neighbourhood.

(53) C. rubeculoides.—The Blue-throated Fly-catcher.

Oates, No. 575 ; *Hume*, No. 304.

Rare here and only a cold weather visitant. Two females were shot in some bamboos in January and February 1898. I saw a fine male in a mango tope at Narhar on the 18th April 1899. I had no gun with me at the time so did not secure the bird.

(54) Stoparola melanops.—The Verditer Fly-catcher.

Oates, No. 579 ; *Hume*, No. 301.

Not uncommon during the cold weather. The only note I can find on this species is that I saw one on a large sisso at Jainagar on the 17th November but that it kept well out of range of my collecting cartridges.

(55) Culicicapa ceylonensis.—The Grey-headed Fly-catcher.

Oates, No. 592 ; *Hume*, No. 295.

Very common during the cold weather. The first arrival was noticed about the middle of October. I have no date of departure.

(56) Terpsiphone paradisi.—The Indian Paradise Fly-catcher

Oates, No. 598 ; *Hume*, No. 288.

Very common during the breeding season. They arrive towards the end of March and leave about the end of October. Building is commenced about the middle of April and some have finished by the end of the month. They

lay from May to August. I found a nest on the 1st of the latter month, but most eggs are got in June. According to Mr. Scroope they are uncommon about Madhubani. All nests were found on mango trees at from 7 to 30 feet from the ground; the majority being between 10 and 20 feet. Some nests are cup-shaped and some cone-shaped according to the shape of the fork in which they are placed. Four is the full complement of eggs, but many birds only lay three. Usually the eggs have a warm back ground but I have a clutch in which it is dull creamy white and the only markings on one of the eggs of the clutch are one or two minute spots at the large end. Both sexes are engaged in building and hatching. I have seen chestnut males with lengthened tail feathers, parti coloured ones and white ones sitting on nests. Parti coloured ones, I mean those which have one lengthened tail feather white and the other chestnut, are seldom seen. Many nests of this species are deserted and many destroyed by *D. rufo*. One of the notes of this species is very pleasant, the harsh notes are generally uttered on the wing.

(57) HYPOTHYMIS AZUREA.—The Indian Black-naped Fly-catcher.

Oates, No. 601; *Hume*, No. 290.

Rather uncommon birds here. More are seen during the cold weather than at any other time. I once shot a male in June which, according to the testes, was evidently breeding, but failed to find the nest. Their note is exactly similar to the less harsh one of *T. paradisi*.

(58) RHIPIDURA ALBIFRONTATA.—The White-browed Fantail Fly-catcher.

Oates, No. 604; *Hume*, No. 292.

Exceedingly common. They don't start building here before the first week in March, the earliest nest was taken on the 1st of April, the latest being on the 30th July; most eggs are to be found in June. The twig on which the nest is placed is generally horizontal, but sometimes it is at an angle, in the latter case of course one side of the nest is deeper than the other. Many birds only lay two eggs, three being the full complement. I have taken two young and a *perfectly fresh* egg from the same nest, and very often nests are found to contain two highly incubated eggs and a fresh one. Both birds are engaged in building and hatching; they are very close sitters almost allowing themselves to be caught on the nest before moving off.

Family TURDIDÆ.

Subfamily *Saxicolinæ*.

(59) PRATINCOLA CAPRATA.—The Common Pied Bush-Chat.

Oates, No. 608; *Hume*, No. 481.

Locally common and probably resident. A nest built in June was latterly deserted though the birds remained near it till the middle of July.

(60) P. MAURA.—The Indian Bush-Chat.

Oates, No. 610; *Hume*, No. 483.

Very common cold weather visitant. First arrival noticed on the 3rd of September. I have no notes on the departure of this species.

(61) P. LENCURA.—The White-tailed Bush-Chat.

Oates, No. 611 ; *Hume*, No. 484.

I saw a bird at Narhar and several at Baghownie which I took to be this species. They had the abdomen, and vent white.

(62) P. INSIGNIS.—Hodgson's Bush-Chat.

Oates, No. 613 ; *Hume*, No. 485.

This species was obtained by Hodgson in Behar and ought, I think, be got in this district which borders on Nepal. There is a good deal of sugarcane grown which would make its occurrence all the more likely. Mr. Scroope sent me the following note :—" I saw a species of *Pratincola* near Motipur on 26th June 1899 which I couldn't identify. It certainly wasn't either of the ones we ordinarily see." It may perhaps have been this species.

Subfamily *Ruticillinæ*.

(63) RUTICILLA RUFIVENTRIS.—The Indian Redstart.

Oates, No. 644 ; *Hume*, No. 497.

Very common during the cold weather. The earliest arrival being seen on the 30th September. It leaves in April.

(64) CYANECULA SUCCICA.—The Indian Blue-throat.

Oates, No. 647 ; *Hume*, No. 514.

Very common during the cold weather. They arrive and depart about the same time as the former species. They keep largely to the sugarcane and rice fields.

(65) CYANECULA WOLFI.—The White-spotted Blue-throat.

Oates, No. 648 ; *Hume*, No. 514 bis.

Hume obtained a specimen in Tirhut, but I have not come across it.

(66) CALLIOPE CAMTSCHATKENSIS.—The Common Ruby-throat.

Oates, No. 650 ; *Hume*, No. 512.

I have only twice seen this bird here and both times at Narhar. On the 28th December 1898 I had a shot at one on a mango tree and missed, it flew off and settled in a large bamboo clump. I had another shot which I think took effect as it never left the clump, the bird, however, was never found. I am certain it was this species, as I know the bird well. The second time I saw one was on the 26th February 1900, as I was riding through a bamboo avenue. The bird was on the ground at the base of a bamboo clump and within 3 yards of me. I had no gun with me and though myself and shikari hunted for it during the afternoon we did not come across it again.

(67) COPSYCHUS SAULARIS.—The Magpie Robin.

Oates, No. 663 ; *Hume*, No. 475.

Very common. It commences building in the first week of March and lays till the end of July. I have found two incubated eggs in a nest. The ground colour varies greatly and all eggs of the same clutch have not invariably the same pattern. One clutch of three eggs is coloured as follows :—Two eggs have a pale greenish back ground and are pretty densely streaked with a dull brownish red, the markings forming an irregular cap at

the thick end; the other egg has a pale blue ground and a dense brownish red cap at the thick end, the remainder of the egg being almost devoid of marks An egg of another clutch has a beautiful pale blue ground the only markings on it being a small reddish brown blotch, a couple of spots and a pale underlying spot of a purplish colour at the large end. The other two eggs of the clutch are more profusely marked but even they are very slightly marked for eggs of this species.

(68) CITTOCINCLA MACRURA.—The Shama.

Oates, No. 664; *Hume*, No. 476.

The only bird of this species I have ever seen in the district is a fine male shot by my shikari at Narhar on the 22nd February 1900. It was in a bamboo tope a little west of where I saw the Ruby-throat. He says it was shy and kept flying from one clump of bamboos to another, always settling in the densest part. I think it must have been a straggler.

Subfamily *Turdinæ*.

(69) MERULA ATRIGULARIS.—The Black-throated Ouzel.

Oates, No. 677; *Hume*, No. 365.

A rather uncommon cold weather visitant. February is the only month in which I have noticed them. They go about in small parties. I came across some in February 1900 on a tree in jungle along the Nepal frontier, near Jainagar, there were about 15 birds; when I got near them they flew off calling as they flew. During the same month Mr. Scroope saw a party in a mango tope at Bhagwanpur.

(70) MERULA UNICOLOR.—Tickell's Ouzel.

Oates, No. 678; *Hume*, No. 356.

Mr. Scroope saw some birds on the 28th November 1898, which he took to be this species.

(71) GEOCICHLA CITRINA.—The Orange-headed Ground-thrush.

Oates, No. 686; *Hume*, No. 355.

A rather scarce cold weather visitant. My specimens, all of them males, were shot in March and November. I sent a note on this species to the Journal some time ago. Here it seems to mostly frequent bamboos.

(72) OREOCINCLA DAUMA.—The Small-billed Mountain-thrush.

Oates, No. 698; *Hume*, No. 371.

Very rare cold weather visitant. The only year in which I saw these birds was 1899. I saw one on the 14th January at Narhar in a mango tope and on the 16th March a pair were shot at the same place.

Family PLOCEIDÆ.

Subfamily *Ploceinæ*.

(73) PLOCEUS BAYA.—The Baya.

Oates, No. 720; *Hume*, No. 694.

Very common and breeds from the middle of July to the end of September. Two is certainly the full complement of eggs. I have, however, got 3 young from a nest.

(74) P. MEGARHYNCHUS.—The Eastern Baya.

Oates, 721; *Hume*, No. 694 bis.

I have several birds of this species, but they are scarce as compared with the last species. These are not the true *megarhynchus*, *Hume* as discriminated by Mr. Finn and will stand as *P. atrigula*.

(75) P. BENGALENSIS.—The Black-throated Weaver-bird.

Oates, No. 722; *Hume*, No. 696.

Very common. I am not sure whether they are resident or not, as I have never shot any from December to the middle of June. The earliest nest was taken on the 10th July and the latest on the 14th September. I have found their nests in sugarcane and also in ekri. Out of 103 eggs taken, 54 were got in August, 47 in July and only 2 in September. Three or four is the usual complement of eggs, twice or thrice I have found five and once I took seven out of the same nest, probably the latter were the produce of two pairs of birds. I have also found a single young one in a nest. Many eggs are destroyed by the pretty little long-tailed Tree-mouse *V. oleracea*. I have several times caught it in these birds' nests.

(76) P. MANYAR.—The Striated Weaver-bird.

Oates, No. 723; *Hume*, No. 695.

I have not noticed this species in this subdivision, but probably it is to be found in the rushes near the large jheels. I have, I am sorry to say, never had an opportunity to visit any of them.

Subfamily *Viduinæ*.

(77) MUNIA ATRICAPILLA.—The Chestnut-bellied Munia.

Oates, No. 726; *Hume*, No. 698.

Very common round about Jainagar and Narhar during the breeding season. It arrives about the third week in June and remains, I think, till the end of November. It commences laying in July, the earliest nest being taken on the 15th of that month and finishes by the end of September. It builds its nests in the same situations as *P. bengalensis*, both species often breeding together. All the nests were from 5 to 6 ft. from the ground. The usual complement of eggs is five or six. I once found seven and have taken three young from a nest. The greatest number of eggs are got in August.

(78) UROLONCHA MALABARICA.—The White-throated Munia.

Oates, No. 734; *Hume*, No. 703.

Very common. January and June are the only months during which I have failed to find their nest. Besides building in the orthodox situations, *viz.*, thorny bushes, they also build on mango and kheir trees (*A. catechu*) bamboos, coccanut palms and in sugarcane; one nest I took from a small hole in a *seet* stack and one from a jack tree (*A. integrifolia*) sapling. One pair took possession of a nest of *Ploceus bengalensis*. I have never found more than seven eggs in any nest, and have several times seen only a

single young one. On the 22nd August 1897, I took a nest containing two slightly incubated eggs of normal size and one, very small one, which was yolkless.

(79) U. PUNCTULATA.—The Spotted Munia.

Oates, No. 735; *Hume*, No. 699.

Very common. Breeds in March and from July to December. The earliest nest was found on the 18th March and latest on the 15th December. Most were situated on babool and kheir trees (*A. arabica* and *A. catechu*), several were on Palmyra palms (*B. flabelliformis*) and a very few on mango (*M. indica*) and jack trees (*A. integrifolia*). Those on mango trees were about 15 feet from the ground, but those on palms were very high up. Seven is the maximum of eggs I have even found in any nest.

(80) SPORÆGINTHUS AMANDAVA.—The Indian Red Munia.

Oates, No. 738; *Hume*, No. 704.

This species is rarer than any of the other munias. I have seen a few in May, but most are seen in July and August. It breeds during July, August and October. I have no nests taken in September. The earliest nest was taken on the 23rd of July and the latest on the 9th of October. I have never found over seven eggs in any nest, the smallest number of incubated ones was three. I have taken two very highly incubated and two fresh eggs from the same nest. In August 1897 I saw several large flocks in the millet fields near Jainaga, one nest taken during that month was in sugarcane, but all the others were in grass, the stems of which were incorporated with the nest. The native name is *lal*.

Subfamily *Fringillinæ*.

(81) CARPODACUS ERYTHRINUS.—The Common Rose Finch.

Oates, No. 761; *Hume*, No. 738.

This is a rare visitant to the district. I have only come across four or five during my three years residence in the subdivision, they were single birds seen in February, March and April.

(82) GYMNORHIS FLAVICOLLIS.—The Yellow-throated Sparrow.

Oates, No 775; *Hume*, No. 711.

Flocks are seen from May to October. On the 14th May a nest was being made in a hole in a rotten stump of a mango tree about 8 feet from the ground, it was latterly deserted. In April another nest was found, it was also deserted; those are the only two I have ever come across.

(83) PASSER DOMESTICUS.—The House Sparrow.

Oates, No. 776; *Hume*, No. 706.

Abundant. It builds most of the year. I have taken no nest however during January, June, July, August, and December, but I may have overlooked them. Six is the greatest number of eggs I have taken from a nest. I have sometimes found a solitary young one. On the 1st April 1898 I took an egg which was *pear shaped* from a nest at Narhar; on the 19th March I took

three eggs from a nest, and on the 1st April it was found to contain six more. I have also taken a tiny egg quite yolkless. The native name is *buggera*.

Family *Hirundinidæ*.

(84) COTILE RIPARIA.—The Sand-Martin.

Oates, No. 808; *Hume*, No. 87.

I have never shot this bird in this subdivision, but in February 1898, my shikari shot one flying over a river at Hassowlie Fly, some nine or ten miles from Somastipur. I am sure I identified it correctly as there was a tuft of feathers on the tarsus; the skin unfortunately got destroyed and I have been unable to obtain another.

(85) C. SINENSIS.—The Indian Sand-Martin.

Oates, No. 809; *Hume*, No. 89.

Exceedingly common. They breed here in November, December, January, and also in April as I found on the 6th of that month an addled egg and two newly hatched young. I have found them breeding in the banks of the Kamla wherever they were fairly steep. Four is the greatest number of eggs ever taken from a nest; most eggs were got in November, one burrow measured was 36" deep and the hollow in which the nest rested was 5"×4½"; the nest being a loose pad of grass.

(86) HIRUNDO RUSTICA.—The Swallow.

Oates, No. 813; *Hume*, No. 82.

I shot a few swallows in January 1900; those of this species had a perfect band across the breast, but the lower plumage was almost pure white. There were several very dark rufous bellied birds, but I didn't secure one; they may have been *H. tytleri*, but more probably were only deeply coloured *H. rustica*. I have noticed swallows in considerable numbers from July till the end of the cold weather. On the 1st of April many were seen flying northward towards Nepal.

(87) H. GUTTURALIS.—The Eastern Swallow.

Oates, No. 814; *Hume*, No. 82 bis.

A bird shot on the 15th January has a narrow pectoral band well broken by the rufous of the throat, but the lower plumage is very pale rufous, darker on the undertail-coverts and the measurements are more those of *H. rustica* than of this species. I have several birds which I take to be *gutturalis*, but most appear to be hybrids.

(88) H. NEPALENSIS.—Hodgson's Striated Swallow.

Oates, No. 822; *Hume*, No. 85 bis.

This is not such a common species but a fair number of birds are seen at the same time of the year. I saw about half a dozen flying over the indigo at Narhar on the 11th April but after that month they appear to leave the district till July as I can find no notes on them during the intervening months.

Family *Motacillidæ*.

(89) MOTACILLA ALBA.—The White Wagtail.

Oates, No. 826; *Hume*, No. 591 bis.

Very common cold weather visitant. They arrive about the first week of September and most have left before the end of April.

(90) M. LEUCOPSIS.—The White-faced Wagtail.

Oates, No. 827; *Hume*, No. 590.

I have few specimens of this species and consider it uncommon.

(91) M. PERSONATA.—The Masked Wagtail.

Oates, No. 828; *Hume*, No. 591.

This is one of our rarer wagtails. I have only two specimens, both got in January 1898.

(92) M. HODGSONI.—Hodgson's Pied Wagtail.

Oates, No. 830; *Hume*, No. 589.

Common. My specimens were obtained from October to March.

(93) M. MADERASPATENSIS.—The Large Pied Wagtail.

Oates, No. 831; *Hume*, No. 589 bis.

I have never come across this species in the subdivision, but Mr. Scroope says he has seen it. I shot a specimen however at Doodpoora Factory, near Somastipur, in January 1896. I also found a nest at Belahi Factory, in the Mozufferpur district in the side of a well, unfortunately the eggs were destroyed.

(94) M. MELANOPE.—The Grey Wagtail.

Oates, No. 832; *Hume*, No. 592.

I have failed to secure a single specimen of this species though Oates remarks it is a winter visitor to every portion of the Empire. I may perhaps have overlooked it, but out of a series of about a hundred wagtails not one belongs to this species.

(95) M. BOREALIS.—The Grey-headed Wagtail.

Oates, No. 833; *Hume*, No. 593.

This is not a common species. I have only five specimens in my collection.

(96) M. FLAVA.—The Blue-headed Wagtail.

Oates, No. 834; *Hume*, No. 593 ter (part.)

Not uncommon. I sent some wagtails to Mr. Baker, which he kindly went through for me, some belonged to this species.

(97) M. BERMA.—The Indian Blue-headed Wagtail.

Oates, No. 835; *Hume*, No. 593 ter (part.)

Exceedingly common. The earliest arrival noted was on the 7th September and all had left by the 3rd May.

(98) M. CITREOLA.—The Yellow-headed Wagtail.

Oates, No. 837; *Hume*, No. 594 ter.

Rather uncommon. I have noticed none after the middle of April.

(*To be continued.*)

THE LATE MR. C. L. DE NICÉVILLE.

Charles Lionel Augustus de Nicéville, the entomologist to the Government of India, died in Calcutta last Tuesday, and the world of science loses a brilliant and successful worker. He was born in 1852, and came of a noble Huguenot family long domiciled in England, and was the last baron of his line. His father was a member of the medical profession. He was educated at St. John's College at Hurst Pier Point, near Brighton, and gave early evidence of entomological tastes, as a schoolfellow informs us that he spent all his spare time in studying insects instead of participating in the ordinary school games. After leaving school he was for some time employed in a bank, but came out to India, and held non-gazetted appointments from 1876, his last one being that of clerk of the Calcutta Small Cause Court, in which employment he was well-known for many years in Calcutta. His holidays and daily leisure he employed in the study of Oriental butterflies, on which he was recognized as the greatest authority. His papers on this subject were over 70 in number, and were of the very greatest importance, as he was a naturalist of the all-round type, not only studying his specimens in the cabinet, but collecting largely for himself, and devoting much attention to breeding. By this method he experimentally proved that in no less than four cases seasonal forms of the same butterfly had been wrongly separated as species, and by applying this knowledge was able greatly to elucidate the history of other forms. He described many new species of butterflies and contributed much to our knowledge of the distribution of these insects, travelling in the course of his entomological researches far and wide in the East from Ladakh to Japan and Sumatra. His researches were carried on for many years in a room allotted to him in the Indian museum, where he kept his very fine and extensive collection, which has lately been acquired by purchase by that institution. It was his custom to daily resort to the museum for two or three hours' study before breakfast, and thus he was able to get through a great amount of work during the many years in which he pursued his studies.

His results were published in several scientific journals, especially in those of the Asiatic Society of Bengal, and of the Bombay Natural History Society. Of both of these he was a member, in the latter case an honorary corresponding one, and he served them loyally and well. More than once he officiated as Natural History Secretary to the Asiatic Society, and once as the Secretary for Anthropology, and from his long connection with the Society dating from 1881, he was a living repository of its observances and traditions. To the Bombay Society he was of the greatest assistance, as he long undertook the task of correcting the proofs of their journal, at which he was most painstaking and assiduous. The qualities of method and industry were, indeed, most characteristic of him, and make his published work of the very highest value.

He was a constant contributor to *The Asian*, an ever ready reference on the special subjects with which his name will be remembered, and a writer who spared himself no trouble whenever and in whatever connection his assistance was sought. Personally we lose in him a staunch friend, while the paper is the poorer by the removal of one of our most valued co-adjutors.

In addition to his connection with these Indian scientific societies, he was a member of the Linnean and the Entomological Societies, and in 1888 was elected a corresponding member of the Zoological Society of London, to whose proceedings he also contributed.

His great work on the Butterflies of India, Ceylon and Burma was unfortunately never finished, but such portions of it as were published have been of the very greatest use. For three years, from 1881 to 1884, he was put on special duty in the Indian Museum, whose collection of butterflies he arranged, and at the beginning of the present year, to his great satisfaction, he was attached officially to that institution on the creation of the post of Government Entomologist. He attacked the work of economic entomology with his wonted energy, and in the pursuit of his studies in the Darjeeling Terai contracted the fatal attack of fever and pneumonia which caused his untimely death.

This has come as a terrible blow to his numerous friends, for his singularly kind and genial disposition had endeared him to all. With a wide capacity for enjoyment he combined singularly simple tastes, and both in this and in his equanimity of temper and cheerfulness of mind showed himself a true philosopher; while he also realized in the fullest degree Chaucer's noble definition of the true gentleman as one who is always courteous and ever on the alert to do a kindness whenever he can. He leaves but one child, a daughter, and the heartfelt smypathy of all who knew and loved him in the East and at home will be with this young lady and her relatives in their sad bereavement.—*The Asian.*

CALCUTTA, 10*th Dec.*, 1901.

MISCELLANEOUS NOTES.

No. I.—A SNAKE AND A FISH.

This morning, walking round the Lake, I saw a large water-snake swimming towards the shore, and on nearer inspection I found he had in his mouth quite a large fish which he held firmly by the extreme end of the tail and which lay on its side apparently helpless underneath the snake. I do not know what sort of fish it was, but it was about 8 inches long or a little more, and about 3 inches deep,—very narrow, like a small sole or dab. It appeared to be dead. The snake swam to the edge which consisted here of a walk of rough stones about 5 feet high, down which it was quite impossible to get, and presently finding a hole proceeded to enter and pull the fish in. This at first it had some difficulty in doing and on my throwing a stone down, the fish showed renewed signs of life and getting round into a vertical or natural position, made a bit of a fight and pulled the snake's head and some eight or nine inches of its body out of the hole. I dropped a stone right on to the top of the snake, but the result was not what I expected, for it gave its body a jerk, and getting the fish on to its side, again pulled it clean out of sight into the hole. As I say, it was impossible to get down, so I cannot surmise how the snake disposed of the fish, which would, of course, in time be drowned, in fact it seemed greatly advanced towards that condition when I saw it, due probably to being towed along backwards through the water. Snakes are, we know, pretty handy at swallowing, but the process of absorbing a fish tail foremost back fins and all is rather a large order. I do not know whether my experience is a common one, so send it on chance.

H. D. OLIVIER, Col., R.E.

Mount Abu, *March*, 1901.

No. II.—OCCURRENCE OF THE LAGGAR FALCON IN BURMA.

I am sending the skin of what I take to be the Laggar Falcon (*F. jugger*) and shall be glad to know whether my identification is correct. In the Fauna of British India (Birds, Vol. III, p. 420) it is mentioned as not having been observed in Burma, but it may have been recorded since the publication of that work.

At any rate the bird in question is fairly common in this district, and during the last two years I have found five nests—three of which contained eggs and the other two young birds. Two of the latter I kept for some months, but both unfortunately died before attaining to the adult stage of plumage.

On the same large cotton tree, on which was the nest from which I took the young birds on 23rd March, there were also some four or five nests of the common Heron, some of which contained eggs. Two days previously I shot a Falcon of the same species off her nest, from which I got three eggs of much lighter colour and smaller than the others I have, and on this same tree was the nest of a Black Ibis (*Inocotis davisoni*) containing a young bird almost fully fledged and one addled egg. The Herons and Ibises on both

occasions appeared to be breeding on quite friendly terms with the Falcons within a few feet of each other. On two other occasions I found the old or deserted nest of a Heron or Stork had been occupied by the Falcons.

K. C. MACDONALD.

MYINGYAN, UPPER BURMAH, 13*th March*, 1901.

NOTE.— The specimen sent, which is the skin of an adult bird, has been carefully examined and there is no doubt Mr. Macdonald is correct in his identification. So far as I know the species has not previously been recorded from Burma and the fact of its now being found to be fairly common in the Myingyan district only goes to show how much we have still to learn of the distribution of many species. Mr. Blanford, in noting the absence of records of this falcon from Burma, also mentions Assam. It has since been reported from Cachar by Mr. Inglis and others, although Mr. Stuart Baker writes in our Journal (Vol. XI, p. 403) of the latter district that 'it must be a very rare bird, as I have never seen one, nor have any of my collectors managed to get me one.

E. COMBER.

BOMBAY, 27*th March*, 1901. Honorary Secretary (Birds).

No. III.—BIRDS' NESTING ROUND POONA AND ELSEWHERE.

In the cold weather one has to be content with quality not quantity; it may be termed the "dull season"; nesting being confined practically to birds of prey which necessitates a good deal of travelling in order to cover a large amount of ground. On the whole, however, I have met with a considerable measure of success.

THE KING OR BLACK VULTURE (*Otogyps calvus*).—During the past two seasons, I have obtained three nests, two round Poona and one in the Sholapur District. The latter nest was an enormous structure and was placed on the top of a lofty tamarind tree, in taking which rather an amusing incident occurred. During my tour I was accompanied by a friend, who made use of a horse as a means of locomotion, while I relied on my bicycle. He sarcastically told me he thought I should probably have to foot it most of the way as the roads were bad and hoped I was fond of walking. As luck would have it, I had only ridden a very few miles on the first day, when my byke punctured badly; I, however, managed to repair it very quickly and reached camp safely to be met with further sarcasm. As the sequel shows my turn came and I had rather the best of the laugh. My friend constantly chaffed me regarding my passion for nesting. When proceeding to take the above nest, he accompanied me: on seeing it, he observed "why, that's only a dove's nest!" While engaged in this banter, he was getting through a hedge, when he ran a babul thorn into his leg: we tried our utmost to get it out but failed, even though we enlisted the aid of the village barber! As most people are aware, a babul thorn in the flesh is most painful. I assisted my chum into camp and next day we made tracks for Sholapur to obtain medical

aid, I on my byke, my friend in a bullock gharry ! his leg being far too painful to admit of his riding. As I passed him, jolting along, I had the laugh of him as I told him I was sorry he had been so badly punctured ! I obtained a perfectly fresh egg out of this nest. Date 19th January.

On the 6th March, I obtained a much incubated egg from a nest placed in a small Pipal tree, situated in a lonely and bare glen, where it was easily reached. On the 4th February 1901, I obtained another perfectly fresh egg. The nest was a huge mass placed on the top of a high and large mango tree in a tope, to climb which a rope had to be thrown over one of the lower branches. On finding the nest I threw up stones to try and dislodge the bird, though I could see none from below, owing to the size of the nest, and as this had no effect, I fired a shot into the tree when Mrs. Vulture made a most hasty exit.

THE PALLID VULTURE (*Gyps pallescens*).—It is not easy to obtain eggs of this species. They usually select the faces of precipitous cliffs to nest in, such as Shivner Fort near Junnar. This season, I came on one which was accessible and within easy reach. I consequently wrote and asked a gentleman, who very kindly obtained and sent me a fresh egg, which reached me on X'mas Day. I only remained a day at the spot, so could not arrange to take the nest myself.

THE WHITE SCAVENGER VULTURE (*Neophron ginginianus*).—I have found many nests of this species this season. They take a long time over their domestic arrangements. The favourite site seems to be a mango tope, some little way from human habitation. A fairly large tree is selected and the nest is built in the hollow made by the large limbs branching away from the trunk, which gives a good foundation ; as often as not very little of the nest is visible from below and it is not as a rule very far up. I have found most nests by seeing a pair hanging about a tope, and on searching a nest is invariably disclosed. The same nest is used for several seasons ; the birds begin to hang about and repair the old nest in December, though they lay chiefly towards the end of February ; two seems the complement of eggs, and if one lot is taken they will lay again. The eggs are very handsome, being richly and boldly blotched, streaked and spotted with brick red, while some of the richer eggs are almost entirely of that colour.

THE INDIAN TAWNY EAGLE (*Aquila vindhiana*).—I observed a nest of this bird on the top of a lofty mango tree early in January, my attention being drawn to it by one of the birds being perched on the tree ; at this period the nest had only just been commenced, and I could see through it. I visited the nest shortly after and came to the conclusion it had been deserted, as neither of the birds were in the neighbourhood and the nest did not seem to have progressed. Being in the vicinity of the nest still later, I just went to have a look at it, when the bird quitted it. I sent a man up by means of a rope thrown over a lower branch, and obtained two perfectly fresh eggs. Date—4th February 1901.

THE BRAHMINY KITE (*Haliastur indus*) is fairly common on the river here, but seems to withdraw itself for nesting. This year, however, I found a nest building in a mango tope about half mile from the river. I noticed the birds hanging about the tope in December, though I did not get the egg till the 25th February. This particular pair only laid one egg, but as a rule, two is the complement. I obtained another nest containing two fresh eggs on the 22nd February, which was built on a bare mango tree on the banks of the Mina, north of Poona. The nest rather resembles a crow's nest, being much smaller and more compact than that of the common kite. From observing the habits of this bird the female seems to sit on the nest before the eggs are laid.

THE INDIAN BARN OWL (*Strix javanica*), I believe, is fairly plentiful round Poona but escapes observation owing to its nocturnal habits and its retiring down old and disused wells, during the day. I have not had luck this year but hope to obtain several clutches next, as I found nests with young and believe this species invariably breeds year after year in the same place. On the 25th November, two eggs were found, so I left them in the hope that I might get more, but unfortunately something or somebody took them and I had to do without. On the 30th December, I explored two more wells only to find half-grown young.

THE BROWN FISH OWL (*Ketupa ceylonensis*).—While nesting on the Banks of the Mina, north of Poona, a large nest was observed about 40 feet up a large Banyan tree : judging by the site, I thought it was an old nest of the White Scavenger Vulture. On throwing up stones, one lodged in the nest, when a large owl flew off. A boy was sent up, who reported one egg. I left this and returned three days later. On this occasion the bird had to be roused off the nest by the boy and as there was still only one egg I took it. It was hard set but I cleaned it by the water process. This was on the 22nd February. The village near which I was encamped was surrounded by mango topes and I heard and saw several owls. As I was not sure of the species I am sorry to say I shot the owl ; she was in bad condition, so far as feathers were concerned but was very fat. Immediately on leaving the nest she was beset by crows, who mobbed her unmercifully, tweaking her feathers and pecking her and they were so thick about her that one was knocked over by the shot which killed her.

THE SPOTTED OWLET (*Carine brama*) is very common about here. I fancy they nest in any convenient place. I have obtained several clutches of eggs this year, which I have found in holes in trees, usually in mango topes. Nearly every tope near here has its spotted owlets, which are seen to flit away from holes in the trees on one's approach : these holes if examined from the middle of January to March, will usually be found to contain eggs.

R. M. BETHAM, MAJOR,
8th Bombay Infantry.

POONA, 31*st March*, 1901.

No. IV.—HYÆNAS HUNTING WITH JACKALS.

The night before last a hyæna visited my camp accompanied by a jackal. My *shikari* and other servants saw them quite distinctly in the faint moonlight as they came very close to the camp—the jackal keeping just behind the hyæna. I was at dinner and heard the jackal howl. My *shikari* came up and told me the hyæna was close by, so I went towards the cook-house and saw him followed by a jackal cantering past. I had a shot at the hyæna and missed him, but he came again an hour afterwards unaccompanied and I rolled him over with a charge of S S G. I have read of tigers having their attendant jackal but have not heard of a hyæna and jackal hunting together. It gave me great satisfaction to encompass this one's death as he is credited with killing two of my predecessor's dogs. They went down an earth after him and never came out again.

E. O'BRIEN.

CAMP VELAN,
AMRELI, KATHIAWAR.

No. V.—STRANGE BEHAVIOUR OF A PANTHER.

In Part I, Vol. XII, Mr. Lester gave an account of the strange behaviour of a panther. A very similar occurrence happened at D—— the other evening, 2nd February. It was first reported to me about the 15th January that a man-eating panther had been doing a lot of damage on the outskirts of D—— and on making enquiries I found that two men and a woman had been mauled and that one of the former died on the 31st, or sixteen days after he had been mauled. I could find no evidence of the man-eating part of the story, but think that the brute emboldened by constant success, *viz.*, picking off goats and dogs from the compounds, had come to regard man as a very indifferent animal. However I determined on sitting up for him; so on the 1st instant two goats were sent out to be tied up within a quarter of a mile of each other at the foot of the hill behind the Railway Station. On visiting the spot next morning I found one of the goats had been killed and only a few bones left, but I found panther pugs near by. I sent my men out to build a *machan* and was sitting up by 5-30 p.m. I thought it quite likely the panther would turn up before dark, although there were a lot of huts within 150 yards of the kill. Just before dark, however, a couple of men came up to the goat with the intention of carrying it off, thinking, I suppose, it was a stray one. The men had not been gone fifteen minutes when I heard a noise at the back of the *machan*, and on looking round saw the panther coming out of a cover not 20 yards from the *machan* and a little below it. I was afraid to turn round and fire thinking he would see me and be off, so I waited and in about five minutes saw him kill. Immediately after killing he looked up at the *machan*. I fired and to my disgust heard him going off up the hill. I might say it was just too dark to see my foresight clearly. Thinking he might by

chance pay another visit, I remained quiet, and to my surprise just as I was getting ready for a long spell, I heard him coming back. This time he walked straight to the goat and commenced dragging or trying to drag it away, but finding he could not do so, he walked about five paces off and sat down and looked at the kill. I fired again and missed him. This time, instead of bolting up the hill, he, as far as I could guess by the noise, only went off about 30 yards. As I had given my men orders to turn up with lights, &c., at 10 p.m., I decided to stay up in the *machan* till they came. Imagine my surprise when, about ten minutes after my last shot, I saw the panther standing over the kill but looking up towards the *machan*. I was resolved, however, not to fire too quickly and waited. He would not touch the kill but stood over it for quite ten minutes or such it seemed to me. I then let him have another shot. He dashed off, making straight for the tree I was on which however he passed, and I think he made for the cover he had originally come out of. It was about 8 o'clock when I fired my third shot. I still had two hours to wait. About 9 o'clock the panther again put in an appearance going straight to the kill and commencing to feed. I waited for a few minutes, fired and missed, when he went straight off up the hill.

I was using a ·577 rifle with a bit of cotton wool for my foresight, and on examining the spot next morning found that my shots went over him.

I firmly believe it was the same panther that turned up each time.

I should be obliged if any of your *shikari* readers would let me know through the Journal whether it is the rule or exception for panthers to be so daring.

GEORGE E. BRIGHT.

RAIPUR, C.P.

No. VI.—THE MIGRATION OF BUTTERFLIES IN THE KANGRA VALLEY.

Butterflies of widely separated genera have constantly been recorded as having been observed in different parts of India pursuing an almost uninterrupted flight in a fixed direction, the reason of their so doing is not however quite clear. On the 12th of August 1900, I observed a very large flight of *Catopsilia crocale*, Cramer, interspersed with a few examples of *C. pyranthe*, Linnæus, travelling in an easterly direction, the wind at the time being from the S.-E. All the well-known varieties of the former were procured by me, females being nearly, if not quite, as numerous as males. Of *C. pyranthe* I only obtained females and saw no males on the wing. The flight lasted all day and numbers of the insects were to be seen at a great height above the ground all travelling in the same direction. Occasionally a specimen or two might be seen stopping for a very brief space on a flower, but for the most part the flight was a continuous one. My examples pointed to their having only recently emerged from the *pupa*. On the 7th of April 1901, another

flight of butterflies was seen, but on this occasion the species was *Belenois mesentina*, Cramer, with a few examples of *Danais plexippus*, Linnæus (*genutia*, Cramer). On this occasion the direction of flight was from the East to the West. For some days previously rather strong winds had prevailed, and judging from the torn state of the specimens caught by me, I should be inclined to think that they had been damaged by gales which had probably carried them from their original locality, to which they were now returning. In a distance of about 20 yards *B. mesentina* crossed the line of sight at the rate of about 25 per minute, whereas *D. plexippus* only passed at about 2 or 3 in the same time. The wind was light and from the East. In the migration of *Catopsilia* in August there was no possibility of computing the number passing, as the whole sky as far as it was possible to see, was filled with them whereas in the *Belenois* and *Danais* flight the insects seemed to be all close to the ground, but flying without hesitation in the uniform direction. Residents who have lived in the Kangra Valley for some years have informed me that these migrations of butterflies are not unusual.

G. C. DUDGEON, F.E.S.

HOLTA TEA ESTATE,
PALAMPUR, KANGRA.

No. VII.—OCCURRENCE OF THE BLACK-BEARDED BAT (*TAPHOZOUS MELANOPOGON*) NEAR BOMBAY.

In Mr. Wroughton's most interesting paper on "Some Konkan Bats" (Vol. XII, p. 716) allusion is made to one species only of the family *Emballonuidæ* or Sheath-tailed Bats as represented, so far as his collection was concerned, in the district. When visiting the Kenery Caves in Salsette last February, I found a number of bats in the main cave-temple, but being without proper means for obtaining specimens, I was only able to secure one—knocked down with a stone. This turned out to be a male of *Taphozous melanopogon*, the Black-bearded Sheath-tailed Bat. On referring to Mr. Wroughton's paper and finding that he had not come across this species, I sent my skinner up again, with the result that he brought me a series of 13 specimens.

The most notable feature about them is the much darker colour of the fur generally of the females compared with the males. In measurements they come out slightly larger than those given in the Fauna of British India (*Mammalia*), *viz.*, head and body, average of 14 specimens, 80 mm., ranging from 82 down to 75 mm., and forearm 65 mm., average, ranging from 67 down to 63 mm.

E. COMBER.

BOMBAY, 15*th May*, 1901.

No. VIII.—OCCURRENCE OF THE BRONZE-CAPPED TEAL (*EUNETTA FALCATA*) IN SIND.

The Society has lately received the well-preserved skin of an adult male specimen of the Bronze-capped teal (*Eunetta falcata*) from Mr. L. Robertson, I.C.S., who writes that he shot it on 10th January last in a jheel in the (Eastern) Nara Valley about 20 miles from Mirpur Khas, Sind. This species is ordinarily an inhabitant of Eastern Asia, only occasionally visiting India in the winter months, and few records of its occurrence in India proper exist, though probably the females and young males are at times, when obtained, passed over without notice in a mixed bag of ducks. Since Mr. Stuart Baker's article on the species appeared in our Journal (Vol. XII., p. 18) one of our members has recorded seven specimens brought to him during the cold weather of 1899-1900 in Tirhut. The present instance is however the more interesting, as it is undoubtedly the most western point from which the species has been recorded in India, the limit of range having previously been Bahawalpur, and next to that Ferozepore and Delhi.

E. COMBER.

BOMBAY, *August*, 1901.

No. IX.—HABITS OF THE LUNGOOR MONKEY.

At the Village of Mallegaon Jageer, during the cold weather, I one day went out alone with my gun, partly to see what I could get, and also to think over at my leisure a case which was before me for decision. To the west of the Akola road, near which my tents were pitched, there was then a large grove, almost big enough to be called a wood, in which the trees were of great size, but owing to the shade they gave, there was very little undergrowth. Wishing to find some shade, as the sun was becoming uncomfortably hot, I turned my steps to one end of the grove, and soon became aware that there was a great stir in the monkey world that inhabited the trees. They were lungoors, monkeys about as big as a Newfoundland dog when full grown, and they were running about in a very agitated manner. Living so much in camp, I had, of course, seen hundreds of lungoors at nearly all times and seasons, but now I saw at once that something unusual was going on. As the trees grew on both sides of a nullah that ran through the wood I wondered at first if a panther were in the nullah or anywhere about, and if the commotion were due to his unwelcome presence ; but after looking on for a few minutes I saw that the real reason of the scrimmage was the return to the herd of all the young males, which are yearly driven away by the principal male monkey, the strongest and biggest, and, therefore, the sovereign, generally called "the rajah."

I had heard from the natives that this happened every year, and that the rajah never kept undisputed possession of his harem for more than one year, and it was my good fortune to see how he was driven away or killed. The bark of a full-grown male lungoor cannot, after being once heard, be

mistaken, and the deeper the note the older and stronger the monkey. Therefore, hearing a chorus of deep-throated barks, I went in the direction of the sound to see what was happening there. The monkeys were far too engrossed in their own affairs to pay any attention to me whatsoever, so I took a post behind the trunk of a large tree on the main branch of the nullah, which was shallow and quite dry. Soon after I took up my position a number of half-grown monkeys passed me at a rush, some of them racing along the ground, others bounding from branch to branch of the trees. Having gone a certain distance, they all pulled up, and looked round in the direction from which they had come.

Evidently they were in a state of great fear, and chattered incessantly to each other. Soon a couple of dozen ordinary full-grown lungoors also passed me at a rush. They, too, appeared to be very much afraid, but halted on the edge of the grove of trees. Last of all some half dozen very big ones passed me, but stopped when they came among their smaller brethren. They seemed afraid, too, but, ran, as it were, unwillingly from a big fierce-looking monkey whose size and solitariness proclaimed him rajah. He came to within 50 yards of the crowd of monkeys, who, I suppose, had fled from him, and then took up his position in the bed of the nullah, and faced them, giving several loud, deep barks, but all the time keeping a wary eye over his shoulder. Suddenly from the crowd of males a big one ran out and placed himself on the edge of the nullah, about halfway between his friends and the rajah, who was now at bay, at the same time looking round on the groups of waiting ones, as much as to say "Who is coming?" The challenge was instantly accepted, and another large monkey went over to the opposite side of the nullah and posted himself. Then they both looked round, evidently not averse to still further assistance, on which a third monkey came forward and took up his position between his two friends in the centre of the nullah; so, that finally, at about a distance of 15 yards or so, the rajah, still facing his enemies, had three opposed to him, who looked as big as he was, though probably they had not his weight and age.

Suddenly the three champions, on some signal which I did not catch, rushed simultaneously at the rajah, who turned tail, and were immediately followed at full speed by the whole crowd, each and all making the echoes ring with their deep barks. Whether they caught the rajah, and having caught him, killed him, or merely satisfied themselves by making sure that he would never wish to be rajah again, I do not know, but I am sure that they put it out of his power to again attack them singly and so master them. All that I saw and could find out that day was that the largest and strongest monkeys were all in full cry after the rajah, and that they drove him altogether out of that grove of trees, but when and where they overtook him I do not know and could not find out. Having been master of a herd of such numbers, it is probable that the rajah was pretty soon overtaken.

The temporary absence of all the large monkeys was promptly taken advantage of by the younger and weaker ones, who tried to separate small parties, of females from the general herd, and get them away to some other grove of trees. Probably the bigger ones, when they had settled their account with the rajah, would find out these little parties, and having chased away their younger brethren, would take possession of the not unwilling females until they, in their turn, were ousted by some bigger and stronger lungoor. Judging from appearances, I should say that the rajah would not allow himself to be disposed of without a fierce fight, which probably left those engaged in it very sorry for themselves, and until they had fully recovered their strength they would not be in a condition or have the wish to fight, for another's harem. In the end that monkey who had suffered least in the fight and who was the biggest and strongest, would collect from the others their respective flocks until he became master of an immense crowd of unwilling bachelors. These in time would be unwilling to bear the sight of their victorious brother, and as soon as they were strong enough would combine to drive him away as I have described. The intense fear they have of the rajah shows that when he catches them singly he is utterly merciless, and probably in escaping from him they, or their friends, have suffered so in body or mind as to make them very apprehensive of being caught. The natives have an idea that when the rajah or any other male monkey catches another poaching on his preserves he renders him powerless for the future. Whether this be true or not I do not know. Another thing I should like to find out is what becomes of the dead monkeys, as I have never yet met any one who came across the corpse or skeleton of one. The natives say that when a monkey, with the instinct of a wild animal, feels that his end is coming he gets into the fork of a tree and clasps the trunk, dying in that position, but I have never heard this assertion either confirmed or contradicted. It may be true, but one would think that vultures and other carrion birds would be attracted by bodies so placed, and would pull them out of the fork of the tree, when they would naturally fall to the ground, and other wild animals would eat what the birds had left, excepting the skulls and larger bones; but, so far as I know, these have never been found. Apparently the numbers of monkey neither increase nor decrease; younger ones are always being carried about by their mothers, but what becomes of the dead ones I do not know.

J. F. G.

(*The above appeared in the "Field."*)

No. X.—SOME NOTES ON THE INDIAN ELEPHANT.

During ten years' residence in Burma I had many opportunities of closely observing elephants, both in a tame and wild state. During that period I had from two to ten elephants under my immediate charge. For six

years I was in charge of the forests in one district where there were over 500 tame elephants, belonging to a single timber trading firm, besides numerous herds of wild animals, which I made it my business to observe whenever I could spare the time. I was then transferred to a district where the same firm (the Bombay-Burma Timber Trading Corporation, Limited) had over 600 animals at work in the forests under my charge, there being also two small herds of wild ones, the whereabouts of which (the district being a fairly well populated one) were always known, it can be seen that I have had exceptional chances of learning a little of their habits, both in a state of semi-domestication as well as in a feral state. My observations if not of value, may be at least of interest. I put them forward with some diffidence, as I have come to conclusions directly opposed to those formed by such famous authorities as the late Mr. G. P. Sanderson and Mr. W. T. Blanford, F.R.S.

Now both these gentlemen make little of the intelligence of the elephant. I have kept a great number of pets, ranging from porcupines up to hooluks (*Hylobates hooluk*), and, with the exception of the latter, I do not think I have ever been so struck with the intelligence of any animal as I have with that of the elephant. I give examples, which any forest officer in Burma could, I have no doubt, confirm.

It is common to see an elephant break off a branch with its trunk and use the bit broken to scratch some portion of the body ungetatable by any other means. Again, in a long march I have often ridden on one of the baggage animals passing the time by reading a book, no portion of my body even touching the animal, and there being no mahout on the neck; the animal has steadily marched along the narrow forest track, carefully guiding itself in and out of the trees, so that no tree shall strike the baggage, and at the same time carefully pulling down and breaking low branches which might scrape me off the heaped-up pile of miscellaneous kit. Once I saw a female elephant run away. She had attached to her front leg a long tethering chain. On being called on to stop by her attendant, who ran after her and tried to grab the end of the chain trailing behind, she picked the end up with her trunk, so that she should not be hampered by stepping on it, and so that the man also should not be able to seize it, and made off into the jungle.

These few cases out of many which I could record certainly seem to me to denote great reasoning power. Another point which both the above quoted authorities emphasise is the rarety of the elephant breeding in captivity. The trouble I experienced, in common with other Government forest officers and forest managers of timber firms in Burma, is to prevent the female domestic elephants from having calves. It is very inconvenient for a forest officer to find that one, or sometimes both, the baggage animals allowed him by Government are heavy with calf, and have to be put out of

work for a time, whereas the loss to a timber firm of keeping a good dragging female idle for a considerable period is a serious one.

For some time I had five females and a tuskless male attached to my division as transport animals. Four of the females in one year gave birth to young; three of the calves were born at various times during one rainy season, while one was born in the middle of the following hot weather, the morning after the mother had made a long march with a heavy load of baggage. Two of the calves were males and both tuskless, corroborating the assertion of the mahouts that the tuskless male was the father. I felt quite convinced that this tame male was the father, as the females were always under my personal supervision, and I know that no wild elephant had any access to them; moreover, my experience is that tame females, as well as males, show great terror for even the propinquity of wild elephants. Of course there are exceptions to this. All these calves when I left Burma in 1900 were still alive, and on the books of the Forest Department, being then rising five years old, strong and healthy. The elephants of the Forest Department in Burma have calves continually being born, and numerous ones are on its books; some, indeed, are now at work as baggage animals. One particularly fine little tusker, twelve years old, was a special favourite of the Conservator of the Southern Circle, Upper Burma. My experience is that elephants are affectionate and careful mothers, though male full-grown animals seem to object to youngsters near them. In the Salween district of Tenasserin almost every Karen village has a few female elephants, which are kept for breeding purposes. There are no wild elephants about, and elephant breeding from tame males is a well-known and lucrative source of income to the villagers, the elephant being used as pack animals, and often in the rains for ploughing the paddy fields. Mr. Roberts, Manager of the Bombay-Burma Trading Company, Limited, Pyinmana, kindly collected statistics of births among elephants under his charge (some 600, male and female). I regret to say that I have mislaid his most interesting statement, but it may be summarised as follows:—It is so common an occurrence as to give rise to no comment, beyond a little strong language. The calves are invariably strong and healthy, and only 3 per cent. die. The cause of death can always be traced to the mother being put on to heavy work too soon after the calf is born, which tends to stop the flow of milk.

The Bombay-Burma Timber Company have many elephants now in work which were born from dragging or transport females, and their mahouts all assert the fathers are nearly always also domestic elephants. The mother cannot be worked while the calf is small, as she is frightened of damaging her child, the latter's favourite position for walking being just underneath the mother, almost between the front legs. Elephants in Burma are not kept in stables, but are hobbled (either the two front legs or the two hind

legs being tied together), and are then turned out to graze. Hence it is not a matter for surprise that they do breed. I regret I have no data of my own absolutely reliable to quote as to the period of gestation, but I give the following extract from an interesting letter on the subject which appeared in the *Indian Forester*, April, 1899:—

"In June, 1897, one of the mahouts reported that his elephant had been covered by the tusker attached to the division whilst the animals were turned out to feed. The act was observed every evening for about a week, from about May 18 to May 25, 1897. Neither of the animals showed signs of sexual excitement previously, though the male paid assiduous court to the female for a few days before coition was permitted. They were both at work at this period, dragging logs, and gave no trouble to their attendants. The report was noted, but, I am sorry to say, forgotten, till Nov. 3, 1898, when, in the evening, the elephant gave birth to a female calf.

Fortunately that day she had only carried a light load for a short march. The baby, though so weak that it had to keep itself upright by holding on to a bamboo with its mouth, was perfectly healthy and well formed, and after a day could stand and suckle. The period of gestation, therefore, had been a little over seventeen calendar months, or almost exactly eighteen lunar months.—C. B. S."

I have carefully noted the habits of tame elephants, and find that healthy animals sleep twice in the night, from about twelve o'clock to two o'clock and again about four o'clock till dawn; some, however, only sleep once, *i.e.*, from four o'clock till dawn. If an animal sleeps oftener it is not well. They lie down full length on their sides to sleep. This early morning time for sleeping explains why it is so injurious to the health of elephants to march for days together before dawn, as is frequently done in the hot weather by officers wishing to spare these animals the torture of marching in the sun. My experience also is that if a tame elephant lies down during the day the animal is going to die. As regards "must," I am of an opinion it is of a sexual nature, as I have noticed that it is rarer and not so intense among males if allowed free access to females as when they are excluded from all female society.

Now for another matter—the finding of remains of wild animals in the forest. This subject has given rise to many very pretty fables, and sportsmen have, because they personally have not found dead animals themselves, believed all sorts of fairy tales. I would ask sportsmen to try and remember how many times they have found the remains of any of the larger species of mammalia, such as gaur, rhino, or tsaing, in the forests; very, very seldom I venture to think; tropical rains, birds, animal, and white ants will soon destroy all traces of any organic matter. However, the finding of dead wild elephants is not quite unknown. In 1893 I was camped some

ten miles (in very thick forest) from an assistant, Mr. A. M. Burn-Murdoch, now Deputy Conservator of Forests; he wished to send me a note on business, and sent a peon with it. The peon, after having been gone a few hours, returned to his camp saying he had found a dead wild tusker in the forest, quite fresh. Mr. Burn-Murdoch informed the head man of the nearest village, and ordered him to proceed to the carcase to take charge of the tusks as Government property. The villagers ate the flesh, and on my interviewing the head man he informed me that it was perfectly fresh, and had not a mark on its body to show how it come by his death. I notified the find all over the district. There was no Government animal missing, nor any belonging to the Bombay-Burma Trading Company. I examined the tracks, and was convinced the animal belonged to a herd of about a dozen which had recently crossed towards the Chin Hills. The tusks were consequently sold as Government property, and the sum paid for them may be seen in the books of the Forest Department of the division to this day.

In the same division one of my hunters told me that a large male tuskless elephant died one rainy season on a sandbank in the river after having been on the sandbank two days. As I could not confirm this with any European evidence, owing to the animal being tuskless, it was not reported to the Government. I give this report for what it is worth, though I knew the hunter well for six years, and always found him truthful and not given to exaggeration. That large game do find their way when dead into the rivers, however, I can prove, as in 1894 a huge bull gaur came floating down the Yu River, Upper Burma, dead, but quite fresh. It was salved and eaten by the villagers, and the head man brought the remarkably fine head, to me, and I gave the head to Capt. Perkins, I.S.C., who, I believe, has it now.

Again, Mr. Hannyngton, of the Bombay-Burma Trading Company, once when tracking wild elephants in the Teungchoingyi forests, came on to a dead wild female; she had been dead about two days. She was not a Government animal nor one belonging to the Company, and Mr. Hannyngton told me that he was convinced she was a wild one.

I was for six years in charge of the frontier revenue station, where all forest produce from the semi-independent country had to pay duty. Tusks, old and brown, were continually being brought down for the payment of the Government royalty, and on my questioning the Chins they declared they had found them in the forests. This, however, is little proof, for I believe the wild Chins use poisoned arrows, which, of course, would account for dead animals being found.

C. W. A. BRUCE, F.L.S.,
Forest Department, Burma.

(*The above appeared in the "Field."*)

No. XI.—PROBABLE HYBRID BETWEEN THE INDIAN RING DOVE (*TURTUR RISORIUS*) AND THE SPOTTED DOVE (*TUTUR SURATENSIS*).

On the 27th of last month I saw a dove which I take to be a hybrid between the Indian Ring Dove (*Turtur risorius*) and the Spotted Dove (*Turtur suratensis*). The bird was feeding on the ground alone. The general appearance of the upper parts of the plumage resembled *T. suratensis*, while the lower parts were like those of *T. risorius*, and it had a distinct *black* collar round the neck. The size was intermediate between the two species. As hybrid doves have been bred in captivity I see no reason why they should not occasionally cross with each other in a wild state.

G. DALGLIESH.

HATTOMRIE FACTORY,
HYA GHAT, TIRHUT, *4th June* 1901.

No. XII.—OCCURRENCE OF THE MUTE SWAN (*CYGNUS OLOR*) IN SIND.

I am sending you the head and feet of a mute swan, *Cygnus olor*, that was captured by some Mohanas (fishermen) in February 1900, at Sita Road in Upper Sind.

During the months of January, February and March 1900 it was extremely cold in Sind, and several swans were seen, of which some were shot and some were captured. I send you a few notes of this occurrence :—

January 10th.—Nine swans were seen on the Hubb River, about fifteen miles from Karachi. Two were killed by Mr. Janes, of the Indo-European Telegraph Department, who says the birds were very tame. One was killed with a rifle and one with a shot gun, the remaining seven birds did not appear to be much alarmed, for they flew some five hundred yards down stream and settled again.

Saturday, 13th January 1900.—Eight swans flew over the tennis courts at Kotri, about one hundred yards off and thirty high at about 5-30 p.m. Several people were on the courts at the time ; I could clearly see what the birds were, and called out, "Swans." One of these birds came to grief against the telegraph wires that span the Indus here and was captured by Mr. Canning, Platelayer, who says that the bird was unable to rise off the ground, but ran at great speed three or four times, one hundred yards at a go, before it was killed by his coolies. This bird is stuffed (after a fashion) by the taxidermist of the Karachi Museum. It is quite a young bird of a sooty white color, and fairly long buff colored crest at back of head.

February 1st.—Two swans, adult birds, were captured in ordinary duck nets, at Sita Road station : one died soon after its capture (head and feet sent you), the other bird I procured and presented to the Karachi Gardens on the 6th February 1901. This bird is still living.

Some time early in February 1900 eight swans were seen at Bostan, on the Beluchistan frontier: four of these birds were shot, three dead and one winged; this latter bird is still alive, I believe; Mr. Mathews, Platelayer, who shot them, says it was bitterly cold at the time, and the birds were fairly tame.

About the middle of March a swan was shot on the Munchar Lake by Mr. Cross, of the I. C. S., who says the bird was among a lot of duck and fairly easy of approach.

At the end of March ten swan were seen for three consecutive days on the Laki Lake. On the third day, Mr. Vivian, Platelayer, fired nine shots at them before they flew away; he used an ordinary 12-bore gun and No. 1 shot; he says that the birds were about 100 yards off on the water, and that he could hear the shot rattle against them.

On *27th April* one was shot by Mr. Wragge, Platelayer, Meting,—the river Indus runs about twelve miles from Meting. The bird was seated on a small sand drift close to the bank. No. 2 shot at about 40 yards. The weather was very warm at the time, and the bird was sent to Karachi to be cured, but the man there threw it away finding it too much for his olfactory organs. This was an adult bird.

G. C. McMULLEN.

KOTRI, SIND, *8th June* 1901.

No. XIII.—WILD ANIMALS AT WATER.

A considerable amount of misconception appears to prevail, even among scientific naturalists, regarding the drinking habits of wild animals. In order to illustrate this I may quote from several works on the fauna of India, to which my knowledge is limited. Thus Mr. Blanford believes that the Indian gazelle never drinks, and states that he "never saw the easily recognised footprints of gazelles among those of the animals that habitually came to drink at the pools." Mr. Sterndale, in his *Natural History of the Mammalia of India*, tells us that it is his belief that sambur drink only every third day. In his lately issued work on *The Great and Small Game of India* Mr. Lydekker remarks that "nilgai can exist with but a small supply of water; and it is probable that, in the cold season at least, they drink only every second or third day and at a pinch could go for a considerably longer period without liquid." Again, with regard to the Indian antelope we are informed in the same publication, "whether it ever drinks is a matter on which there may be some difference of opinion among observers, but that it can exist perfectly well without taking liquid food is demonstrated by the existence of a herd on a narrow spit of land between the Chilka Salt Lake in Orissa and the sea, where, for a distance of thirty miles, the only fresh water obtainable is derived from wells." As this question of animals being "addicted to drink" is one of some importance both to naturalists and sportsmen, and as conflicting

views appear to prevail on the subject, it may not be uninteresting to adduce some evidence drawn from personal experience.

That most animals in torrid climates are generally very impatient of thirst is a fact well known to all observers. In fact the first undertaking of the sportsman in search of game is usually the examination of the vicinity of water for the footprints of animals that have been to drink, so that their presence may be discovered. The great *felidæ* nightly visit the water ; tigers are seldom found far from it, and are fond of lying immersed in it during the heat of the day. The panther appears to find water less necessary, but my observation tends to show that he drinks nightly, although he frequently lies up at a considerable distance from water. The black bear of the Indian plains (*Ursus labiatus*) visits the forest pool by night, and I have seen him before sunset scratching for water in the side of a hill where a thin spring was oozing and trickling down the slope. The gaur drinks frequently—at least once a day—and wanders far in search of liquid in the secluded forests where he loves to roam. The spotted deer lives on the shady banks of jungle rivers, drinking often from the pools in which its graceful form is reflected.

The naturalists above referred to do not apparently dispute these facts with regard to the foregoing beasts, so I will turn to those of which they make special mention in this connection. With reference to the sambur, my observation does not agree with that of Mr. Sterndale. It is many years since I have seen much of this deer, but to the best of my recollection, the evidence of footmarks and the movements of the animal all pointed to its habit of visiting the water once every twenty-four hours, usually by night. I can speak with more certainty of the nilgai, having closely observed this animal for many years, and having been frequently encamped amid its haunts, and within my observation it is a fact admitting of no doubt that it drinks daily—sometimes in the evening and sometimes after nightfall, according to locality. That it does so also during the cold weather I have unmistakeable evidence. During the season of 1899-1900, I was several times encamped at a place where a few of these animals, whose numbers were known to me, existed. The season at the commencement of the great famine was one of drought and all the water-courses were dried up. The only water was contained in the wells and irrigation channels in the vicinity of villages. At these wells the patient, laborious cattle toiled all day to draw the water that ran down the channels to irrigate the fields. At night, when all was quiet and the watchmen slumbered on their platforms amid the crops, the nilgai always came down and drank where the water was collected, and especially at the shallow wooden troughs, hollowed out of the trunks of trees, which were placed for the cattle near the wells. The marks of their feet were plain in the soft mud, and might be seen every morning. At night, too, the prowling panther visited such a spot where he might find a victim among the

herds of gazelle that trooped down during the hours of darkness from the neighbouring stony and arid hills, or might pick up a stray goat or dog belonging to the hamlet, or a calf that was perishing of want. The Indian gazelles, too, drank here in numbers, leaving a regular beaten pathway from their jungle haunts.

Around the life-giving water all that passes during the night, all the comings and goings of the beasts of the fields, may be read from the book of nature that lies open to the observant eye. There is a beaten track of many dainty little pointed feet—the marks of the gazelle, and the larger spoor of the antelope. The pugs of the panther may be looked for upon any of the paths that approach the trough or water channel. All animals prefer to keep to a beaten track, and their wanderings are thus more easily followed. The porcupines, most nocturnal of creatures, have come down from their cave dwellings in the banks of the dry ravines and in the hill sides, and one has dropped a quill on the margin of the tiny rivulet, whilst another has pierced through the heart a goat that was tied up as bait for a panther in the adjacent nullah. Jackals, wild cats, foxes, hares, peafowl, partridges, quail, all these and many others have been here to quench their thirst, and have left unmistakeable impress of their presence. At one point the panther has crouched, and crept toward some animal stalking his prey. Then he has made a rush, but his intended victim has escaped him. There is such a mingling of footmarks here that it is impossible to tell what was the spotted one's quarry; only a buck gazelle has galloped off from the place, and may have been the object of the chase. All this, and much more, can be read upon the dusty path and on the surface of the soft earth of the field that lies crumbled into powder under the heat of the sun. Not only have I observed the marks of gazelle at water, but have seen one in the act of drinking at a pool, and there is a family of three animals near the cantonment, where I was lately residing, which drink nightly at one place. Perhaps the poet's observation was more accurate than that of the naturalist when the former wrote:

> The wild gazelle on Judah's hills
> Exulting yet may bound,
> And drink from all the sacred rills
> That gush on holy ground.

With regard to the Indian antelope, I have frequently observed these animals going to water in large herds, and I know many places to which they resort every evening to quench their thirst. I have also a photograph, taken in Rajputana, of a herd of these antelopes in the act of drinking. In fact, there can be no question of their drinking daily when they can get water. With regard to the herd living in the vicinity of the Chilka Lake, most careful observation is necessary. As there are wells there, it is probable that there are irrigation channels, and perhaps also troughs for cattle.

In this case the animals would have no difficulty in obtaining a daily supply of water. No doubt there are deserts in Sind and Bikanir where animals go for considerable periods without water. But the results of my observation convince me that where water is obtainable all animals in India drink every day.

R. G. BURTON.

(*The above appeared in the "Field."*)

No. XIV.—ELEPHANT SHOOTING IN UPPER BURMA.

South-East of Katha, Upper Burma, lies a delta formed by the junction of the Irrawaddy and one of its large tributaries the Shweli.

Viewed from the high bank of the river on the Katha side, the prospect is somewhat uninviting; the delta has no Government forest reserves, and consists chiefly of low-lying areas, sparsely cultivated here and there, but mostly abandoned to wilderness of giant grass 10 feet high, known in the vernacular as khine.

The delta is intersected by one main and several branch creeks connecting the Irrawaddy and the Shweli, along whose tree-shaded banks are numerous picturesque villages. Further inland there are considerable forest areas covering the higher elevations, but the main factor of the locality is khine, and its concomitants elephants, tigers, sambur and wild pig.

It was here, "owing to that excellent institution privilege leave, and the courtesy of the Deputy Commissioner of Katha" that I found myself during part of April and May, under the guidance of an experienced Burmese tracker, to be initiated in the highly exciting and interesting sport of elephant shooting.

Of the danger of following and shooting elephants in khine there appears to be a consensus of opinion among certain well-known sportsmen in Burma, and as a tyro, I am precluded from expressing an opinion, but after practically living in khine for a month, I can only say, I was never charged in it. I saw one big stampede, and was stampeded myself at 10 yards by a herd of not less than thirty. Danger there is no doubt, but it is very largely discounted by the knowledge and tactics of an experienced tracker, who knows when and where to approach the animals. My chief objection is the terrible hard work, and the difficulty of eliminating a tusker from the herd, coupled with the necessity of negotiating the less desirable but certainly more dangerous female, or tuskless male, when they present themselves.

Without detailing the numerous and various stages of funk through which I passed during my novitiate, or the failure to find the fatal spot at the psychological moment, when the long sought quarry did present itself at the familiar distance of 15 or 20 yards in the khine, I pass on to the more pleasing subject of my first tusker.

About 8 a.m. on the 4th May, I left my comfortable, if somewhat airy quarters in the Burmese rest-house at Kummongyun accompanied by a tracker, two local hunters, two villagers carrying my tiffin basket and my Burmese servant who acted as interpreter. I carried a hammerless double 8-bore rifle by Greener weighing 16½ lbs. but beautifully balanced, the tracker had my double, ·577, and the rest carried weapons of the pop-gun description in which, however, they appeared to place a confidence it would have been a sin to deprecate.

Our information was that 2 miles distant seven elephants including a tusker had been seen the previous evening near the hamlet and rice-fields of Myoungyi, and to this place we trudged across country alternating in paddy fields and khine grass. Here further enquiries were made, and then we proceeded to some high half-burnt khine intersected with numerous old elephant tracks. The ground was very rough and the khine stubborn and difficult to get through, but we soon came on fresh tracks which we lost after following them for an hour. The sun by this time was beginning to make itself felt, and I was glad to avail myself of my water bottle. After some little delay and a dispute between the tracker and the local hunters, we again found fresh tracks, which led us about 11 a.m. to a large irregular track of high khine bordered by a thin belt of jungle. The tracker went up a tree, and after a long observation, came to the conclusion that the tusker was not far off. The khine was too high for the elephants to be seen, but the movement of it in certain directions indicated their presence.

Now following the tracks into the khine meant taking the first beast that presented itself, and as this was not my object, we decided to burn the khine on the side where we thought the tusker was; and to watch the operation from the secure, if somewhat ignoble, position of the tree-tops.

Three men were sent round to burn the khine, and I with my Burmese servant took up a position in one tree while the tracker went up another.

No sooner had the khine begun to burn than a commotion in the high khine showed the presence of elephants and through the occasional clearings I saw four elephants emerging and coming straight for my tree. A female led, then came the tusker closely followed by two more females, one of which was only half-grown. At this juncture, one of the Burmans in another tree who had descended to get my water bottle, began climbing my tree, and hearing that the elephants were in sight got flurried and made a noise, with the result that the elephants turned off at right angles to the left and went a quarter of a mile to some trees from whence they emerged to continue their original direction.

We then left the trees and burnt the khine on three sides to drive out the remaining three elephants, but though we waited anxiously for an hour until nearly all the khine was burnt they broke back and went away to the right.

Now we took up and followed the tracks of the four elephants to the trees where finding shade and water we were both ready and glad to tackle our

mid-day meal. After food and an hour's rest we again took up the tracks of the four elephants which led us a "Follow the man from Cook's" dance through half-burnt khine until we came to some very high khine bordering on jungle. Here we proceeded with great caution. The tracker led, I followed, and then came the following with the pop-guns just in the middle of a long tunnel of khine, in which it would have been quite impossible to shoot. A rushing sound about 5 feet on the left indicated an elephant, much too close to be pleasant. Fortunately the beast was moving away from us and not towards us, or the sequel might have been different. With difficulty we extricated ourselves from the khine as soon as possible, and sought a small nulla which separated the khine from the jungle and along this we raced to intercept the elephant before he should enter the jungle. Arriving breathless we again plunged into the khine, but not before the practised eye of the tracker had caught a glimpse of the tusker as he passed through some low khine. Judging with an unerring instinct the place where the tusker would come out, the tracker led the way to a small clearing 5 yards in radius centred by a small tree about 15 feet high and about as thick as an oar handle. Here we formed up to see the tusker emerge three seconds later. He was a big beast 9 feet high and as he was standing on raised ground he appeared to be only 15 yards off. I aimed at the nasal base of the trunk, and as the 8-bore spoke the tusker tottered, turned, and fell. The tracker and retinue, however, loosed off immediately, which drove off a large female who came up just in time to see the tusker fall.

The tracker ran in and gave the tusker his *coup de grace* by a shot from the ·577 through the chest, but it was a work of supererogation, for he had already breathed his last, and I found that my steel-pointed bullet had hit just below the nasal base and passed through it in an upward direction.

It was now 2 p.m., so after I had photographed the dead beast with the tracker sitting upon him holding my 8-bore, and the tracker had cut off the trunk we worked our way back to my camp, leaving the task of cutting up the animal until the next day.

Unfortunately the tusks turned out to be small, together weighing only about 50 lbs., but the front feet were 18 inches in diameter indicating a height of 9 feet, and the 40 men who turned up to eat the beast the following day were not able to turn him over and had to content themselves with the meat on one side only.

E. R. JARDINE.

RANGOON, *25th June* 1901.

No. XV.—ARTIFICES PRACTISED BY BULBULS.

On the 24th of May I was walking at Mahabuleshwar, when I came upon a young Red-whiskered Bulbul (*Otocompsa fuscicaudata*) which had left the nest before it was able to fly. The parents were twittering about in great

alarm, for of course it was at the mercy of any crow, or other enemy, that might pass that way. When I went up to it, their alarm reached fever heat, and suddenly one of them fell with a gentle slope, like a wounded snipe, into the middle of the road, twenty yards from me, and, making its way to the side with much apparent difficulty, proceeded to scramble away among the fallen leaves, falling on its face at every other step, with wings outspread, and screaming piteously. When I followed it to see what was the matter, it flew up into a tree and twittered to me airily. I could scarcely credit a Bulbul with so much cunning, so I went back to the young one and pretended to be trying to catch it, when the trick was repeated, the other parent this time abetting its mate by pretending to pursue and attack it. I rewarded them by putting their young one into a place of safety. A few days later I saw another pair of Bulbul successfully deceive a crow by the same trick and draw it away from a place where its presence was not desired.

E. H. AITKEN.

9th July 1901.

No. XVI.—ON THE DEPOSITS OF FOSSIL REMAINS OF EXTINCT ANIMALS IN THE SEWALIK HILLS OF THE PUNJAB AND NORTH-WEST PROVINCES.

While shooting along the base of the Hoshiarpur Sewaliks, I heard of some limestone quarries not far off, so I rode over to see them. On my way I found the so-called limestone being brought to a village near my camp to be burnt into lime in kilns of which there were many built of circular mud walls.

On examining the stone, I found it to be, not limestone, but phosphate of lime formed by the fossilized bones of prehistoric animals, among which I recognized the teeth of the Mastodon, and the bones of elephantine creatures, probably of *Mastodon*, *Elephas ganesa and Elephas bombifrons*. I lost no time in going to see the quarries, about a mile and-a-half from the village, and I found them to be excavations in the side of one of the hills of this range. Large cavernous holes had been dug in many places in the hill side wherever it was suspected that this fossil deposit lay beneath. The bones were never very far from the surface, and here again I identified the bones I have already described. There were others that I could not recognize. All these remains were being loaded on camels and donkeys, and were sent off to the village kilns.

The sloping surface of the hill side was covered with the semi-pulverized debris of the fossil deposits from the quarries, and upon this crops of chenna and mustard were growing. The extraordinary luxuriance of these crops showed me at once (what is of course known) the immense value, as a fertilizer, of this phosphate, which is daily being wasted in the lime kilns.

It was in this range of hills that the fossil skeleton of the Sivatherium (now in the British Museum) was found, a gigantic bovine animal of extraordinary form and stature.

Starting from the left bank of the river Beas, near Talwarra, and following the Sewaliks along to the Jumna, and again across the valley of the Dehra Dhun to the Ganges, there are many known places in the hills where these fossil deposits are found, and as I stood near the quarries I have described, watching the immense bones that were exhumed, my mind became lost in a maze of speculation as to what sudden catastrophe it could have been, which overwhelmed and buried such a large concourse of now extinct creatures in this sub-Himalayan region. For the part I am now writing of, is not more than thirty or forty miles from the main range of the Himalayas.

As I have already mentioned, the fossil bones were not far from the surface, the soil of the hills is throughout the Hoshiarpur Sewaliks composed of sand, here and there indurated into a soft sandstone, and the range was probably created by the same tremendous agency which involved all these now extinct monsters in one sudden and common destruction.

The most prominent of all the points presented by this mere cursory examination of one of the phenomena of this hill range, interesting alike to geologist and naturalist, are, first, might not a more thorough search for fossils than has already been made, reveal fresh discoveries to science. And secondly, bearing in mind the poverty of the soil in most parts of the Punjab and adjacent provinces, would it not be possible, as well as profitable, to turn these valuable phosphate deposits to their proper use as fertilizers, and prevent their being wasted, as they are now, on the production of inferior lime.

W. OSBORN, LIEUT.-GENERAL, I.S.C.

JUGATSICK KULLU—PUNJAB,
June 24th, 1901.

No. XVII.—HABITS OF THE INDIAN TREE MAGPIE.

(*Dendrœitta rufa.*)

This bird, like the English Magpie, is a great destroyer of the eggs of other birds, and, though I have not seen it do so, I have no doubt that it captures and devours young nestlings, for this Magpie seems to be of a well developed carnivorous habit, and to have a special liking for flesh.

Last year while I was encamped at the foot of the Hoshiarpur Sewaliks, on a shooting trip, I had some joints of a Black Buck hung up to a tree close to my tent. A pair of Tree Magpies at once took possession of one of the joints tearing off pieces of meat with their strong bills. I would not allow them to be disturbed, and remained watching them from time to time. They were at work on the meat, with intervals, nearly the whole day, and the quantity of flesh these two small birds managed to dispose of quite surprised me. Probably they had a nest of young ones in the vicinity.

This year I was encamped within ten miles of the same spot and the same thing was repeated. A pair of these marauding Magpies at once alighted on some Black Buck's flesh that was hung upon a tree for my dogs, and as on the former occasion, the birds were at the meat nearly the whole day, going away for a rest, and returning for more.

W. OSBORN, LIEUT.-GEN., I.S.C.

JUGALSUK, KULLU—PUNJAB,
June 20th, 1901.

No. XVIII.—INDIAN SHEEP DOGS, AND ANOTHER INDIAN DOG.

After reading Miscellaneous Note No. 23 in the *Journal of the Bombay Natural History Society*, published on the 18th of May 1901, on Indian Sheep Dogs, I can fully endorse all that "J. F. G." has therein written on their instinct, courage, and training, as I have had during my travels, and shooting rambles, very many opportunities of seeing, and watching the working of these valuable assistants to the Indian shepherd. That these dogs can, and do drive off wolves, I think there is no doubt. I have seen a pair of wolves watching a flock of sheep, during the temporary absence of the shepherd. The dogs being on guard, the wolves were evidently afraid to attack, though everything was in their favour, except the Sheep Dogs. So intent were these two wolves on the business before them, waiting for a chance, that I was able to shoot one of the pair, the female.

From the large hairy sheep dog of the Guddis, who come down with their sheep and goats from Chamba, Lahoul, and Spiti, into the North Punjab during the winter, down to the sheep dogs of Southern India, these animals are nearly all trained in the manner described by "J. F. G." Of their ferocity, and capability of attacking any animal whatsoever that approaches their flocks, I once had an interesting experience. I was black buck shooting on the plains between Bellary in the Ceded Districts and Hurryhur in the Mysore Country. I had wounded a fine buck, and was riding him down with the spear. The buck was practically mine, for the plain extended for miles; my nag had plenty of go left in him and the buck was getting done, when unluckily for him, he took a course which led him quite close to a sheep-fold. Directly he passed it, three large sheep dogs bounded over the thorn fence, attracted by the sound of the buck galloping over the stony ground. At this point of the chase I was only thirty or forty yards behind. The dogs laid into the buck in first rate style, and pulled him down in about a quarter of a mile. I jumped off my horse, intending to give the *coup de grace*, but so fierce and determined were the dogs that I thought it most prudent to stand out, and let the fight go on without me. The buck was dead and mangled by the time the shepherds came up, and they rescued the venison for me. Had

I interfered, I think I should have fared badly, especially as I am sure the dogs had never seen a *Feringhee* before. When the rally was over I gralloched the buck and threw the whole of the viscera to the dogs, to reward them for their assistance, and for the interesting piece of sport they had shown me.

These sheep dogs of the Deccan, the Ceded districts and the adjacent province of Mysore, are all of the same class, chiefly red in colour, a few black and tan, and a very few quite black. Many of the red ones are feathered on the ears, tail and down the forelegs, and there are many quite smooth, like the ordinary red pariah.

It is not all about sheep dogs, however, that I am writing ; I wish to say a word or two on behalf of the common dog of the country, the unjustly despised Pariah. I don't mean the Mongrel that one sees about Indian towns and cantonments but the true Indian Pariah Dog, mostly red in colour.

That we have neglected this animal as a faithful companion, good watch dog, and an excellent assistant in many field sports, there is no doubt, though it is not strange that we should have done so, as sportsmen are a conservative body, many of whom consider that there is nothing good in the sporting line out of England. But of the good qualities of the true Pariah, as I have to call him, I have seen many instances. Notably when passing the hot weather months on the Ramandroog Hills, not quite 40 miles from Bellary, I found there were sixteen men of a tribe called "Bender" in the village below my camp who used to hunt with their dogs which were of the same class as I have described the true breed of country dog from which the sheep dogs are taken.

These sixteen men had a pack of eight dogs. Each man was armed with a spear, a small axe, and a knife. In addition to these, he carried a flint and steel, and tinder in his pouch. I am writing of a time years ago, when there was a fair head of game on this small range of hills, consisting of tigers, panthers and leopards, many sambur, pigs, &c. These Benders used to turn out for a hunt regularly twice a week, their game being always sambur, and in those times it was not long before the pack of eight were in full chase of a stag or hind. I never saw these dogs lose a sambur once. When they found they stuck staunchly to their quarry, and the end was always the same, stag, or hind, at bay, either against a rock, or in a pool of water, the pack laying around, and the Sambur slain at last by the spears of the Benders exactly, from start to finish as is described by Sir Samuel Baker in his description of Sambur hunting with hounds, in his Book "The Rifle and Hound in Ceylon."

I am not writing a sporting article but I am endeavouring to show the good qualities of the Indian dog. Sometimes these same "Benders" used to hunt hares in the grassy plains below the hills. Assisted by their eight dogs (all red ones) and armed only with their throwing sticks, a curved hardwood stick

with a knob at one end shaped something like a boomerang, I have seen them bring home fifteen to twenty hares, not one of which they could have secured without their dogs.

Once I was after a man-eating tigress; two Benders and one of their dogs were with me. I wounded the tigress which took refuge in a deep rocky glen, thickly covered in with a species of climbing, thorny mimosa. Entrance through this net work of hooked thorns was impossible to a man, but the dog, a red pariah was able to crawl in, found the tigress, and bayed her incessantly for half-an-hour. When the dog got too close, the tigress would execute a charge with the usual music, but could not get home, as her back was injured. However, the dog stuck to his work, and I was able to mark the spot where the tigress lay by the moving of the bushes, and meeting each charge with a couple of barrels, at hazard, a lucky shot at last finished the business, and I bagged the tigress which I certainly should have lost but for the dog.

These dogs are trained by native shikaris to other kinds of sport. Once when duck shooting in Mysore country, I was seated on a hillock watching a flight of ducks on a sheet of water, when I saw a performance that surprised me. In a hole dug in the ground about twenty yards from the brink of the water was seated a shikari, well concealed from the birds. He had with him his old gun and a red pariah dog. His object was to attract the birds to within shooting distance. To accomplish this, every now and then, at fairly regulated intervals, he threw a lump of a thick kind of *chupattie* they eat in these parts, down to the margin of the water. The red dog would then jump out of the hole, run to the *chupattie*, eat it, and return at once to his master. This was repeated till the attention of the ducks was attracted and it was continued, the flock swam gently on in the direction of the dog in that curious manner in which many birds will follow, and mob their natural enemy. At length coming well within range, bang went the old musket, and the shikari emerged from his pit to gather in the slain.

The interesting point here, apart from the performance of the dog, is the well-known habit of wild birds following their natural foes. In this instance the ducks evidently mistook the red dog for their enemy the fox or jackal. In English decoys this habit has been taken advantage of. The Decoy man trains a small red dog to show himself at different points to the ducks on the water. These invariably follow the dog slowly till he leads them into the mouth of the decoy net, and onwards, till the birds enter the fatal chamber from which there is no escape. Here we have an Indian shikari following a practice that has been for ages in use in England. Did we learn this trick from the East? The Indian fowlers could hardly have got it from us.

W. OSBORN, LIEUT.-GEN., I.S.C.

JUGALSUK, KULLU—PUNJAB,
June 30th, 1901.

No. XIX.—EXTRACT FROM THE ANNUAL REPORT OF THE DIRECTOR OF THE BOTANICAL DEPARTMENT, NORTHERN INDIA, FOR THE YEAR 1900-1901.

Botanical Tours.

Northern Oudh and Nepal Terai.—My head plant collector, Inayat Khan, was sent off early in April to collect botanical specimens in the northern districts of Oudh and the adjacent portions of the Nepal Terai. I wish to acknowledge the great assistance he received from the officers in charge of the forests in the Gonda, Bahraich and Kheri divisions. Of the many interesting plants found during this tour is a small tree called *Piptadenia oudhensis*, Brandis For. Fl. 168, belonging to the natural order Leguminosæ, and allied to Adenanthera. It was originally discovered in 1871 by Mr. Richard Thompson, formerly in the Forest Department, in the northern portion of the Gonda district. My plant collector saw it there, and also more abundantly in ravines within the Nepal frontier, growing near water. He was fortunate in finding the tree in flower as well as in fruit. The genus *Piptadenia* contains about forty species, mostly natives of America. Another interesting plant discovered by him is *Cephalanthus occidentalis*, L., a shrub belonging to the natural order Rubiaceæ. It was found growing in jhils in the Kheri district, and specimens of the same plant were collected by Inayat Khan in a similar locality in the Pilibhit district in 1898. Previously it was not known to occur westward of Assam. It is also recorded from Burma, Central China and North America where it is known under the names of "Button Bush" or "Globe Flower." Two new species of *Brachystelma* (Nat. Ord. Asclepiadaceæ) were also discovered during this tour, and specimens of several interesting orchids were collected.

Kumaon Tour.—A very successful and extensive tour was undertaken by my head plant collector, Inayat Khan, through a large portion of Kumaon during the rainy season of last year. He started from Saharanpur on the 18th of July and returned on the 6th of October. His instructions were to collect specimens of every kind of balsam (Impatiens), as well as flowering specimens of all the orchids he could find. As both balsams and orchids are with difficulty determinable if collected and dried in the ordinary way, he was ordered to put into a preservative solution some flowers of each kind, also to dry very carefully the separated portions of the flowers. The balsams were collected specially at the request of Sir Joseph Hooker, who is now preparing a revised account of all the Indian species. The collection from Kumaon, representing 110 gatherings, were despatched as soon as possible to Sir Joseph Hooker, together with the glass tubes containing flowers in solution, and it was gratifying to hear from him how completely satisfied he was with this collection and with the excellent condition of the specimens prepared by my collector. The latter also was much pleased on hearing that Sir Joseph Hooker had proposed to name one of the many novelties of this

collection after him. The collection of orchids was also a very good one, and contained many varieties, such as:—

Bulbophyllum affine, *Lindl.*
Cœlogyne ovalis, *Lindl.*
Cymbidium macrorhizon, *Lindl.*
„ pendulum, *Swartz,*
Dendrobium chrysanthum, *Wall.*
Habenaria arietina, *Hkf.*
„ Elisabethæ, Duthie (*ined.*)
„ n. sp. allied to H. reniformis, *Hkf.*
Herminimum Duthie, *Hkf.*
Liparis Duthiei, *Hkf.*
„ longipes, *Lindl.*
Orchis habenarioides, *King and Pantling.*
Ornithochilus fuscus, *Wall.*
Saccolabium papillosum, *Lindl.*

A large number of very interesting plants belonging to other natural orders were also collected.

Tours undertaken in the neighbourhood of Mussoorie.—One of my plant collectors was employed during the rainy season in procuring from Dehra Dun and the Siwalik range specimens of certain plants required in connection with my "Flora of the Upper Gangetic Plain." He was also sent, in company with a trained collector belonging to Mr. Phillip Mackinnon, to Bok Hill in Tehri-Garhwal, where many rare orchids were found, also a very curious and rare Orobanchaceous plant, called *Boschniackia himalaica*, found on the roots of Rhododendron arboreum. Specimens of another very remarkable leafless parasite, belonging to the same natural order, were sent to me from Deoban, beyond Chakrata, by Mr. B. B. Osmaston. It was originally discovered three years ago by Mr. Gleadow, Deputy Director of the Forest School, and has recently been described and published in the Journal of the Asiatic Society of Bengal, by Dr. Prain and Mr. Gamble, under the name of *Gleadovia ruborum*. It is found abundantly on the roots of Rubus nivens, which forms a large portion of the undergrowth in the forests on the northern slopes of the Deoban range.

J. F. DUTHIE,
Director, Botanical Dept., N. India.

MUSSOORIE:
The 5th June 1901.

No. XX.—EXTRACT FROM THE REPORT ON THE BOTANICAL SURVEY OPERATIONS IN THE BOMBAY PRESIDENCY FOR THE YEAR 1900-1901.

1. *Tours.*—During the hot-weather vacation I travelled through parts of the Dharwar and Kanara Collectorates, and also the forests bordering on Goa

territority from Castle Rock to Londa. During the autumn vacation I toured along the Ghâts on the southern and western sides of the Poona District, re-collecting many of Mr. Woodrow's discoveries to provide material for distribution. I also paid a visit to Nandgaon to inspect the experimental plantation of Sisal Hemp. Mr. Bhide, the Herbarium Keeper, completed a tour from Poona to Nagotna. He found many interesting plants, but his purpose was more especially to collect good material of *Podostemon hookerianus* and other species on behalf of Mr. J. C Willis, the Director of the Royal Botanic Gardens, Peradeniya, Ceylon, who is making a special study of the order *Podostemonaceæ*. Mr. Willis, during his visit to the Bombay Presidency, in search of these plants, was good enough to give us valuable information and identifications of the materials in this Herbarium.

During the tours special attention was devoted to obscure plants and many —specially orchids—were brought back alive to Poona, so that Mr. Bhide could figure them at leisure as they came into flower.

Drawings of many Bombay orchids were despatched to the Bombay Natural History Society for future publication in its Journal.

To Mr. Symonds, the Director of Agriculture, who is an enthusiastic botanist, I am indebted for interesting plants collected by him when travelling and also for samples of plants, said to have been utilized by the people when reduced to straits by famine. I append a list of these plants identified by me as the information may prove of interest to botanists :—

Plants used for their leaves are :—

Portulaca suffruticosa, *Wight.* (*vern.* Morad).
" quadrifida, *Linn.* (*vern.* Chighal).
Abutilon indicum, *G. Don.* (*vern.* Kachnia).
Tribulus terrestris, *Linn.* (*vern.* Sarata).
Rhus mysorensis, *Heyne.* (*vern.* Ambogna).
Launæa nudicaulis, *Less.* (*vern.* Pathari).
Dregea volubilis, *Bth.* (*vern.* Phandi).
Rivea hypocrateriformis, *Choisy.* (*vern.* Fangi).
Hygrophila Serpyllum, *T. Anderss.* (*vern.* Godadi).
Digera arvensis, *Forsk.* (*vern.* Kemjar).
Chenopodium album, *Linn.* (*vern.* Chil).

The only bulbous plant used was :—

Cyperus bulbosus, *Vahl.* (*vern.* Theg).

The plants utilized for their seeds and grains are :—

Indigofera linifolia, *Retz.* (*vern.* Pandarphale).
" glandulosa, *Willd.* (*vern.* Defri, Barbada).
" cordifolia, *Linn.* (*vern.* Vakal, Godadia).
Ocimum canum, *Sims.*
Cyanotis axillaris, *R. & S.* (*vern.* Damrs, Narids, Ichaka),
Scirpus maritimus, *Linn.* (*vern.* Dero, Chids).

Panicum prostratum, *Lamk.* (*vern.* Puhatu, Bateru).
" colonum, *Linn.* (*vern.*. Samo).
" flavidum, *Retz.* (*vern.* Garin).
Setaria verticillata, *Beauv.* (*vern.* Kulelu).
Æluropus villosus, *Trin.* (vern. Del.).
Elusine ægyptiaca, *Desf.* (*vern.* Manacha; Manachobi; Manchi; Anchi Manchi).
Dinebra arabica, *Jacq.* (*vern.* Kharin).
Polytoca barbata, *Stapf.* (*vern.* Khad-Khadio).
Apluda varia, *Hack.* (*vern.* Bhangaru).
Anthistiria ciliato, *Linn. f* (*vern.* Ratadin).
Iseilema Wightii, *Anderss.* (*vern.* Gadhu).
" laxum, *Hack.* (*vern.* Rahu tholvi).
Ischæmum rugosum, *Salisb.* (*vern.* Varchu).
Andropogon annulatus, *Forsk.* (*vern.* Zangroo).
" contortus, *Linn.* (*vern.* Soorwalu).
Chloris pallida, *Hook. f.* (*vern.* Chakalio).
Aristida (sp. inc.) (*vern.* Tholvi).
Sporobolus diander, *Beauv.* (*vern.* Dhul).
Eragrostis interrupta, *Beauv.* (*vern.* Dhadi).

Of all these plants, *Panicum colonum* (*Samo*) seems to have been most esteemed as a makeshift for better food.

Information regarding doubtful plants was supplied to Dr. T. Cooke, C.I.E., who is elaborating a Flora of Bombay in the Herbarium at Kew, and he in return, from time to time generously sends notes which supplement or correct our knowledge of Bombay plants.

Mr. G. M. Woodrow, my predecessor, still retains an interest in the Survey work, for which he did so much during his service, and, while drawing up the final part of the list, he supplied me with correct names for many gatherings of specimens.

4. *Experimental Culture of Sisal Hemp.*—The station at Nandgaon was fully planted up during the early part of the rains and the plants under observation there now number 3,000. The plants were in a flourishing condition at the time of my visit, and there is a certainty of the plantation ultimately proving a success. Twenty-one thousand young plants and bulbils were distributed to various applicants and a large number have been promised for this season to the Divisional Forest Officer at Nasik. As the area at my disposal is so circumscribed and as Sisal culture has become established in several parts of India, this Department may now restrict itself to the growth of plants solely for distribution.

G. A. GAMMIE, F.L.S.,
Officer in charge of the
Botanical Survey, Bombay Presidency.

POONA, *June*, 1901.

No. XXI.—A PIED-CRESTED CUCKOO'S EGG (*COCCYSTES JACOBINUS*) FOUND IN THE NEST OF THE BENGAL RED-VENTED BULBUL (*MOLPASTES BENGALENSIS*).

While strolling round my garden the other evening I found a Bulbul's nest which I had not previously observed. I have been leaving all the eggs of this bird in order to get the young ones for my aviary, so only wished to examine the nest, and as it was about 10 feet from the ground I had to get into the tree, but could not see into the nest even then. On putting my hand inside I felt 4 eggs, so determined to take them, as this was the first clutch of four I had ever found of this bird's, but the second egg removed proved to be that of a Pied-crested Cuckoo. I recognised it at once by its being almost round.

I have both this bird and the common Hawk Cuckoo (*Hierococcyx varius*) in the garden, but as the *Crateropus* (Babblers) are not laying at present, I never expected to find the eggs of the Pied-crested Cuckoo for sometime to come, and then not in a Bulbul's nest.

The common Hawk Cuckoos have been in the garden since February and after I had taken a few clutches of *Grateropus canorus* I left the others, only examining them for *Hierococcyx varius* of which I found none, nor have I seen young of the latter bird. *Coccystes jacobinus* has only been about the garden for a month or 6 weeks so I expected to have to wait for its eggs also. I have searched dozens of Bulbuls nests since, but have failed to find any more eggs of *Coccystes jacobinus*.

E. E. TOOTH.

DUM-DUM, 14*th June* 1901.

No. XXII.—UNUSUAL ABUNDANCE OF SANDGROUSE AT DEESA.

The common Sandgrouse (*Pterocles exustus*) has been unusually abundant near Deesa this year. I feel sure they have increased in numbers largely since I first came here, now nearly 5 years ago. Possibly the last few years, which have been unusually dry, have been especially favourable to their increase. A few weeks ago over 400 were shot over a running stream one morning by a party of 7 or 8 guns, and this at a place where more than 200 had been killed on several previous occasions during the course of a few weeks.

The painted Sandgrouse (*Pterocles fasciatus*) appears also to have increased in numbers. It is usually only found 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 packs 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 35 yards of them. However, I managed to shoot 21, 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.

As regards shooting both these species in the hot weather, and rains, I have no compunction. *P. exustus* breeds all the year round, and *P. fasciatus* during the greater part of the year, as I believe it does not usually breed in the rains. If they want the benefits of a close season, they should limit their breeding season to, say, six months in the year, like most other respectable game birds.

C. G. NURSE,
Major, 13th Bombay Infantry.

DEESA, 11*th August* 1901.

No. XXIII.—THE MASKED FINFOOT (*HELIOPAIS PERSONATA*) IN CACHAR.

I write to record the occurrence of *Heliopais personata*, the Masked Finfoot in the Chutla Bhil, Cachar. A pair of these birds were shot by Mr. C. B. Antram of Kuttal T. E., Cachar, in June last and the skins afterwards given to me.

Both birds appear to be in fully adult plumage and were most probably breeding at the time, as they were noticed to frequent only one reach of the river.

As Mr. Baker in his Birds of North Cachar, Vol. XII., notes it being extremely rare, the following description of the plumage may be of interest:—

Male—Forehead, lores, supercilium, and throat black, narrow white line bordering throat patch; neck above slaty grey, sides olive brown, as is also back, rump, escapulars, upper tail coverts, and the whole of the wing, sides of the body are brown barred lighter, breast and abdomen white tinged pale brown, in fact the upper part of the breast is brown.

Female wants the black throat patch of the male, this being replaced by white margined with black, the rest of the plumage is very similar to that of the male, with the exception that the breast and under parts are much lighter, and the sides barred with almost white.

Colours of soft parts in life said to be—Bill bright orange in the male, paler in the female, legs and feet in both apple green. Irides brown.

This bird, I am told by Mr. Campbell, Kuttal T. E., has been shot by him on several occasions and that in former years he did not consider it a rare bird though always more or less local and frequenting those parts of the Bhil around whose edges there was a heavy growth of Nijal trees and cane, into which it could make its way if alarmed. The Chutla Bhil is now very much clearer of jungle to what it was some years ago and this may perhaps be why the bird is less often met with.

A. M. PRIMROSE.

REMA T. E., CHARDPUR BAGAN,
S. SYLHET, 9*th August* 1901.

No. XXIV.—"BIRDS OF PREY."

Under the above heading, Major Rodon asks the question, as to what becomes of the bones of birds, after they have been struck by hawks and whether a hawk eats his prey, where he struck it, or carries it away elsewhere. Vol. XIII., page 185. To begin with the second question. It depends entirely on the locality, in which the hawk has struck, as to whether it will attempt to eat its quarry where it has caught it. If the place is well wooded, or otherwise offers good cover, for the hawk to sit and enjoy its meal in peace, it will pluck and devour it there and then, but very few will attempt it in the open, where the keen eyes of their bigger cousins, are liable to see. A peregrine may, sometimes, be seen on an open plain, or on the bed of a river, eating its prey, but in that case, it has probably caught a duck and more than it can conveniently carry, or it finds, that, by flying across an open plain, with a bird in its talons, it is much more liable to be seen, by one of the large sea-eagles, always to be found in such localities, than if it remained where it killed. Of course a hawk may occasionally be seen having its meal in the open, but it is the exception. As to what becomes of the bones, is a question which must be answered by first taking into consideration the different kinds of hawks and what is most likely to be the extent of their prey, for all hawks, in their wild state prefer tackling something considerably smaller than themselves, with the exception of the peregrine (*F. communis*) and some of the Himalayan eagles, but we will come to them later on. A hawk's digestion is nothing short of marvellous and all ordinary bones that it can break with its beak, it swallows together with the feathers and they seem to rather agree with it than otherwise. The feathers are expectorated every morning in a ball before the hawk goes out to search for its morning meal.

I shall begin with the small hawks, such as the merlins, sparrow-hawks, &c. They seldom rise to anything bigger than sparrows, finches, wagtails and similar birds and these are eaten till not a vestige remains to tell the tale, except a few feathers. The luggur falcon (*F. juggur*) generally preys upon rats, bats, lizards, &c., but will also tackle minahs, babblers and even seesee and partridges, but as they invariably hunt in pairs even a partridge is by no means a big meal between two. The same rule is applicable more or less throughout, *viz.*, that a hawk will nearly always prey upon something it is capable of eating every scrap of. The Chirug (*Hierofalco saker*) though it can be easily trained to kite, hare, houbara, &c., prefers in its wild state to live on rats, lizards and small birds. The peregrine (*F. communis*) and sometimes the Shaheen (*F. peregrinator*) prey a good deal on duck which they certainly cannot devour entirely, but as I mentioned before their hunting grounds are chiefly open plains, river beds or jheels where any remnants lying about, would very soon catch the eye of some passing harrier, or kite and be made short work of or carried away. In the Himalayas we have the eagles which tackle monaul, tragopan, snow-cock, &c., and it is chiefly to these that

Major Rodon refers. Among these big birds the chief depredators are the golden eagle (*A. chrysætus*), the spotted hawk eagle (*Spizætus nepalensis*), the Imperial eagle (*A. heliaca*), and the Goshawk (*Astur palumbarius*) sometimes. The goshawk in his wild state however seldom exceeds a kalij or koklass. Others too I daresay prey on monaul but these are I think the chief. Some of the bones of the monaul or snow-cock, take for instance the tibia, would be a hard nut to crack even for the powerful beak of the golden eagle, but my reason for its non-appearance among the feathers, which are frequently to be found lying about in heaps, are as follows: —

Between the months of March and October their absence is easily accounted for. All the larger eagles pair in February and March and begin building their nests very soon after, and from that time on till the young birds are fully fledged and able to follow their parents, all the game is brought to the nest daily, minus the feathers, which are plucked by the parent birds, presumably where the bird was caught. I had an opportunity of watching the actions of a pair of spotted hawk eagles, only a short time ago and finally sent up a man for the young one, which had only just begun getting a few of its back feathers. In the nest was a whole dove, with the exception of its feathers, a few, but very few feathers, of koklass and monual but any number of bones of all sorts and sizes. The young bird leaves the nest in August, but not to wander far from it and does not accompany its parents, till nearly the middle of September when it gets its first training and is initiated into the mysteries of "striking." I have frequently seen the young birds, getting a lesson. The mother soars into the heavens with her offspring following close behind and with a tender morsel in her talons. When sufficiently high to give the youngster a good fly, she drops it and lets him stoop after it, keeping near enough herself to catch it before it reaches the ground, in case the young one fails to get it. However it is only one or two of the largest eagles that dare resort to this style of amusement, as any of the smaller ones attempting the experiment would soon have their breakfast snatched from them. It is from October to March that the absence of bones is hard to account for. Of course during these months not many sportsmen visit the haunts of monaul and snow-cock to notice, and even then in the majority of cases the eagles are usually followed by crows who bother the life out of them as soon as they (the eagles) leave their perch. The keen eyes of the lammergeyer (*Gypactus barbatus*) too are ever on the watch for scraps. Then again there are pine martens and foxes, neither of which would despise even the bones of a pheasant. It must also be remembered that eagles are by no means the only enemies that pheasants have. The pine marten is an adept at climbing trees and watches its opportunity when the birds go to roost and last but by no means least, comes the curse of the Himalayas, *viz.*, the "pahary" with his snares. One frequently finds 4 or 5 consecutive spurs lined with nooses from top to bottom, chiefly set for muskdeer, but birds

by no means come amiss and keep the men in food till a few unfortunate muskdeer also fall victims. I have taken the greatest delight, on several occasions, in cutting every noose and have gone up and down the spurs from end to end especially for the purpose, thereby demolishing in one day what has taken two to four men a couple of weeks hard work to put up. I am glad to add we are pretty free of snaring in this district now. Well, to come to the point: the birds found hanging in the nooses, each morning, are carried off in triumph and plucked, in some cases, near the first stream the men come to or carried off to their camp, usually some well concealed cave or a large and thickly foliaged tree. Since these men change their camp every three or four days for fear of attracting attention, by staying in one place where their fires might be noticed, it stands to reason, the heaps of feathers of monaul and tragopan are pretty considerable and would strike a casual observer in each case as the work of a hawk, but a short search somewhere in the vicinity will bring to view bits of charred wood and ashes and some leaves and grass well flattened out which the men have used as beds. These signs together with those of a spur that has been noosed, though it may be a couple of miles away, tell their own tale. The feathers would naturally be plucked a few yards away from where the cooking takes place, if not as I mentioned above at the first stream the man comes to and thus easily accounting for the absence of bones among the feathers.

C. H. DONALD.

BHADARWA, KASHMIR STATE, 27*th July*, 1901.

No. XXV.—NESTING OF THE COOT (*FULICA ATRA*) AT POONA.

Oates in editing "Hume's Nests and Eggs of Indian Birds" states "The Coot breeds throughout India in large jheels and lakes that contain water all the year round." Further on he only mentions two recorded instances of eggs of this bird having been taken outside Cashmere, *viz.*, Lieut. Burgess at Ahmednagar in 1849 and Col. Butler near Belgaum in 1879. Personally, though I have searched water in various parts of this Presidency on many occasions, until this year, I have never found this bird breeding. Pieces of water where these birds abound in the cold weather usually contain a few birds, which I have always taken to be those who have been wounded or otherwise crippled so that they were unable to migrate and did not breed. It may therefore interest ornithologists to hear that this year they are breeding fairly commonly round Poona. I visited a jheel on the 14th July with a view to seeing what water birds I could pick up and was wading very nearly waist deep in water, in which reeds were growing freely, when I saw a floating mass of rushes. I sent a coolie out to see whether it was a nest or not: he reported that it was and contained 6 eggs. On inspection I found it was a Coot's (*Fulica atra*) nest and saw the hen swimming away in the offing. The nest was a very solid structure, the foundations

being of rushes collected together and welded into a rough sort of mat, on this the nest proper was built, principally of rushes which had evidently been green but were dry and brown: it was neatly finished off and lined: the whole structure was floating and appeared to be attached or entangled in the reeds, so that it should not float away. On the 4th August, I found another nest containing 2 chicks and 6 eggs on the point of hatching. On the 11th idem a nest with 9 practically fresh eggs and on the 17th another with 5 fresh eggs. The nests in all cases being similarly situated and constructed. Capt. Payn, of the King's Shropshire Light Infantry, has also found them breeding. On the large pieces of water there are a few pairs and on all small ones just a pair, but they seem to be nesting on any place where found. As I have never found the bird before and have always been on the look out, I am very interested in the find and should like to know whether any other ornithologists have found the bird breeding in India excluding Cashmere.

R. M. BETHAM, Major,
8th Bombay Infantry.

POONA, 20*th August*, 1901.

No. XXVI.—THE FLOWERING OF BAMBOOS.

In the issue of *The Garden* for June 16 of last year (page 435) "S. W. F." mentions the flowering of Bambusa Simoni striata at Abbotsbury, Dorsetshire, and comments on the flowering of Bamboos as follows:—"It has been asserted that with regard to the flowering of Bamboos, the whole species blossoms simultaneously, and not isolated examples, and that subsequent to flowering the clumps die." In the following week's issue, at page 456, corroboration of this is given by quoting an extract from the *Westminster Gazette*, based on some remarks in the annual report of H. B. M. Consul, Pakhoi. I take the following remarks, in connection with the subject, from Munro's "Monograph of the Bambusaceæ." In regard to Bambusa arundinacea the author says:—"Bambusa arundinacea takes a long time in coming to the flowering stage. Dr. Hooker is of opinion that this Bamboo does not flower at any particular age, but at any period when full grown, and the circumstances of the season are favourable to its flowering." Of other species the following interesting information is given:—"The late Sir W. Sleeman stated, as a fact observed by himself, that in 1836 all the large Bamboos in the Deyrah Shoon which had been the principal feature of beauty in the valley for the last twenty-five years, ran to seed and died." "Dr. Wallich mentions that a celebrated grove of Bamboos which surrounded the city of Rampoxe, in Rohilcund, blossomed universally in 1824, and every stem died, and he was informed that the same event happened forty years previously." "Mr. Spilsbury states that all the Bamboos between Jubbulpore and Mundlah seeded in 1839, and died shortly afterwards. Melocanna bambusoides flowered generally in Tipperah, Rungpore, Arracan, and Chittagong in 1863-66, and died immediately afterwards." "Dr. Anderson, Superintendent of the

Botanic Gardens, Calcutta, states that in 1857 and 1858 many of the Bamboos near Calcutta and on Parasnath flowered and seeded, but in no case that he was aware of did a general death of the Bamboos follow. So far as he observed only the flowering shoots died, and their place was taken by young shoots springing from the roots, but during the flowering and seeding the foliage almost entirely disappeared. He adds: Bambusa gigantea at Calcutta flowered for the first time after thirty years in 1861, and remained alive although the plants were weakened." "Arundinaria hookeriana, Munro," Dr. Hooker says, "After maturing its seeds and giving off suckers from the root, the parent plant dies." "Bambusa flexuosa, Munro, Osbeck during his travels in China in 1751, mentions that it is said to flower once in sixty years." Munro says of Dendrocalamus strictus, Nees, that it flowers frequently, if not every year, and does not die down after flowering. Roxburgh states, according to Munro, that he never saw Bambusa Balcooa more than once in flower, and Humboldt according to the same authority, "Mons Mutis herborised for twenty years in the country where Bambusa guadua formed marshy forests, several leagues broad, without being able to procure a flower." Munro also says: "Some of the Arundinaria which die down every year, and springing up again, flower, annually."

From "Hooker's Flora of British India," Vol. VII., I take the following:— "Arundinaria walkeriana, Munro; probably flowers frequently." "Arundinaria wightiana, Nees, flowers annually." Arundinaria racemosa, Munro; flowers rarely, and only in the higher elevations, 6,000 feet to 12,000 feet." "Arundinaria griffithiana, Munro; only once seen in flower," "Bambusa Tulda, Roxb; flowers gregariously, and in single clumps." "Bambusa arundinaria, Willd; flowers gregariously and in small clumps."

Hance, in his supplement to the "Flora Hongkongensis," at page 49, has the following remarks on the flowering of Dendrocalamus latiflorus, Munro:— "This fine species, the 'Great Bamboo' of the Chinese, which has culms about 40 feet high, instead of 7 feet—as stated by Munro—flowers, *favente Jove* annually without dying down or being apparently weakened." On the same page, he says of Bambusa flexuosa, Munro:—"A curious and distinct species, forming dense clumps, apparently flowering less regularly than Dendrocalamus latiflorus, but also not dying afterwards."

As regards the flowering of Bambusa tuldeides, Munro, I can say from personal observations that it has flowered annually in Hong Kong for the last six or seven years without dying subsequently, and also that clumps of apparently the same age do not flower simultaneously. This species flowers from March onwards, and at the time of writing (the beginning of August) many clumps of it are in flower. It becomes considerably weakened by flowering, and loses many leaves, but ultimately recovers. Schizostachyum dumetorum, Munro (Bambusa dumetorum, Hance), also flowers annually without dying down. Phyllostachys bambusoidus and an Arundinaria I

obtained in flower in 1897, but I have not seen them in flower since. I know, however, that they did not die after flowering. Although it is an undoubted fact that many Bamboos die immediately after flowering, it will be seen from the foregoing remarks that many others do not. The popular notion that all bamboos die subsequently to flowering has probably arisen from observations made in India, where large forests of bamboos exist. Each bamboo forest is composed principally (probably) of one species, and if that particular species dies after flowering it does not require much stretching of the imagination to come to the conclusion, when a whole forest disappears, that all bamboos die after flowering.

W. J. TUTCHER.

BOTANIC GARDENS, HONG KONG.

(*The above appeared in "The Garden" on 9th March* 1901.)

No. XXVII.—MIGRATION OF BUTTERFLIES.

It is now nearly thirty years since I first began to take an interest in Lepidoptera, and although I have, of course, read of the migration of large bodies of butterflies, I never witnessed any flight that could be considered migration until the last few days. When riding back from shooting three days ago, I noticed a large number of *Catopsilia pyranthe*, all flying against the wind in a north-westernly direction. I first saw them about 7 miles from Deesa, and the swarm continued until I reached cantonments; in every direction there appeared to be about an average of one *C. pyranthe* to every 10 or 12 square yards of ground. There was plenty of other butterflies about, chiefly various specis of Teracolus; these, however, were flitting about the bushes as usual, but there was scarcely a single *C. pyranthe* that had not urgent business towards the N.-W. The flight or migration continued all that day and the next, and to-day there have also been a considerable number of the same species flying in the same direction, but not nearly so many as on the two previous days, so I conclude the flight is now over. An observant friend tells me that the same migration of this species has taken place about this time every year for the last three years at least, but I have never been here at the end of August before, so I have not seen it. *C. pyranthe* is common enough in this neighbourhood, the larva feeding on a small shrub with yellow flowers, of which I do not know the name; but I have never seen a tenth of the numbers I saw during the last 3 days.

C. G. NURSE, Major,
13th Bombay Infantry.

DEESA, *27th August* 1901.

No. XXVIII.—NIDIFICATION OF THE DESERT SAND LARK.
(*ALŒMON DESERTORUM.*)

I have at last obtained the eggs of the Desert Sand Lark, for which I have long been on the look out. A few days ago my *shikari* (who is also my understudy as an oologist) came to me and said he had seen out in the

Runn, on one of the many small islands, a curious bird the like of which he had never seen before. He is not clever at noting the colouration of the birds but on this occasion he had noticed that the bill was slightly curved and that the legs were white; he further added that the bird has a curious way of throwing itself up into the air and at the same time uttering a shrill whistle. He had found the nest and there was one egg in it which he had not taken as he supposed more would be laid. Strongly suspecting that this must be the Desert Sand Lark, I sent him out a few days later with my gun, telling him to shoot the bird as it left the nest and to bring me the bird and eggs. Two days ago he brought in the bird (which is undoubtedly *Alæmon desertorum*) and a nice clutch of 3 eggs which are now in my collection. I have had the bird's skin preserved and hope to send it to you for inspection. From the notes on the breeding of this species to be found in "Hume Oates" and "Blanford by Oates" I find that the breeding season is in May and June, whereas my clutch was obtained on 19th August. The lateness of the monsoon this year (and consequent extension of the hot weather) may account for the late breeding of this bird in the present case.

The eggs are white with bold yellowish-brown spots, the shell rather glossy and they are rather larger than any of the other lark's eggs.

HARRINGTON BULKLEY.

KHARAGHORA, 22*nd August*, 1901.

No. XXIX.—THE BANDED CRAKE AT KHANDALLA.

Last year my *shikari*, at Khandalla, brought me a clutch of seven creamy white eggs, in the middle of August, together with a nest and said they belonged to a bird which he described as a "burra bhagné wallah" that lived in grassy swamps. He called the bird "lekhir." As I could not identify the eggs, I sent them to Mr. Stuart-Baker for an opinion. He returned them saying he thought they were the eggs of the Little Bittern (*Ardea minuta*). They certainly are of that type. My *shikari* said the bird was fairly common at Khandalla and says it is not a "bagla" at all. I gave him orders to look out again this year, which he did and towards the end of August brought me a nest of the same bird containing 8 eggs and a bird, which I could not identify, but on sending it to the Bombay Natural History Society it was found to be the Banded Crake No. 1395 (*Rallina superciliaris*). The *shikari* says he shot the bird with an arrow on the nest; as he is not reliable I cannot accept his word, but merely record the fact. The nest looks more like a Bittern's than a Rail's. Early in September, I went to Khandalla myself as the *shikari* told me he had another nest marked down. On arriving at the place, I was disappointed as the nest contained no eggs. It was situated in swampy ground and, I believe, was the nest of

the Blue-breasted Banded Rail (*Hypotænidia striata*) and not of the bird laying the white eggs, an opinion I arrived at by finding the egg shell of that bird in the vicinity of the nest. I shall endeavour next year to make sure of the bird that lays the white eggs, for although the latter are not the type of egg one would expect the Banded Crake to lay, it may be so. That the Banded Crake is to be obtained at Khandalla during the monsoon there is no doubt as the bird was shot there.

R. M. BETHAM, MAJOR,
8th Bombay Infantry.

POONA, 21*st September* 1901.

No. XXX.—A RARE SNAKE.

I have much pleasure in sending for our Society's collection, a specimen of a rare snake *Contia angusticeps* obtained by me in Malakand and possibly a few notes about it may be of interest to our Members.

The first specimen I got was sent to Calcutta, where Major Alcock was unable to identify it, and concluded it was a new species. Mr. Boulanger of the British Museum, to whom it was sent, identified it as the *Contia augusticeps*, of which one specimen was found several years ago, and it, the type specimen, was said to be in the Indian Museum at Calcutta. It cannot be found there and must have been lost.

The specimen I have sent you is one of eleven specimens obtained by me (all at Malakand) and therefore one of the twelve only specimens (including the lost type specimen) yet discovered. The others are in the Indian Museum, British Museum, Dublin Museum, and one in my own possession.

This snake in life, is a very lively little creature. The markings on the head are jet black in life, but fade rapidly in spirits. The measurements of the 11 existing specimens are:—

	Body.	Tail.	Total length.
1	9·75″	3·0″	12·75″
2	9·25″	2·25″	11·5″
3	9·25″	2·75″	12·0″
4	9·75″	2·0″	8·75″
5	10·1″	2·9″	13·0″
6	...	...	9·5″
7	...	...	11″
8	...	...	13″
9	...	...	14″
10	...	...	15″
11	...	...	11″

A. H. McMAHON, MAJOR.

ZIARAT, 4*th August* 1901.

No. XXXI.—ON THE NEW SPECIES OF BUTTERFLIES RECENTLY DESCRIBED BY MR. A. G. BUTLER

Mr. Butler in the Annals and Magazine of Natural History, Vol. 7, No. 39, has separated the Ceylon species of *Iraota* from the Indian and has bestowed on it the name *I. Nicèvillei*. He writes, "*Iraota mæcenas*, Moore, Lep. Ceylon, Vol. 1, p. 102, pl. XL. figs. 2, 2a ♂, 1880-81. This species differs from the true *I. mæcenas* (dry phase of *I. timoleon*) in the much more restricted and metallic morpho like colouring of the patches of colour on the upper surface. According to Moore these patches are metallic blue; but it would be more correct to call them green, as it is difficult to get them so placed as to eliminate all yellow from the blue; and when facing the light, the colouring is glittering metallic green. On the under surface the differences are not striking between the two species, but the white discoidal markings are less silvery in the Ceylonese insect and the discal white lunules on the primaries are reversed, their concavities being directed towards the base instead of the outer margin. Our examples, which are females, differ from the rich purple females of *timoleon* in their longer secondaries and with more slender tails; indeed in their general aspect they more nearly resemble the male than the female of *I. timoleon*."

This insect was apparently described from specimens in Mr. Mackwood's collection.

In a small collection of the rarer Ceylon butterflies collected by Mr. Pole and now in the Colombo Museum, I was interested to note two specimens of *Iraota* and made the following notes on them. Both specimens are males. The first specimen has the patch on the primaries brilliant metallic green in all lights. Two small white markings on the disc beneath the lower one the larger almost square, the upper consists of a few white scales. The white marking on the costa touches the discoidal spot.

The other specimen is a deep mettallic blue in nearly all lights sometimes with a purplish tinge. The markings on the under-surface more distinct, the lower and larger somewhat triangular with the base downwards, and almost touching the upper one which is similar to the other specimen. The white costal markings are much reduced and scarcely touch the discoidal spot. These two specimens come from the Hambantotte district in the South of the Island. Mr. Butler would, I presume, describe these specimens as *I. Nicèvillei* ♂ but it will be seen how much they differ from each other, both the upper and under-surfaces presenting many points of difference. I think before the Ceylon insect receives specific rank, something more should be known about it.

In the same number of the Annals Mr. Bulter describes *Spindasis minima* sp. n. He states that it is probably nearest to *lilacina*, a species so far as I know that does not occur in Ceylon. But he goes on to say that it is very distinct from all known species. He further says that the general disposition of the markings of the under-surface is that of *S. fusca*. The

specimen or specimens from which the description is made were taken by Mr. Pole on the Segersta Estate near Matale at an elevation probably of 1,000-2,000ft. Mr. Pole writes to me "*Minima* I took in the Segersta Estate amongst high grass . . . . I am sending two specimens to Bulter for identification." While not wishing in any way to invalidate this species, I would wish to warn Entomologists including Mr. Bulter from describing as a new species a member of the genus *Spindasis* from Ceylon unless they possess a very full series. This genus in Ceylon varies to an extraordinary extent and until extensive breeding operations are carried on, the confusion is only likely to increase with each new species described. Mr. Bulter also describes *S. trifurcatus* as occurring in the island; as far as I can gather from Mr Pole from a single specimen captured at Chilaw. Mr. de Nicéville, Brit. Ind., Vol. III, page 362, appears to consider *Spindasis* (*Aphnæus*) *trifurcata* as identical with *ictis*, a common Ceylon species.

N. MANDERS, MAJOR, R.A.M.C.

CEYLON, 21*st August* 1901.

XXXII.—LIST OF BIRDS' SKINS.

RECEIVED FROM THE INDIAN MUSEUM, CALCUTTA (in exchange), February 1901.

1	*Corvus corax*	Raven.
12	*Urocissa occipitalis*	Red-billed Blue Magpie.
13	„ *flavirostris*	Yellow-billed Blue Magpie.
14	*Cissa chinensis*	Green Magpie.
24	*Garrulus lanceolatus*...	Black-throated Jay.
35	*Ægithaliscus erythrocephalus* ...	Red-headed Tit.
42	*Machlolophus xanthogenys*	Yellow-cheeked Tit.
44	*Lophophanes melanolophus*	Crested Black Tit.
69	*Garrulax leucolophus*	Himalayan White-Crested Laughing-Thrush.
70	„ *belangeri*	Burmese „ „
72	„ *pectoralis*	Black-gorgeted „ Laughing-Thrush.
85	*Trochalopterum nigrimentum* ...	Western Yellow-winged Laughing Thrush.
108	*Argya subrufa*	Large Rufous Babbler.
116	*Pomatorhinus schisticeps*	Slaty-headed Scimitar Babbler.
129	„ *erythrogenys*	Rusty-cheeked „
135	*Dumetia hyperythra*	Rufous-bellied Babbler.
144	*Pellorneum ruficeps*	Spotted Babbler.
145	„ *subochraceum*	Burmese Spotted Babbler.
160	*Turdinus abbotti*	Abbott's Babbler.
163	*Alcippe nepalensis*	Nepal Babbler.
172	*Stachyrhidopsis ruficeps*	Red-headed Babbler.
174	„ *pyrrhops*	Red-billed „
176	*Mixornis rubricapillus*	Yellow-breasted Babbler.
182	*Sittiparus castaneiceps*	Chestnut-headed Tit-Babbler.
219	*Siva strigula*	Stripe-throated Siva.
232	*Ixulus flavicollis*	Yellow-naped Ixulus.

LIST OF BIRDS' SKINS.—(*contd.*)

234	*Herpornis xantholeuca*	White-bellied Herpornis.
236	*Cutia nepalensis*	Nepal Cutia.
250	*Chloropsis chlorocephala*	Burmese Chloropsis.
255	*Melanochlora sultanea*	Sultan-bird.
261	*Psaroglossa epiloptera*	Spotted-wing.
263	*Criniger flaveolus*	White-throated Bulbul.
282	*Molpastes bengalensis*	Bengal Red-vented Bulbul.
285	„ *leucotis*	White-eared Bulbul.
321	*Sitta castaneiventris*	Chestnut-bellied Nuthatch.
323	„ *leucopsis*...	White-cheeked Nuthatch.
325	„ *frontalis*...	Velvet-fronted Blue Nuthatch.
364	*Acrocephalus orientalis*	Eastern Great Reed-Warbler.
367	„ *agricola*	Paddy-field Reed-Warbler.
381	*Cisticola cursitans*	Rufous Fantail-Warbler.
382	*Franklinia gracilis*	Franklin's Wren-Warbler.
394	*Hypolais rama*	Sykes's Tree-Warbler.
395	„ *pallida*	Olivaceous „
396	„ *caligata*	Booted „
399	*Sylvia jerdoni*	Eastern Orphean Warbler.
400	„ *nana*	Desert Warbler.
402	„ *affinis*	Indian Lesser White-throated Warbler.
405	*Phylloscopus affinis*	Tickell's Willow-Warbler
407	„ *tristis*	Brown „
408	„ *indicus*...	Olivaceous „
410	„ *fuscatus*	Dusky „
415	„ *proregulus*	Pallas's „
416	„ *subviridis*	Brooks's „
417	„ *superciliosus*	Crowned „
418	„ *humii*	Hume's „
421	*Acanthopneuste nitidus*	Green „
422	„ *viridanus*	Greenish „
426	„ *lugubris*	Dull-green „
428	„ *occipitalis*	Large Crowned Willow-Warbler
458	*Suya crinigera*	Brown Hill-Warbler.
462	*Prinia lepida*...	Streaked Wren-Warbler.
464	„ *socialis*	Ashy „
465	„ *sylvatica*	Jungle „
466	„ *inornata*	Indian „
474	*Lanius collurioides*	Burmese Shrike.
486	*Tephrodornis pelvicus*	Nepal Wood-Strike.
490	*Pericrocotus speciosus*	Indian Scarlet Minivet.
499	„ *roseus*	Rosy Minivet.
514	*Oriolus indicus*	Black-Naped Oriole.
524	*Eulabes intermedia*	Indian Grackle.
530	*Sturnus porphyronotus*	Central Asian Starling.
532	„ *menzbieri*	Common Indian „
533	„ *poltaratzskii*	Finsch's „
538	*Sturnia malabarica*	Grey-headed Myna.
557	*Muscicapa grisola*	Spotted Fly-catcher.
558	*Hemichelidon sibirica*	Sooty „
575	*Cyornis rubeculoides*...	Blue-throated „
592	*Culicicapa ceylonensis*	Grey-headed „
599	*Terpsiphone affinis*	Burmese Paradise Fly-catcher.
605	*Rhipidura albicollis*	White-throated Fantail „
626	*Saxicola deserti*	Desert Chat.

LIST OF BIRDS' SKINS.—(*contd.*)

639	*Ruticilla frontalis*	Blue-fronted Redstart.
650	*Calliope camtschatkensis*	Common Ruby-throat.
651	„ *pectoralis*	Himalayan „
654	*Ianthia rufilata*	Red-flanked Bush-Robin.
676	*Merula boulboul*	Grey-winged Ouzel.
680	„ *obscura*	Dark Ouzel.
692	*Petrophila solitaria*	Eastern Blue Rock-Thrush.
708	*Cinclus kashmiriensis*	White-breasted Asiatic Dipper.
717	*Tharrhaleus fulvescens*	Brown Accentor.
721	*Ploceus megarhynchus*	Eastern Baya.
737	*Stictospiza formosa*	Green Munia.
745	*Pyrrhula aurantiaca*	Orange Bull-finch.
746	„ *erythrocephala*	Red-headed „
748	„ *nepalensis*...	Brown „
754	*Propasser thura*	White-browed Rose-finch.
757	„ *grandis*	Red-mantled „
758	„ *rhodochrous*	Pink-browed „
765	*Procarduelis nepalensis*	Dark Rose-finch.
772	*Hypacanthis spinoides*	Himalayan Green-finch.
778	*Passer hispaniolensis*...	Spanish Sparrow.
779	„ *montanus*	Tree-Sparrow.
790	*Emberiza fucata*	Grey-headed Bunting.
791	„ *pusilla*	Dwarf „
797	„ *aureola*	Yellow-breasted Bunting.
810	*Ptyonoprogne rupestris* ...	Crag-Martin.
814	*Hirundo gutturalis*	Eastern Swallow.
819	„ *fluvicola*	Indian Cliff-Swallow.
826	*Motacilla alba*	White Wagtail.
827	„ *leucopsis*	White-faced Wagtail.
829	„ *personata*	Masked Wagtail.
830	„ *hodgsoni*	Hodgson's Pied Wagtail.
831	„ *maderaspatensis*	Large Pied Wagtail.
832	„ *melanope*	Grey „
833	„ *borealis*	Grey-headed Wagtail.
834	„ *flava*	Blue-headed „
836	„ *feldeggi*	Black-headed. „
837	„ *citreola*	Yellow-headed „
838	„ *citreoloides*	Hodgson's Ylw. headed Wagtail.
845	*Anthus richardi*	Richard's Pipit.
849	„ *cervinus*	Red-throated Pipit.
851	„ *spinoletta*	Water Pipit.
855	*Otocorys pencillata*	Gould's Horned Lark.
856	„ *longirostris*	Long-billed „
857	„ *elwesi*	Elwes's „
860	*Alauda arvensis*	Sky-Lark.
801	„ *gulgula*	Indian Sky-Lark.
874	*Galerita cristata*	Crested Lark.
882	*Æthopyga scheriæ*	Himalayan Ylw. backed Sun-bird
884	„ *cara*	Tenasserim „ „
886	„ *vigorsi*	Vigor's Yellow-backed Sun-bird.
887	„ *ignicauda*	Fire-tailed „ „
890	„ *saturata*...	Black-breasted „ „
892	„ *nepalensis*	Nepal „ „
912	*Dicæum cruentatum*...	Scarlet-backed Flower-pecker.
915	„ *ignipectus*	Fire-breasted „
919	„ *erythrorhynchus*	Tickell's „

LIST OF BIRDS' SKINS.—(*contd.*)

931	*Pitta cyanoptera*	Lesser Blue-winged Pitta.
933	„ *brachyura*	Indian Pitta.
940	*Cymborhynchus macrorhynchus* ...	Black-and-red Broad-bill.
944	*Psarisomus dalhousiæ*	Long-tailed „
949	*Gecinus viridanus*	Burmese Scaly-bellied Green Wood-pecker.
960	*Hypopicus hyperythrus*	Rufous-bellied Pied Woodpecker.
964	*Dendrocopus darjilensis*	Darjeeling Pied „
973	*Iyngipicus semicoronatus*	„ Pigmy „
983	*Micropternus phæoceps*	Northern Rufous „
988	*Tiga javanensis*	Common Golden-backed three-toed Wood-pecker.
1025	*Eurystomus orientalis*	Broad-billed Roller.
1031	*Nyctiornis athertoni*	Blue-bearded Bee-eater.
1055	*Rhytidoceros subruficollis*	Blyth's Wreathed Hornbill.
1069	*Cypselus apus*	European Swift.
1073	„ *affinis*	Common Indian Swift.
1074	„ *subfurcatus*	Malay House-Swift.
1075	*Tachornis batassiensis*	Palm-Swift.
1077	*Chætura nudipes*	White-necked Spine-tail.
1085	*Collocalia linchi*	Horsfield's Swiftlet.
1086	*Macropteryx coronata*	Indian Crested Swift.
1096	*Lyncornis cerviniceps*	Great-eared Mightjar.
1101	*Harpactes erythrocephalus*	Red-headed Trogan.
1112	*Cacomantis passerinus*	Indian Plaintive Cuckoo.
1140	*Palæornis rosa*	Eastern Blossom-headed Paroquet.
1156	*Asio otus*	Long-eared Owl.
1160	*Syrnium indrani*	Brown Wood-Owl.
1173	*Scops giu*	Scops Owl.
1178	„ *bakkamœna*	Collared Scops Owl.
1183	*Glaucidium cuculoides*	Large Barred Owlet.
1199	*Gypaëtus barbatus*	Lämmergeyer.
1212	*Spizaëtus limnaëtus*	Changeable Hawk-Eagle.
1213	„ *nepalensis*	Hodgson's „
1230	*Milvus melanotus*	Large Indian Kite.
1234	*Circus cineraceus*	Montagu's Harrier.
1235	„ *cyaneus*	Hen „
1241	*Buteo desertorum*	Common Buzzard.
1260	*Falco sub-buteo*	Hobby.
1261	„ *severus*	Indian Hobby.
1267	*Microhierax eutolmus*	Red-legged Falconet.
1283	*Sphenocercus sphenurus*	Kokla Green Pigeon.
1286	*Ducula insignis*	Hodgson's Imperial Pigeon.
1296	*Columba leuconota*	White-bellied Pigeon.
1298	*Palumbus casiotis*	Eastern Wood-Pigeon.
1304	*Turtur orientalis*	Rufous Turtle-Dove.
1308	„ *tigrinus*	Malay Spotted Dove.
1327	*Polyplectrum chinquis*	Grey Peacock-Pheasant.
1336	*Gennæus albicristatus*	White-crested Kalij Pheasant.
1339	„ *horsfieldi*	Black-breasted „
1344	*Tragopan satyra*	Crimson Horned „
1370	*Caccabis chucar*	Chukor.
1415	*Houbara macqueeni*	Houbara.
1425	*Glareola orientalis*	Large Indian Pratincole.
1434	*Sarcogrammus atrinuchalis*... ...	Burmese Wattled Lapwing.

LIST OF BIRDS' SKINS.—(*concld.*)

1436	*Vanellus vulgaris*	Lapwing or Peewit.
1438	*Chettusia leucura*	White-tailed Lapwing.
1459	*Terekia cinerea*	Avocet Sandpiper.
1461	*Totanus glareola*	Wood "
1477	*Tringa subarquata*	Curlew Stint.
1478	" *alpina*	Dunlin.
1490	*Larus ridibundus*	Laughing Gull.
1491	" *brunneicephalus*	Brown-headed Gull.
1492	" *hemprichi*	Sooty "
1495	" *cachinnans*	Yellow-legged Herring-Gull.
1496	*Hydrochelidon hybrida*	Whiskered Tern.
1501	*Sterna media*	Smaller Crested Tern.
1503	" *seena*	Indian River "
1504	" *melanogaster*	Black-bellied "
1506	" *fluviatilis*	Common "
1548	*Dissura episcopus*	White-necked Stork.
1575	*Phœnicopterus roseus*	Common Flamingo.
1586	*Rhodonessa caryophyllacea*... ...	Pink-headed Duck.
1594	*Eunetta falcata*	Crested Teal.
1601	*Querquedula circia*	Garganey or Blue-winged Teal.

PROCEEDINGS

OF THE MEETING HELD ON 16TH APRIL, 1901.

A MEETING of the members took place on Tuesday last, the 16th April, 1901, Colonel Olivier, R.E., presiding.

NEW MEMBERS.

The following elections of new members were announced :—

Lieutenant H. Wood, R.E. (Mussoorie), Lieutenant G. G. Young, I.M.S. (Baroda), Mr. William Jesse, M.A. (Lucknow), Lieutenant R. R. Henderson (Lucknow), Dr. J. D. Gregerson (Dibrugarh), Mr. Mirza Nazir Beg (Hyderabad), Mr. E. W. Trotter (Pyapon, Burma), Lieutenant Allen R. B. Shuttleworth (Zhob Valley), and Dr. Morrison, M.D. (Bombay).

CONTRIBUTIONS TO THE MUSEUM.

Mr. H. M. Phipson, the Honorary Secretary, acknowledged receipt of the following contributions to the Society's Museum since the last meeting :—

Contribution.	Description.	Contributor.
2 Snakes	*Ablabes calamaria, Silybura macrolepis*	Mr. R. C. Wroughton, I.F.S.
1 Russell's viper	*Daboia russellii*	Mr. E. Yeo.
1 Snake (alive)	*Lycodon aulicus*	Col. A. S. Croly, R.A.M.C.
1 Gargeny teal	*Querquedula circia*	M. W. F. Biscoe.
1 Orange-breasted green pigeon.	*Osmotreron bicincta*	Do.
1 Anderson's squirrel	*Sciurus quinquestriatus*	Mr. H. H. Harrington.
1 Striped Himalayan squirrel.	*Sciurus macclellandi*	Do.
1 Malay Tree-shrew	*Tupaia ferruginea*	Do.
1 Fishing cat	*Felis viverrina*	Do.
1 Capped monkey	*Semnopithecus pilcata*	Do.
1 Laggar falcon	*Falco jugger*	Mr. K. C. Macdonald.
2 Jackals (alive)	*Canis aurius*	Mr. C. Merrony.
1 Albino snipe	*Gallinago celestis*	Major G. H. Evans.
3 Kalij pheasants	*Gennæus sp*	Mr. W. G. Nisbett.
1 Arakan hill-partridge	*Arboricola intermedia*	Do.
1 Grey quail	*Coturnix communis*	Do.
1 Ruff	*Paroncella pugnax*	Lieut. J. W. Watson.
1 Indian turtle dove	*Turtur ferrago*	Do.
1 Black-throated ouzel	*Merula atrigularis*	Do.
1 Rose finch	*Rhodospiza obsoleta*	Do.
1 Pied chat	*Saxicola picata*	Do.
1 Isabelline chat	*Saxicola isabellina*	Do.
1 Indian redstart	*Ruticilla rufiventris*	Do.
1 Pale-brown shrike	*Lanius isabellinus*	Do.
1 Raven	*Corvus corax*	Do.
1 Bronze-capped teal	*Eunetta falcata*	Mr. L. Robertson.

MINOR CONTRIBUTIONS FROM

A. L. Alexander, Miss Hume Henderson, Mr. S. F. Melling, Mr. C. S. F. Crofton, and Mr. E. W. Trotter.

CONTRIBUTIONS TO THE SOCIETY'S LIBRARY.

Thirty-first Annual Report of the Entomological Society of Ontario, 1900; Canadian Entomologist, Vol. XXXIII, No. 3; Through Unknown African Countries (A. D. Smith'), J. Johnston; Island Life (A. R. Wallace), J. Johnston; The Nile Tributaries of Abyssinia (Sir Sam. Baker), J. Johnston; Rambles in Polynesia, J. Johnston; American Hydroids, Part I; Fishes of North and Middle America; Society of Protection of Birds, Report; and Memoirs of the Geological Survey of India, Vol. XXXIII, Part. I.

PROTECTION OF BIRDS IN INDIA.

The Honorary Secretary drew attention to the fact that the Society for the Protection of Birds, which was founded in England 1889, now propose to extend their operations to this country, and as a preliminary step were anxious to enrol the names of all those who sympathize with the objects of the Society, which are embodied in the following rules:—

I. That members shall discourage the wanton destruction of birds, and interest themselves generally in their protection.

II. That members shall refrain from wearing the feathers of any bird not killed for the purposes of food, the Ostrich only excepted. (*The attitude of the Society is strictly neutral on the question of the killing of game birds and legitimate sport of that character.*)

Mr. Wm. Jesse, M.A., of La Martiniere College, Lucknow, is at present acting as Honorary Secretary of the above Society, and all communications should be addressed to him.

BISONS IN CAPTIVITY.

Mr. R. Gilbert exhibited an excellent photograph of two cow Bisons (*Bos gaurus*) in possesion of his Highness the Maharajah of Mysore. The animals which were caught when only a few months old, have now been in captivity for four years. They are quite tame, and are allowed to graze under the custody of an attendant in the Maharajah's garden, their food being grass, bamboo leaves and cooltee.

It was resolved that the photograph, which was taken by Mr. Hughes, the Superintendent of the Maharajah's Zoological Collection at Mysore, should be placed in the Society's album.

PAPERS READ.

The following papers were read and discussed:—

1. Bird-Nesting in the Neighbourhood of Poona, by Captain R. M. Betham.
2. Notes on the Narcondam Hornbill, by Rev. C. P. Cory.
3. Occurrence of the Laggar Falcon in Burmah, by E. Comber.
4. Nesting Difficulties of the Coppersmith, by E. Tooth.
5. Bulbuls, by E. H. Aitken.

PROCEEDINGS

OF THE MEETING HELD ON 9TH JULY, 1901.

A meeting of the members took place at the Society's Rooms on Tuesday last, the 9th instant, the Ven'ble Archdeacon Scott presiding.

NEW MEMBERS.

The election of the following new members was duly announced :—Mr. N. W. Kemp (Bombay) ; Lieut. W. A. Payne (Poona) ; Capt. H. D. Foulkes, R.F.A. (Ferozepore) ; Mr. G. B. Dawson (Rangoon) ; Mr. A. J. Harrison, C.E. (Assam); Mr. H. Fagan (Rangoon) ; Mr. A. E. Wilenan (Kobe, Japan) ; Lieut. D. Campbell (Deolali, Life Member); the Superintendent, Mysore Government Museum (Bangalore) ; Lieut. A. Delmé Radcliffe (Saugor) ; Mr. J. W. Oliver, I.F.S. (Dehra Dun) ; His Highness the Maharajah of Cooch Behar (Life Member) ; Lieut. N. S. H. Sitwell, R.A. (Bombay) ; Lieut. B. C. Graham (Drosh, Chitral) ; Mr. E. D. Mackay (Assam) ; Mr. M. E. Nigel-Jones (Assam) ; Lieut.-Col. G. D. Bourke, R. A. M. C. (Rawul Pindi) ; Mr. R. Oaken, I. C. S. (Meerut) ; and Mr. Robert S. Hole, I.F.S. (Jubbulpore).

CONTRIBUTIONS TO THE MUSEUM.

Mr. H. M. Phipson, the Honorary Secretary, acknowledged receipt of the following contributions to the Society's Museum since the last meeting :—

Contributions.	Description.	Contributor.
A number of Birds' Nests..	.....	Mr. Isaac Benjamin.
1 Tawny Eagle-Owl.....	*Bubo coromandus*.....	Mr. C. Maries.
1 Ruff	*Pavoncella pugnax*	Do.
1 Eastern Baillon's Crake..	*Porzana pusilla*	Do.
1 Indian Blue-Rock Pigeon	*Columba intermedia*	Do.
1 Eastern Stock Pigeon ...	*Columba evarsmanni*	Do.
1 Lizard	*Euplepharis macularius*.....	Mr. A. R. Shuttleworth.
2 Indian Wolf Cubs (alive).	*Canis pallipes*	Mr. H. H. Dean.
1 Green Tree Viper (alive)	*Trimeresurus gramineus*.....	Mr. Paul Girhardt.
1 Silver Pheasant.....	*Gennæus* sp.	Capt. W. G. Nisbett.
1 Arakan Hill Partridge ...	*Arboricola intermedia*	.....
1 Palm Civet	*Paradoxurus musanga*.....	Mr. A. H. Stephens.
1 Brown Tree Snake.....	*Dipsas trigonata*	Capt.G.T. Birdwood,I.M.S.
A number of Birds' Skins	.....	Col. R. C. Temple.
1 Vulture	*Vultur monachus*	Genl. Osborne.
1 Flying Lizard	*Draco maculatus*	Mr. F. Andersen.
3 Nests of Iora	*Iora tiphia*	Capt. H. Kelsall, R.A.
1 Nest of Flower Picker...	*Dicæum cruentatum*	Do.
1 Nest of Black-throated Weaver Bird.	*Ploceus megarhynchus*	Do.
1 Nest of Black Racket-tailed Magpie.	*Crypsirhina varians*..... ...	Do.
1 Nest of Azure Fly-Catcher.	*Hypothymis azurea*.....	Do.
1 Flying Lizard.....	*Draco maculatus*	Capt. G. W. Nisbett.
1 Snake	*Tropidonotus stolatus*	Mr. T. Glover Wright,I.C.S.
1 Flying Lizard.....	*Draco dussumieri*.....	Mr. G. Laird-Macgregor, I.C.S.
6 Large Pin-tailed Sand Grouse (alive).	*Pterocturus alchata*	Lieut. Howse, R.N.
1 Florican (alive).....	*Sypheotis aurita*	Major H. Hazelgrove.
7 Crocodiles (alive)	*Crocodilus palustris*	Mr. C. Merrony.
1 Snake (alive)	*Tropidonotus plumbicolor* ...	Mr. G. Laird-Macgregor, I.C.S.

Contributions.	Description.	Contributor.
Eggs of Common Heron ...	*Ardea cinerea*	Dr. G. McMullen.
Eggs of Large Egret.....	*Herodias alba*	Do.
Eggs of Great Stone Plover.	*Esacias recurvirostris*	Do.
Eggs of Purple Coot.....	*Porphrio poliocephalus*	Do.
Eggs of Seesee Partridge ...	*Ammoperdix bonhami*.....	Do.
Eggs of Laggar Falcon.....	*Falco juggar*.....	Do.
1 Screech Owl (alive)	*Strix flammea*	Mr. R. F. Smith.
1 Skink	*Calcides ocellatus*.....	Mr. A. Baglehole.
1 Grass Snake	*Tropidonotus stolatus*	Mr. Paul Girhardt.
1 Water Snake	*Do. piscator*.....	Do.
2 Tree Vipers.....	*Trimeresurus gramineus*.....	Do.
1 Brown Tree Snake.....	*Dipsas ceylonensis*	Do.
1 Lizard	*Hemidactylus* sp	Do.
1 Great Slaty-backed Woodpecker.	*Hemilophus pulverulentus* ...	Mr. C. B. Smales.
1 Tickell's Golden-backed Woodpecker.	*Chrysocolaptes guttieristatus.*	Do.
1 Northern Rufous Woodpecker.	*Micropternus phæceps*.....	Do.
1 Indian Grackle	*Eulabys intermedia*.....	.....
1 Black-bellied Tern	*Sterna melanogaster*	Do.
1 Phoorsa	*Echis carinata*	Mr. H. Bulkley.
A number of Scorpions.....	.....	Do.
1 Snake	*Contia angusticeps*	Major A. H. McMahon.
Specimens of New Zealand Woods.	.....	Mr. E. L. Barton.
1 Large Photograph of an Elephant.	.....	Mr. E. R. Jardine.

There were minor contributions from Messrs. H. D. McLaughlin, E. O'Brien, C. F. Spencer, W. Gonsalves, G. E. Bright, Marshall Reid, and D. A. MacMillan.

CONTRIBUTIONS TO THE LIBRARY.

"Bulletin de la Société Zoologique de France," 1900; "The Structure and Life History of the Harlequin Fly" (from Mr. L. C. Miall); "Annuaire du Musée Zoologique de St. Petersburg"; "Boletin del Instituto Geologico de Mexico"; "Botanical Notes and Papers" by Major D. Prain, I.M.S.; "Transactions of the Entomological Society of London," 1900; "Memoirs of the Geological Survey of India"; "Researches on the Past and Present History of the Earth's Atmosphere," by Dr. T. L. Phipson; "Indian Deep Sea Crustaceans"; "Annals of the Royal Botanic Gardens, Peradeniza," Pt. I., Vol. I.

SOCIETY FOR THE PROTECTION OF BIRDS.

With reference to the announcement made at the meeting on 16th April last regarding the Society for the Protection of Birds, efforts are now being made to secure the sympathy and support of the members of the Bombay Natural History Society to the movement. Mr. E. Comber has been appointed local Secretary of the Indian Branch, to whom subscriptions may be

sent by those willing to become associates of the Society. Associates who pay Re. 1 a year will receive a copy of the annual report and those subscribing Rs. 5 a year will be entitled to all publications issued by the Society.

SNAKES' SLOUGHS.

Mr. E. L. Barton exhibited a number of pieces of the slough cast by the large Python in the Society's rooms, mounted on different materials, with a view of ascertaining what use, if any, these sloughs might be put to. The specimens mounted on bright-coloured calicoes, especially green, were by far the most successful, and the concensus of expert opinion appeared to be that from a millinery point of view the sloughs might be used with advantage for the purpose of trimming hats!

THE SOCIETY'S COLLECTION OF BIRDS' SKINS.

Mr. E. Comber announced that the Society's collection of birds' skins now consisted of 2,109 specimens, comprising 767 species, and that they had all been recently re-arranged and completely catalogued. They now form a fairly representative collection of the birds of the Indian Peninsular with the exception of South India and Ceylon, from which region specimens are much wanted. A revised list of *desiderata* is in course of preparation, and will be published shortly.

PAPERS READ.

The following papers were then read and discussed :—

1. "Notes on some Plants which have been introduced into the Victoria Gardens, Bombay, during the past eight years," by K. D. Mahaluxmiwalla.
2. "Curious Habits of the Bulbul," by E. H. Aitken.
3. "The Migration of Butterflies in the Kangra Valley," by G. C. Dudgeon, F.E.S.
4. "Occurrence of the Black-bearded Bat (*Taphozous melanopogon*) near Bombay," by E. Comber.
5. "Occurrence of the Bronze-capped Teal (*Eunetta falcata*) in Sind," by E. Comber.

Mr. K. D. Mahaluxmiwalla exhibited several of the plants referred to in his paper.

PROCEEDINGS

OF THE MEETING HELD ON 20TH AUGUST, 1901.

A meeting of the members took place at the Society's Rooms on Tuesday last, the 20th instant, Dr. D. Macdonald presiding.

NEW MEMBERS.

Captain H. C. Tytler (Dinapore); Mr. C. H. Blathwayte, I.C.S. (Dharwar); Mr. J. Mumford (Bombay); Mr. E. Brook-Fox, C.E. (Bankipur); Mr. W. L. Dickinson (Sibsagar); Mr. C. Ittensohn (Bombay); Mr. G. W. D. Rhé-Philipe (Lucknow); Lieutenant C. W. Prescott (Poona); and Mr. H. W. Few (Pakkoku, Burma). His Highness the Maharajah of Kotah has become a life member of the Society.

CONTRIBUTIONS TO THE MUSEUM.

Mr. H. M. Phipson, the Honorary Secretary, acknowledged receipt of the following contributions to the Society's Museum since the last meeting:—

Contributions.	Description.	Contributor.
1 Brown tree snake	*Dipsas forstenii*	Mr. F. Dundas-Whiffin.
1 Scaley ant-eater	*Manis pentodactylus*	Mrs. Fawcett.
1 Snake (alive)	*Zamenis fasciolatus*	Mr. F. G. Hutchinson.
Eggs of the following:—		
White-winged myna	*Sturnia nemoricola*	Capt. H. H. Harrington.
Siamese myna	*Æthiopsar grandis*	Do.
Burmese pied-myna	*Sturnopastor superciliaris*	Do.
Magpie robin	*Copsychus saularis*	Do.
Small Himalyan yellow-naped Woodpecker.	*Gecinus chlorolophus*	Do.
Indian skimmer	*Rhynchops albicollis*	Major C. R. Bartlett, R.A. M.C.
Little tern	*Sterna minuta*	Do.
Brown rock-chat	*Cercomela fusca*	Do.
1 Palm civet	*Paradoxurus niger*	Mr. F. L. Goldsmid.
2 Red-billed blue Magpies	*Urocissa occipitalis*	Mr. S. L. Whymper.
1 Chestnut bellied rock-thrush.	*Petrophila erythrogaster*	Do.
Tree lizard's eggs	*Calotes versicolor*	Rev. H. Mould.
Geoko's eggs	*Hemidactylus* sp.	Mr. W. F. Hamilton.
1 Woodcock	*Scolopax rusticola*	Mr. J. W. Fellowes.

COLLECTION OF BIRDS' SKINS.

Mr. Comber drew attention to a most interesting collection of bird skins mostly excellent specimens, received lately from Captain H. H. Harrington, which he had collected around Kamaing, and other parts of the Myitkyina district, Upper Burma. The collection consists of 112 specimens representing 74 species, and of these 27 are new to the Society's collection, as follows:—

No. 87, Trochalopterum phœniceum crimson-winged laughing thrush; No. 137, Gampsorhynchus rufulus, white-headed shrike babbler; No. 143, Pellorneum minus, Sharpe's spotted babbler; No. 169, Stachyris nigriceps, black-throated babbler; No. 203, Sibia picaoides long-tailed sibia; No. 222, iva sordida, dull siva; No. 228, Zosterops simplex, Swinhoe's white-eye; No. 238, Pteruthius æralatus, Tickell's shrike-tit; No. 257, Mesia argentaris, silver eared mesia; No. 276, Hemixus tickelli, Tickell's bulbul No. 287, Xanthixus flavescens, Blyth's bulbul; No. 290, Otocompsa flaviventris, black-crested yellow bulbul; No. 333, Dicrurus cineraceus, grey dronga; No. 522, Oriolus traillii, maroon oriole; No. 535, Spodiopsar cineraceus, grey starling; No. 539 Sturnia nemoricola, white-winged myna; No. 553, Æthiopsar grandis, Siamese myna; No. 554, Æthiopsar albicinctus collared myna; No. 559, Hemichelidon Serruginea, ferruginous flycatcher; No. 569, Cyornis melanoleucus, little pied

flycatcher; No. 723, Ploceus manyar, striated weaver-bird; No. 922, Piprisoma modestum, Hume's flower-pecker; No. 974, Ignipicus pygmaeus, Himalayan pigmy wood-pecker; No. 1001, Picumnus innominatus speckled piculet; No. 1002, Sasia ochracea, rufus piculet; Coturnix japanica, Japanese gray quail.

PAPERS READ.

The following papers were then read and discussed :—1. Our Collection of Indian Pigeons, by E. H. Aitken. 2. Elephant Shooting in Upper Burma, by E. R. Jardine. 3. On the deposits of fossil remains of extinct animals in the Sewalik Hills of the Punjab and North-West Provinces, by General W. Osborn. 4. The Lillies of Mahableshwar and others, by W. P. Symonds, I.C.S.

PROCEEDINGS

OF THE MEETING HELD ON 17TH SEPTEMBER 1901.

A meeting of the members took place on Tuesday last, the 17th September, the Ven'ble Archdeacon Scott presiding.

NEW MEMBERS.

The election of the following new members was announced :—

H. H. the Maharajah of Travancore (Life Member), Mr. G. H. White, (Nasik), Mr. W. M. Crawford, I.C.S. (Khandwa), H. H. the Gackwar of Baroda, who was already a member, has now become a life member of the Society.

CONTRIBUTIONS TO THE MUSEUM.

The Honorary Secretary acknowledged receipt of the following contributions to the Society's museum since last meeting:—

Contributions.	Description.	Contributor.
1 Indian Monitor (alive)...	*Varanus bengalensis*	Mr. C. L. Burns.
1 Krait.....	*Bungarus coeruleus*.....	Mr. T. Dundas Whiffin.
1 Snake	*Dipsas forstenii*	Do.
1 Snake	*Dipsas trigonata*	Do.
3 Snakes	*Lycodon aulicus*	Do.
1 Tree Snake	*Tropidonotus plumbicolor*....	Col. R. H. Light.
A Collection of Spiders and Scorpions.	.....	Mr. Chas. Gray.
4 Eggs of Eastern Purple Heron.	*Ardea manillensis*	Mr. S. L. Whymper.
4 Eggs of Night Heron ...	*Nycticorax griseus*	
4 Eggs of Lesser Cormorant	*Phalacrocorax javanicus* ...	
3 Eggs of Pied Ground Thrush.	*Geocichla wardi*	
2 Eggs of Red-billed Blue Magpie.	*Urocissa occipitalis*.....	
2 Eggs of Spotted Wing ...	*Psaroglossa spiloptera*.....	

MINOR CONTRIBUTIONS.

From Mr. A. H. Simcox, I.C.S., Mr. J. Fraser, and Mr. Gerhardt.

THE SOCIETY'S JOURNAL.

A special vote of thanks was passed to Mr. E. Comber for having prepared a complete index (subjects as well as authors) of the Society's Journal from its commencement to the end of Vol. XIII. This most useful work will be published in a few days in part 5 of Vol. XIII, and enable one to find, at a glance, all the papers which have appeared in the Journal on any subject since it was started in 1886.

On looking through the thirteen volumes, and taking the illustrations as a criterion, it will be seen that there have been published 55 plates of butterflies, moths, larvæ, &c., 23 plates of other insects, 40 plates of birds, eggs, nests, &c., 79 plates of plants, 38 plates of animals, and 25 plates of miscellaneous, besides a large number of electro blocks and wood-cuts.

The average cost of the coloured plates amounts to about £23 each for 1,000 copies. A complete set of the Journal from its commencement with all the plates is now of considerable value, as many of the earlier numbers are now out of print and the "reprints" now being issued naturally do not contain any plates.

PAPERS READ.

The following papers were then read and discussed:—1. "Habits of the Indian Tree Magpie," by Lieutenant-General W. Osborn. 2. "The Masked Finfoot in Cachar," by A. M. Primrose. 3. "Birds of Prey," by C. H. Donald. 4. "Nesting of the Coot at Poona," by Major R. M. Betham. 5. "Migration of Butterflies," by Major C. G. Nurse. 6. "Our Collection of Partridges and Pheasants," by E. Comber.

PROCEEDINGS OF THE MEETING HELD ON 19TH NOVEMBER 1901.

A meeting of the members took place at the Society's Rooms on Tuesday last, the 19th November 1901, Captain G. Lamb, I. M. S., presiding.

NEW MEMBERS.

The election of the following members was announced:—Colonel J. G. Harwood, R. A. M. C. (Bombay); Captain B. T. Ready (Ahmednagar); Captain L. W. S. Oldham, R. E. (Raipur); Mr. E. Muspratt, D. S. P. (Sibsagar), *Life Member*; Mr. O. S. Wickwar (Colombo); Lieutenant J. C. S. Oxley, I. M. S. (Mandalay); Captain W. McG. Armstrong (Kasauli); Captain H. T. Fulton, D. S. O. (Chitral), *Life Member*; Lieutenant J. S. M Harcourt (Chitral); Dr. C. Bach (Bombay); Mr. K. G. Menon, I. F. S. (Trichor, Cochin); Mr. W. P. White (Mandla); Mr. J. C. H. Mitchell (Assam); Mr. George E. Coles, C. E. (Agra); Mr. J. A. Higgins, D. S. P. (Mandla); Mr. Ardesir B. Kotewal (Bombay); and Mr. Robert D. Richmond, I. F. S. (Madras.)

CONTRIBUTIONS TO THE SOCIETY'S MUSEUM.

Mr. H. M. Phipson, the honorary secretary, acknowledges receipt of the following contributions to the Society's Museum since the last meeting :—

Contribution.	Description.	Contributor.
1 Egg of Sarus Crane	*Grus antigone*	Mr. A. Hawkins.
5 Eggs of the Coot	*Fulica atra*	Major R. M. Betham.
1 Indian Pitta	*Pitta brachyura*	Mrs. Brown.
40 Young Sea-Turtles (alive)	*Chelonia viridis*	Mr. F. W. Townsend.
A Framed Picture of the Okapi.	*Okapia johnstoni*	Khan Bahadur C. M. Cursetjee.
2 Snakes (alive)	*Lycodon aulicus*	Capt. Lamb, I.M.S.
	Tropidonotus stolatus	Do.
1 Wild Cat	*Felis temminckii*	Mr. C. W. Allan.
1 Black Cobra (alive)	*Naga tripudians*	Capt. Lamb, I.M.S.
1 Snake (alive)	*Simotes arnensis*	Do.
2 Eggs of the Snow-Cock.	*Tetraogallus himalayensis*	Major G. A. Leslie, R.E.
1 Red-billed Chough	*Graculus eremita*	General W. Osborn.
1 Western Spot-billed Fork-tail.	*Henicurus maculatus*	Do.

SPECIMENS OF BLOOD.

The honorary secretary read a letter from Dr. G. H. F. Nuttall, Lecturer in Bacteriology at Cambridge, asking members of the Bombay Natural History Society to help him to obtain specimens of the blood of all vertebrates (mammals, birds, reptiles, fish and batrachians) to enable him to carry on the researches in which he is at present engaged. The results obtained from an extended series of bloods have given such striking reactions that the study requires to be taken up on a larger scale, and the help of naturalist and sportsmen in all parts of the world is now being solicited. The method of collecting dried specimens of blood, on strips of filter paper is exceedingly simple, and full details will be sent by the honorary secretary of the Bombay Natural History Society to all those who are willing to assist.

PAPERS READ.

The following papers were read and discussed :—The Earwigs of Ceylon, by Malcolm Burr; Memoirs on Oriental Rhynchota, by G. W. Kirkaldy, F.E.S. ; Nidification of the Desert Sand-Lark, by H. Bulkley ; A Rare Snake, by Major A. E. McMahon, C.I.E., C.S.I. ; The Banded Crake at Khandalla, by Major R. M. Betham ; On the New Species of Butterflies recently described by Mr. A. G. Butler, by Major N. Manders, R.A.M.C. ; Our Collection of Indian Snakes, by Rev. F. Dreckmann (S. J.) and Mr. H. M. Phipson.


G.E. Lodge

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THE MOTHS OF INDIA.

SUPPLEMENTARY PAPER TO THE VOLUMES IN "THE FAUNA OF BRITISH INDIA."

SERIES II. PART VI.

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(*Continued from page* 117, *of this Volume.*)

Moths of India—5a.

Genus Pexinola.

Type.

Pexinola, Hmpsn., Cat. Lep. Phal. B. M., II., p. 79 (1900)... *longirostris.*

Proboscis fully developed; palpi porrect, extending quite three times the length of head and strongly curved downwards the 2nd joint fringed with hair above and with tuft at extremity below, the 3rd well developed; antennæ of female minutely ciliated; legs long and slender, the spurs long. Forewing elongate, narrow, the apex produced and acute; veins 2 and 3 curved, the former from close to angle of cell, the latter from angle; 4 from angle; 5 from above angle; 6 and 7 separate from below angle of cell; 8-9 shortly stalked; 10-11 from cell. Hindwing with vein 2 from middle of cell; 3 and 5 from angle; 4 absent; 6-7 coincident; 8 from middle of cell; the median nervure and vein 1 strongly pectinated above.



Pexinola longirostris ♀ ♩.

1550c. Pexinola longirostris, Hmpsn., Cat. Lep. Phal. B. M., II., p. 79 (1900).

♀. Head, thorax and abdomen grey-white strongly mixed with black. Forewing grey suffused with olive-brown and strongly irrorated with black; an antemedial ridge of blackish scales tipped with white from subcostal

nervure to vein 1 ; tufts of similar scales below the cell at origin of vein 2 and at upper angle, the latter with indistinct blackish line from it bent outwards above inner margin ; a diffused waved dark subterminal line. Hindwing grey-white.

Habitat.—Tibet, Yatung, 10500′. *Exp.* 32 mill.

1534. NOLA NIGRITA belongs to the *Noctuidæ*. Genus MIMORUZA.

1536. RHYNCHOPALPUS DENTATUS belongs to the *Noctuidæ*. Genus LABANDA.

1543*a*. PISARA ARGENTISPARSA belongs to the *Noctuidæ*. Genus ZAGIRA.

1550*a*. SELEA NIGRA belongs to the *Lymntriaadæ*. Genus LYMANTRIA.

AGARISTIDÆ.

1554. CHELONOMORPHA VULCANIA, insert. (syn) *Eusemia glossatrix*, Westw., Oates' Matebeland, p. 356.

1581. MIMEUSEMIA BASALIS.—A ♀ from Sikhim has the orange patch of hindwing absent except for a streak on end of median nervure on underside.

1581*a*. MIMEUSEMIA DAVIDSONI, Swinh., A. M. N. H. (7), 3, p. 112.

♂. Differs from *basalis* in the hindwing, having a yellowish-white patch in and below cell conjoined at lower angle to the discoidal patch ; the orange on inner area reduced to slight streaks.

Habitat.—Karwar. *Exp.* 52 mill.

NOCTUIDÆ.

1657*a*. AGROTIS DERAIOTA, n. sp. (pl. B., f. 7).

♀. Head and thorax dark chocolate-brown ; tegulæ ochreous-white with two brown lines, the tips chocolate ; abdomen brown. Forewing brown suffused with grey ; a short bisinuate subbasal grey line ; an antemedial grey line with two sinuations between costa and vein 1, then strongly excurved and obsolescent ; orbicular grey, ∨-shaped on a brown patch in cell not suffused with grey and diffused below cell ; reniform with grey outline and centre ; an indistinct dentate postmedial line with two series of dark points on the veins ; an indistinct sinuous submarginal line. Hindwing brown.

Habitat.—Maturatta, Ceylon (Mackwood). *Exp.* 48 mill. *Type*—in B. M.

1679*a*. HADENA AXYLIDES, n. sp.

♀. Head and thorax dark-brown mixed with grey scales ; abdomen ochreous. Forewing grey ; a ferruginous patch on basal area from cell to inner margin ; a very highly dentate antemedial line, rather indistinct and interrupted in places, running out to two very long points in cell, the angle below the cell conjoined to the blackish claviform stigma ; the orbicular indistinct lanceolate ; the reniform indistinct, defined by rufous and with blackish suffusion between it and the double waved postmedial line which is excurved from costa to vein 4, then retracted to below end of cell ; a series of dark points just beyond it ; an irregularly sinuous rufous subterminal line with blackish suffusion beyond it except towards apex. Hindwing white with a slight yellowish tinge towards termen.

Habitat.—Sikhim 1800′ (Dudgeon) ; Belgaum (Watson). *Exp.* 30 mill. *Type*—In B. M.

1682*a*. HADENA CHRYSONA, Borkh., Naturg. Eur. Schmett, IV., p. 264 (1792).

Head, thorax and abdomen clothed with grey and fuscous hair; patagia edged with orange; tarsi banded with black. Forewing grey and fuscous; waved subbasal and antemedial lines with the area between them rather paler, the former with orange points on it below costa and cell, the latter with some orange on it below the cell, then with two stronger sinuations; the orbicular and reniform with some orange on their edges, the former small; the postmedial line crenulate, excurved from costa to vein 3, then incurved, the area beyond it paler; a subterminal series of small V-shaped black marks with orange points between their arms; a terminal series of small lunules; cilia chequered white and fuscous. Hindwing whitish, the veins and terminal area broadly fuscous; some white on termen towards tornus; cilia with a dark line through them, yellowish at base, white at tips, underside with discoidal point and curved postmedial line.

Habitat.—Europe; Syria; W. China; Kashmir. *Exp.* 36 mill.

Under *Euplexia* insert (syns) *Borbotana*, Wlk., IV., 1651 (1858) and *Choluata* Wlk., Journ. Linn. Soc., VII., 57 (1863).

1717*a*. EUPLEXIA OXYDATA, n. sp.

♂. Ferruginous-red; head somewhat variegated with reddish-ochreous; meso- and meta-thorax reddish-ochreous; tarsi banded with ochreous. Forewing variegated with ochreous, especially in base of cell, on inner margin and before the postmedial line; the veins streaked with fuscous; the lines ochreous defined by fine ferruginous lines; a short curved subbasal line; the antemedial line angled inwards in cell and on vein 1, outwards below the cell and below vein 1; orbicular small; the reniform with a white mitre-shaped mark on it; the postmedial line minutely dentate, oblique from costa to vein 4, where it is angled, then incurved; a subterminal series of small wedge-shaped marks, the area beyond them tinged with fuscous except towards apex; cilia ferruginous and fuscous. Hindwing dark-brown; the cilia pale-ferruginous; underside with the veins irrorated with ochreous and fuscous; a prominent dark cell spot.

Habitat.—Sikhim, 7000′ (Pilcher). *Exp.* 50 mill. *Type*—In B. M.

1717*b*. EUPLEXIA PURPURINA, n. sp.

♀. Head, thorax and forewing deep purplish-red; abdomen greyish-brown, the extremity and ventral surface reddish. Forewing with a silky texture; the veins slightly streaked with fuscous; the orbicular almost obsolete; the reniform white strongly irrorated with black; a postmedial series of white points on the veins. Hindwing fuscous-brown, the cilia pale-chestnut; underside with dark discoidal lunule and sinuous postmedial line.

Habitat.—Tibet, Yatung (Hobson). *Exp.* 42 mill. *Type*—In B. M.

1717*c*. EUPLEXIA ASKOLDIS, Oberth. Et. Ent. v. p. 72 pl. 3. f. 13 (1880).

Apamea niralis Butl. Trans. Ent. Soc. 1881, p. 177.

♂. Head and tegulæ red-brown and black mixed with white; thorax and abdomen pure white; legs fuscous with whitish bands on tarsi; abdomen

with the extremity and ventral surface irrorated with brown, the anal tuft with some fulvous hair. Forewing red-brown; the inner area white, its irregular upper edge bounded with black, the white extending before middle nearly up to costa and before the postmedial line to vein 2; a large irregular patch beyond the cell extending to termen at apex and vein 2, and leaving a small fuscous patch on middle of termen; the orbicular with white centre and ochreous ring; the reniform white; the postmedial line white with fuscous edges, dentate, strongly excurved from costa to vein 4, then bent inwards to lower angle of cell; an indistinct curved, slightly waved subterminal line; three white points on costa towards apex; cilia reddish. Hindwing yellowish-white slightly tinged with fuscous towards apex; an indistinct discoidal spot and traces of a curved postmedial line.

Habitat.—Siberia, Askold; Japan; W. China; Assam, Khásis. *Exp.* 30-46 mill.

1725. *Euplexia subcurva.* Larva black with irregular dorsal and lateral grey patches streaked with black; head red, some orange on 1st somite; stigmata white; a large irregular dorsal orange patch on terminal somite (Fellowes Wilson).

1734*a*. EUPLEXIA MESOMELANA, n. sp.

♂. Head, thorax and abdomen fuscous-black; tegulæ in front olive-green; the hair on frons and the tuft behind tegulæ white tipped; the anal tuft greyish. Forewing pinkish-grey; the costal area olive-green with a series of black striæ and some white points towards apex; a white mark in base of cell and curved black streak below the base with an olive and blackish patch beyond it on vein 1; the orbicular with olive-green centre, whitish ring and black line round it; a Y-shaped black medial band with its arms on each side of the orbicular, and becoming olive-green on inner margin; the reniform with black centre, some olive-green on its inner side and white on its outer, and with a black line round it; the postmedial line minutely dentate, indistinct, excurved from costa to vein 4, then incurved; a subterminal whitish line angled at veins 7 and 3, with some black suffusion on its inner side and olive-green on its outer. Hindwing pale-fuscous with discoidal lunule and sinuous postmedial line more distinct on underside; cilia of both wings whitish with a fuscous line through them.

Habitat.—Simla, 7000′ (Pilcher). *Exp.* 36 mill. *Type*—In B. M.

1734*b*. EUPLEXIA CHLOROGRAMMATA, n. sp.

♂. Head and thorax moss-green, mixed with dark-brown scales; palpi ochreous in front; pectus and legs ochreous, the latter irrorated with black and with patches of green above; abdomen fuscous mixed with ochreous. Forewing black-brown and pinkish-brown suffused in parts with green; a green spot at base of costa; a short green subbasal line; an irregularly waved antemedial green line with black line on its outer edge; a series of small green spots on terminal half of costa; the orbicular and reniform large, brown-centred, ringed with green and edged with black; the latter with pale patch

at upper extremity ; a green postmedial line edged by waved black lines and excurved beyond the cell ; a sinuous green subterminal line connected with the postmedial line by a streak on inner margin and with a pale spot on its inner side above vein 5 ; a terminal series of black lunules ; cilia brown and green. Hindwing pale-yellowish with obscure fuscous discoidal spot and sinuous postmedial line ; the terminal area broadly suffused with fuscous ; cilia ochreous with a blackish line through them.

Habitat.—Sikhim 1800′ (Dudgeon). *Exp.* 42 mill. *Type*—In B. M.

Sec. IIIc. (*Borbotana*). Forewing of male with elongate fo eal depression between bases of veins 6·7 which are thickened and curved.

1756*a*. EUPLEXIA NIVIFASCIA, Wlk., XV., 1651.

Choluata eburneifera, Wlk., Journ. Linn. Soc., VII., 57.

Head and thorax dark red-brown ; abdomen paler with the dorsal tufts rufous. Forewing dark red-brown ; a pure white antemedial band with irregular edges, the outer edge being slightly toothed outwards below costa and strongly below cell ; a white point in cell and irregular discoidal lunule with white spot above it on costa and two points beyond it ; a white line from vein 4 to inner margin, dentate inwards above vein 1 in the Bornean specimens, developed into a quadrate patch on inner area in the Sikhim specimen ; an indistinct oblique red streak from apex and patch at middle. Hindwing dull reddish-brown, whitish towards base. Underside of both wings irrorated with white ; hindwing with discoidal lunule.

Habitat.—Sikhim, Borneo. *Exp.* 28-30 mill.

1758*b*. EUPLEXIA SUBPURPUREA, Leech. Trans. Ent. Soc. 1899, p. 71.

Head and thorax purple and grey, meta-thorax chestnut-red, palpi below, coxæ and parts of pectus fiery-red ; tibiæ purplish-fuscous, tarsi whitish ; abdomen whitish, brown, and purplish, the dorsal tufts chestnut-red, the anal tuft pale-chestnut, the ventral surface crimson. Forewing ochreous, irrorated and suffused in parts with brown ; a purplish patch in and below base of cell ; the orbicular somewhat V-shaped, with purplish edges and brownish centre ; the reniform with parallel edges, a chestnut patch on it and a purplish line on its inner edge ; a purplish line with dark edges from lower angle of cell to above middle of inner margin, then recurved to submedian fold and with bright chestnut suffusion in its angle ; a double fuscous postmedial line from just below costa, angled at vein 5, then incurved to the line from angle of cell and with its outer line sinuous ; a pale slightly sinuous subterminal line from vein 7 to inner margin, defined on each side by olive-brown ; the termen irrorated with blue-grey. Hindwing pale-ochreous, the costal and terminal areas tinged with pink, the inner area with brown ; an indistinct fine sinuous postmedial line ; two indistinct fine subterminal lines coalescing and becoming diffused from vein 2 to inner margin ; some grey suffusion on termen. Underside suffused with fiery-red ; forewing with curved, hindwing with sinuous postmedial line ; both wings with rather obscure subterminal line and dark blotches on termen.

Habitat.—W. China; Simla, 7,000′. (Pilcher). *Exp.* 54 mill.

1770*a*. ANCARA VIRIDIPICTA, n. sp. (pl. B., f. 6).

♂. Dark red-brown; palpi with the third joint whitish; vertex of head and thorax pale moss-green; abdomen with the two medial dorsal tufts green. Forewing with some white point on costa; two ill-defined subbasal waved blue-green bands, two antemedial and two postmedial, the last with a series of points beyond them excurved at median nervules; some spots in end of cell; traces of a dentate subterminal line developed into irregular patches below middle. Hindwing with four small white subterminal spots towards tornus.

Habitat.—Khâsis. *Exp.* 48 mill. *Type*—In B. M.

1789*a*. POLIA OBLIQUISIGNA, n. sp.

♀. Grey; head, thorax and abdomen mixed with black scales; tegulæ with a black transverse line the area behind it and the patagia whiter. Forewing with black-edged whitish patch on base of costa; some black striæ and white points in cell and on vein 1 before the slightly sinuous black antemedial line; the orbicular large and white with fine black edge and with an irregular white patch below it defined on lower side by the U-shaped claviform mark; reniform large, grey-white with fine black edges; the postmedial line represented by a series of white and black points on the veins; an indistinct pale subterminal line defined in parts by black, angled inwards above vein 1 and with some streaks from it to the terminal series of lunules. Hindwing fuscous with indistinct discoidal lunule and darker terminal line; cilia whitish chequered with black at middle; underside whitish irrorated with fuscous, the discoidal spot prominent; an indistinct curved postmedial line.

Habitat.—Simla 7000′. (Pilcher). *Exp.* 40 mill. *Type*—In B. M.

1795*a*. POLIA PYROXANTHA, n. sp.

♂. Head and thorax yellow mixed with bright-ferruginous; abdomen yellowish-grey irrorated with fuscous, the anal tuft pale-rufous. Forewing yellow very largely suffused with bright ferruginous; the veins and costal area brownish; a dark waved antemedial line; the orbicular yellow; a dark-edged white discoidal lunule; a crenulate postmedial line excurved from below costa to vein 3, then incurved. Hindwing ochreous-yellow with traces of discoidal spot and curved postmedial line more distinct on underside.

Habitat.—Tibet, Yatung (Hobson). *Exp.* 30 mill. *Type*—In B. M.

1798*a*. POLIA FUMEA, n. sp.

♂. Head and thorax black; antennæ pale; abdomen fuscous. Forewing fuscous-black irrorated with a few white scales; the orbicular and reniform small, ringed with white and with greyish centres; slight subterminal black streaks on veins 4-5, and a terminal series of black striæ. Hindwing fuscous, the inner area tinged with yellowish-brown; a discoidal dark point and a fine terminal line; cilia whitish at tips.

Habitat.—Sikhim, 1800′; (Dudgeon). *Exp.* 30 mill. *Type*—In B. M.

1806*a*. CUCULLIA POLIORHIZA, n. sp. (pl. B., f. 27).

Head and thorax fuscous mixed with grey; abdomen brownish-grey. Forewing grey strongly irrorated with black-brown; an oblique black striga from base of costa; a short sinuous streak below base of cell; the antemedial line irregularly dentate, strongly angled outwards below the cell and conjoined to the small diamond-shaped claviform stigma; the orbicular greyish, narrow, oblique, its lower end conjoined to the lunulate reniform, the two stigmata defined below by a sinuous black streak; the postmedial line excurved, indistinct, dentate, and angled inwards on vein 1; a subterminal series of short black streaks, those on veins 4·5 displaced inwards and the two above inner margin longer and with a blackish mark between them; cilia of both wings whitish with fine dark line through them. Hindwing grey with darker streaks on the vein.

Allied to *C. petrorhiza*, Bork., from Europe, but darker and without the dark lines on tegulæ and patagia.

Habitat.—Tibet, Yatung (Hobson). *Exp.* 50 mill. *Type*—In B. M.

1813. ACRONYCTA ANÆDINA, insert (Syn.) *Acronycta iria*, Swinh., A. M. N. H. (7) 3, p. 113.

1838*a*. CALLOPISTRIA NOCTURNA, n. sp.

♀. Head and thorax clothed with black, fuscous, and red-brown scales, many of them tipped with grey; abdomen black-brown. Forewing fuscous tinged with blue-grey, many of the scales having pale tips; some reddish-brown suffusion in parts, especially on medial inner area; the basal area with traces of waved black lines; a grey antemedial line defined by black scales, waved from inner margin to subcostal nervure, then curved downwards to median nervure in end of cell, and up again to costa; the reniform with grey outline; a postmedial fine black line defined by grey, strongly excurved from below costa to vein 3, then incurved, with a double rufous streak defined by black from it to subterminal line on vein 6 and whitish mark above and below vein 4; a fine irregularly waved grey subterminal line; a terminal series of black lunules defined by grey. Hindwing fuscous-brown; cilia fuscous with grey tips.

Habitat.—Cuddapah, Horsleykhonda, 3500′ (W. H. Campbell). *Exp.* 30 mill. *Type*—In B. M.

1839*b*. CALLOPISTRIA HARMONICA, n. sp.

♂. Head, thorax and abdomen variegated with pale-brown, madder, black, and white scales; palpi white towards extremity; sides of frons and tegulæ with white stripes; small fulvous tufts behind patagia; abdomen with rufous dorsal tuft. Forewing olive-brown suffused with purplish and grey scales to beyond middle, and some purplish suffusion on inner area; two subbasal purple-brown spots with a striga beyond them; three antemedial spots with a spot on costa beyond them and a striga below the cell; the orbicular and reniform indistinct, grey with brown outline, with quadrate purple-brown spot between them and spot on costa above it; a grey band with purple-brown edge beyond cell from below costa, curved to below end of cell, then

erect and with a curved grey band beyond it, followed by a large quadrate purple-brown patch on costa with decreasing spots below it on inner side of the sinuous grey subterminal line which has some brown beyond it towards costa; a series of purple-brown terminal points forming an elongate spot below apex, the cilia beyond it dark. Hindwing fuscous-brown with dark discoidal spot; cilia pale with a dark line through them; underside clothed with grey and red scales; the discal spot prominent; an indistinct dentate postmedial line.

Habitat.—Sikhim (Dudgeon), 1800'. *Exp*. 30 mill. *Type*—In B. M.

1849*a*. CALLOPISTRIA CELISIONA, n. sp.

♀. Head, thorax and abdomen dark-brown mixed with grey-brown. Forewing grey-brown suffused with red-brown and irrorated with black; a strongly curved antemedial dark line defined by pinkish-white on each side; a curved comet-shaped whitish mark from lower angle of cell extending along costa to near apex with a rather darker centre on the discocellulars; an ill-defined blackish line from just above lower angle of cell, angled at vein 4, then incurved; an indistinct grey subterminal band, excurved at middle and with slight pinkish lines on each side of it; an oblique whitish streak from apex and another to middle of termen; cilia intersected with white towards apex. Hindwing fuscous-black, the underside paler with indistinct medial and curved postmedial lines.

Habitat.—Ceylon, Labugania (Macwood). *Exp*. 32 mill. *Type*—In B. M.

1874*a*. CARADRINA DISCOPHORA, n. sp.

♂. Frons with large rounded prominence with flattened plate below it and disc with raised rim and point in centre at its extremity; antennæ laminate.

Head and thorax ochreous slightly mixed with fuscous; palpi and legs with black scales; abdomen ochreous. Forewing ochreous strongly irrorated with black and with numerous indistinct waved lines; the basal area tinged with pink; a pink streak in submedian fold and a less prominent streak in discal fold; the orbicular, reniform and eliptical claviform tinged with pink and with black edges; the subterminal line irregular; a terminal series of black strigæ. Hindwing pure white.

Habitat.—Cuddapah, 500' (W. H. Campbell). *Exp*. 26 mill. *Type*—In B. M.

1874*b*. CARADRINA TENEBROSA, n. sp.

♀. Frons with large rounded prominence with disc with raised rim at its extremity.

Head and thorax grey mixed with brown and black; abdomen brownish-ochreous irrorated with fuscous. Forewing grey strongly irrorated with brown and fuscous; subbasal, antemedial, medial and postmedial oblique black lines from costa, the first two short, the third reaching lower angle of cell, the fourth the upper angle; an ill-defined triangular black-brown patch on costa towards apex with three whitish points on it; an obscure

blackish mark on middle of inner margin and another before termen above middle; a terminal series of black points, the cilia somewhat crenulate. Hindwing whitish suffused with pale brownish-ochreous, the terminal area with fuscous; cilia whitish at tips.

Habitat.—Cuddapah, Horsleykhonda, 3500′ (W. H. Campbell). *Exp.* 50 mill. *Type*—In B. M.

1990*a*. ERASTRIA DORATA, n. sp.

♀. Head and thorax golden-yellow mixed with reddish-brown; abdomen pale-ochreous mixed with fuscous. Forewing pale largely suffused with ferruginous and dark-brown and irrorated with a few black scales; some white scales below basal half of costa; an antemedial white line; an irregular medial white edged golden mark, toothed on outer side in cell; a similar S-shaped reniform stigma; the inner area golden from just before the antemedial to the postmedial line, which is strongly excurved from costa to vein 4, then angled inwards, defined on inner side below vein 4 by a golden band and on outer side by a slender white line; the termen and cilia golden with fine black terminal line. Hindwing yellowish-white strongly irrorated with fuscous; a discoidal spot and minutely waved postmedial line more distinct on underside; a fine terminal black line.

Habitat.—Ceylon (Mackwood). *Exp.* 30 mill. *Type*—In B. M.

1993*a*. ERASTRIA NIVEIGUTTATA, Dudgeon. Ined.

♀. Head pure white; antennæ black except basal joint; palpi with the second and third joints ringed with black; frons with triangular medial black spot and lateral points; thorax black; patagia with some white scales; metathorax with white patch; abdomen grey with dorsal black tufts. Forewing black with irregular subbasal ante- and postmedial white patches on costa, the first small, and ante- and postmedial patches on inner margin; some white points on costa near end of cell and near termen. Hindwing whitish with two obscure fuscous medial lines and the terminal area fuscous.

Habitat.—Sikhim, 1800′. *Exp.* 40 mill.

1996*a*. MALIATTHA PLUMBITINCTA, n. sp.

Head whitish and olive-yellow; abdomen whitish irrorated with fuscous and with the dorsal tufts fuscous. Forewing with the base olive-green turning to yellow; the medial area darker-green irrorated with black and becoming brownish towards costa, defined on inner side by a sinuous white line from cell to inner margin, defined on outer side by a dentate leaden-grey line edged with black, slightly excurved at median nervules and becoming white below vein 2; a leaden-grey discoidal spot and the median nervules streaked with grey to the postmedial line; some diffused black beyond the postmedial line, its outer edge sinuous, excised between veins 4 and 6, and with patches of leaden scales beyond it at costa, vein 5, and above inner margin; the terminal area bright-green; the cilia grey irrorated with white. Hindwing white, the inner area slightly irrorated with fuscous; a terminal series of dark striæ; the cilia tipped with fuscous towards apex.

Habitat.—Tibet, Yatung, 10,500′ (Hobson). *Exp.* 16 mill. *Type*—In B. M.

2092. METACHROSTIS SEPARATA, insert (syn.) *Cosmia ozela*, Swinh., A. M. N. H. (7), 3, p. 114, and transfer to *Catephia* next *flavescens*. *Habitat*—Bhutan; Karwar. *Exp.* ♀ 34-40 mill.

2110*a*. PACHYLEPIS ROSEATA, n. sp.

♂. Head black; the vertex and antennæ whitish; thorax pinkish; abdomen fuscous except towards base; tibiæ and tarsi banded with black. Forewing whitish tinged with pink and irrorated with a few black scales; three elongate black spots on costa and a truncate triangular patch towards apex; an oblique bar-shaped black discoidal spot; a terminal series of black points and a somewhat triangular mark at tornus. Hindwing pale-fuscous with bar-shaped discoidal black spot and whitish postmedial line somewhat angled at middle, then defined by black on inner side, and with blackish patch and white point beyond it towards tornus; a terminal series of black points.

Habitat—Simla, 7000′ (Pilcher). *Exp.* 20 mill. *Type*—In B. M.

2114*a*. EUBLEMMA BILINEATA, n. sp.

♂. Head and tegulæ orange; thorax grey, whitish in front; legs and abdomen brownish-orange. Forewing grey irrorated with white; the costal area whitish; the costal edge orange towards base; a black point with a minute yellowish striga from it at middle of costa; two fine grey postmedial lines arising from black points on costa, strongly excurved below costa, then oblique; the costal area orange towards apex, where there is a white patch with a black spot on it and some orange below it; cilia with fine white lines at their base and near tip. Hindwing pale yellowish grey-brown; traces of an oblique postmedial line; cilia with a yellowish line at base.

Habitat—Simla (Harford); Kulu (Pilcher). *Exp.* 20 mill. *Type*—In B. M.

2130*d*. EUBLEMMA VINOTINCTA, n. sp.

♀. Head and tegulæ pale red-brown; thorax whitish slightly tinged with vinous-red and with dorsal red-brown stripes; abdomen pale-brownish. Forewing whitish suffused with vinous-red, especially towards tornus, the costal edge pale red-brown, slightly waved red-brown antemedial and medial lines angled below costa, then oblique; the postmedial line oblique from costa to vein 6, then sinuous, incurved below vein 3; traces of a pale irregular subterminal line with blackish points on it towards costa. Hindwing vinous-red, whitish towards base and costa; indistinct antemedial, medial and subterminal whitish lines, the last with some black scales on it; both wings with fine white terminal line. Underside tinged with fuscous-brown.

Larva.—Coccidiphagous, feeding on a species of *Lecanium* and forming a covering of their scales.

Habitat—Ceylon, Pundaloya (Green). *Exp.* 16 mill. *Type*—In B. M.

2130*e*. EUBLEMMA SUBANGULATA, n. sp. (pl. B., f. 5).

Greyish-ochreous irrorated with a few dark scales. Forewing with indistinct antemedial line angled inwards in cell and outwards below it; dark points at middle and end of cell; crenulate medial and post-medial lines, excurved beyond cell, then oblique; three blackish subapical marks; the outer margin somewhat angled at middle. Hindwing with slightly waved antemedial and medial lines; a diffused postmedial line and traces of a submarginal series of points; both wings with a fine ochreous line at base of cilia.

Larva—Coccidiphagous; preys on *Maskellia zonata*, Green.

Habitat—Pundaloya, Ceylon (E. E. Green). *Exp.* 20 mill. *Type*—In B. M.

2130*f*. EUBLEMMA RUBRICILIA, n. sp.

♂. Grey irrorated with purplish-fuscous scales; palpi, frons and basal joint of antennæ black. Forewing with very indistinct dentate antemedial, medial, and postmedial lines, the two latter bent outwards to inner margin and arising from small black costal spots; a diffused discoidal spot; a subterminal series of dentate marks; a terminal line. Hindwing with faint traces of dentate antemedial, postmedial and subterminal lines, the terminal area strongly irrorated with fuscous; cilia of both wings bright-rufous with pale line at base. Termen of forewing strongly angled at middle.

Habitat—Sikhim, Bhutan (Dudgeon); Singapore (Ridley). *Exp.* 16 mill.

2130*g*. EUBLEMMA RUBRA, n. sp.

Bright red-brown; abdomen with fine white segmental lines. Forewing with antemedial white line acutely angled below costa, then incurved; a postmedial line oblique and white from costa to vein 5, then grey and sinuous, a yellowish mark from its angle to the oblique white striga from costa terminating in two white-edged black dentate marks with some grey beyond them and followed by some black subterminal points. Hindwing with obscure-oblique antemedial grey line, sinuous postmedial line and subterminal black points.

Habitat—Sikhim, 1800′ (Dudgeon); Singapore; Java. *Exp.* 16 mill. *Type*—In B. M.

2131*b*. EUBLEMMA SEMIRUFA, n. sp.

Grey; head and tegulæ pale-rufous; abdomen with 3rd to terminal segments rufous above, the 3rd, 4th and 5th with whitish segmental lines. Forewing with traces of short subbasal and waved fuscous antemedial lines; an oblique medial rufous striga from costa; a waved post-medial line, angled below costa, and a dentate whitish subterminal line angled outwards at middle, the area between them filled in with rufous except the costal area and traversed by an obscure waved line. Hindwing with nearly straight antemedial and somewhat irregular subterminal line, the area between them rufous irrorated with ochreous traversed by an irregular medial line; cilia of both wings rufous.

The N. Guinea specimen has the rufous area on forewing extending more towards costa and the subterminal line of both wings whiter and more irregularly dentate.

Habitat—Sikhim, 1800′ (Dudgeon); N. Guinea (Wallace). *Exp.* 18. mill. *Type*—In B. M.

2146*a*. CORGATHA OLIVATA, n. sp.

♂. Head and collar olive-brown; thorax and abdomen grey-brown. Forewing olive-green, the basal area grey-brown; an antemedial dark line angled below costa; reniform greyish with dark outline and two black specks at centre; a dark postmedial line excurved beyond cell and with grey-brown suffusion beyond it; a series of brown-edged grey submarginal spots and of black points just inside margin. Hindwing olive-green with the base grey-brown; a medial brown line with grey-brown suffusion beyond it; a very indistinct postmedial series of grey spots and a submarginal series of black points.

Habitat—Sikhim, 1800′ (Dudgeon). *Exp.* 24 mill. *Type*—In B. M.

2155*a*. ORUZA XANTHOPERA, n. sp.

♀. Deep purplish-red-brown; collar and anal tuft ochreous. Forewing with slight pale streak below basal half of costa; some yellow at base of inner margin; a pale oblique antemedial line with dark outer edge; a pale point at upper angle of cell and black point at lower; an oblique slightly sinuous postmedial pale line defined by fuscous on inner side; an obscure irregular subterminal line; a large ochreous patch on outer margin below apex; a small spot above tornus; a terminal series of black points. Hindwings with obliquely sinuous medial line with large irregular patch beyond it below costa and small patch at tornus; a terminal series of black points. Underside of forewing mostly pink; hindwing ochreous suffused with pink in places.

Habitat—Khásis. *Exp.* 30 mill. *Type*—In B. M.

2168*a*. DINUMMA INANGULATA, n. sp.

♀. Brown irrorated with black; patagia with their outer edges black; abdomen with the dorsal tufts black. Forewing with black patch at base of costa; a deep black band just before middle with irregular edges, its inner edge angled inward on vein 1, its outer slightly angled outwards in cell; the postmedial line erect, minutely dentate and with some grey on its outer edge; an indistinct, minutely dentate subterminal line slightly angled outwards below costa; a subterminal series of white and black points developing into a patch with a black spot above it just above middle. Hindwing fuscous-brown. Underside grey irrorated with black; hindwing with dentate fuscous and white subterminal line; both wings with terminal series of black and white points.

Habitat—Sikhim, 2800′ (Pilcher). *Exp.* 34 mill. *Type*—In B. M.

2174*a*. CALLYNA CHALCOELA, n. sp.

Head dark-brown, yellowish on vertex; thorax pale-yellow; abdomen brownish, the dorsal tuft at base pale-yellow, the 2nd segment tinged with orange. Forewing with the inner area brassy-yellow shading to greyish and to olive-brown on costal area; some bluish white at base and some oblique

marks on costal area ; an orange subbasal mark on costa ; traces of a waved antemedial line ; reniform very large and quite round with yellow medial spot and edge ; traces of an oblique waved postmedial line with black spots on its outer edge at middle of inner margin and above veins 2 and 4 ; some irregular white marks just inside and on termen below middle. Hindwing fuscous with obscure ante and postmedial and terminal lines ; a yellow patch on inner area at tornus. Underside of forewing mostly suffused with grey and fuscous.

Habitat—China ; Sikhim (Dudgeon). *Exp.* 40 mill. *Type*—In B. M.

2180*a*. WESTERMANNIA CŒLISIGNA.—♂. Antennæ fasciculate ; the basal joint with tuft of hair above, the base of shaft excised.

2180*b*. WESTERMANNIA EUPREPIA, n. sp.

♂. Head and tegulæ dark-chocolate ; patagia and thorax grass-green ; pectus pale ; legs pale-brownish with dark band at end of tibiæ ; abdomen orange, the terminal segments suffused with blackish, the ventral surface pale brownish. Forewing grass-green ; the costal edge brown ; a white discoidal lunule ; the apical area brown from costa above discoidal lunule to tornus ; an indistinct double postmedial line on the brown area, angled at vein 5 and with two dark teeth from it above the angle ; faint traces of an irregular subterminal line with slight dark marks on it below apex, angled inwards on vein 6 and with faint greenish suffusion between it and postmedial line from vein 5 to below costa ; a fine dark waved terminal line ; cilia crenulate with dark tips. Hinding orange with brown suffusion on apical area.

Habitat—Cuddapah, Horsleykhonda, 4000′ (W. H. Campbell) ; Ceylon (Mackwood). *Exp.* 40 mill. *Type*—In B. M.

2186*c*. BREVIPECTEN APICALIS, Leech. Trans. Ent. Soc. 1900, p. 514.

♂. Antennæ ciliated.

Pale-red-brown and ochreous. Forewing with pale oblique antemedial line excurved to inner margin ; the orbicular and reniform rather dark, or brown with pale rings, the former large, the latter very large, the postmedial pale line oblique from costa to vein 6, then excurved, incurved below vein 4, a large subquadrate dark-brown patch on its outer edge on costa with a point of the same colour below it, another point below vein 3 and larger spot below vein 2. Hindwing fuscous.

Habitat—China, Chekiang (Pryer) ; Burma Hsipaw (DeNicéville). *Exp.* 36 mill.

B. cosmiodes also belongs to this section.

2194*a*. TRIORBIS AUREOVITTA, n. sp. (pl. B., f. 16).

♂. Head and thorax dark red-brown ; abdomen brown, yellowish towards base with dark dorsal tufts, pinkish towards extremity. Forewing red-brown shading to purplish and pink ; a metallic golden fascia below the cell becoming ochreous and dark streaks along vein 2 ; an obscure, very irregularly dentate antemedial line ; orbicular round, pale brown with tuft of dark scales in it ; reniform similar but small, pear-shaped, emitting a long

tooth to the postmedial line which is ochreous defined by brown and very highly dentate towards costa and inner margin ; a sinuous submarginal ochreous line angled inwards at veins 5 and 2 and with dentate dark marks on its inner edge ; a fine waved ochreous line just inside margin and black line through cilia. Hindwing red-brown, costal area whitish ; a dark mark with pale line on it at tornus, underside whitish with dark discoidal lunule and diffused curved subterminal line.

♀. Thorax and abdomen darker, the latter with sides of basal segments distinctly yellowish. Forewing darker with the medial part of costal area and cell suffused with fuscous ; the fascia below cell streaked ochreous and blackish to base ; hindwing dark-brown.

Habitat.—Margharita, Assam (Doherty) ♀ ; Penang ♂. *Exp.* ♂ 56, ♀ 46 mill. *Type*—In B. M.

2196. ARIOLA CŒLISIGNA, insert (syn.) *Ariola ransonneti*, Feld. Reis. Nov. pl. 108., f. 1.

2271*a*. EUTELIA DIAPERA, n. sp.

♀. Head and thorax variegated brown, black, and grey ; abdomen olive-grey with dorsal red-brown patch extending to 5th segment. Forewing grey suffused in parts with purplish and olive ; a purplish-brown mark at base of costa ; a straight antemedial line ; the orbicular and reniform grey with fuscous between them and a slightly sinuous line from former to inner margin ; a double postmedial line acutely angled above vein 5, then oblique and sinuous ; a curved dark mark from angle of postmedial line to outer margin below middle ; a waved white subterminal line excurved from costa to vein 3, then incurved ; a waved white line across apex with grey beyond it and a black spot on its inner side near termen. Hindwing fuscous-brown, the base of inner area whitish ; cilia white with waved fuscous line through them. Underside grey irrorated with brown ; forewing with minutely dentate postmedial line ; hindwing with discocellular point and dentate antemedial, postmedial and subterminal lines, the 1st angled outwards at middle.

Habitat.—Bhutan (Dudgeon). *Exp.* 28 mill. *Type*—In B. M.

2203*a*. PLOTHEIA VIRESCENS, n. sp. (pl. B., f. 25).

Hindwing with veins 3·4 on a long stalk, 5 from angle of cell.

♀. Head and abdomen grey ; thorax pale-green. Forewing white, almost entirely suffused with green ; an indistinct sinuous black subbasal line followed by black spots in and below cell ; double sinuous ante and post-medial lines, the former angled outwards above inner margin, the latter inwards below vein 2 ; a bright rufous discocellular spot ; an indistinct irregularly dentate subterminal line and a series of points on the termen. Hindwing grey tinged with fuscous.

Habitat.—Sikhim, 7000′ (Pilcher). *Exp.* 26 mill. *Type*—In B. M.

2227*a*. PTISCIANA SCOTIA, n. sp.

♀. Red-brown; palpi at sides, fore-legs, and patagia blackish. Forewing suffused with black to the postmedial line and with a diffused streak from angle of the line to apex; tufts of greyish-black scales near base and at middle and end of cell; the antemedial line greyish, dentate and acutely angled outwards below the cell; the postmedial line defined by greyish scales becoming white towards costa, arising from costa before middle, very oblique to beyond angle of cell, then inwardly oblique and acutely angled inwards on vein 1, some fine black streaks from it on the subcostal veins; the subterminal line greyish and minutely dentate. Hindwing with the cilia whitish at tips.

Habitat.—Sikhim, 1800' (Dudgeon). *Exp.* 34 mill. *Type*—In B. M.

2236*a*. HYPOTHRIPA VERNA, n. sp.

♂. Head and collar white-and-grey; palpi marked with brown; patagia and thorax variegated with purplish-brown-and-black; abdomen grey. Forewing grey, a large area on disc suffused with grey-green; a large rounded patch at base of costal area, yellowish-white at middle, then olive-green and edged by brown; a sinuous white antemedial line angled inwards on vein 1; a discocellular line; an irregularly dentate postmedial line, oblique to costa and with some black points on medial part of its inner edge; an irregular fuscous subterminal line; some black points on costa and termen. Hindwing pale-fuscous.

Habitat.—Sikhim, 1800' (Dudgeon). *Exp.* 22 mill. *Type*—In B. M.

2236*b*. DENDROTHRIPA MACKWOODI, n. sp.

♂. Forewing with fringe of short pink hair on underside of costal vein; a fringe of long ochreous hair below the cell; hindwing with the costal area largely expanded and fringed with rough hair; the apex with large triangular excision; the discocellulars almost obsolete.

Head, thorax and abdomen pale-ochreous; frons with black bar above. Forewing greyish-ochreous, tinged with fuscous from costa to submedian fold to the postmedial line, the terminal area suffused with green; a blackish patch at the base of costa; a sinuous medial line from costa to submedian fold with black suffusion on its outer edge; the postmedial line strongly excurved beyond the cell, defined by whitish on outer side and with some vinous, then fuscous suffusion beyond its excurved portion; a sinuous subterminal line with some black suffusion in its medial sinus; some vinous suffusion on termen below apex and at middle; a fine terminal black line. Hindwing ochreous-white, the cell slightly irrorated with black scales. Underside with the costal area of both wings and terminal area of forewing tinged with pink.

Habitat.—Ceylon, Colombo (Mackwood). *Exp.* 18 mill.

2258. EUTELIA PICTICOLOR, insert (syn). *Ptisciana ioda*, Swinh., A. M. N. H. (7), 3, p. 114, Karwar.

No. 2258*b*. EUTELIA STICTOPROCTA belongs to Sect. III. with the antennæ strongly bipectinate.

2258*c*. EUTELIA CATEPHIFORMIS, n. sp.

♂. Head pale red-brown ; palpi dark at base ; thorax and abdomen fuscous-brown. Forewing dark red-brown ; the basal area blackish with traces of waved lines and two more prominent lines on its outer edge angled inwards above vein 1 ; an ochreous discoidal lunule ; a fine medial waved line very strongly bent outwards round the discoidal lunule ; a double similar more prominent postmedial line with small ochreous spot beyond it above vein 1 ; traces of irregularly waved lines on outer area and an obscure olive-yellow and dark fascia across apical area. Hindwing fuscous-black with white patch on basal half of inner area. Underside greyish with numerous minutely dentate dark lines on terminal area.

Habitat.—Naga Hills (Doherty). *Exp*. 30 mill. *Type*—In Coll., Elwes.

2274*a*. EUTELIA PICTATRIX, n. sp.

Head, thorax and abdomen brown-pink mixed with dark-brown scales ; abdomen with some blackish patches, the male with dorsal white patch on 4th segment. Forewing pink strongly mixed with dark red-brown scales ; very numerous waved fuscous lines ; double antemedial, medial, and postmedial lines rather more prominent, the 1st strongly curved, the 2nd bent outwards below costa, the 3rd excurved from below costa to vein 4 ; tufts of bright-red scales in cell near base, at middle and at upper angle ; pale wedge-shaped streaks on median nervure from before middle to the postmedial line, and in submedial interspace from near base to termen ; a short white streak below costa towards apex with an irregular dentate subterminal line from below it to inner margin ; a fine terminal black line and some blackish white-irrorated marks on termen from below apex to below middle, some similar spots on cilia. Hindwing yellowish-white ; the terminal half strongly suffused with fuscous from costa to vein 4, the veins on it black ; the submedian interspace pale ; vein 2 and the inner margin with alternating red and black marks ; cilia bright red-brown with fine pale line at base.

Habitat.—Ceylon, Gampola (Mackwood), Dickoya (Green). *Exp*. 32 mill. *Type*—In B. M.

2290*a*. STICTOPTERA LUCTUOSA, n. sp.

♀. Head and tegulæ fuscous-black ; thorax ochreous-brown ; abdomen fuscous. Forewing fuscous-black, the basal third pale brownish ochreous with a browner patch on it from costa to median nervure traversed by a black subcostal streak, the antemedial line just inside its outer edge ; the dark area with traces of numerous minutely dentate lines, the subterminal line with two ochreous marks on it below costa and one in submedian fold. Hindwing black-brown.

Habitat.—Ceylon (Mackwood). *Exp*. 42 mill. *Type*—In B. M.

2290*b*. STICTOPTERA NEGRETINA, n. sp.

♂. Black-brown. Forewing with a purplish tinge ; a waved antemedial black line ; a medial line oblique from costa to submedian fold, then erect,

the area between it d antemedial line black with three tufts of raised scales; a medial line from costa to median nervure, angled on subcostal nervure, two discoidal tufts of scales; a double sinuous post-medial line angled below costa and at middle; an indistinct highly dentate subterminal line. Hindwing almost black; underside with two indistinct medial lines.

Habitat.—Khásis. *Exp.* 32 mill. *Type*—In B. M.

2293*a*. GYRTONA CRISTIPENNIS, n. sp.

♀. Head whitish; thorax grey and brown, ochreous at extremity; abdomen greyish tinged with ochreous. Forewing violaceous-grey, the base and costal area tinged with ochreous; an oblique double dark brown costal striga near base; a whitish antemedial band with two slightly waved dark brown lines on it, the inner expanding into a diffused patch of scales in cell; a tuft of raised fulvous scales beyond the band in cell and another blackish below median nervure; the end of cell and costal area above it brown variegated with pinkish with some black striæ and a blackish discoidal tuft of scales defined by white lines; a large ochreous lunulate mark from costa beyond cell defined by a fine dentate black line on its outer edge; a subterminal line of white striæ and a terminal line of white and black striæ.

Hindwing semi-hyaline, the terminal half suffused with fuscous.

Habitat.—Khásis. *Exp.* 36 mill. *Type*—In B. M.

2332. CAREA XANTHIA, n. sp.

Forewing with the apex produced; the termen slightly angled at vein 4. Bright chrome yellow; palpi and antennæ red, the former white in front; pectus white; tibiæ and tarsi with red-brown and orange scales. Forewing slightly irrorated with black; a slight red and black streak on inner margin before middle; pale brownish spots in middle of cell, above middle of inner margin, on discocellulars and in submedian fold beyond middle; an oblique red-brown patch from apex with some white scales on it; cilia red-brown with some patches of white scales. Hindwing rather pale yellow with rufous suffusion from lower angle of cell to apex and middle of termen.

Habitat.—Sikhim, 1800′ (Dudgeon). *Exp.* 28 mill. *Type*—In B. M.

2358*a*. CATOCALA TRISA, Swinh., A. M. N. H. (7), 3., p. 115. (1899).

Head and thorax dark-fuscous-brown; abdomen yellow; pectus and ventral surface of abdomen whitish. Forewing dark brown; a short subbasal line; a double waved antemedial line, the outer stronger, especially towards costa; the postmedial line minutely dentate, very strongly angled below costa, less strongly angled on vein 3, then retracted to origin of vein 2 and outwardly oblique to inner margin; an obscure highly dentate curved subterminal line; the apex greyish. Hindwing pale yellow with fuscous band from costa just before apex expanding to termen between veins 6 and 2 where it terminates.

Habitat.—Bombay, Satara. *Exp.* 42 mill.

2450*a*. MELIPOTIS CAILINO, Lef. Ann. S. Linn., Paris 1827, p. 94, pl. 5, f. i.

Head whitish ; antennæ black ; thorax grey suffused with black ; abdomen grey irrorated with fuscous. Forewing with the base grey ; a short subbasal black line with a short streak from its lower extremity below the cell ; an antemedial black line sinuous and oblique from costa to submedian fold where it is angled, the area between it and the subbasal line blackish ; the medial area grey-brown, whitish towards costa on outer side of antemedial line ; the postmedial line very strongly excurved beyond the cell, angled at veins 6 and 4, and incurved between those points, then very strongly retracted to lower angle of cell and sinuous to inner margin ; a black line on discocellulars with some dentate white marks beyond it in the sinus of the postmedial line, the area beyond it blackish to the subterminal line which is angled outwards at vein 6 and excurved at middle ; the terminal area grey. Hindwing white suffused with fuscous ; a dark discoidal lunule with a white patch beyond it ; a white patch on termen at vein 2 ; cilia white with a black patch at middle. Underside of forewing with the basal half whitish, the terminal half fuscous with a white patch beyond the cell ; hindwing white with black discoidal lunule, postmedial band and black patch on middle of termen.

Habitat.—France ; Greece ; Armenia, Kashmir (Pilcher). *Exp.* 40 mill.

2532. *Serrodes inara*. Larva purplish white specked with black ; head and lateral band on thoracic somite flesh colour ; a flesh-coloured band on the swollen 4th somite with irregular black markings behind it ; dorsal, two lateral and sublateral interrupted waved flesh-coloured fasciæ on 5th to terminal somite. Pupa black with purple bloom. (Fellowes Wilson).

2535. SYMPIS RUFIBASIS. The specimen figured is a ♀, the ♂ has tufts of hair on extremity of 2nd joint and on 3rd joint of palpus and at base of antennæ.

2538*b*. BANIANA NODA, Swinh., A. M. N. H. (7), 3, p. 116 (1899).

Head yellowish white, the vertex, antennæ and tegulæ black ; thorax grey with a purplish tinge ; abdomen fuscous. Forewing reddish brown suffused with greyish purple and irrorated with black ; an antemedial black-brown mark from cell to inner margin with white outline, its inner edge sinuous, its outer angled on vein 1, traces of a fine line from it to costa ; a more or less prominent discoidal dark lunule edged with grey ; an obscure sinuous postmedial line ; some pale specks on costa towards apex ; a fine terminal series of dark points. Hindwing fuscous, the cilia brown.

Habitat.—Karwar ; Nilgiris. *Exp.* 38 mill.

2545. BOCULA *lutosa*, insert *Agrotis* INCONCLUSA, Wlk., Journ. Linn Soc. Zool., vi., p. 188, Borneo which has precedence.

2643. *Ophideres hypermnestra*. Larva : ♂ purplish fuscous speckled with blue; irregular blackish patches on thoracic and terminal somites ; stigmata with black points ; 5th and 6th somites with large lateral black ocelli ringed with red and yellow, 4th somite with lateral orange spot ; irregular yellow lateral marks on 7th and 8th somites and their prolegs.

♀ with the spot on 4th somite and the irregular marks on 7th and 8th pinkish-white. (Fellowes Wilson).

2697*b*. CALESIA CANESCENS, n. sp.

♀. Pale-grey-brown; head, collar, thorax below, and abdomen crimson; 3rd joint of palpi, antennæ, and tarsi black; wings quite uniform grey-brown.

Habitat.—Sikhim, 1800′ (Dudgeon). *Exp*. 50 mill. *Type*—In B. M.

2705*a*. MECODINA CYANODONTA, n. sp.

♀. Rufous brown; thorax except collar and abdomen suffused with bluish grey. Forewing with the basal half suffused with blue-grey; fine indistinct waved rufous lines on basal area followed by a black point in cell; an oblique medial rufous line; reniform outlined with rufous; outer half rufous with indistinct blue-grey line near its inner edge, excurved below costa, then very highly dentate; darker rufous streaks in the interspaces of outer area; traces of a waved subterminal blue-grey line below apex and some points towards tornus. Hindwing with the basal half suffused with blue-grey; the outer half rufous with dark streak in the interspaces; a blue-grey patch on termen at apex and some points towards tornus. Underside brown with traces of three darker lines on medial area.

Habitat.—Khásis. *Exp*. 44 mill. *Type*—In Coll., Elwes.

2710*a*. MECODINA SUBJECTA, Wlk., xxxiii, 1012.

♀. Yellow-brown; head and collar grizzled with white; thorax and abdomen tinged with fuscous and with grey below. Forewing with bisinuate fuscous antemedial line; a whitish line on discocellulars; a medial line highly excurved beyond cell, then oblique; a postmedial oblique line angled below costa; the outer area suffused with fuscous and with a deeper fuscous mark on costa before apex. Hindwing with fuscous antemedial line excurved below costa; a medial line oblique towards inner margin; an obscure bisinuate subterminal line; the apical area suffused with fuscous. Underside with white suffusion beyond the postmedial line.

Habitat.—Bhutan (Dudgeon); Sierra Leone (Clements); Cape Colony. *Exp*. 52 mill. *Type*—In B. M.

The specimens from Africa are more suffused with fuscous than the one from Bhutan.

2729*a*. ZETHES STENIPTERA, n. sp.

♀. Dark-brown; head and thorax slightly pencilled with grey; tarsi and abdomen with greyish segmental lines. Forewing with dark antemedial line edged with ochreous on inner side, slightly curved and bent inwards above inner margin; the postmedial line straight, hardly angled at middle and edged with ochreous on outer side, between it and the pale sinuous punctiform subterminal line suffused with purplish grey. Hindwing dark-fuscous, the underside irrorated with grey.

Habitat.—Sikhim, 1800′ (Dudgeon). *Exp*. 28 mill. *Type*—In B. M.

2737. ZETHES NIGRILINEA, insert (syn.) *Zethes ochrodes*, Swinh., A. M. N. H. (7), 3, p. 115.

2738*a*. ZETHES APICATA, n. sp.

♂. Head and thorax dark-purple-brown; abdomen pale ochreous-brown. Forewing pale ochreous-brown with numerous pale striæ and irrorated with a few black scales; a subbasal purple-brown band edged by rufous lines; the postmedial line angled at vein 5, dark brown above that point, pale below it; a quadrate purple-brown apical patch extending nearly to cell and to vein 4 with an oblique pale mark on it from costa; a pale crenulate subterminal line and almost terminal series of points. Hindwing pale greyish brown; two discoidal points; a medial pale line defined by brown on outer side, the area between it and the crenulate postmedial line reddish; some black spots on the postmedial line towards inner margin; a subterminal series of small lunules; a fine pale terminal line.

Habitat.—Khásis. *Exp*. 30-32 mill. *Type*—In B. M.

2740*a*. ZETHES MACARIATA, Dudgeon. Ined.

♀. Pale-ochreous tinged with pale-rufous in parts and irrorated with a few dark scales; palpi and antennæ blackish. Forewing with two indistinct curved and waved antemedial lines; a black point in middle of cell and white discoidal bar with somewhat excised outer edge; a pale highly sinuous medial line running out to an angle below costa and with bluish-white suffusion between it and the postmedial line becoming almost white near costa; the postmedial line angled outwards below costa and at middle and bent outwards to inner margin, the area beyond it red-brown with a whitish patch at apex and traces of a subterminal series of black points. Hindwing with indistinct subbasal line angled at middle; a sinuous medial line with red-brown suffusion on its inner side; an indistinct curved and slightly waved postmedial line; a very indistinct sinuous subterminal line with dark red-brown patch beyond it towards tornus with three black points on it, the termen straight from apex to the angle at vein 4.

Habitat.—Sikhim, 1800′ (Dudgeon). *Exp*. 48 mill. *Type*—In B. M.

2738*a*. CAPNODES PURPUREA, n. sp.

♂. Dark purple-red; abdomen blackish above towards extremity. Forewing with small oblique fulvous spot below middle of costa; black point in cell and two grey points on discocellulars; a small white lunule on costa beyond middle and three points towards apex; a treble black and brown line from apex to middle of inner margin of hindwing; both wings with minute series of white points just inside termen.

Habitat.—Khásis. *Exp*. 34 mill. *Type*—In B. M.

2769*a*. DIOMEA LIVIDA, n. sp.

♂. Head black; thorax rufous, the tegulæ ochreous in front; abdomen fuscous, the dorsal tufts rufous, the anal tuft ochreous. Forewing purplish brown, the costal area suffused with reddish-ochreous; small subbasal and antemedial black spots defined by whitish on the costa; traces of an antemedial line on inner area and of a double line just beyond the middle; a large deep black discoidal lunule with diffused black above it on costa; a

crenulate black postmedial line with white points on its teeth ; an irregularly sinuous subterminal line with the area beyond it deeper red-brown. Hindwing pale brown suffused with fuscous to the indistinct postmedial crenulate line which has some white points on it ; an irregularly sinuous subterminal line with the area before it pale purplish grey, beyond it red-brown ; both wings with terminal series of small ochreous spots with black striæ on their inner side. Underside greyish irrorated with fuscous with black cell spots and medial and postmedial lines.

Habitat.—Simla (Pilcher). *Exp.* 36 mill. *Type*—In B. M.

2785*a*. AVITTA INSIGNANS, n. sp.

♂. Head and thorax brown ; abdomen grey-brown. Forewing brown suffused with purplish grey, the basal area brown ; two indistinct fine oblique antemedial lines ; a diffused medial line not reaching costa ; an obscure discoidal lunule ; two fine sinuous indistinct postmedial lines followed by a diffused band not reaching costa ; a waved subterminal line and some diffused brown on termen. Hindwing fuscous. Underside grey with an ochreous tinge ; forewing fuscous except the costal and terminal areas ; hindwing with slight discoidal lunule.

Habitat.—Khásis. *Exp.* 48 mill. *Type*—In Coll., Elwes.

2785*b*. AVITTA PASTEA, n. sp.

♀. Head and thorax dark-brown, the scales pencilled with pale brown ; palpi paler ; tarsi with ochreous rings ; abdomen black-brown. Forewing dark red-brown, finely irrorated with grey forming a large patch on costal area from end of cell to apex ; two obscure waved antemedial lines incurved below cell ; a nearly straight medial line ; a discoidal spot ; two minutely dentate postmedial and a subterminal line. Hindwing blackish with a bluish tinge, the cilia grey. Underside grey with discoidal lunules and curved postmedial lines.

Habitat.—Sikhim, 1800′ (Dudgeon) ; Margharita, Assam (Doherty). *Exp.* 46 mill. *Type*—In B. M.

2889*a*. TALAPA ACYPERA, n. sp.

Forewing with the outer margin very acutely angled at vein 4.

♂. Head, tegulæ and base of patagia and meso-thorax pinkish grey-brown ; the rest of thorax dark rufous ; abdomen pinkish grey. Forewing pale irrorated with brown ; an oblique antemedial pink line defined by rufous on outer side and with diffused rufous beyond it ; dark points in cell and on discocellulars ; a curved slightly sinuous postmedial pink line defined by a fine rufous line on inner side and with diffused rufous beyond it ; an oblique streak from apex with an oblique rufous line from below its extremity to tornus ; a slight series of terminal points. Hindwing ochreous suffused with fuscous with traces of medial and postmedial lines ; underside with discoidal black spot.

Habitat.—Khásis. *Exp.* 40 mill. *Type*—In B. M.

2912*a*. RHYNCHINA ALBILUNA, n. sp.

♂. Pale ochreous-brown ; abdomen whitish at base. Forewing with slight black suffusion just beyond end of cell ; a white lunule on inner area just beyond middle ; a subterminal line, finer highly dentate and whitish from costa to vein 4, then strongly incurved, blackish and diffused ; a fine pale line at base of cilia. Hindwing pale brownish ; the terminal area fuscous.

Habitat.—Sikhim, 2800′ (Pilcher). *Exp*. 28 mill. *Type*—In B. M.

2985*a*. HYPENA UMBRIA, n. sp.

♂. Dull ochreous-brown ; palpi black ; meta-thorax with blackish patch ; wings irrorated with fuscous. Forewing with blackish patch at base ; a small black spot in cell and eliptical discoidal spot with brownish centre ; traces of waved antemedial and medial lines and a more distinct subterminal line with blackish patch on its inner side towards costa ; a terminal series of black points. Hindwing with discoidal point and indistinct waved medial, post-medial and subterminal lines ; the terminal area suffused with fuscous ; a terminal series of black points.

Habitat.—Ceylon, Puttalam, Maturatta (Pole). *Exp*. 20 mill. *Type*—In B. M.

2998*a*. CHUSARIS SEMIALBA, n. sp.

Head, thorax and abdomen greyish white ; palpi, pectus, and ventral surface of abdomen black, the last suffused with fuscous above towards extremity. Forewing with the basal half greyish white ; a dentate antemedial dark line ; a sinuous medical line angled at lower angle of cell ; a waved postmedial line bent outwards at middle ; the apical third of wing greyish brown from middle of costa to inner margin beyond postmedial line ; a waved sub-terminal line with some black marks beyond it. Hindwing white with medial brownish band not reaching costa irrorated with black and with waved black edges ; terminal area brown with white line and black and white marks on it. Underside blackish.

Habitat.—Sikhim, 1800′ (Dudgeon); Rangoon. *Exp*. 20 mill. *Type*—In B. M.

3000*a*. CHUSARIS NIGRISIGNA, n. sp.

♂. Dark grey-brown ; palpi blackish, the 3rd joint ringed with white. Forewing irrorated with blue grey and black scales ; small dark basal and antemedial spots on costa ; a larger black spot in end of cell with some spots above, beyond and below it ; a subtriangular black patch on costa before apex, some points on termen. Hindwing fuscous, the inner area greyish brown with some black striæ.

Habitat—Sikkim, 1500′ (Dudgeon). *Exp*. 22 mill. *Type*—In B. M.

Section II. Palpi extending about three times length of head ; forewing with vein 7 stalked with 8·9·10 and 11 approximated to them at middle ; hindwing with veins 3·4 and 6·7 stalked ; the costa somewhat excised beyond middle.

3008*c*. PROLOPHOTA BISIGNATA, n. sp.

♂. Ochreous-white ; palpi, abdomen and wings irrorated with a few black scales ; meta-thorax with prominent black patch. Forewing with the costa blackish towards base ; an antemedial series of four minute points angled in cell ; two prominent obliquely-placed discoidal points placed on an obliquely curved fuscous band with rather darker edges and not reaching costa on which there is a black point ; a pair of prominent postmedial spots below costa and two points between veins 3 and 5 ; a subterminal series of points. Hindwing with slight discoidal point ; a slightly sinuous brownish medial band edged by black lines and not reaching costa ; traces of a postmedial line ; a subterminal series of black points.

Habitat.—Ceylon, Pundaloya (Green). *Exp*. 24 mill. *Type*—In B. M.

SNAKE VENOMS: THEIR PHYSIOLOGICAL ACTION AND ANTIDOTE.

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(*Read before the Bombay Natural History Society on 21st January 1902.*)

At a recent meeting of our society Mr. Phipson and Father Dreckman showed us the beautiful collection of snakes, which, as a rule, is kept shut up in a cupboard. On this occasion Mr. Phipson indicated to us the way by which naturalists tell a poisonous from a non-poisonous snake: he also told us about the structure of the poison apparatus and about the mechanisms by which the so-called erection of the fangs and the ejection of the poison take place. It is, therefore, unnecessary for me to again enter into these most interesting subjects. Further, Father Dreckman told us, that, although there are many varieties of poisonous snakes in India, there were only four terrestrial snakes which could be said to offer any danger to man, and that naturalists put these four into two great groups, *viz.* (1) two of the Colubrine family—the Cobra and the Kraits; (2) two Viperine, *viz.*, Russell's Viper or Daboia and Echis Carinata or Phoorsa. This evening I propose to tell you something about the nature and physiological action of the venoms of these snakes. At the outset, however, I should like you to understand that my remarks on this subject will be strictly confined to a summary of the observations which I have made with the poisons of the two most deadly of these snakes, *viz.*, the Cobra and the Daboia. I have little or no experience of the poison of the Kraits or that of the Echis, nor do I know of any thoroughly trustworthy scientific observations which have been made with the venoms of these two species. And let it be clearly understood, that, although the Krait is a Colubrine snake and the Echis a viper, it by no means follows, as I have good reason to know, that the poison of the Krait has the same physiological action as the venom of the Cobra or that of the Echis the same as the venom of the Daboia.

On the Method of procuring the Poison for Experimental Purposes.

All the older experiments with snake venom were made by allowing the snake to bite some animal or other. This method is, of course, a crude one and affords us no information as to the amount of poison which a snake can inject nor as to the exact quantity which can prove lethal to a given animal. Nowadays all investigators

work with dried and weighed quantities of venom. The poison may be collected in one of two ways: (1) the snake is caught by means of a guillotine arrangement or a strong pair of forceps behind the neck. If these are not available, a trained snake-man will serve the purpose equally well. The animal, caught in either of these ways, is then securely held with one hand behind the head. The lower jaw is then forcibly opened by catching the skin covering it. The fangs become erected and the duct continuous. In the case, however, of the Daboia, which has exceptionally long fangs, it is well to pass a piece of string behind them and pull them forward with this. With the finger and thumb of the other hand firm and steady pressure from behind forwards is made over the glands situate behind the orbits. The poison escaping from the fangs is caught in a watch-glass held by an assistant in a pair of long forceps. The process is, you will understand, a process of squeezing, not, as we sometimes call it, one of "milking;" (2) the snake, held securely behind the head, is allowed to bite through a piece of rubber stretched over a watch-glass or other suitable receptacle. The liquid poison is then quickly and thoroughly dried over lime or sulphuric acid. I have carefully estimated the average amount of venom which can be got in this way. I find that a medium-sized Cobra, that is, one from 500 to 1,000 grammes weight ($\frac{3}{4}$ to $1\frac{1}{4}$ lbs.), will yield about 200 milligrammes of dried poison; the larger-sized Cobras will give as much as 240 to 250 milligrammes or even more.* The amount of water contained in fresh liquid cobra poison varies from 60 to 75 per cent., so that fresh cobra venom is a 25 to 40 per cent. solution of the dried material.

Let us say that a Cobra gives 200 milligrammes of dried venom. This is sufficient to kill 5,000 ordinary rats. It is, of course, without actual experiment, impossible to say how much Cobra venom it takes to kill a man; but, calculating this amount on the basis that man is as susceptible, weight for weight, as a rat, and from my experiments on mice, rats, rabbits, monkeys, and horses, I have no reason to think that he is less susceptible, then 200 milligrammes of poison—the amount which can easily be got from a Cobra—would be sufficient to kill eight ordinary-sized men, that is to say, that a medium-sized Cobra can inject eight times the quantity, which would be sufficient to kill a man. A large Cobra would have ten times the necessary amount.

* 1 milligramme=·015 grain, or about $\frac{1}{65}$ part of a grain.

Physical and Chemical Properties of Venom.

Fresh liquid poison is of a yellowish or straw colour. Cobra venom is quite clear, while Daboia poison has, as a rule, a small quantity of undissolved suspended matter. The reaction of both venoms is invariably acid to litmus paper, unless there has been much admixture with the alkaline secretions of the mouth. Cobra venom has a very bitter astringent taste ; chewing Daboia venom is like chewing ordinary gum acacia—there is no taste at all.

Venom dried rapidly in a thin layer over calcium chloride cracks into small pieces. In the case of Cobra poison these particles are of an irregular shape, as broad as they are long ; they are yellowish and translucent. In the case of Daboia venom the cracking is more or less in longitudinal striæ, and, in consequence, fine needle-shaped particles are found. I show you here good specimens of both these varieties of snake venom.

Thoroughly dried venoms retain their toxic power for an indefinite period. They dissolve again readily and completely in water or salt solution.

It is quite unnecessary for me to enter into the complicated question of the chemical constitution of these poisons. At one time, not very long ago, it was thought that the toxic constituents of all snake venoms were alkaloids, similar to the poisonous vegetable alkaloids, such as strychnine. This, however, has been shown to be an entirely erroneous supposition ; and I think I am right in saying that all investigators are agreed that all snake venoms owe their poisonous properties to the proteid or albuminous substances which they contain in solution—substances similar in composition to the albumen or white of egg. All snake poisons are, in fact, almost pure solutions of proteids, and contain little else beyond a trace of inorganic salts and a small quantity of an organic acid and colouring matter. Further, there is no doubt that each venom contains two or more different proteids, and that the physiological action of a particular venom depends on the nature of the proteids which it contains. Organic chemistry has, unfortunately, not advanced far enough as to be able to separate in pure form these various proteids or to arrive at any estimate of their chemical constitution. We have, therefore, to content ourselves at present with various crude methods of studying the physiological actions of the different proteids in snake venoms.

Effect of heating Snake Poison.

When a solution of snake venom is heated the poison is affected in two ways :—

(1). Some of the proteids present become coagulated, in the same way as the albumen of egg is coagulated for breakfast.

(2). The toxic power of the proteids which are not coagulated is impaired, while their solubilities are not altered.

Whether the toxic power is completely destroyed by heating or not depends on the degree of heat used, the duration of time for which it is applied, and the strength of the solution which is heated. Different poisons are affected in different ways. Thus, while a 0·1 per cent. solution of Cobra venom can be heated for half an hour at 73° C., with the result of only slightly diminishing its original toxicity, heating a 0·1 per cent. solution of Daboia venom at the same temperature for the same length of time completely destroys its toxic power, so that large quantities can now be introduced into the blood stream of an animal without causing any symptoms.

You will appreciate from this, then, that we have arrived at the stage when we can say that the poison secreted by a Cobra is, in all probability, of quite a different nature from the venom manufactured by a Daboia. In this connection I may say, without entering into tedious details and long explanations, that I feel to-day in a position to state, without fear of contradiction, that Cobra venom contains no poisonous element which is contained in Daboia venom, and *vice versa* that Daboia venom is necessarily quite free from any of the toxic constituents of Cobra poison. I know that this opinion is in contradiction to the working hypothesis put forward by Martin of Melbourne some years ago—an hypothesis which, however, was only provisional and fitted to the facts then available.

Physiological Action of Venoms.

We have, therefore, now to pass on to a brief consideration of the manner in which each of these venoms brings about its fatal result when injected into an animal.

Let us begin with Cobra venom, the poison which has received more attention from investigators than any other. If one injects a solution of Cobra venom into a hot-blooded animal, no matter what the species of the animal may be, one observes a train of symptoms which there is no doubt points to the poison having acted directly

on the central nervous system, that is, the spinal cord and brain. The animal after a while becomes lethargic and disinclined to move; there is no preliminary stage of excitement: then one observes that the hind legs have become paralysed, the animal drawing them after it when endeavouring to progress. The paralysis of the hind legs gradually becomes more marked, while at the same time the paralysis spreads forwards and involves the forelegs. Ultimately the animal becomes completely paralysed and lies down unable to move. The breathing still continues. Thus one sees in all such experiments a most striking and typical picture—the animal, be it bird or mammal, mouse or horse, lying on the ground completely unable to stir, the breathing still going on, and the saliva trickling from its mouth.

This, however, does not last long. The paralysis soon involves the respiratory centres; gasping in the search for air becomes marked, and the scene is closed with the total cessation of respiration. Just before this, however, there may be slight general convulsive movements, due to the accumulation of carbonic acid gas in the system. Mark you, there has been no word of failure of the heart; there has been no diminution in the strength of the pulse. After the breathing has completely stopped, if one opens the chest, one sees the heart beating away as if nothing had happened. I have observed this beating go on for twenty minutes to half an hour after the chest has been laid open and gradually to become weaker and weaker and ultimately cease altogether.

As well as this action on the central nervous system, Cobra venom has got an action on the blood. It has got a very wonderful power of breaking up the red corpuscles of the blood, with the result that a certain amount of the colouring matter is set free. Thus, when a sample of the blood is taken into a test-tube after death and allowed to clot, the serum is noticed to be dark-red in colour, due to the hæmoglobin which has been set free. Further, Cobra venom has an action on the normal coagulability of the blood, that is to say, on the property which blood has of coagulating or setting when withdrawn from the vessels. The clot which forms is not so firm or so compact as in normal blood, and the time which it takes to form is much lengthened. As far, however, as my experiments have shown me, I cannot find any possible relation between the nervous symptoms which I have described and this action which Cobra poison has on

the blood. This conclusion is, I know, contrary to the opinion of Cunningham who, however, is the only observer who contends that the action on the blood is the primary one, and that the nervous symptoms are dependent on and result from this destruction of the blood cells. This is a long and complicated story and one which, I hardly think, would give us much profit to pursue at this time.

If Cobra venom be injected directly into the blood stream—into a vein, for example—the same train of symptoms as I have described above is observed, the only difference being that the symptoms come on more quickly and march to a fatal termination much more rapidly than when the injection is given under the skin.

When a man is bitten by a Cobra, the same general symptoms, which I have sketched above as following the artificial injection of the poison into an animal, are observed. As well there is, as a rule, at the beginning sickness and vomiting and a feeling of lethargy and disinclination to work; paralysis, however, soon sets in, and life ends, as we have seen, by cessation of respiration.

In addition to these general symptoms, however, there are marked signs of poisoning locally at the site of the bite. There is very severe pain which follows immediately on the infliction of the wound. The parts around become swollen and tender, and a bloody serum oozes away from the punctures. If the bite has been inflicted on a dependent part, such as a finger, the swelling spreads up the digit which soon becomes exceedingly tense and extremely painful. Should the patient ultimately recover from the general condition, the tissues for a short distance around the bite die, a black slough forms, and on separating leaves a deep hole. This hole heals up very slowly, and there is left an ugly depressed scar.

To complete the picture, I may state that in man the general symptoms, as a rule, do not set in for an hour or two after the bite, and that on the average death takes place about three to six hours later. The fatal result, however, may be accelerated, or, on the other hand, it may be delayed for some considerable time, even a day or two, according to the amount of poison which has been injected. You will appreciate, nevertheless, that we have got in all cases a certain interval of time, as a rule some hours, between the bite and the onset of symptoms and death—an interval of time precious, indeed, as you will see, when I come to speak of the treatment of these cases.

Such, then, is a short sketch of Cobra venom intoxication. We may now pass on to the consideration of the effects of an injection of the venom of Russell's Viper or Daboia. Experiments with this poison and clinical observations on actual cases show quite a different picture to what I have described in the case of Cobra venom. I have had the privilege of studying the action of Daboia poison on many varieties of animals—mice, rats, fowls, pigeons, guinea-pigs, rabbits, monkeys, dogs and horses. At the outset it would be well to clear the ground by stating that, as far as my experience goes, it would appear that Daboia venom has no direct action on the central nervous system. I have never seen paralysis of the legs, even in the prolonged cases, follow its injection. The respiration is only interfered with as a result of its action on the blood and heart. Its action seems to be confined entirely to the circulatory system, *viz.*, the blood plasma—that is, the fluid part of the blood,—the blood corpuscles, the capillary walls and the heart.

We may divide all cases of Daboia intoxication into two groups—

(1) those cases in which death follows very rapidly—say, within 10 or 15 minutes or sometimes it is only a few seconds—after the injection of the venom ; and

(2) those cases in which death is prolonged for some hours or even some days after the injection of the poison.

Let us take the first group.

When a small quantity of Daboia venom is injected directly into the blood stream of an animal—say, into the marginal vein of the ear of a rabbit,—or when a comparatively large quantity is put under the skin,—say, of a pigeon,—death follows rapidly, sometimes in a few minutes. You will notice that the animal first becomes unsteady on its legs, its powers of equilibration are seriously affected ; then it falls down, and almost immediately violent convulsions set in. Death follows in a few seconds after the onset of these convulsions. From the observation of these symptoms Cunningham was led to believe that they resulted from the direct action which the poison had on the central nervous system. This, however, I have shown to be quite an erroneous hypothesis. What, then, has really taken place? On opening the animal immediately after death, if the dose has been at all a large one, the whole of the blood is found to be clotted solid ; the cavities of the heart, the veins of the lungs and abdomen, and even

the arteries are found full of solid clot. The heart has, of course, ceased to beat. If the dose has been a smaller one, the clotting may be confined to the pulmonary arteries, the right heart and the portal veins. The degree and extent of the clotting depend on the amount of venom injected and the rapidity with which it has been injected. But, in all cases of rapid death resulting from Daboia intoxication, there can be no shadow of doubt but that the fatal result has been caused by this most extraordinary and remarkable intravascular clotting. The symptoms which Cunningham interpreted as resulting from a direct action of the poison on the central nervous system are due to carbonic acid poisoning, the result of the non-aëration of the blood in the lungs.

In the second group of cases, *viz.*, that in which death is delayed for sometime, we have several different phenomena presenting themselves.

In the first place, death may follow in a few hours after the injection. In such a case the fatal result is, I am sure, due to the depressing action which the poison has on the heart. Thus I have seen a horse, which had received into a vein a quantity not sufficient to cause clotting, fall down quite collapsed ; its pulse has become feeble, hardly to be felt ; its body cold and covered with perspiration—a typical picture of cardiac depression or syncope, known popularly as a faint. There was no paralysis : after a rest the animal got up and walked about, only, however, to fall down again in another faint. This condition sometimes ends in death, while, on the other hand, it may be recovered from.

In the second place, should the fainting condition be recovered from, then a whole series of phenomena develops, which is dependent on the action of the venom on the blood corpuscles, the coagulability of the blood and the capillary walls.

I have told you that when large doses are given either intravenously or subcutaneously, the coagulability of the blood may become so increased as to lead to rapid intravascular clotting and death. Should, however, the quantity be not sufficient to cause this clotting, and especially will this be the case if the subcutaneous method of injection has been used, then the very opposite condition of blood coagulability results. In some cases the blood remains absolutely unclotted when drawn into a test-tube, while in others it clots only after a long interval of time, and the clot is very loose and soft. As

well as this action on the coagulability of the blood, Daboia venom, somewhat similar to Cobra venom, has a very marked destructive effect on the red-blood corpuscles. Further, Daboia venom has a great destructive action on the capillary walls, making them more permeable to the blood they contain—a blood by its deficiency in coagulability more ready to exude out. As a result of these various effects on the blood and capillary walls, it comes about that bleeding is very common in these chronic cases of Daboia poisoning. Thus, around the site of the actual punctures or injections in experimental cases there are a large bloody extravasation and much swelling. This swelling spreads rapidly up the limb. The tissues all around the place of injection die and offer a suitable pabulum for all sorts of bacteria. Thus it happens that death in these cases usually results from some bacterial poisoning, such as malignant œdema or general septicæmia. As well as this local action hæmorrhage may take place from every orifice of the body—from the nose, from the mouth, from the bowel, or from the kidneys and bladder. The blood is in a fluid condition and clots badly, while the destruction of the small vessel walls allows of it to exude easily. The blood-stained fluid which exudes contains few red corpuscles; the colouring matter of these has been dissolved out and now stains the plasma.

Such, then, is the picture of a typical case, either actual or experimental, of chronic Daboia intoxication, and it is this state which is usually seen to follow the bite of a Daboia in the human subject.

This condition can be and often is recovered from, the great danger being, as I have indicated, a secondary bacterial infection.

Thus, while I have said that a man bitten by a fresh medium-sized Cobra, if the snake succeeds in injecting even a modicum of its poison, will invariably die if left untreated, it often happens that authentic cases of bites from Daboia recover, even after serious hæmorrhages have occurred from many places. As I have said, I have never seen paralysis in all my experiments with Daboia venom, nor can I find any authentic record of such having occurred in actual cases.

To sum up, then, it would appear that Daboia poison acts mainly, if not entirely, on the circulatory apparatus—

(1) It affects the coagulability of the blood. Injected directly into the blood stream, or in large doses under the skin, it so increases

this as to cause extensive intravascular clotting. In small doses it causes, after no doubt a short-lived phase of increased coagulability, a marked and prolonged phase of diminished coagulability, so that in some instances I have noticed the shed-blood remain absolutely unclotted even after 24 hours.

(2) It has a destructive action on the red-blood cells, breaking these up and setting free the colouring matter contained in them.

(3) It has a marked destructive action on the capillary walls, rendering them more permeable to their fluid contents.

(4) It has a marked depressing action on the heart, so marked, indeed, as to sometimes lead to a fatal termination from this action alone.

(5) It has no action on the central nervous system; and there is therefore no paralysis ever observed.

Such then, as far as I know it, is the physiological action of the venom of the Daboia Russellii.

As regards the Bungarus, or Krait family, I have had little or no experience. From a few experiments recently made with the poison of Bungarus fasciatus, it would appear that in large doses this venom has the property of causing intravascular clotting, while in smaller doses it causes paralytic symptoms similar to, but more prolonged than, those resulting from Cobra venom. Beyond this I cannot go for want of material.

With the poison of the Echis carinata I have, from lack of venom, made no experiments whatever.

The Treatment of Cases of Snake-bite.

In conclusion, I have a few words to say as regards the treatment of cases of snake-bite. When we consider the terribly dramatic, even tragic, circumstances attending these cases, it is not to be wondered at that the treatment of cases of snake-bite has been surrounded by all kinds of quackery and roguery, especially in a country like India, where the people's emotional reflexes are easily stimulated to belief. Who has not heard of the method, still in vogue, of applying the cloacæ of fowls to the bite? One after the other the fowls mysteriously die almost as soon as the application is made, until there is arrived a time when the poison has all been "sucked out"

and the fowls no longer die. Who has not heard of the magic stone, of the virtue of *nêm* leaves, both when locally applied and when internally administered, of spells and incantations? What remedy has not been tried and vaunted as a specific for these cases? Strychnine, alcohol, pushed to cause helpless drunkenness, &c., have all at various times been praised and put forward as absolutely infallible. All these methods and drugs, and many others besides, have had, however, to give way before the test of scientific research. While, however, scientists have so ruthlessly demolished all these so-called specifics, they have given us a remedy, certain and trustworthy, for at least all cases of Cobra bite. I speak, ladies and gentlemen, of the anti-venomous serum prepared by Dr. Calmette of Lille, which can be procured and easily used by any one. I have carefully guarded myself by saying that this serum is useful at least for all cases of Cobra bite, for while Martin of Melbourne has shown that it has little or no power to neutralise the poisons of two poisonous Australian snakes, *viz.*, *Pseudechis* and the dreaded *Hoplocephalus*, I have demonstrated in many experiments with different animals that it is of no avail whatever in counteracting the poisonous effects of Daboia venom. I have not yet tested it with the venom of the Krait family or with that of the Echis, but from *á priori* reasons it is almost certain that it would have no power whatever to neutralise either of these poisons.* But it is a great step in advance that we have at hand an antidote to the venom of the Cobra, certain and reliable if properly administered. If such is possible to obtain, then we have hopes, amounting almost to certainty, that anti-toxic sera will ultimately be obtained for the poisons of our other snakes. Such, then, is the position of the question at the present day as far as our Indian snakes are concerned. I am quite aware that Calmette claims that his serum is equally effective against every kind of snake venom. But Martin, Cunningham, Stephens, Hanna and myself have shown beyond a doubt that this statement is an untrue one and must be considerably modified. As regards the reasons for this opinion, both *á priori* and experimental, it is unnecessary for me to enter into any polemical discussion. I have already done that elsewhere.

NOTE.—Since writing this I have made some series of experiments with Calmette's serum and the venom of *Bungarus fasciatus*. These experiments, which are in process of publication, definitely show that this serum has no neutralising action with this venom. My *á priori* reasoning was, therefore, correct.

What, then, is this serum, and how and in what doses is it to be administered?

You are, no doubt, aware that an animal reacts to the injection or some toxins or poisons, if the dose is not a fatal one, by manufacturing in its body an anti-toxin, that is to say, a substance which is chemically antagonistic to the toxin, and which by combining with the toxin in some obscure way or other forms a substance which is no longer poisonous. This action is, as far as we know, quite specific. Thus the anti-toxin got by injecting an animal with a toxin called A will neutralise that toxin A and not toxin B, no matter how closely allied these two toxins may be to one another. Further, there are only some poisons to which animals react in this way. Among these may be mentioned the poisons manufactured by the diptheria and tetanus bacilli, the vegetable poison abrin and the venom of the Cobra and possibly of other snakes.

The method, then, of preparing an anti-toxin is to inject an animal with a small non-fatal dose of the toxin to which an antidote is desired. Some small amount of anti-toxin is then prepared by the animal. This enables the animal to stand a larger dose of toxin the next time. In this way, by gradually increasing the dose of the poison at each injection, and by allowing a sufficient interval of time between each injection for the formation of more anti-toxin, the animal becomes immunised, that is to say, becomes able to stand enormous doses of the toxin, each of which doses would represent many times a single fatal dose for an untreated animal. To get an animal up to this state of immunity requires a long time, six months to a year and in some cases even longer. Calmette takes 18 months to two years to immunise his horses. No one knows how and where the antidote is manufactured. But what is important is, that this antidote is present in considerable quantity in the circulating blood. All that has to be done then is to tap the animal and collect the blood. The blood is allowed to clot, and the clear fluid or serum which exudes from the clot contains the anti-toxin desired.

Horses being large animals and yielding a large quantity of blood at one time without damage to themselves are, as a rule, the beasts employed for this purpose. You will, perhaps, be astonished when I tell you that a horse can be bled to the extent of a gallon or more without doing it the slightest injury.

If you have followed me in this rather technical explanation, you will now understand that anti-venomous serum is the serum of a horse which has been immunised with snake venom, that is, a horse which has been treated over a length of time with gradually increasing doses of venom. The serum thus got is put up into small bottles containing 10 cubic centimetres * each.

What, then, is the method of administration of this antidote, and in what doses should it be given ?

In the first place, it is necessary for you to understand—and, if you have followed me so far, you will understand—that to be of any good whatever the anti-venomous serum must come into actual contact with the venom. Now after a man is bitten by a snake the poison is rapidly absorbed from the side of the bite and circulates freely in the blood. Our aim, therefore, is to get the serum as quickly as possible into the blood stream, if possible before the poison has done any damage to the central nervous system, in other words, before any symptoms have appeared.

This, of course, can be easily done by injecting the serum directly into a vein, such as a vein at the bend of the elbow. If competent medical assistance is at hand, I should certainly advise all cases of Cobra bite being treated in this way. Less serum is required, and the results would be more satisfactory. But, unfortunately, in these cases such assistance is not usually available. We have then to fall back on injecting the serum under the skin and allowing it to be absorbed into the blood from there, a process which Martin has shown occupies a considerable time. The best site for injection is, I think, the loose tissues of the flank. A large quantity of serum can be injected there, if the needle is plunged deeply enough, without giving the patient the slightest inconvenience. If time permit, the syringe should be boiled before being used; but if symptoms have already developed, this preliminary boiling may be dispensed with.

As to the dose to be injected, Calmette contends on very slender, in fact on empirical grounds, that from 10 to 20 cubic centimetres, that is, from one to two bottles, is sufficient for any case of Cobra bite. In my opinion—and I speak from a large experimental experience with this poison, as well as from some most interesting observations which I

* A cubic centimetre is about 16 to 18 drops.

was privileged to make recently on an actual case of Cobra bite at the laboratory at Pare—this dose would in many cases fail to save the life of the patient.

A short account of this case might perhaps interest you. An officer of the laboratory, while assisting in extracting the poison from a full-sized Cobra, put his fingers where he had no business to, that is, in the neighbourhood of the snake's mouth. In a moment the animal had buried one of its fangs in the point of the right thumb. The thumb was at once withdrawn, but not before the total amount of poison in the gland had been injected. The symptoms, both objective and subjective, &c., which followed, were carefully noted as they occurred. Locally there was much pain at the site of the injection. Swelling of the parts soon began and gradually became well marked. A bloody serum oozed out from the puncture and continued to do so for 24 hours.

Fortunately for the experiment no fresh serum was available, and we had to inject two bottles of a serum which had been the property of this Society and which was at least four years old. Just the week previous to the accident I had tested this serum with Cobra venom on rats and had found that it had little or no neutralising power. The patient then went on with his work. About three hours after the bite he began to get lethargic and lazy, did not wish to work and preferred to lie down. This was soon followed by sickness and violent vomiting. Then he noticed that his legs were weak, he was unable to move about and had perforce to adopt the prone position. It appeared then that the serum had had little or no effect and that the case was hopeless. Just at this time, however, some fresh serum arrived. Ten cubic centimetres were at once injected and the symptoms watched. In about half an hour the paresis of the legs showed signs of improvement. A short time later our patient was able to walk away and drive to the club. Locally, the pain and swelling continued for some time. A small slough formed. This, on separating, left a deep hole which gradually healed up. A depressed scar is now the only sign of the accident remaining.

It is, of course, apparent to you that the dose of antidote necessary in the case of any cobra bite must depend on two unknown quantities, *viz.*: (1) on the amount of venom injected by the snake, and (2) on the smallest quantity of venom which can

kill a man. It is also apparent that we must, however, always calculate on the assumptions that the snake has been a full-sized one and that it has injected the maximum quantity which can be squeezed out from the gland, and, further, that man is as susceptible, weight for weight, as the most susceptible animal with which we are experimentally acquainted. Granted these assumptions, there is no doubt that from 30 to 40 cubic centimetres would be necessary in some cases of snake-bite in order even to save the life of the patient. It is, of course, evident that in many cases, such as, when the snake has been a small one, when it has already exhausted its poison, when it has not got properly home with its bite, &c., a much smaller quantity would suffice. I should, however, recommend you to inject right off in all cases of Cobra bite three bottles of serum and to watch the result. If no symptoms appear, nothing further need be done. Should symptoms come on after this injection, another injection of the same amount should be given.

The above doses apply only in those cases in which marked nervous symptoms have not developed before the patient comes under treatment. Should paralysis have begun, then intravenous injection should be made of at least 30 cubic centimetres and, if necessary, repeated. The symptoms show us that the venom has already joined on to the nerve centres, and to affect it now, "mass" action must be resorted to. The poison must be separated from its connection with the nerve centres by means of an overwhelming amount of antitoxin.

If the antidote is used in this way and in these quantities, I am convinced that, if a patient is not absolutely moribund when he comes under treatment, every case of Cobra bite should be saved.

Now a word, in conclusion, as regards the local treatment of these cases. Nothing should be done, with the exception, perhaps, of applying a tight ligature above the bite. This delays the absorption of the poison and gives the serum time to be absorbed into the blood and to neutralise the poison circulating there. Cutting open the wound, sucking, cauterising with the actual cautery or with strong acids and such like heroic measures are of little avail. They may destroy a small quantity of the poison with which they come in contact, but in animal experiments it has been definitely shown that they do not or only slightly delay the march of the symptoms.

In the cases where recovery has resulted after the use of these measures alone, the explanation undoubtedly is, either that a fatal dose has not been injected or that the snake has been a non-poisonous one or, perhaps, a lizard.

The injection of chloride of lime, permanganate of potash or chloride of gold at the site of the bite has been, I know, recommended by Calmette. Martin, however, has shown that this also has no effect in delaying the symptoms if a ligature has not also been applied. When a ligature has been applied along with such an injection, it is the ligature and not the injection which has been beneficial.

As regards the treatment of Daboia intoxication I know of no specific. These cases have to be treated on general principles—stimulants of a diffusible nature to tide over the stage of cardiac depression might be given. Beyond this I can suggest nothing which would be at all likely to influence these cases for the better.

I have told you that the whole problem of the physiological action of the venoms of the Kraits and of the Echis has still to be worked out, and that antidotes have still to be got for the poisons of the Daboia, the Kraits and the Echis. Should any of you be in the position to procure living specimens of these snakes, especially Kraits, I earnestly beg of you to send them to me. There is no limit to the number I can receive, and I am willing to pay any expenses which may be incurred. If you help me in this, I promise you that I shall do my part of the work to the very best of my strength and ability.

ON NEW AND LITTLE-KNOWN BUTTERFLIES, MOSTLY FROM THE ORIENTAL REGION.

By Lionel de Niceville, f.e.s., c.m.z.s., &c.

(With Plate FF.)

(*Read before the Bombay Natural History Society on* 19*th Nov.*, 1901.)

Family NYMPHALIDÆ.

Subfamily Danainæ.

1. Euplœa (*Crastia*) kinbergi, Wallengren. Plate F.F., fig. 1 ♀.

E. kinbergi, Wallengren, Wien. Ent. Monatsch., vol. iv, p. 35, n. 8 (1860); idem, id., Kongl. Svensk. Fregat. Eugenies Resa, Zool. p. 352, n. 4 (1861) Insecta; *Crastia kinbergi*, Butler, Journ. Linn. Soc. Lond., Zoology, vol. xiv, p. 297, n. 6 (1878); *Tronga kinbergi*, Moore, Proc. Zool. Soc. Lond., 1883, p. 269, n. 12; *Euplœa lorquinii*, Felder, Reisi Novara, Lep., vol. ii, p. 340, n. 472 (1865); *Euplœa felderi*, Butler, Proc. Zool. Soc., Lond., 1866, p. 275, n. 20; idem, id., Journ. Linn. Soc. Lond., Zoology, vol. xiv, p. 300, n. 18 (1878); *Euplœa* (*Crastia*) *frauenfeldi*, Walker (*nec.* Felder), Trans. Ent. Soc. Lond., 1895, p. 447, n. 11; *Crastia frauenfeldii*, Moore (*nec* Felder), Lep. Ind., vol. i, p. 87, pl. xxvii, figs. 1, 1*a*, *male* (1890).

Habitat: Southern China (Hongkong Kowloon, Macao).

Through the kindness of Professor Chr. Aurivillius of Stockholm I have received the very beautiful coloured drawing of the type specimen of *E. kinbergi*, Wallengren, here reproduced. It was originally described from "China, December" an extremely vague locality, China being so vast a country. Professor Aurivillius writes to me, however, that the unique specimen, a female, which Wallengren described "was taken during the cruise of H. M. S. 'Eugenie,' and must, therefore, be from the neighbourhood of Hongkong, the only place in China, which, as far as I know, was visited by the 'Eugenie' frigate." Wallengren failed to give the sex of his type specimen which, however, is a female. Professor Aurivillius further writes: "*E. kinbergi* is probably the female of a common and well-known species," a very just remark, as *E. kinbergi* is the commonest *Euplœa* in Hongkong, flying all the year round. It is extremely variable, some are strongly glossed with blue on the upperside of the forewing, others, like the specimen Dr. F. Moore has figured in Lep. Ind., lack this gloss almost entirely; the maculation also is very inconstant, as it is in so large a number of species in the genus, but it would be tedious to recapitulate these numerous variations.



G.C.Chakrabutty del. West, Newman. chromo.

ORIENTAL BUTTERFLIES.

Its name occurs but rarely in the literature of butterflies. Dr. A. G. Butler records it correctly from China as a *Crastia*, Dr. F. Moore in 1883 gives it from China, but places it incorrectly in his genus *Tronga*, and Herr H. Fruhstorfer incorrectly records it from East Java. As regards its synonyms, Dr. Felder re-described it as *E. lorquinii* from Southern China, and Dr. A. G. Butler as *E. felderi* from Hongkong and Sumatra, the type specimen being apparently from Sumatra. The association of these two habitats is unfortunate, no species of *Euplœa* occurring both in China and Sumatra as far as I am aware. If the "type" of *E. felderi* is a Sumatran insect, the synonymy should read "*E. felderi*, part." Dr. Butler has noted that *E. felderi* "is the *E. lorquinii* of Felder". Mr. James J. Walker in his Preliminary List of the Butterflies of Hongkong records it as *Euplœa* (*Crastia*) *frauenfeldii*, var. *a lorquinii*, Felder, and says that the larva feeds on *Strophanthus divergens*. Lastly, Dr. Moore has described and figured it from "a single male, in the collection of the British Museum, which was taken at Trincomalee on the north-east side of the island." I am very incredulous that this specimen ever came from Ceylon*; moreover the true *E. frauenfeldii* is a Nicobarese species, and a synonym of it is the *E. esperi* of Felder, as Felder has himself admitted.

2. EUPLŒA (*Chirosa*) ERA, n. sp. Plate FF, fig. 2 ♂.

HABITAT: Santa Cruz, one of the Solomon Isles.

EXPANSE: ♂, 2·9 and 3·1 inches.

DESCRIPTION: MALE. Near to *Euplœa* [*Chirosa*] *netscheri* Snellen, Tijd. voor Ent., vol. xxxii, p. 384, pl. VIII, fig. 3, *male* (1889), from New Guinea (*Snellen*), in my collection from Humboldt Bay and Andai, in the north-west of that island, and from Stefansort, in German New Guinea, from which it differs on the UPPERSIDE of *both wings*, having the ground-colour darker, and the margins paler, much less rufous, and narrower. *Forewing* has the sexual brand straight instead of curved. *Hindwing* has the dark-ground colour very much more extensive, occupying two-thirds of the area instead of about one-third. UNDERSIDE *both wings* with the same differences as on the upperside; the markings the same as in *E. netscheri*, they consist of a small bluish-white spot in the discoidal cells, the *forewing* with two small spots beyond the cell divided by the third median nervure, and a

* *Vide* de Nicéville, Journ. A. S. B., vol. lxviii, pt. 2, p. 178 (1899.)

larger elongated one in the first median interspace; *hindwing* with five small spots arranged in a curved band beyond the cell, one in each interspace.

Described from two specimens kindly given to me by Mr. Henley Grose-Smith.

Subfamily SATYRINÆ.

3. CALLEREBIA NIRMALA, Moore. Plate FF, Fig. 3♂.

Erebia nirmala, Moore, Proc. Zool. Soc. Lond., 1865, p. 501, n. 91; *Callerebia nirmala*, id., Lep. Ind., vol. ii, p. 100, pl. xvi, figures 2, 2*a*, 2*b*, 2*c*, 2*d*, 2*e* (1893).

HABITAT: Drosh, Chitral, Western Himalayas.

EXPANSE: ♂, 2·0 inches.

DESCRIPTION: MALE. The specimen figured is an aberration or "sport" of the common *C. nirmala*, Moore, which is found all over the Western Himalayas. It was sent to me by Mr. W. H. Evans, R.E., without date of capture. It differs from typical specimens of true *C. nirmala* taken at Drosh in July and August by having no ocelli on the UPPERSIDE whatever; on the UNDERSIDE of the *forewing* the sub-apical ocellus is very small, less than half the normal size, and the *hindwing* has no ocelli. It is a far more aberrant form than the vars. *intermedia* and *cashapa* of Dr. Moore figured in Lep. Ind. It is apparently scarce, as the specimen figured is the only one Mr. Evans has obtained, whereas typical *C. nirmala* is very common in Chitral.

Subfamily ELYMNIINÆ.

4. ELYMNIAS (*Dyctis*) MELA, n. sp. Plate FF, figs. 4♂, 5♀.

HABITAT: Ké Islands.

EXPANSE: ♂, 3·1 to 3·4: ♀, 3·4 to 3·6 inches.

DESCRIPTION: MALE. UPPERSIDE, *both wings* deep indigo-blue more or less shaded with green. *Forewing* with a sub-apical curved macular fascia commencing just behind the costa and ending on the anal angle, the fascia is widest anteriorly decreasing posteriorly, anteriorly it is whitish mixed with green, posteriorly entirely green, in one specimen the submarginal oval black spots on the underside appear also on the upperside on the above-described fascia. *Hindwing* with a large outer discal patch, white shaded with green at the edges, outwardly bearing two, three or four round black spots. UNDERSIDE *both wings* fuscous, in old specimens this blackish colour fades to a dull ferruginous. *Forewing* with the sub-apical fascia as on the upper-

side, but narrower and entirely white, at its outer edge or just beyond its edge there are sometimes as many as four oval black white-pupilled spots, which may be reduced to three, two, one or none. *Hindwing* with the outer discal patch of the upperside much narrower and entirely white, bearing as many as five round black white-pupilled ocelli, the posteriormost ocellus the largest and bi-pupilled, the ocelli decreasing in size towards the apex of the wing, the anteriormost ocellus sometimes wanting, the two anteriormost ocelli, often blind, the three posteriormost ocelli broadly surrounded with orange. *Cilia* throughout white, but marked with black at the ends of the veins. *Antennæ, thorax and abdomen* black. FEMALE. UPPERSIDE, *both wings* of a curious shade of dull fuscous, outwardly darker, almost black. *Forewing* with a large discal white patch divided by the fuscous veins, inwardly powdered with dull fuscous scales, posteriorly tinged with bluish, the fascia is broadest anteriorly, rapidly decreasing in width posteriorly. *Hindwing* also with a large discal white patch, beyond which are four round black spots, the two anteriormost blind, the other two sometimes with a bluish pupil, the anteriormost spot, the smallest, the penultimate spot the largest, the two anteriormost spots placed on a bluish ground. UNDERSIDE, *both wings* dull fuscous. *Forewing* with the discal white patch as on the upperside but posteriorly it is broader, at its outer edge are four round black spots, the two anteriormost pupilled with pale-blue, the others blind, the one in the upper discoidal interspace the largest, faintly appearing on the upperside. *Hindwing* with a large discal white patch, anteriorly sharply bounded by the second subcostal nervule, posteriorly ending in the middle of the submedian interspace; with five ocelli at the outer edge of the patch as in the male, but the ocelli are all larger and all pupilled. *Cilia* as in the male. *Antennæ* and *thorax* fuscous. *Abdomen* chrome-yellow.

Mr. Hewitson in Proc. Zool. Soc. Lond., 1858, p. 465 and plate LV, described a male and three females (which latter he called varieties of an *Elymnias* which he named *Melanitis melane*, giving the habitat as New Guinea. He remarked:—"Greatly as the four examples of the plate differ from each other, I cannot separate them, except in colour; their chief variation seems to consist in the differing distance of the eye-like spots from the outer margin. This may be noticed in the genus *Drusilla* [*Tenaris*], in which the beautiful large eyes of the

posterior wing vary much in their relative distance from the outer margin." With regard to this last remark I may note that the two species (one each) of *Elymnias* which are found in the Ké and Aru Archipelagos respectively appear from the considerable series of both in my collection to be quite constant as regards the position of the ocelli on the hindwing.

Dr. A. R. Wallace in Trans. Ent. Soc. Lond, 1869, p. 329 n. 29, in speaking of *Elymnias melane*, Hewitson, records that species from the Aru and Ké Islands only, and not from New Guinea, the habitat given by Mr. Hewitson. He noted :—" *Males.* Mr. Hewitson's fig. 1. represents a male from the Aru Islands ; one from the Ké Islands [my *E. mela*] has the whitish band on the hindwings much broader, and the black spots without ocelli. *Females.* Mr. Hewitson's fig. 2. represents one from [the] Ké Islands [this figure does not agree with my *M. mela*, as the figure has no white patch on the hindwing, the form figured probably occurring in the Aru Islands] ; another from Aru is much darker, and has the white patch on the anterior wings reduced. Fig. 3 is from the Aru Islands. [I have seen no female from the Aru Islands agreeing with this figure, which shows an almost entirely white insect on the upperside. Is Dr. Wallace correct in saying this very distinct form is found on the Aru Islands ?] Fig. 4 [also fig. 5] is from the Ké Islands. [This figure does not agree with my Ké Islands females ; the ground-colour of the forewing on the upperside is ferruginous instead of dull fuscous, and the white areas on both wings on both surfaces as shown in the figures are much more extensive ; it probably is found in New Guinea only.] It is difficult to determine whether the forms from these two islands should be separated. There are some differences in neuration, but a close examination of all my specimens has shown that these are not constant in both sexes. It will, perhaps, be better therefore to leave them together till a more extensive series from both islands may enable us to determine if any constant differences exist."

I may note, in conclusion, that all writers (Ribbe, Standinger, Külin and myself) have hitherto followed Dr. Wallace in recording *E. melane* from the Ké Islands, but as the *Elymnias* from thence agrees with none of Hewitson's figures of *E. melane*, and is, moreover, within certain slight limitations constant, it appears to me that it is a distinct species, and I have here figured both sexes.

Since the above was written, Mr. H. Fruhstorfer in Stet. Ent. Zeit., vol. lx, pp. 339-342 (1899) has given a revision of the species of *Elymnias* of the *agondas* group. He gives "*E. agondas melane*, Hewitson and Wallace" from the Key Islands (p. 342), although Hewitson described it from New Guinea, and none of Hewitson's figures agree with any examples I have seen from the Ké Archipelago. He describes *E. agondas aruana*, new subspecies, pp. 341, 342, from the Aru Islands. The female can at once be distinguished from that sex of *E. mela* from the Ké Isles both by having the abdomen yellow instead of black; both sexes of species differ greatly in coloration and markings.

5. ELYMNIAS (*Dyctis*) MELANE, Hewitson.

Melanitis melane, Hewitson (part), Proc. Zool. Soc. Lond., 1858, p. 465, pl. lv, figs. 1, *male*; 2, *female*.

HABITAT. Aru Islands?; New Guinea (*Hewitson*). Mr. Hewitson's figure of the male of this species is quite good and agrees with my specimens from the Aru Islands; the figure of the female, however, is not correct, as it shows the ground-colour of the upperside ferruginous, whereas in my Aru Island specimens it is greenish-plumbeous. Hewitson calls it "light rufous-brown." Whether or no, true *E. melane* as here restricted really occurs in New Guinea or not I am unable to say, as I have no specimen from New Guinea which agrees with Hewitson's figures. Dr. A. R. Wallace does not quote Hewitson's habitat for it, but says that *E. melane* is found in the Aru and Ké Islands only. The female figure quoted, he says, represents a Ké Island specimen, but it does not agree with my females from the Ké Islands. Mr. H. Fruhstorfer has named the Aru Islands form *E. agondas aruana*.

6. ELYMNIAS (*Dyctis*) MELETUS, n. n.

Melanitis melane, Hewitson (part), Proc. Zool. Soc. Lond., 1858, p. 465, pl. lv, fig. 3, *female*.

HABITAT: New Guinea (*Hewitson*).

I propose to re-name Mr. Hewitson's figure quoted above. He thus describes it: "Differs from the last [figure 2, typical *E. melane*, Hewitson, female] (which appears to be the most typical) as represented in the plate. On the under side it differs from that figure in having the costal margin broadly brown, the eye-like black spots surrounded with orange, the spot nearest the anal angle marked with two dots of light blue."

As the females of *Elymnias* are never *dimorphic* as far as I am aware, I think it more than probable that this form represents a distinct species. Dr. Wallace says that it is found in the Aru Islands, but it differs widely from my females from thence.

7. ELYMNIAS (*Dyctis*) MELITIA, n. n.

Melanitis melane, Hewitson (part), Proc. Zool. Soc. Lond., 1858, p. 465, pl. lv figs. 4, 5, *female*.

HABITAT: New Guinea (*Hewitson*).

I also propose to rename Mr. Hewitson's figures above quoted. He describes this form thus:—"Has (more than the other varieties) two indistinct black spots on the upper side of the anterior wing. On the under side there are three such spots (two only, dotted with light-blue). On the under side of the posterior wing there is a fifth black spot." Dr. A. R. Wallace says that this form is found in the Ké Islands, which, however, is not my experience. Like *E. meletus*, mihi, it probably occurs in New Guinea as Mr. Hewitson says it does.

ATELLA ARIEL, n. sp.

HABITAT: Humboldt Bay, N.-W. New Guinea.

EXPANSE: ♂, 2·0 inches.

DESCRIPTION: MALE. Nearest to *A. fraterna*, Moore, from the Nicobar Isles. UPPERSIDE, *forewing* differs from that species in having no black markings on the disc and base below the median nervure, the black band on the outer margin broader. *Hindwing* differs in the discal and basal black markings in *A. fraterna* being absent in this species, the outer black border darker. UNDERSIDE *both wings* of a darker shade of fulvous, all the black markings more conspicuous, the discal macular fascia tinged with lilac instead of being pale fulvous. It is also near to *A. arruana*, Felder, from the Aru Isles, but is of a different shape, the wings being shorter, the ground-colour of the upperside paler, the black markings more numerous.

Mr. Henley Grose Smith in Nov. Zool., vol. i, p. 248, n. 87 (1894) has recorded *A. arruana* from Humboldt Bay, Dutch New Guinea, collected by the late Mr. W. Doherty, from whom I received *A. ariel*, and it is probable that Mr. Grose Smith's specimens are really the latter species. Herr Th. Kirsch in Mitth. Zool. Mus. Dresden, vol. ii, p. 124, n. 81 (1877), also records *A. alcippe* var. *arruana* from north-western New Guinea. From Tule Island, New Guinea, *A. cervina*, Butler, has also been described, but it is apparently quite distinct from *A. ariel*.

The following species of the *alcippe* group of the genus *Atella* have been described. I have arranged the species chronologically.

(1.) *Papilio alcippe*, Cramer, Pap. Ex., vol. iv., p. 207, pl. ccclxxxix, figs. G., H., *female* (1782).

HABITAT: Amboina (*Cramer*); Ceram; Batchian; Gilolo (*Wallace*); Ambonia; Batjan; Halmaheira (*Pagenstecher*); Great Ceram (*Ribbe*); Kaisir Wilhelmsland, German New Guinea (*Hagen*); Moluccas; Halmaheira (*Fruhstorfer*); Amboina; Ké Isles; Moluccas (*Moore*); Bhatjan; Halmaheira (*coll. de Nicéville*).

(2.) *Atella arruana*, Felder, Wien. Ent. Monatsch., vol. iv, p. 236, n. 84 (1860).

HABITAT: Arru Isles (*Felder*); Aru Isles; Mysol (*Wallace*); Aru Isles (*Ribbe*); New Guinea (*Kirsch*); Aru Isles (*Fruhstorfer*) Aru Isles (*coll. de Nicéville.*)

(3.) *Atella celebensis*, Wallace, Trans. Ent. Soc., Lond., 1869, pp. 343, 344.

HABITAT: Macassar in Celebes (Wallace); Celebes (*Hopffer*); S. W. Celebes (*Snellen*); North and South Celebes (*Fruhstorfer*).

I have not seen this species.

(4.) *Atella cervina*, Butler, Proc. Zool. Soc. Lond., 1876, p. 767, pl. lxxvii, fig. 5, *female*.

HABITAT: Yule Island off New Guinea (*Butler*); Hattam, Kapaur, Dorey—all in New Guinea (*Fruhstorfer*).

I have not seen this species, which is apparently nearest to *A. arruana*, Felder.

(5.) *Atella alcippe*, var. *pallidior*, Staudinger, Iris, vol. ii, p. 48 (1889).

HABITAT: Palawan Isle in the Philippines; Sikhim; Andaman, Isles; Malacca; Borneo; Philippine Isles (*Staudinger*).

Under this name I would place the *A. alcippe* of Semper, Schmett Philipp., p. 127, n. 149, pl. xx, figs. 8, *male*; 9, *female* (1888), p. 344, n. 149, (1892), from North-East Luzon, Central Luzon, Cebú, Camiguin de Mindanao, East Mindanao, Mindoro—all in the Philippine Isles; Sulu Isles (*Semper*); the *A. alcippe* of Distant, Rhop, Malay., p. 174, n. 2, (with a woodcut of a male (1882), from Sylhet; the Andaman Isles; Burma; Tavoy; Penang and Province Wellesley (*Distant*) the *A. alcippe* of de Nicéville, Butt. of Ind., Burmah and Ceylon, vol. ii, p. 31, n. 315 (1886), from Sikhim; Sylhet; Mergui,

Tavoy; Malay Peninsula; Andaman Isles (*de Nicéville*); the *A. alcippoides* and *A. semperi* of Moore, and the *A. alcippe violetta* of Fruhstorfer, mentioned below. Fruhstorfer records *A. pallidor* [sic !] from Malacca, Sumatra, Java, Palawan in the Philippines, and Flores. It occurs in the hills of North-Eastern India, Assam, Burma, the Malay Peninsula, in Kanara in South India, the Andaman Isles, Sumatra, Java, Borneo, the Philippine Isles (I have it only from Bazalan Isle), and probably from Engano Isle from whence Mr. Doherty has recorded *A. alcippe*. In South India (Kanara) the larva of this butterfly feeds on *Alsodeia zeylanica*, Thwaites, Natural Order *Violaceæ*, not on *Hydrocarpus*, sp., as recorded by Messrs. Davidson, Bell and Aitken.

(6.) *Atella alcippoides*, Moore, Lep. Ind., vol. iv, p. 199, pl. ccclxi, figs. 1, 1*a*, *male*; 1*b*, *female*, *wet-season* form; 1*c*, 1*d*, *male*, *dry-season form* (1900).

HABITAT: Sikhim; Silhet; Khasias; S. India; Burma; Tenasserim; Andamans; Malay Peninsula; Borneo (*Moore*).

This species is a synonym of *A pallidior*, Staudinger, which Dr. Moore restricts to Palawan in the Philippines.

(7.) *Atella fraterna*, Moore, Lep. Ind., vol. iv, p. 201, pl. ccclxi, figs. 2, *male*; 2*a*, 2*b*, *female* (1900).

HABITAT: Little Nicobar, Nankauri, Teressa, Kutschall—all in the Nicobar Isles (*Moore*).

This species may perhaps be retained, though it is very close to Andamanese specimens of *A. pallidior*, Staudinger.

(8.) *Atella semperi*, Moore, Lep. Ind., vol. iv, p. 201 (1900).

HABITAT: Luzon in the Philippine Isles (*Moore*).

Dr. F. Moore has re-named Herr Georg Semper's *A. alcippe*, Schmett, Philipp., p. 127, n. 149, pl. xx, figs. 8, *male*; 9, *female* (1888), p. 344, n. 149 (1892), recorded by him from North-East Luzon, Central Luzon, Cebú, Camiguin de Mindanao, East Mindanao and Mindoro, all in the Philippines. I can discover no character by which to separate this species from *A. pallidior*, Staudinger.

9. *Atella alcippe violetta*, Fruhstorfer, Berl. Ent. Zeitsch., vol. xlv, p. 17, n. 41 (1900).

HABITAT: Bazilan in the Philippines; Jolo Isle; Andamans; Nicobars (*Fruhstorfer*).

This species was described in the same year (1900) as *A. alcippoides* and *A. semperi* by Dr. Moore. As all three species are synonymous with the much older *A. pallidior*, Staudinger, it is unimportant whose species, Moore's or Fruhstorfer's, is the older. The Nicobar race given by Fruhstorfer as *A. violetta* is the *A. fraterna* of Moore.

Subfamily NYMPHALINÆ.

8. ARGYNNIS VITATHA, Moore. Plate FF, Fig. 6 ♀.

A vitatha, Moore, Proc. Zool. Soc. Lond., 1874, p. 568.

HABITAT : Ziarat, Chitral, Western Himalayas.

EXPANSE : ♀, 2·8 inches.

DESCRIPTION : FEMALE. The specimen here figured was sent to me by Mr. W. H. Evans, R.E., and is quite unique. I have seen nothing at all like it. If it is true *A. vitatha* it bears the same relation to that species that the dimorphic second form of the female (*valezina*, *Esper*) does to the normal first form of the female of *A. paphia*, Linnæus. It is much larger than normal females of *A. vitatha*, the UPPERSIDE of *both wings* are of a rich deep glossy purple colour instead of being fulvous, the *hindwing* with a rounded spot at the end of the discoidal cell, a streak beyond it, behind the latter a small round spot in the upper median, another four times the size in the lower median, and a third similar in size to the second in the submedian interspace, and the submarginal series of seven lunules all whitish instead of fulvous. On the UNDERSIDE of the *forewing* all the black markings are larger and of a deeper shade than in *A. vitatha*, and the green ground-colour of the *hindwing* is much deeper and richer.

Normally coloured *A. vitatha* occurs in Gilgit, which is close to Chitral ; the single female here described, which was caught in August, is the only specimen of that species I have hitherto received from Chitral. It probably bears the same relation to normal *A. vitatha* that the dark females of *A. aglaia*, Linnæus, found in England, do to the ordinary light females, as mentioned by Mr. H. J. Elwes, (Trans. Ent. Soc. Lond., 1889, p. 559), *A. vitatha* being a local race of *A. aglaia*.

Family LYCÆNIDÆ.

9. CYANIRIS SHELFORDII, n. sp. Plate FF, Fig. 7 ♂.

HABITAT : Matang, 3,200 feet, Sarawak, Borneo.

EXPANSE : 2·2 inches.

DESCRIPTION: MALE. UPPERSIDE, *both wings* shining, rather dark-blue. *Forewing* with the costa as far as the subcostal nervure, the apex broadly, and the outer margin less broadly and slightly decreasingly towards the anal angle black; a conspicuous narrow black line on the disco-cellular nervules. *Hindwing* with the costa broadly blackish; the outer margin rather broadly black, with a series of six bluish lunules anterior to this black border, again inwardly bounded by a narrow blackish lunulated band. UNDERSIDE, *both wings* dead white, the markings black (not fuscous), rather small and very conspicuous; with the usual narrow black line defining the outer end of the cell; an anteciliary black thread. *Forewing* with an outer discal curved series of six small linear spots, placed transverse to the veins and not in echelon; a similar sub-marginal and marginal series, the latter inconspicuous. *Hindwing* with the usual basal and discal spots, rather small and uniform in size; a submarginal lunulated line; and a marginal series of six oval spots placed between the veins.

Of the known Bornean species of *Cyaniris* this is nearest to *C. plauta*, H. H. Druce, which, however, I have not seen. From the description and figure of that species it differs in being smaller, on the upperside of the hindwing in having no white areas; *C. plauta* has a marginal series of black spots which in *C. shelfordii* are developed into a continuous band. On the underside the coloration and markings appear to be very similar in the two species.

Mr. H. H. Druce in Proc. Zool. Soc., Lond., 1895, pp. 571-575, and 1896, p. 655, records ten species of *Cyaniris* from Borneo, namely—(1) *C. dilectissima*, H. H. Druce, (2) *C. puspa*, Horsfield, (3) *C. placidula*, H. H. Druce, (4) *C. lugra*, H. H. Druce, which undoubtedly is the same species as *C. musina*, Snellen, from Perak in the Malayan Peninsula, Sumatra and Lombok, (5) *C. salma*, H. H. Druce, (6) *C. strophis*, H. H. Druce, (7) *C. plauta*, H. H. Druce, (8) *C. ripte*, H. H. Druce, (9) *C. camenæ*, de Nicéville, and (10) *C. sonchus*, H. H. Druce. Of these I possess specimens from the State of Sarawak of Nos. 2, 3 and 4. I have besides (11) *C. shelfordii*, de Nicéville, and (12) *C. melæna*, Doherty. Ten species are known to me from Sumatra, and nine from Java, so Borneo is the richest of the three islands in this genus. Dr. A. G. Butler in his "List of the Species of *Cyaniris*, a well-known Group of the Family *Lycæinidæ*" in Ann. and Mag. of Nat. His. seventh series, Vol. V, pp. 441-451

(1900), gives only three species of *Cyaniris*, from Sumatra, *cossæa*, *corna* and *corythus*, all described by myself, and five from Java *akasa*, Horsfield, *puspa*, Horsfield, *coalita*, de Nicéville, and *catreus* de Nicéville. He records *C. ceyx* with a query from Java; I possess seven males from thence, and three males and a female from Celebes. He says he has specimens of *C. ceyx* from Foo Chow in China; these probably represent a distinct species, as excepting *C. akasa*, Horsfield, and *C. puspa*, Horsfield, the oriental species of the genus are not widely distributed. As regards *C. cara*, de Nicéville, he notes "Mr de Nicéville knows his genera of *Lycænidæ*; otherwise, I should certainly have supposed this to be a *Lycænesthes* near to *L. turneri*, Miskin". But the last named species has the apex of the forewing in the males typically produced, while *C. cara* has it rounded as is typical of the genus *Cyaniris*, and the latter has no sign of the ciliated "tales" to the hindwing usually found in *Lycænesthes*. I think therefore that *C. cara* is a true *Cyaniris*.

10. NACADUBA NI, n. sp. Plate F F, Fig. 8 ♂.

HABITAT: N.-E. Sumatra; W. Java.

EXPANSE: ♂, 1·1 to 1·2 inches.

DESCRIPTION: MALE. Nearest allied to *N. bhutea*, de Nicéville, from Sikhim, but is tailless, whereas that species is tailed. UPPERSIDE, *both wings* similar to those of that species. UNDERSIDE, *both wings* with the ground-colour more ochreous. *Forewing* with the spots forming the discal catenulated band separated further from one another, the band more regular, the spot in the first median interspace nearer the margin of the wing, and with an additional spot behind it in the submedian interspace; and, most important of all, the base of the wing up to and including the spot in the middle of the discoidal cell heavily clouded with fuscous; otherwise similar. *Hindwing* as in *N. bhutea*.

This species differs markedly from the same sex of the tailless, form of *N. noreia*, Felder, in its larger size, more pointed apex and straighter outer margin of the forewing, and on the underside of the forewing in the discal band forming a regular curve instead of being dislocated behind the second median nervule. The black clouded base of the wing will distinguish it from all the species of *Nacaduba* known to me. Mynheer P. C. T. Snellen has kindly sent me coloured drawings of his *Lycæna datarica* and

L. glauca, described from Java in Tijd. voor Ent., Vol. XXXV, pp. 140, n. 5, and 142, n. 6 (1892), taken from the types, which are reproduced on Pl. FF, figures 8 and 9, respectively. Both represent the male sex, and are tailless species of the genus *Nacaduba*. They are certainly distinct from *N. ni*, but are very near to *N. noreia*, Felder, the tailed form of which has been described as a distinct species by Dr. F. Moore as *N. ardates*, to *N. hampsonii*, de Nicéville, and to *N. dana*, de Nicéville, the latter probably being the same species as *Plebeius tombugensis*, Röber, Iris, Vol. I, p. 63, pl. V, fig. 18, *male* (1888), from Tomboegoe in East Celebes, and *Lycæna ardeola*, Staudinger, Iris, Vol. II, p. 97 (1889) from Darjeeling, Calcutta [this latter locality is certainly incorrect], and Palawan, one of the islands in the Philippine Archipelago. The drawing of "*Lycæna*" *glauca* agrees almost exactly, except in being taken from a larger specimen, with specimens of *N. noreia* from Java in my collection. Another allied species is *N. nelides*, de Nicéville, Journal, Bombay Nat. Hist. Soc., Vol. IX, p. 280, n. 16, pl. O, fig. 24, *male* (1895), from N.-E. Sumatra. The typical form from Sumatra is tailed, but on page 281, I described a tailless variety from West Java of the same species. This also is very close to the drawing of *N. glauca*. Till the types or typical specimens of these various species are brought together and carefully compared, it will, I fear, be very difficult to say definitely how many of them, or if all, are really distinct species or not.

Described from many males from N.-E. Sumatra, and a single male from Sukabuni, 2,000 feet, W. Java, collected by Mr. H. Fruhstorfer in 1893.

11. CURETIS PARACUTA, n. sp.

C. acuta, Pryer (nec. Moore), Rhop. Nihonica, p. 11, n. 26 (1886), pl. iv, figs. 1A, *male*; 1B, *female* (1888); id., Leech, Butt. from China, Japan, and Corea, p. 349 (1893).

HABITAT: Japan.

EXPANSE: ♂, 2·0 to 2·1; ♀ 2·0 to 2·2 inches.

DESCRIPTION: MALE. UPPERSIDE, *both wings* may be distinguished from all known species of the genus by having the red areas of a duller colour, ferruginous rather than cupreous; as usual, the extent of the red colouration varies greatly, in some specimens being twice as great as in others. FEMALE. UPPERSIDE, *both wings* differen-

tiated in the same way by the white areas being heavily frosted with bluish scales, the extent of these bluish-white areas being as variable as in the male ; and the apex of the *forewing* also varies in its greater or lesser acumination.

All writers on Japanese butterflies have called the species of the genus *Curetis* occurring there *C. acuta*, Moore, which was originally described from Shanghai in North China, and of which the *C. truncata* of Moore, and the *C. angulata* of Moore are, in my opinion, synonymous. *C. acuta* occurs from the eastern coast of China (Shanghai and Hongkong) to the Western Himalayas. The female has the wings above with white central areas. The late Mr. H. Pryer's figure of the female of the Japanese *Curetis* is very bad, as it shows the upperside of both wings white instead of bluish-white as it is, I believe, invariably. He describes it as "blue." *C. paracuta* appears to be a fairly common species in Japan, Pryer giving four localities for it, Leech the mountains of Central Japan, and I have it from Tokio and Nikko, besides other places not specified.

12. CHRYSOPHANUS EVANSII, n. sp. Plate FF, Fig. 11 ♂.

HABITAT : Drosh, Chitral, Western Himalayas.

EXPANSE : ♂, 1·3 inches.

DESCRIPTION : MALE. Closely allied to *C. sarthus*, Staudinger*, from the Pamirs, from which it appears to differ in being larger and the forewing narrower and more elongated. UPPERSIDE, *hindwing* has the anal orange patch much smaller, reduced to a small and narrow streak on the submedian nervure. UNDERSIDE, *forewing* has the orange area larger, occupying nearly the entire surface, the black spots fewer in number, the spot behind and opposite the one in the middle of the discoidal cell in *C. sarthus* absent, and the discal series entirely absent ; the spots of the submarginal series are smaller. *Hindwing* the same as in *C. sarthus*.

Described from a single specimen kindly given to me by Mr. W. H. Evans, R.E., who captured it.

Family PAPILIONIDÆ.

Subfamily PIERINÆ.

13. COLIAS EOGENE, Felder. Plate FF, Fig. 12 ♀.

C. eogene, Felder, Reise Novara, Lep., vol. ii, p. 196, n. 197, pl. xxvii, fig. 7, *male* (1865); id. Erschoff in Fedtschenko's, "Travels in Turkestan," series ii, Zoology, vol. v, pt. 3, p. 6, n. 15 (1874); id., Lang, Butt. Europe, p. 366 (1884); id., Elwes, Trans. Ent. Soc. Lond., 1880, p. 136; idem, id., Trans.

* *Polyommatus sarthus*, Staudinger, Stet. Ent. Zeit, vol. xlvii, p. 202 (1886); id., Groum Grshimailo, Mém. Lép., vol. iv, pp. 53, 95, 361, n. 56, pl. vi, fig. 5 *male* (1890).

Ent. Soc. Lond., 1884. pp 6, 8, 13, 14, 15; idem, id., Journ. Bomb. Nat. Hist. Soc., vol. xi, pp. 465, 466 (1898); id., Alphéraky, Stet. Ent. Zeit., vol. xliv, p. 493 (1883); id., Groum-Grshimaïlo, Mém. Lép., vol. iv, pp. 59, 246, 248, 266, 269-276, 278—282, 288, 298, n. 23,329, n. 39, pl. v, figs. 1*a*, *male*; 1*b*, 1*c*, *female* (1890); *C. myrmidone*, var. *a*, *eogene*, Keferstein, Verh. Zool—bot. Gesells. Wien., vol. xxxii, p. 452, n. 2 (1883).

C. eogene, var.? *stoliczkanus* [sic], Elwes, Trans. Ent. Soc. Lond., 1884; p. 6; *C. eogene*, var. *stoliczkana*(?) Alphèraky, Mém. Lép., vol. iii, p. 404 (1887), *C. eogene*, var. *stoliczkana*, id., Mém. Lép., vol. v, p. 74, n. 10, pl. iv, figs. 4*a*, 4*b*, *male*; 4*c*, 4*d*, *female* (1889); id., Groum-Grshimaïlo, Mém. Lép., vol. iv, p. 298, (1890); *C. eogene*, var. *stoliczkanus*, Groum-Grshimaïlo, Mém. Lép., vol. iv, p. 266 (1890).

C. eogene var. *arida*, Alphéraky, Mém. Lép. vol., p. 76, n. 11 (1889); id., Groum-Grshimaïlo, Mém. Lép., vol. iv, p. 266 (1890); idem, id., Hor. Soc. Ent. Ross., vol. xxvii, p. 382, n. 12 (1893); *C. eogene*, var.? *arida*, Groum-Grshimaïlo, Mém. Lép., vol. iv, p. 298, n. 23 (e) (1890).

C. eogene arida, ab. *auritheme*, Groum-Grshimaïlo, Hor. Soc. Ent. Ross., vol. xxvii, p. 383, n. 13 (1893).

C. eogene arida, var. et ab.? *wanda*, Groum-Grshimaïlo, Hor. Soc. Ent. Ross, vol. xxvii, p. 383, n. 14 (1893).

C. eogene, ab. *cana*, Groum-Grshimaïlo, Mém. Lép., vol. iv, pp. 298, n. 23 (a), 333 (1890).

C. eogene, a var. *erythas*, Groum-Grshimaïlo, Mém. Lép., vol. iv, pp. 298, n. 23 (b), 332 (1890).

C. eogene, var. *elissa*, Groum-Grshimaïlo Mém. Lép., vol. iv, pp. 298, n. 23, (c) 332 (1890).

C. eogene, ab. *hybrida*, Groum-Grshimaïlo, Hor. Soc. Ent. Ross., vol. xxvii, p. 381, n. 10 (1892).

C. eogene, var. *leechi*, Groum-Grshimaïlo, Hor. Soc. Ent. Ross., vol. xxvii, p. 382, n. 11 (1892).

HABITAT: Female Form II, Skoro-la, Baltistan, Western Himalayas, 15,000 feet.

EXPANSE: ♀ Form II, 2·3 inches.

As will be seen from the synonymy given above, *C. eogene*, Felder, has received many names. I do not propose to add to them. *C. stoliczkana*, Moore, is now considered to be a distinct species, though three writers have placed it as a variety of *C. eogene*. The names *arida*, *auritheme*, *wanda*, *cana*, *erythas*, *elissa*, *hybrida* and *leechi* all represent varieties or aberrations of the parent form. As far as I can ascertain *C. eogene* throughout its extensive range in the Himalayas and to the north of them in the Central Asian plateau which includes the Pamirs, has never been recorded to be dimorphic in the female but on the Skoro-la [la=pass] in Baltistan, it certainly is so. This second form differs from the first form in having no orange coloration whatever on the upperside, that colour being replaced by bluish-white. On the

underside of the forewing the usual orange coloration is replaced by bluish-white. On the Skoro-la the late Mr. H. J. Leech and I in 1887 found *C. eogene* fairly common (though this species, as far as my Himalayan experiences go, is never really common), a fair proportion of the usual [Form I] females being obtained. But Form II was very rare, we got one on July 31st, one each day on August 3rd and 4th and two on August 5th, five in all, and we caught all we saw. No other *Colias* occurred on the pass while we were on it, and there is no doubt that the bluish-white females of the *Colias* we took there in company with many males and ordinary females of *C. eogene* are actually a dimorphic female form of that species.

Family HESPERIIDÆ.

Genus Barca, n. n.

Mr. T. D. A. Cockerell in "The Entomologist", vol. xxxi, p. 45 (1898), having pointed out that the name *Dejeania*, Oberthür, Et. d'Ent., vol xx, p. 40 (1896), of which *Dejeania bicolor*, Oberthür, l. c., pl. ix, fig. 163, *male*, is the type, is preoccupied in *Diptera*, I propose the name *Barca* for this handsome hesperid, found in Tse-kou, Ta-tsien-lou, Mou-pin, and Sias-lou—all in Western China, of which Mr. Oberthür has kindly sent me seven male examples. The female appears to be unknown. The genus has been described by Messrs. Elwes and Edwards in Trans. Zool. Soc. Lond., vol. xiv, p. 169 (1897), under the name *Dejeania*.

EXPLANATION OF PLATE FF.

Fig. 1. *Euplœa* (*Crastia*) *kimbergi*, Wallengen ... ♀, p.
2. „ (*Chirosa*) *era*, n. sp. ... ... ♂, p.
3. *Callerebia nirmala*, Moore ... ... ♂, p.
4. *Elymnias* (*Dyctis*) *mela*, n. sp. ... ... ♂, p.
5. „ „ ... ... ♀, p.
6. *Argynnis vitatha*, Moore ... ... ♀, p.
7. *Cyanirts shelfordii*, n. sp. ... ... ♂, p.
8. *Nacaduba ni*, n. sp.... ... ... ♂, p.
9. *Lycœna datarica*, Snellen ... ... ♂, p.
10. „ *glauca*, Snellen ... ... ♂, p.
11. *Chrysophanus evansii*, n. sp. ... ... ♂, p.
12. *Colias eogene*, Felder ... ... ♀, p.

(*To be continued.*)

THE FERNS OF NORTH-WESTERN INDIA.

Including AFGHANISTON, the TRANS-INDUS PROTECTED STATES, and KASHMIR: arranged and named on the basis of Hooker and Baker's *Synopsis Filicum*, and other works, with New Species added.

BY C. W. HOPE.

(*Continued from page* 127 *of this Volume.*)

PART III.—THE GENERAL LIST.—(*continued.*)

28. **Asplenium schimperi**, A. Br.; Syn. Fil. p. 489; Blanford in Journ. Asiat. Soc., Bengal, Vol. LVII, Part II, No. iv, 1888. *A. filix-femina*, Bernh., var. 8 (of C. B. Clarke's vars.), *Schimperi* (sp.), Mong.; Fèe, Gen. Filic. (Polypod), p. 187, Clarke et Baker, in Journ. L. Soc., 8-12-1888. *Athyrium schimperi*, A. Br., Bedd. Suppt. H. B., 36.

PUNJAB: *Hazára*—Thandiána 8500′, Trotter.

KASHMIR: Basaoli 6000′, Clarke No. 31595, 26-9-'76; Rattan Pir 8000′, Trotter.

PUNJAB: *Chamba*—Kajiár 7000′, Clarke No. 24038, 1874; 7-8500′, McDonell; 5-9000′ J. Marten, 1897; *Simla Reg.*—T. T. Bates; Simla and along the ridge eastward 6-10,500′, common.

N.-W. P.: *D. D. Dist.*—Jausár—Duthie's Collector; Mussooree and Landour 5-7000′ and upwards, very abundant; *T. Garh.* 8-9000′, Duthie, *Kumaun*—6-11,000′, common.

DISTRIB.—*Asia*: N. Ind. (Him.) Sikkim—Yakla, *T. T.*; Dárjiling 7200′, Levinge, *Gamble*. Centr. Ind.—Rájputána—Mt. Abu, *Duthie* No. 6794, 1887.

The Messrs. Mackinnon were, I believe, the first to hint that this fern was found in India, for in 1879, on getting the second edition of the "*Synopsis Filicum*", they thought that, from its widely creeping rhizome, the fern so common in Mussooree must be *A. schimperi* which was therein described, and they named their specimens accordingly. In Mussooree this fern grows in large beds. Some years later I mentioned the Mackinnons' opinion to Mr. Levinge, and I believe he and Mr. Blanford agreed it was correct, and worked it out when they retired from Government service and went home. Hence, probably, the entry of Simla as a habitat, on Blanford's authority, in Clarke and Baker's paper in Journ. L. Soc., 8-12-'88, though why Mr. Baker should have given in and withdrawn the species he admitted in the second edition, "*Synopsis Filicum*," I know not. These authors say, under *A. filix-femina*:—

> "Adde var. 8. Schimperi, sp. Mong., Fée, Gen. Filic. (Polypod.), p. 187; rhizomate horizontali elongato.
>
> "Simla, H. Blanford.
>
> "Exempla, a H. Blanford communicata, cum Abyssinicis omnino congruunt; H. Blanford autem exempla misit alia quorum rhizoma abbreviatum stipitibus contiguis."

From the last clause of the above, and also from what Blanford says in his "List" as to the fronds varying from lanceolate to deltoid lanceolate, I think it evident that these three authorities included, under *A. schimperi*, *A. rupicola* Hope, though it has a very different root-stock. The rhizome, or *sarmentum*, of *A. schimperi* is widely creeping and branching, and, where its growth is not impeded by circumstances, the fronds spring up quite apart; but *A. rupicola* grows in isolated plants: the caudex is thick and erect, or sometimes procumbent, and the stipes are always densely tufted.

The rhizome of *A. schimperi* is densely clothed with bright-brown narrowly lanceolate-acuminate scales; those at the base of stipe few, and darker in colour. Blanford rightly says that the basal portion of the stipe is dark-coloured, though I should say purplish brown, rather than deep purple. Beddome rightly corrects Baker in saying that the frond is only bipinnate—tripinnatifid, or sometimes only bipinnatifid. I have both these forms grown on the same rhizome, and the cutting of their pinnules is very different. Beddome is incorrect, I think, in saying that the frond is "lanceolate, gradually reduced below": the shape may be called broadly lanceolate-acuminate, somewhat truncate at base: Blanford notices this. The rhachises of the pinnæ are winged, with an actual interruption of the wing only in well developed fronds; and the pinnules are decurrent both ways on the rhachis, so that the fern is only just bipinnate. Even in the largest Indian fronds the wing is sometimes unbroken, and it is continuous in the reduced basal pinnæ even when broken in those above. The basal pinnæ are apt to be sterile, or partly so, at their bases.

The specimens of the African and Indian plants in Kew do not exactly agree; and I have noted that the only specimen in the Calcutta Herbarium so named (before I picked out Indian ones in 1896), from T. Moore's Herbarium, ticketed Africa, is different from the Indian plant in cutting and that the pinnæ are opposite. That specimen has no rhizome. But the Indian plant may stand as *A. schimperi* until the African plant is better known.

29. **A. pectinatum**, Wall. Cat. 231, as to type sheet only. *A. filix-femina*, Bernh. (an E. Indian form of), Syn. Fil. 228. *A. filix-femina*, var. 2, pectinata (sp.), Wall., C. R. 492. *Athyrium filix-femina*, var. 2, *pectinata*, Wall., Bedd. H. B. 169. *Athyrium pectinatum*, Wall., Bedd. Suppt. H. B. 36.

PUNJAB: *Chamba*—Ravi Valley, Sao Valley and elsewhere not specified, McDonell; *Kangra V. E.*—4500′, Trotter; *Simla Rey.*—4500-6000′, common, in and about Simla.

N.-W. P.: *D. D. Dist.*—In the Du—2500′, Mussooree 4-6000′: plentiful in several places; *T. Garh.* 4-5000′, Duthie, Gamble; *Kumaun* 4-7000′, frequent.

DISTRIB.—*Asia*: N. Ind. (Him.) Bhután 2-7000′; Bengal—Parasnáth Mt. 4-4500′, *T. T., C. B. Clarke, F. H. Ward* in Herb. *Rev. A. Campbell.*

I have been disappointed that Mr. Baker has not admitted this plant to specific rank; but possibly he has not seen the rhizome which is as widely creeping and branching as is that of *A. schimperi*—a character mainly founded on to distinguish the latter species from *A. filix-femina*. This radical difference in root-stocks in ferns is a distinctive character that seems to be quite unsurmountable. Possibly, accidental plants or cultural varieties of *A. filix-femina* may be found with cutting like that of *A. pectinatum*, but they cannot have a creeping *sarmentum*. Clarke's figure, Plate 68 of his "Review," shows the cutting of the frond well; but, without the rhizome, which he does not even mention, it gives no idea of the appearance of the plant. Beddome's description in his Supplement should be referred to, but his *B. tenellum*, F. S. I., t. 154, which seems to show an erect caudex, cannot be this species. Sometimes, perhaps, fronds spring in tufts from the creeping rhizomes. In large specimens the lower pairs of pinnæ get very distant—four inches and more apart. The plant is very tender, succulent, and brittle in life. The sori are generally very minute, but the cutting of the plant is so fine that there is no room for large sori. The contrast between the habitats in Sikkim—on dry burning slopes to the South, according to Clarke, and, in the Simla Region, in damp ravines, according to Blanford, is very great. The plant, as I know it, grows longest in rich soil in the shade; but I have seen it doing well in the open, and even on dry rocks, though stunted.

30. **A. oxyphyllum**, Hook; Syn. Fil. 228; C. R. 493. *Athyrium oxyphyllum*, Bedd. H. B. 170.

N.-W. P.: *Garhwal—fide* Clarke in "Review"; *Kumaun*—Naini Tal, Davidson 1875, in Herb., Hort. Sahar.; between Dandihát and Karela 5-6000′, Duthie No. 3170 1884; MacLeod 1893 (no locality stated).

DISTRIB.—*Asia*: N. Ind. (Him.) Nepál to Bhután: "very common from Nepál eastwards" (*Clarke*); Assam—Khasia 3-6000′, common, Kohima 5000′, *Clarke*.

This seems to be one of the rarest ferns in North-Western India—only twice or thrice collected, so far as I know. MacLeod's specimens in my possession are very small, simply pinnate, with no involucres. Another small frond, from the same source, may be different: it is truly lanceolate, and the segments are completely covered with ripe sori, among which large reverted involucres are copiously present.

31. **A. fimbriatum**, Hook.; Syn. Fil. 229; C. R. 494. *Athyrium fimbriatum*, Wall. (under Polypodium) Bedd. H. B. 172, and Suppt. H. B. 37, *var. squamatum*.

KASHMIR: Sarpat 10,000′, McDonell and McLeod 1891:—"Water-shed between Jhelum and Kishenganga Valleys, common at 10,000′, never lower: on north slopes only" (MacLeod). *E. Kashmir—fide* Clarke in "Review."

PUNJAB: *Chamba*—Sára 11,000′, Clarke No. 24152, 1874, in Herb. Kew; Ravi Valley 8000′, McDonell, 10,000′, J. Marten 1897; *Kulu*—8-10,000′, Trotter; *Mandi*

State—8-10,000′, Trotter; *Simla Reg.* Jual State, Chor Mt. 10,000′, Collett; Ridge east of Simla 83-10,000′, Collett, Hope, Bliss; Bisáhir—Kushung (or Kasong) Forest 9500′, Lace.

N.-W. P.: *D. D. Dist.*—Jaunsar: Deoban 9000′, Herschel; *T. Garh.*, Nág Tiba Mt. 9000′, Mackinnons; Ganges Valley 9-12,000′ and Jumna Valley 9-10,000′, Duthie; *Brit. Garh.*—above Ramri 8-9000′, Duthie; *Kumaun*—Guinji Pass 8000′, Davidson; 5 stations 7-10,000′, Duthie.

DISTRIB.—*Asia*: N. Ind. (Him.) Bhotán.

Beddome, in the Supplement to his Handbook, has rightly added to the description—"root-stock creeping, stipes solitary, distant," which character distinguishes this species from the next. So do the scales at base of stipe. In *A. fimbriatum*, as the "*Synopsis*" says, these are dark brown: in *A. foliosum* they are bright chesnut, and much more numerous.

I have gathered this fern only in the Simla Region, and at the time, following Blanford, I understood it to be Clarke's *A. Atkinsoni, var.* Andersoni; but I never could separate that fern from *A. fimbriatum*. Blanford has it under Clarke's variety.

On a sheet in the Saharanpur Herbarium, from British Garhwal, I find a note by Mr. Duthie—"used by *Paháris* (Hill men) as a remedy for snake-bite". Doubtless: but would it not be as useful to use a snake as a remedy for the bite of a *Pahári*?

32. **A. foliosum**, Wall. Cat. 339 (or 359); Bedd. Suppt. H. B. 37. "Root stock erect or suberect, stipes approximate; rhachis with a gland at the axis of the pinnæ; stipes and rhachis often red; fronds up to 3 feet high; primary pinnæ 5—8 inches long, generally about 1½ broad, but varying from ¾ inch to 3 inches; lowest secondary pinnule on the superior side of the pinnæ always more or less elongated and often double the size of the others; lowest superior lobe of the pinnule also elongated; sori strictly athyrioid. Bedd. F.B. I., Pl. CCXCV, Wall. Cat. 339, first sheet in Linn. Herb. (the second being *Athyrium macrocarpum*). Clarke, pl. 62, fig. 1, (*sphæropteroides*) a good figure of this plant, but scarcely showing the enlarged lowest secondary pinnule at the superior base of the pinnæ which is most characteristic of this fern, This must, I think, rank as a species, being nearer to *macrocarpum* than to *fimbriatum*."

The above is Colonel Beddome's description.

PUNJAB: *Chamba*—Rávi Valley—near Langera 6000′, McDonell (in Herb. Gamble); *Kangra Vy. Dist.*—Dharmsála 10,000′, Clarke Nos. 23934 and 24361; *Simla Reg.* "above Simla," Bates; Ridge east of Simla 8000′, *fide* Beddome; between Nagkanda and Bághi 8500′, Hope.

N.-W. P.: *Garh.*—Dr. J. L. Stewart; *T. Garh.* Nág. Tiba Mt. 9000′, Mackinnons 1878-79; *Brit. Garh.*, 8-9000′, Duthie No. 5152, 1885; *Kumaun*—Wallich in Herb. Kew: Kalimundi Pass 8000′, S. and W.; Forest near Sosa 8-9000′, Duthie 6255′, 1886; Summit of Dhánkuri Pass 10,500′, Trotter No. 792, 1891; Mangalia Gor—ridge above Ránti, MacLeod 1893.

DISTRIB.—*Asia* : N. Ind. (Him.) Nepál—*Wallich* ; Sikkim—*Jerdon*.

As Beddome says, this fern is nearer to *A. macrocarpum* than to *A. fimbriatum*, *i.e.*, as to cutting; but the different rhizome at once separates it from both; and the smaller, often very minute, sori show that it is not *macrocarpum*. I separated, as this species, some specimens in Gamble's Herbarium, from Sikkim and Bhotan, named *A. macrocarpum* and *A. fimbriatum*—the smaller sori being sometimes the chief guide; and some of these, and also McDonell's from Chamba, are hardly bipinnate. One Chamba plant, with fronds only 9—10″ long, is tripinnatifid only near the base, and I was nearly describing it as a new species. Others, again, of the eastern specimens, are almost quadripinnate. The fern is, I think, never flaccid and membranous as some forms of *A. macrocarpum* are. The stipes and rhachises are wiry, though slender. The cutting is very defined and elegant : the sori copious from base to tip.

As to dimensions : my specimen from Tehri Garhwál, given me by the Messrs. Mackinnon, is a portion—the 3½ lowest pair of pinnæ, I think—of a very large frond ; the width is about 20½ inches, and the second lowest pair of pinnæ 10 inches long (each) by 4½ inches broad. The frond must have been 6 feet, including stipe—twice the limit Beddome gives.

[*A. procerum*, Wall., Cat. 2203 (*A. umbrosum*, *Sm.*, *var. procerum*, Syn. Fil. 489), said by Mr. Clarke and Colonel Beddome to be very common in the Himalaya, from Kumaun to Bhotán, has not been got west of Nepâl, that I can see.]

Subgenus DIPLAZIUM, *Swartz*.

33. **A. longifolium**, Don ; Syn. Fil. 234; C. R. 478.

Diplazium longifolium, Don ; Bedd. H. B. 179.

PUNJAB: *Chamba*—McDonell, in list of Ferns identified at Kew ; not seen ; *Simla Reg.*, Simla and neighbourhood 45-5500′, seven or eight stations, Edgeworth, Bates, Fielding, Gamble, Blanford, Hope, Bliss.

N.-W. P. : *D. D. Dist.*—Mussooree, rare, Duthie 1877, Mackinnons 1878-79, Hope 1881; *Kumaun*—near Naini Tál, Hope 1861, Major Buckley.

DISTRIB.—*Asia*: N. Ind. (Him.) Nepál, *Wallich* ; "very restricted in area and nowhere common" (*Clarke* in "Review"); Sikkim—in Herb. *Gamble*, com. *Levinge*. Manipur 6-7000′, *Watt*.

This is undoubtedly a *Diplazium*, as Diplaziums go, and Mr. Clarke has, since the publication of his "Review", in which he placed it under *Euasplenium*, admitted it to be so, in the paper written jointly with Mr. Baker, Journ. Linn. Soc., 8th December 1888, in which it is said—"*In exemplis, a H. Blanford communicatis, J. G. Baker paucos soros diplaziformes invenit.*" Mr. Gamble has a specimen from Blandford with two or three diplazoid sori on it ; and I have two or three fronds from Mr. Bliss on which double sori are

not infrequent: but the paired sori are never of equal length. Beddome's limitation of the sori to the lowest vein of each group does not hold good with regard to Simla and Mussooree specimens; from some of these there are numerous cases of short sori in or near the lobes on the other veinlets. And his figure does not represent these specimens when it shows the lowest superior auricled lobe bare of sori, for in some cases I see a double row of sori in the auricle, consisting of 2—4 pairs on either side of the main vein. The auricle (and sometimes the next lowest segment) has a tendency to be free and in one of Mr. Bliss's specimens it is quite so, and even petiolate.

34. **A. japonicum**, Thumb.; Syn. Fil. 234; C. R. 498. *Diplazium, japonicum*, Thumb., Bedd. H. B. 180.

KASHMIR: Coll. Mardan Ali, 1854, in Herb. Hort., Saharanpur; Panjab 53-5500', Kishenganga Vy. Kerán 5500', McDonell Nos. 33 and 34, 1891.

PUNJAB: *Chamba*—Kalatop Forest 6000', McDonell 1881, *Kangra Vy. Dist.*—Edgew., in Herb. Hort. Kew.; *fide* Trotter in List; *Simla Reg.*—Simla 6000', Blanf., Bliss.

N.-W. P.: T. Garh.—Bhatauli 3-4500', Herschel, Mackinnons, Hope; *Kumaun*—Edgew., Lev., S. & W.; between Ramgarh and Peora, Hope 1861; Booreydar, Davidson 1875; Hawalbagh 4000', Trotter 1891.

DISTRIB.—*Asia*: N. Ind. Assam—Khasia 3000', abundant, *Clarke*; Bengal—Chittagong 200', common, *Clarke*. S. Ind.—Madras Presidency, on the W. Ghâts; Nilgiris 7000', Pulney Hills 7000'; Tinnevelly Hills; Jeypore Hills, west of Vizagapatam, 3-4000' (*Beddome* in H. B.). Manipur, *Clarke*. Burmah, Malaya, China. Japan. Polynesia. Australia. Queensland and Norfolk Island. *Afr.*: Bourbon.

I would add to the description of this fern that the fronds of the N.-W. India plant are dimorphous, *i.e.*, these are fertile fronds which have long stipes, and sterile ones which have short stipes. The long-stiped fronds are always fertile, and the short-stiped—never so. The sterile fronds are generally broader in proportion to their length than the fertile are, and the pinnæ also sometimes broader. A length of rhizome, with both sterile and fertile fronds on it, should always be gathered, or a correct idea of the species will not be got. I feel sure Beddome is wrong, as to the N.-W. Indian *A. japonicum* at least, in saying that the rhizome is "creeping or suberect." It is really always widely-creeping and branching, and sometimes very slender; but occasionally several fronds, sterile and fertile, are thrown up near each other in an apparent tuft. On some fronds few diplazoid sori are found; and I have sometimes seen hippocrepiform sori, *i.e.*, with involucre crossing the vein, unbroken and continuing down the other side of the vein for about half the length that they have before crossing. Other variations in the sori could be cited. I do not consider this species to be much more of a *Diplazium* than *A. thelypteroides* and *A. McDonelli* are.

N.-W. P.: *D. D. Dist.*—Jaunsar 6-7500′, Gammie, Gamble; Mussooree 55-6500″ common; *T. Garh.*—4500′-12,600′, Duthie, Gamble; *Brit. Garh.*—7-8000′, Duthie; *Kumaun*—4—8000′, common.

DISTRIB.—*Asia*: N. Ind. (Him.)—Nepál?; Sikkim and Bhotán, 2000′ and upward, very common; Assam—Khasia 2-6000′, very common; Kohima 5500′, *Clarke*. S. Ind.—W. Forests up to 6000′. Ceylon. Malaya. Australia.

This fern varies much in size and cutting, and also in length of sori, but I think all the N.-W. Indian plants are the same. On seeing them growing in many places, in the Simla Region, Mussooree, and Kumaun, it never struck me that there was any difference. Gamble has named his "No. 25097, Jaunsar 7000′," *Diplazium latifolium*; but the venation is quite different in the two species, and attention to that distinction should prevent any confusion. In all the specimens of *A. latifolium* I have seen the veinlets are simple, though Beddome says simple or forked; the veinlets of *A. polypodioides* are always forked. The venation of Gamble's plant from Jaunsar is that of *A. polypodioides*. Specimens from Simla, marked var. 3, *sublatifolia*, Clarke, also have the venation of the type. This being so, I cannot understand why Clarke says—"This series of plants distinctly approaches *A. latifolium*"; nor why Beddome says—"His (Clarke's) variety *sublatifolia* runs into *latifolia*, and rather belongs to that species, if the two are really distinct, which is very doubtful."

The involucres of *A. polypodioides* are very fugacious, and I believe they are sometimes absent in an early stage of growth. Both Levinge and Trotter were tempted by this to think of *Gymnogramme*. The Mackinnons have shown me plants in cultivation which were quite exinvolucrate. The young fronds are edible. Trotter says the Punjab Hill people eat them like spinach, and call them *Kasmor*. About Mussooree, also, the fronds are eaten, and called *lingra*.

37. **A. squamigerum**, Mett., in Miguel's Annales, Vol. II. 239; Syn. Fil. 237. Plate XXVI.

KASHMIR: Kishenganga Valley, Keran Nála 8000′, McDonell, 3rd September 1891; Kajliban, in moist forest, Duthie, No. 12630, 1892; below Gurais 8-9000′, Duthie No. 14100, 29th September 1893; Kachal 8000′, and Donari Nála 7000′, McDonell 1894.

PUNJAB: *Chamba* State 8000′, J. Marten 1897; *Simla Reg.*—Giri Valley, in Raiengarh Forests 6500′, Gamble, July 1898.

N.-W. P.: *Kumaun*—near Kathi 7800′, S. & W. 1848; Dipl. No. 4 on ticket; Pindar Gorge—Khati 7000′, Trotter, 9th September 1891.

DISTRIB.—*Asia*: China—Patung District, *Henry*; Szechwan (Omei) *Faber*. Japan Siebold, Oldham, Robinson, Bissett, Maries, Hancock, Dickins, Faurie.

I noted this fern as being new to me in Mr. Trotter's collection made in Kumaun in 1891, and brought by him then to Mussooree, and soon afterwards I received a specimen from Kashmir, collected by Mr. McDonell, as it turned out, six days before Mr. Trotter got his specimen, and, though they somewhat differed, I referred them to the same species. I described and named the plant as *A. Trotteri*, under the impression that Mr. Trotter was the first to gather it: there was already an *A. McDonelli*, Bedd., and Mr. Trotter well deserved the compliment. I sent the description to a London botanical periodical for publication, but it never appeared. As will be seen, however, from the entry above, under the habitat "Kumaun", both Trotter and McDonell must yield place as discoverers to Strachey and Winterbottom, who found the fern in 1848, at what is probably almost exactly Trotter's station, there being only a difference in the spelling of the vernacular name and an estimated difference of only 800 feet in the altitude. As Mr. Trotter was always very particular about the spelling of the names of localities, I think it probable that Strachey and Winterbottom's locality was Kháti, and not Káthi. Their specimen, which is in the Herbarium of the Royal Botanic Garden of Calcutta, has no rhizome; but otherwise it agrees exactly with Trotter's. It is distinctly a *Diplazium*, with curved sori long for their breadth; and it differs also in cutting from *Athyrium crenatum*, Rupr., the habitats recorded for which are—Scandinavia, by way of Siberia, to Japan. Mr. McDonell collected some more specimens of his plant in Kashmir in 1894, and sent one, with other ferns, to Colonel Beddome, who reduced it to *A. crenatum*, Rupr., saying that it exactly agreed with Japan specimens. Colonel Beddome had not then seen the Kumaun plant. But Mr. McDonell's Kashmir specimens, though they are smaller, more compound in cutting, and more delicate, agree in rhizome and sori with the Japan specimens of *A. equamigerum*, with which species I became acquainted on returning to England in 1896. Mr. McDonell wrote in 1895—"As to *Trotteri*, it seemed to me that the plant I got in September 1891 is not quite the same as that I sent last year; the former was growing in a cave, the latter is common on hill sides, growing with *Filix-mas*, under cover of trees, in shady places."

Mr. Marten's specimens from Chamba, and Mr. Gamble's from the Raiengarh Forests, are large, and intermediate in cutting between the Kumaun and the Kashmir plants. Mr. Duthie's Kashmir specimens, No. 12630, are more like *A. crenatum*, though some of them differ considerably. His No. 14100 quite matches a specimen from Japan, Yezo—*Forêts de Yubari*, Faurie No. 8111, 3rd July 1892; but the rhizomes are not complete enough.

Pending the collection of further material in the Himalaya, I have given up the attempt to differentiate the three forms, and I give the following description which is intended to cover all the Indian specimens :—

"*Rhizome* more or less slender, widely creeping and branching, black, sending up fronds 1 inch, more or less, apart, stipes sometimes in clusters. *Stipes* up to 1 foot or more long, slender but wiry, their bases clothed with very dark brown large lanceolate-acuminate scales, extending a short way up the stipes and then becoming scarce. *Rhachis* with a few scattered scales the same as those at the base of the stipes, but smaller, and with tufts of linear scales in the axils. *Frond* subdeltoid, bipinnate. *Pinnæ* markedly petiolate, about 13 pairs besides the acuminate pinnatifid apex—lower 5—6 pairs almost opposite, lanceolate-acuminate, lowest 1½—2 in. br., 2 inches apart, all distant. *Pinnules* 10—11 pairs besides the crenate apex, distant, patent, deeply cut into rectangular rounded segments towards the base, and crenated towards the acuminate apex, margins scarcely toothed. *Veins*—3—5 pairs in a segment, curved and often forked. *Sori* $\frac{1}{16}$—$\frac{3}{32}$ inches long, very narrow, curved like the veins, up to five in number in lower segments and in others one on each lowest anterior veinlet, pointing to the sinus between the segments, and forming a row curving outwards on each side of the costa : some of the lowest diplazoid, or semidiplazoid. *Involucres* persistent, and sometimes much broader than the sorus."

Mettenius's description was written from a fragment collected in Japan by Siebold : it began—"Rhizoma ?", and ended—"indusium membranaceum tenerum integerrimum."

Mr. Baker's description in the *Synopsis* is :—

"238 A. (*Dipl.*) *squamigerum*, Mett.; *st.* 6 ins. or more long, straw-coloured, slender, with small scattered, nearly black lanceolate scales throughout; *fr.* 12—15 ins. long by nearly as broad, deltoid, lower pinnæ 6—9 ins. long, 2—2½ in. broad pinnate except at the apex; pinnules 1½ ins. long, ¾ ins. broad, the point blunt, the edge broadly lobed, the lower lobes ¼ in. broad entire; *texture* herbaceous; *rachis* slender, stramineous, chaffy below; *veins* subflabellate, the lower veinlets of the lobes with one or two lateral curved forks on each side; *sori* linear, curved, falling far short of the edge, the lowest 2 lin. long. Mett. Fil. Ind. 2. p. 239."

"Hab.—Japan, *Oldham*, *Siebold*, *Robinson*."

Asplenium (Athyr.) *crenatum* Rupr. resembles *A.* (*Dipl.*) *squamigerum* in having a black creeping rhizome, and broad ovate-lanceolate dark-coloured scales at the base of the stipes; and also in the crenate pinnules. The rhizome of some specimens of the Kashmir plant is almost as slender as that of *A. crenatum*; that of others, and of the Japan

and Kumaun plants, seems to be stouter, and sometimes to throw up fronds in tufts; but there are few examples with rhizomes attached. A Japan specimen in Kew of *A. squamigerum*, from Hyachine, Faurie No. 13583, 24th August 1894, differs somewhat, as to the frond, from his No. 8111 from the Forests of Yubari in Yezo, mentioned above, which quite matches Duthie's No. 14100 from Kashmir. On the same sheet with Faurie's No. 13583, is a rhizome, some inches in length, which is black, creeping and branching, not slender, with stipes in tufts; but this is disconnected from the pale-coloured stipes of the mounted frond, and the stipes itself is broken. Even supposing that rhizome does not belong to that particular frond, it is valuable, as showing that the rhizomes of the Japan and Kumaun plants are the same. Of course, great similarity, or even identity, of rhizome does not of itself prove identity of species: some other characters must agree. In the "Synopsis" *A. crenatum* is said to have stipes "scattered, firm, erect," which implies a widely-creeping rhizome, but does not explicitly negative the supposition that it, like the Asiatic plants, also at intervals throws up fronds in tufts. The amount of "lamina" in a frond of *A. crenatum* is much less than in either the Himalaya or the Japan plants, and the sori seem never so long as in these: Baker says—"oblong, usually nearly straight, often double," and as to *A. squamigerum*—"linear, curved .....the lowest 2 lin. long." But the involucres in Japanese specimens of *A. squamigerum* are often very broad in comparison with the sori, and, as Mettenius said, membranaceous, tender, entire.

I lately asked Dr. H. Christ, of Basel, an eminent pteridologist, whether he could connect *A. squamigerum* with *A. crenatum*, giving him at the same time particulars of the recent discoveries in the Himalaya, and he replied as follows:—

"J'ai le premier (A. crenatum, Rupr.) en echantillons nombreux du Nord: finlande, Scandinavie: plante petite: 3rd dec. stipe grêle: ecailles peu nombreuses, *mais larges*: *noires*, segments petits, sores athyrioides, courts: plante fragile, rhizome presque filiforme, faible.

"J'ai la plante du Japon *l.* Faurie 11,578 et 13,583: toutes les dimensions doubles ou triples: plants 6 Dec. et au deta, stipe jusqu' à 3 mill. en diamètre, ecailles brunes, lanceolées, nombreuses: segments grands, sores jusqu' à un demi-centimètre, souvent diplazoides, rhizome plus épais, rampant, mais il semble que les stipes sont en peu en touffe et non solitaires comme dans la plante du Nord.

"Le plus grand echantillon est celui de Tosa, l. Makimo: fronde de 50 cent. sans tige.

"Je crois que la plante de" Inde (que je n'ai pas vue!) doit être la plante du Japon, mais non la plante du Nord. Je ne nie pas la grande affinite des

deux plantes, etje suis disposé de voir dáns cette dernière une *sousespece* boreale de la première.....".

Colonel Bedd me lately examined along with me all the material available in Kew, including specimens Mr. Gamble had lent me, and he c me to the same conclusion as before, namely, that *Diplazium trotteri* (*i.e.*, *A. squamigerum*) is certainly *A. crenatum*—the Kashmir plant being intermediate The Kew bundle of *Dipl. squamigerum* he considers to be a mixture; one specimen being "certainly typical *A. crenatum* (tripinnate), but one from Japan, with very large prominent indusiæ may be quite a different thing." I think Colonel Beddome is mistaken in styling any of the forms—whether *crenatum*, *trotteri*, or *squamigerum* as tripinnate. No specimen I have seen is so: the utmost development is that the lowest pinnæ are cut down, at the base, nearly to the secondary rhachis—one cannot even say to a winged rhachis. One Norwegian specimen of *A. crenatum* in Kew has sori longer than they usually appear, and some diplazoid; but, as most of the specimens are fully ripe, the involucres are generally obscured.

Since the above was re-written I have again gone over the material, and while I still think all the Himalayan material must be identified as *A. squamigerum*, I now consider it possible that in spreading westward to Norway the Japanese plant has lost in length of sori, and become *A. crenatum*.

38. **A. multicaudatum**, Wall., Cat. 229. *A.* (*Athyrium*) *umbrosum* J. Sm., var. 2. *multicaudatum*. Wall. (*D. Jerdoni*, Bedd. F. B. 1., t. 327), Himalayas, Syn. Fil. 489. *A. multicaudatum*, Wall. Cat. 229. C. R. 502. *Diplazium umbrosum*, J. Smith under *Athyrium*, var. *multicaudatum*, Wall., Bedd. H B. 190.

PUNJAB: *Chamba*—McDonell (in list of Chamba ferns identified at Kew); *Simla Reg.*—below Simla (*fide* Dr. King and Mr. Clarke). Blanf. in "List"; Sirmur State 1832, in Herb. Hort. Calcutta.

N.-W P.: *D D. Dist.*—Near Mussooree, Dr. G. King 1869, 4-5000', Herschel 1879; Sowarna Nálá 4-5000', Mackinnons 1878-79, P. W Mackinnon and Hope 1881; "Mossy Falls" 5000', Hope 1885 and 87 and 1895; *Kumaon*—A. O. Hume; Káli Valley 2-3000', Duthie 1884.

DISTRIB.—*Asia*: N. Ind. (Him.) Nepál, *Wallich*, Sikkim and Bhotán; Assam—Khasia 1-5000'; Chittagong (in the plains of Bengal) 20'—2000', *Clarke*.

I do not remember having seen McDonell's specimens from Chamba, but I believe his list to be generally correct. At Mussooree *A. multicaudatum* grows in beds, and fertile fronds are comparatively rare, and often sparsely soriferous: the creeping rhizome provides for the perpetuation of the species in each locality. None of Gamble's specimens from Sikkim seem quite the same as the Mussooree plant and some seem considerably different, having longer sori, with narrow persistent involucres. On the Mussooree plant it is difficult to find involucres, at least on mature fronds; but I can make out that many sori

are diplazoid ; and this is evident also on some of Gamble's specimens and on a specimen from Sikkim in Kew, Hook *fil.* Some of Wallich's Nepal specimens differ from the Mussooree plant (and from each other) : others are identical.

Mr. Baker, at p. 489, Syn. Fil., 2nd. Ed., under *A. umbrosum* J. Sm., says *A.* (*Dipl*). *Griffithii*, No. 245, is perhaps a variety. I think there is not the slightest doubt that *A. Griffithii*, Baker, is identical with *A. multicaudatum*, Wall. I have not myself gathered *A. Griffithii*, but there is abundant material in Kew from which a conclusion can be arrived at. On several sheets (*ex* Herb. Hort. Bot., Calc.) of specimens collected by him in the Darjiling District at low elevations, his Nos. 9006 and 9079, 1869, Mr. Clarke has written, "Root-stock creeping extensively and throwing up solitary fronds : sori few, scattered, and few of these diplazoid." These are exactly the Mussooree plant, which is certainly Wallich's *A. multicaudatum*. On one sheet of this series, ticketed "*A. Griffithii*, Baker, Rishap, 3000', Darjiling, 4-9-69, No. 9006," and named finally by Mr. Clarke, on 11-1-79, *A. multicaudatum*, Wall., Mr. Baker has pencilled "Madeiran umbrosum." He has also pinned on this sheet a paper as follows :—"Clarke, Nov. 1875, seems to distinguish.

"1 Common species is (has ?) Allantodioid sori.

"Another sere (series ?) of similar structure, but white and with a scabrous stem and rhachis, appears to be *A. umbrosum*, J. Sm., but very unlike *A. australe*.

"*Australe*, Brack., from Thwaites—not Bengal, at all.

"Bengal fern which Dr. King and others call *A. australe* is for me *D. Jerdoni*, or *Griffithii* (I think the former). These two have creeping rhizomes which send up distant solitary fronds, the stipe rising through the earth."

I consider it quite a mistake to put this fern under *Athyrium umbrosum*, a Madeira fern, which is quite different in shape of frond, as well as of sorus and involucre—not to speak of rhizome. Specimens of *A. umbrosum* in herbaria are generally incomplete, and the descriptions say nothing as to the nature of the caudex ; but in a privately printed account of "An Easter Holiday in Gran Canaria and Madeira", 1893, written by one whom I know to be a keen observer and collector, I find this allusion to the plant—from which I gather that it is subarborescent, and must have a stout erect caudex :—"At one waterfall" (in the *Levada do furado*) "I noticed *Asplenium umbrosum* seven feet in length and as thick as a miniature tree." The young plants growing in the Kew houses have fronds in tufts, and certainly no creeping sarmentum. *A. umbrosum* has always, I think, an ovate or lanceolate frond : *A. multicaudatum*—a subdeltoid frond, with the lowest pair of pinnæ sometimes hardly less than the next above which are the longest. The involucres of *A. umbrosum* are described by Hooker and Baker as being "large, tumid, membranous." Those of *A. multicaudatum* are very small and narrow, so far as is visible. Beddome

gives *Dipl. Jerdoni*, Bedd., and *D. Griffithii*, Baker, as synonyms, and Clarke these, and also *A. spectabile*, Wall., Cat. 237[A]—a fern which is not mentioned in either the *Synopsis* or Beddome.

This seems to be one of the instances in which descriptions of old species are altered or re-written, in new books, so as to include subsequently discovered and sometimes very different plants, or to fit the theories of the later authors—a very reprehensible practice, in my opinion.

Subgenus—ANISOGONIUM, *Presl.*

39. **A. esculentum**, Presl ; Syn. Fil. 244 ; C. R. 503 ; *Anisogonium esculentum*, Presl. ; Bedd. H. B. 192.

PUNJAB : *Chamba*—McDonell ; *Kullu*—Trotter, twice collected, the 1-pinnate form.

N.-W. P. : *D. D. Dist.*—The Dehra Valley 1000'—2500' ; very common near water ; *T. Garh.*—Ganges Valley, Duthie ; *Kumaun*—5-7000', S. & W., Duthie, MacLeod.

DISTRIB.—*Asia* : N. Ind. (Him.)—Nepál, *Wallich* ; Sikkim 3500', *Gamble* ; plains of Assam and Bengal, and Parasnáth Mt. 2500', very common in Bengal. Centr. Prov. Ind.—Pachmarhi. S. Ind.—"Common in the plains on the western side, up to 3000' (*Beddome*). Ceylon. Malay Penins, and Isles. Java. Moluccas. Celebes. New Guinea. Tonkin. Hainan. Formosa. Hongkong. Philippines. Admiralty Isles. Samoa. Viti.

Fronds either simply pinnate, and then more or less lobed and toothed, or completely bipinnate with the pinnules again similarly lobed and toothed, but with a simply pinnate apex with up to 10—12 pairs of pinnæ ; *or*—with only one or two pairs below pinnate or partly so. The simply pinnate fronds are probably from young root stocks, and have pinnæ varying from 2½ to 5 ins. in length and from ½ to 1¼ ins. in breadth ; but I think both forms of frond are to be found on the same root-stock. In large bipinnate frond the lowest pinnæ are very distant, and sometimes simple and short. The root-stock is, as the books say, subarborescent ; the roots are black and wiry, and go deep into the ground. The plant loves ditches and swamps, and silty soil by the edges of streams. It is very common in the Dehra Dun where I have seen it in large bushes on the banks of rivers, and also in swamps among gigantic grasses—in separate plants, growing 9 to 12 feet high, with caudices 6—12 inches high.

The occurrence of this fern in North-West India was first recorded by me in the Catalogue of Ferns in the Saharanpur Herbarium.

Subgenus HEMIDICTYUM, *Presl.*

40. **A. Ceterach**, L. ; Syn. Fil. 245 ; Cl. Rev. 504. *Hemidictyum Ceterach*, L. ; Bedd. H. B. 44.

AFGHAN.—Griffith ; *Kurram Vy.*—rocks overhanging Karriah River ; rare, Aitch., 1897.

TRANS-IND., P. States : *Baraul and Swát*—3 stations 4-7000', General Gatacre.

KASHMIR : Jacquem.; Hook. fil. et Thoms 1848; *Gilgit Dist.*—8000', Tanner, 1880; *Astor Dist.*—8-9000', Duthie; Sind and Jhelum Vys., Aitch., 1878 (?); Jhelam and Kishenganga Vys. 5000' and upwards, very common, Trotter, MacLeod; Takht-i-Sulimán 6000', Lev., Trotter, MacLeod; Gund 7500', Gamble; Ladrawan in Loláb, MacLeod; Barwan 5600', McDonell; *Kishtwar*—3500', Clarke, 1876

PUNJAB : *Hazára*—Kagán Valley, 5000', Trotter, 1891; Malkandi, 4500', Duthie's collector 1897; Black Mt. 5000', Oertel, 1891. *Chamba*—Upper Chenab Vy. 8000', Baden-Powell, 1879 (perhaps in Kashmir); Rávi Valley, 7000', common, McDonell, 1881; *Kullu*—Sartali Valley, Edge.?

N.-W. P.: *T. Garh.*—Ganges Valley: Jangla 8-9000', Duthie, 1883.

DISTRIB.—*Europ*: in many parts of Germany, in Switzerland, the Tyrol, Hungary, Dalwatia, the Caucasus, Belgium, France, Spain, Italy, Greece. It is absent from Scandinavia, Northern Russia, Bohemia, and Austria" (*Britten*, in European Ferns). Lago di Garda, Austria, *Levinge*. In Britain, in all or nearly all the southern, northern, and western counties; "in Somersetshire and Devonshire it is especially abundant; in Scotland it is much less frequent"—chiefly in the West and South-West; frequent in Ireland, though local (*Britten*). *Asia*; Palestine, Persia. *Afr.*: Canaries, Madeira and Cape Verd Islands; Morocco, Algiers, Abyssinia, Cape of Good Hope.

Genus 21. ACTINIOPTERIS, *Link*.

1. **A. radiata**, Link. (for the type—*Acrostichum dichotomum*, Forshk., is the oldest name). Syn. Fil. 246. *A. dichotoma*, Bedd., C. R. 505. *A. dichotoma*, Forshk. (under *Acrostichum*), Bedd. H. B. 197.

AFGHAN.: *Kabul—fide* Clarke in "Review."

PUNJAB: *Delhi Dist.*—"Dry rocky places at Delhi and along the Jumna", Trotter in "List"; *Gurgaon Dist.*—Outliers of Aravalli Mts.; "abundant on north side of Khol Mt., between Karnál and Rewari, J. R. Drummond.

N.-W. P.: *Saharanpur Dist.*—Saharanpur, Dr. Jameson (in Herb. Hort., Sahar.), Duthie, 1881.

Agra Dist.: City of Agra—"Plentifully on old walls, 8th June 1825" (ticket in Wallich's writing?): on another ticket—"19?. *A. plenium radiatum*—Agra, super mures, 1825." in Herb. Hort. Kew; "Walls of City of Agra, 8th June 1825", Wallich?, in Herb. Hort. Calc.; Jharna near Agra, Sahar. collectors June 1843; *Moradabad Dist.—fide* Clarke in "Review"; *Jhansi Dist.*—Duthie, 1886.

DISTRIB.—*Asia*: Mount Sinai, Arabia, Persia.—Cent. Ind.—Bagelkhand, *Hope*, 1860; Cent. Prov., Ind.—Khandwa Dist., *A. E. Lowrie*, very large; Rajputana—Taragarh Hill, Mt. Abu 3700', *King*. Penins. of Ind., in dry rocky places below 3000 ft. elevation (*Beddome* in H. B.); Maisur 10" long. Ceylon. *Afr.*: Angola, Upper Egypt, Abyssinia, Socotra, Zambesiland, Macalisberg, Mascaren Isles.

A. australis, Link, seems to me a different species, but it is not found in British India, unless specimens in Gamble's collection, "from the outer hills of East Nepal, 1880," got by his native collector, be it. Specimens of the type, in Gamble's collection, from the Madras Presidency, show that the rhizome is sometimes procumbent, but with stipes very approximate: scales at base of stipe dark-brown, linear: scales sparsely clothing the stipe, paler, and hair-like.

DESCRIPTIONS OF NEW GENERA AND SPECIES OF *HYMENOPTERA* COLLECTED BY MAJOR C. S. NURSE AT DEESA, SIMLA AND FEROZEPORE.

By P. Cameron.

Part I.

[*With a Plate.*]

(*Read before the Bombay Natural History Society, 11th Dec. 1900.*)

In this paper I have described some new genera and species of *Hymenoptera* taken by Major C. S. Nurse, I. S. C. Apart from the new genera, the most interesting of Major Nurse's discoveries is the undescribed species of *Meira*—a genus not hitherto recorded from India, and of which only a few species are known from the South of Europe and the North of Africa. Major Nurse has also been able to give us the first record of the rearing of a species of *Mutilla* in India, and, what is of as much importance, he has reared both sexes. *Mutilla* is probably one of the largest genera of *Aculeate Hymenoptera*, and is fast becoming utterly unwieldy from the fact of the males and females having to be treated as distinct species.

FOSSORES.

MUTILLIDÆ.

Mutilla climia, *sp. nov.*

Nigra, dense albo pilosa, alis fusco violaceis, basi freè hyalinis; stigmate pallido, magno. ♂

Length.—7-8 mm.

Habitat.—Deesa.

Antennæ black, the flagellum brownish on the lower side, the scape thickly covered with white pubescence. Head black, shining, thickly covered with long white hair, which is longest on the vertex; the front and vertex are closely and distinctly punctured; the apex of the clypeus is piceous. Mandibles black shining, a piceous band near the middle, the palpi black. Thorax black, thickly covered with white hair; the meso- and pro-notum closely punctured, the latter more coarsely than the former. Scutellum closely rugose, the middle coarsely aciculated. Median segment closely and uniformly reticulated. Pleuræ closely, rugosely punctured. Wings fuscous-violaceous, the base and the anterior wings more hyaline in tint; the radial cellule is small, the radius roundly curved from the first transverse cubital

nervure; the basal abscissa is straight, oblique; there are only two transverse cubital nervures; the first is straight and oblique, the second is roundly curved outwardly; there is only one recurrent nervure; the third transverse cubital nervure is curved down, and then runs along parallel with the cubitus. Legs black, covered with white hair; the spurs black. Abdomen black, thickly covered with long white hair; the apex of the second, the third entirely and the others more or less covered with white pubescence; the pygidium is not defined; the apex of the segment is depressed, smooth, bare and shining; the apex transverse with the sides broadly rounded; the hypopygium has the apical half smooth, the basal punctured; the ventral keel has a small tooth at the apex. The petiole is narrowed at the base, where it projects on either side into an oblique tooth; it becomes gradually broader to the apex.

This species comes very near to *M. japhia* here described; it may be known from it by the median segment being uniformly reticulated, there being no clear space in the middle at the base; the wings have a more decided violaceous tinge; the second cubital cellule is smaller; the second transverse cubital nervure has a much more distinctly rounded curve, and is more oblique; it is also a smaller species, and the front is not reticulated.

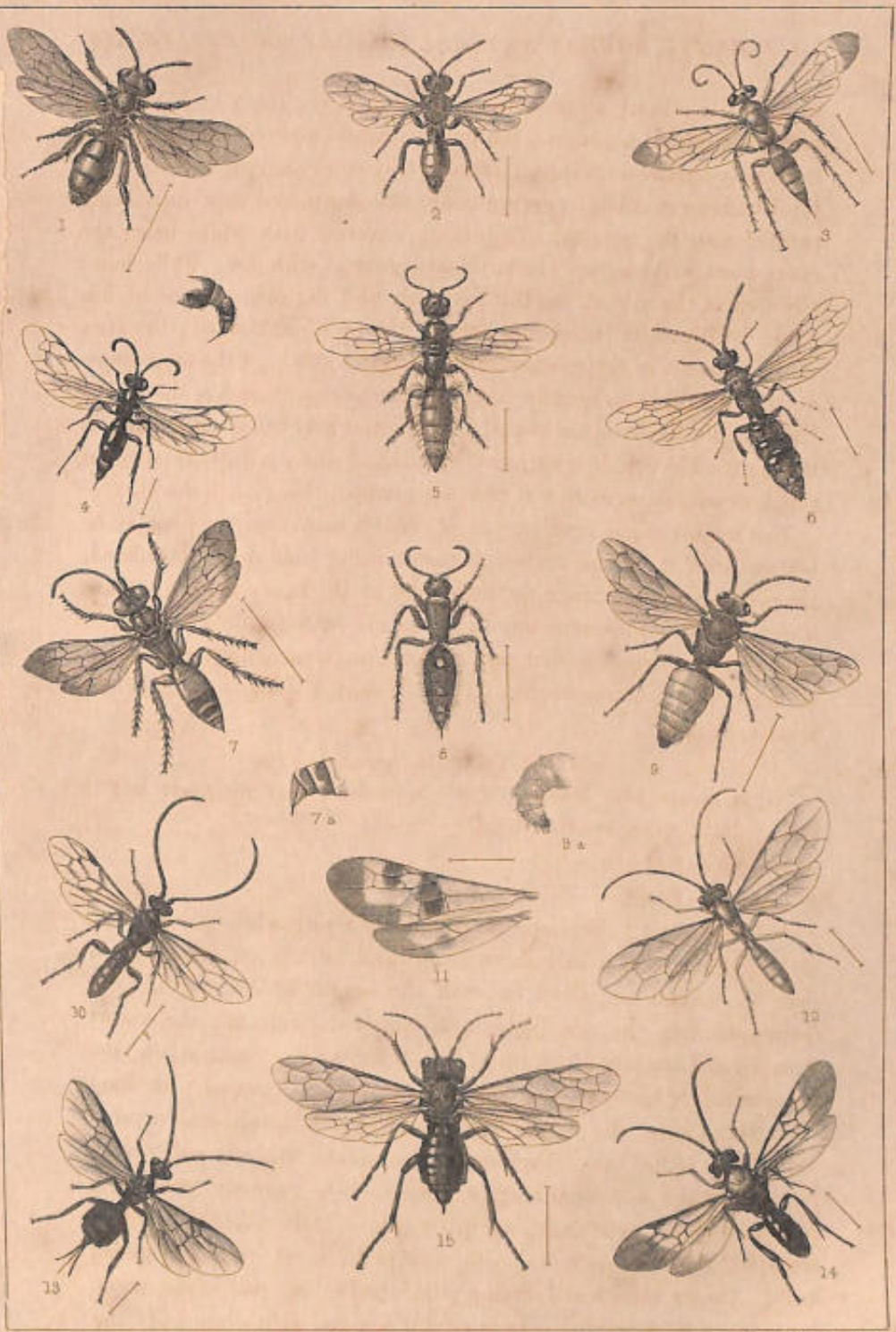
MUTILLA JAPHIA, *sp. nov.*

Nigra, dense albo hirsuta; fronte reticulato, basi metanoto laevo; alis hyalinis, apice fere fumatis. ♂

Length.—8 mm.

Habitat.—Deesa.

Antennæ stout; the scape thickly covered with white pubescence; the flagellum with a pale down; the third joint is not much longer than the second and about one-half the length of the fourth. The front, including the eye incision, is closely reticulated; the vertex strongly and deeply punctured, except behind the ocelli, where the punctuation is weaker; the front and vertex are covered with long white pubescence; the face is opaque, coarsely alutaceous and covered with long white hair. Pro- and meso-notum coarsely and deeply punctured; the scutellum is more closely, more rugosely punctured. Median segment reticulated, except in the middle above the top of the apical slope, where it is smooth, except for some irregular, broken keels. Pleuræ smooth and shining; the raised middle part of the meso-notum coarsely punctured. Legs thickly covered with white hair; the



West, Newman lith.

HYMENOPTERA FROM DEESA & SIMLA.

calcaria pale. Wings hyaline; the apex smoky; th e nervures black the third transverse cubital nervure is obliterated; the cubitus obliterated beyond the second transverse cubital nervure. The petiole and second segment are thickly covered with long white hair, as are also the others, which have also their apices fringed with depressed white hair. The post-petiole is strongly punctured and clearly separated; the ventral keel is straight and of uniform elevation.

MUTILLA ACASTA, *sp. nov.*

Nigra, thorace rufo; alis hyalinis, nervis fuscis. ♂

Length.—7 mm.

Habitat.—Simla.

Antennæ deep black; the scape covered with long white hair. Head as wide as the thorax, shining; above the antennæ closely and distinctly punctured and covered with long white hair; the middle of the front is smooth. Eyes oval, not incised on the inner side. Mandibles curved, broad, ending on the lower side in a sharp, somewhat triangular, clearly separated tooth. Thorax entirely ferruginous; the base rounded. Meso-notum strongly and uniformly punctured and covered with long pale hair; there are no furrows on it. Scutellum more closely punctured than the meso-notum. Median segment with a gradually rounded slope, closely reticulated all over; the reticulations at the base only slightly larger than the others. Wings hyaline, only slightly infuscated towards the apex; the stigma is black; the nervures fuscous; the basal abscissa of the radius is straight and oblique, the apical roundly curved; the first transverse cubital nervure is straight and oblique, the second rounded, the third obliterated; the first recurrent nervure is received near the apex of the basal third of the cellule; the second is faint, almost obliterated, and is received shortly beyond the second transverse cubital nervure; the transverse median nervure is received distinctly beyond the transverse basal nervure; the nervures in the hind wings are either faint or obliterated. Legs black, covered with white hair; the calcaria white. Abdomen black, covered, but not thickly, with long white hair; the second ventral segment is closely punctured; the basal three-fourths keeled in the middle; the keel ends in a triangular tooth; there is no distinct keel on the underside of the petiole; the pygidium is closely punctured and not keeled laterally; the epipygium is dilated in the middle; the basal and apical slopes are straight and oblique.

This species does not fit well into any of the sections of *Mutilla* as defined by recent writers, *e.g.*, M. Ernest André. It appears to be intermediate between *Cystomutilla* and *Dasylabris*; it has the stigma fairly well developed and the abdomen subpetiolated as in the former, but there are no furrows on the meso-notum; from *Dasylabris* it may be known by the abdomen not being clearly petiolated. It cannot very well be confounded with any of the known Indian species, being easily known by there being only two transverse cubital nervures, by the curved mandibles with only one apical tooth, by the transverse basal nervure not being interstitial, and by the almost sessile abdomen.

MUTILLA DIOMEDA, *sp. nov.*

Nigra, dense albo pilosa; thorace rufo; alis fusco-violaceis, basi fere hyalinis, nervis nigris, ♂

Length.—10 mm.

Habitat.—Simla.

Antennæ black, stout, covered thickly with microscopic pile; the scape with longish white hair. Head distinctly narrower than the thorax; the front and vertex rugosely punctured: the ocellar region smooth, raised and bordered laterally by a smooth space; the front bears in the centre a wide, but not very deep, furrow; the front thickly covered with white pubescence and more sparsely with longish white hair; the vertex more sparsely with long white and black hairs. Antennal tubercles rufous. Clypeus roundly, but not deeply, incised in the middle; aciculated. Mandibles black, their base thickly covered with long white hair. Palpi black, thickly covered with white hair. Thorax rufous, the sternum black; pro-notum smooth, transverse at the base; meso-notum coarsely and deeply punctured, the punctures of almost equal size throughout; the two furrows are deep. Scutellum not quite so strongly punctured as the meso-notum, but quite as closely; its base smooth and with an oblique slope. The median segment has a gradually rounded slope, and is closely reticulated; at the base are two large areæ with a smaller, shorter area on the sides; these areæ are irregular in shape. Wings fuscous, with a violaceous tinge; at the base they are paler, more hyaline; the basal abscissa of the radius is straight, oblique and thinner than the rest of it; the apical is roundly curved; the extreme apex straighter than the lower portion; the second transverse cubital

nervure is sharply elbowed above the middle; the third transverse cubital is distinct throughout, but thinner than the others. Legs black, thickly covered with white hair; the calcaria white. Abdomen black; the four basal segments banded with long white hair, the others with long black hair; the petiole and the second segment are closely and strongly punctured; the ventral keel on the petiole is narrow and straight, not projecting much. The last segment is closely and strongly punctured, except in the middle at the apex; below it is punctured strongly and closely; it has no keels, and bears near the base a transverse smooth furrow.

This species is allied to *M. antennata*, Smith, which I only know from the descriptions of Smith and Bingham; the description given by both authors of the meta-thorax does not fit our species at all; it is said to be covered with large shallow punctures and having a smooth channel down the centre, which has on each side an elevated keel; "the palpi are ferruginous, the antennæ fusco-ferruginous," &c.

MUTILLA REGIA, Smith. (P. l. fig. 8 ♀, 9-9 *a* ♂.)

Captain Nurse has reared from adjacent cells in a nest of *Eumenes escuriens* a ♀ *Mutilla regia*, Smith, and a ♂ *Mutilla* which is, doubtless, the other sex. As I cannot make out that this ♂ has been described under any name, I give a description of it. This is the first time the history of any Indian species of *Mutilla* has been recorded. Black; the abdomen ferruginous, the basal and apical segments black. Head thickly covered with silvery hair; the antennal tubercles rufous; the antennal keel sharply projecting. Clypeus covered with long white hair; its apex smooth, rounded. Mandibles broadly rufous before the apex. Palpi black. Pro- and meso-notum closely and coarsely punctured; the pronotum with a broad band of depressed silvery pubescence; the mesonotal furrows are distinct. Scutellum roundly convex, distinctly raised over the meso-notum; rugosely punctured; there is a short, deep, almost smooth, furrow in the middle behind. Median segment closely and regularly reticulated; the base is covered with depressed white pubescence; the central area is widely expanded at the base; its apex is not much wider than the other reticulations. The base of the meso-pleuræ is rugosely punctured; the rest smooth, except for some striations in the middle. Meso-pleuræ coarsely, rugosely punctured. The upper part of the meta-pleuræ is irregularly reticulated; the lower bears deep round punctures. Legs covered with long white hair; the spurs white; the

tarsal spines with a more rufous tinge. Abdomen ferruginous, the petiole and the apical segment black. The petiole covered with long white hairs ; the other segments with ferruginous, except the last, which has blackish hair ; the ventral keel has a slight curve, and at the apex projects into a short, triangular tooth ; the hypopygium has the sides keeled to near the base ; the keel is narrow, straight and curved inwardly at the apex. Wings smoky, with a slight, but distinct, violaceous tinge ; the first cubital cellule at the top is not half the length of the second ; the second transverse cubital nervure is roundly curved above the middle.

SCOLIIDÆ.

MYZINE APIMACULA, *sp. nov.*

Nigra, flagello antennarum tarsisque rufo-testaceis ; abdominis apice late rufo ; alis hyalinis, nervis pallidis. ♀

Length.—9 mm.

Habitat.—Deesa.

Antennæ rufo-testaceous ; the scape, except at the apex, black ; the scape, with a few hairs, smooth and shining ; the basal joints of the flagellum obliquely and gradually narrowed from the apex to the base. Clypeus rufous, strongly punctured, except at the base. Mandibles rufous, the apex black. Pro-and meso-thorax shining ; the pro- finely and somewhat closely punctured ; the meso-notum is impunctate at the base ; the rest of it with minute, scattered punctures. Scutellum sparsely punctured on the sides and on the basal half ; the post-scutellum is minutely punctured. Median segment closely and rather strongly aciculated ; the apical slope bears also some minute punctures, and is thickly covered with white pubescence. Pro-pleuræ with scattered punctures ; the apex closely, rugosely aciculated ; the meso- punctured, except at the apex ; the meta- closely, obliquely striated. Legs black ; the greater part of the tibiæ and the tarsi rufous ; the tibiæ and tarsi are thickly covered with white hair. Wings clear hyaline ; the radial cellule of a faint fuscous colour ; the stigma and nervures pale testaceous. Abdomen black ; the back from the apex of the third segment and the ventral side from the apex of the second, red ; it is sparsely covered with long white hair and minutely, but not closely, punctured ; there is a closely striated band behind the apex of the pygidium.

A species easily known by the red apex of the abdomen. It is one of the smaller species.

POECILOTIPHIA, *gen. nov.*

♂ Forewings with two transverse cubital nervures which enclose a long cellule in the middle, this cellule receiving both the recurrent nervures. Radial cellule closed at the apex; the transverse basal nervure is interstitial; the discoidal cellules are large; in the hind wings the radial, cubital and discoidal nervures are continued to the edge of the wings and not abbreviated as in *Tiphia*. Mandibles bidentate, the lower tooth much larger than the upper. Pro-thorax large, transverse at the base. Legs thickly pilose; the middle with two spurs on the tibia; the claws simple, eyes large, sinuate on the inner side. Basal abdominal segment with a short, but distinct, peduncle at the base; the dilated part rounded on the sides, narrowed at the base and apex; the second segment distinctly narrowed at the base, becoming gradually wider towards the apex. The last abdominal segment is large, widely, roundly and deeply incised at the apex, the sides forming sharp teeth, between which the long curved anal spine projects.

The antennæ are stout; the apex of the clypeus is broadly rounded; the occiput is transverse and is margined; the scutellum is flat; the median segment bulges out roundly in the middle; the second and third abdominal segments are constricted at the base and apex; they are punctured and covered with stiff hair as in *Tiphia*; the legs are short, slender and thickly covered with long stiff hairs; the middle pair have two spurs; the median segment is without longitudinal keels; it is transverse at the apex, with the sides bulging out roundly.

The affinities of this genus are clearly with *Tiphia* and *Myzine*; the character of the alar neuration is sufficient to separate it from either; *Myzine* has three transverse cubital nervures, and the recurrent nervures are received in different cellules; its affinities are closer with *Tiphia*, but in it also the recurrent nervures are received in different cellules, which are also differently formed; *Tiphia* differs further in the middle tibiæ having only one spur; the occiput in our genus is transverse not narrowed gradually, it differing also in having a distinct margin; the apical nervures in the hinder wings are more complete, extending to the apex and not abbreviated as they are in *Tiphia* and, to a less extent, in *Myzine*. The white markings on the abdomen remind one of *Thynnus*.

POECILOTIPHIA ALBOMACULATA, *sp. nov.* (Pl. fig. 6.)

Nigra, flagello antennarum, abdominisque apice rufis, abdomine albomaculato; lineis pronoti, apice clypei tarsisque albis; alis hyalinis, stigmate fusco; nervis pallidis. ♂

Length.—8—9 mm.

Habitat.—Deesa.

Antennæ rufous, the scape black; the apical joints slightly dilated on the under-side; the scape punctured and covered with white hair. Head black; the apex of the clypeus white; the front rather strongly, the vertex more finely, punctured; the antennal tubercles smooth. Clypeus closely punctured, bounded above laterally by oblique, deep furrows. In front of the foreocellus is a deep pit; the hair is long and white. Mandibles rufous. Thorax black, punctured, covered with longish white hair; the hinder border of the pro-notum and a spot on either side at the base, white. Median segment closely, rugosely punctured; the meta-notum in the middle closely, transversely striated; the striæ are curved upwards. Pro- and meso-pleuræ shining, sparsely punctured; the lower part of the meta-pleuræ sparsely punctured, shining. Legs black; the knees, the fore-tibiæ in front and the tarsi white; the hair is long, stiff and white. Abdomen black; the apex of the fifth and its middle more broadly and the whole of the sixth and seventh segments rufous; a line on the middle of the basal five segments at the apex and a mark on either side of it and a small mark on the apex of the sixth, white. The petiole is smooth and shining, as is also the base of the second and the basal half of the third and fourth segments, the smooth and punctured portions being distinctly separated; the rest of the segments and the apical ones entirely punctured, strongly, but not very closely, and covered with longish, white hair; the spine is long, curved, stout and rufous. The ventral segments are fringed with white hair, and are strongly punctured. Wings clear hyaline; the stigma and costa fuscous, the nervures paler; the radius is oblique, and straight at the base; the apical abscissa is curved; the first transverse cubital nervure is elbowed shortly below the middle; the second is roundly curved; the recurrent nervures are received about the same distance from the base and apex of the cellule.

MEIRA QUADRIMACULATA, *sp. nov.* (Pl. fig. 5 ♀)

Nigra, ore, mandibulis, abdomine tarsisque rufis; abdomine quadri-albomaculato; alis hyalinis, nervis fuscis. ♀

Length.—8—9 mm.

Habitat.—Deesa.

Antennæ black; the apex of the scape and the base of the flagellum rufous; the under-side of the scape and the base of the flagellum bearing a few long white hairs. Head black, shining, bare; the antennal tubercles and the apex of the clypeus rufous; the apex of the clypeus transverse; its sides straight; it is sparsely punctured. On the base of the mandibles are some long, pale, fulvous hairs; the apex blackish. Thorax black, smooth and shining; the base of the pro-notum and the pleuræ are sparsely covered with long, soft, white hair; the base of the pro-notum is sparsely punctured; the apex is piceous; on the sides of the scutellum are four punctures; the base of the median segment is indistinctly furrowed. The base of the pro-pleuræ bears some minute punctures; its apex and the meso-pleuræ are strongly, but not very closely, punctured; the upper part of the meta-pleuræ closely, obliquely and minutely striated. Wings hyaline; the stigma black; the nervures testaceous. Legs black; thickly covered with longish white hairs; the tibiæ and tarsi dark rufo-testaceous; the tibiæ darker behind. Abdomen ferruginous, smooth and shining; the basal segment except at the apex, the second segment at the base laterally, and the base of the third laterally to a less extent, black; in front of the black marks is an irregular, oblique, white mark.

Meira has not been hitherto recorded from the Oriental Zoological Region. It is allied to *Tiphia* and *Scolia*, and is easily known by the peculiar neuration of the fore-wings; the second cubital cellule is largely appendiculated; the first transverse cubital nervure is oblique, and bears the minute cubital cellule on its lower end near to the cubitus†; the radial cellule is open in the ♀, closed in the ♂; the third cubital cellule is very large, being as long as the radial.

NURSEA, *gen. nov.*

Wings with two cubital cellules; the first recurrent nervure received in the first, the second in the second cellule; the former at a considerable distance from the transverse cubital nervure, the second close to it. Antennæ becoming gradually thicker towards the apex; the last joint large, twice the length of the preceding. Head distinctly narrowed behind the eyes; the occiput is sharply keeled. The antennæ

† In the figure this little cellule is not shown.

are placed immediately over the clypeus, which is roundly convex and is rounded at the apex ; the apex itself being depressed. Mandibles longish, curved, unidentate. Ocelli large, placed in a triangle. Prothorax reaching to the tegulæ. Scutellum flat, a striated depression at its base ; its sides keeled. Post-scutellum striated. Median segment large, striated ; the sides toothed. Legs short, not elongated as in the *Pompilidæ* ; the middle tibiæ with two spurs ; they are not spined ; the tarsi spined at the apices of the joints ; the fore-tarsi are longer than the others and incised at the base. Abdomen broad at the base ; the last segment keeled down the sides and covered with a soft, depressed pubescence.

The second joint of the antennæ is larger than usual ; the middle coxæ are widely separated ; the sternum in front of them is raised ; the raised part has a broad, raised, rounded border on the outer-side ; the hinder coxæ are large and are closed together ; the second abdominal segment is large, and below is separated from the first by a deep depression ; the basal ventral segment has the sides keeled ; the middle is stoutly keeled, and from the middle keel others branch off to the apex.

The fact of this genus having the pro-notum largely developed behind and reaching to the tegulæ separates it from the *Sphegidæ*. In the latter respect it agrees with the *Pompilidæ*, from which it differs in some important points :—in the second cubital cellule, receiving only one of the recurrent nervures ; whereas in the *Pompilidæ*, when there are two cubital cellules, both the recurrent nervures are received in the second ; the antennæ are shorter, thicker towards the apex and not curled at the apex ; the scutellum is flatter and keeled ; the median segment is striated ; the legs are shorter, the hinder pair not being lengthened, and there is a distinct pygidium, bordered laterally and covered with pubescence, and the middle coxæ are not continuous, but widely separated—feature not found with any known *Pompilid*. The form of the median segment—in its being longitudinally striated and toothed laterally—reminds one of *Dolichurus*, but that is a typical sphegid.

NURSEA CARINATA, *sp. nov.* (Pl. fig. 4.)

Niger, nitidus, femoribus postecis rufis ; alis hyalinis, stigmate testaceo, nervis fuscis. ♀

Length.—6 mm.

Habitat.—Simla.

Antennæ black, distinctly thickened towards the apex ; the flagellum thickly covered with a microscopic white down ; the scape with the pubescence longer. Head above the antennæ smooth, shining, bearing a microscopic down and having a plumbeous hue ; the clypeus is shagreened, more shining in the middle than on the sides. Pro- and meso-thorax smooth and shining, and covered with a white down which is thicker and more distinct on the pleuræ. The depression at the base of the scutellum is finely, transversely striated at the base; the apical half is longitudinally striated. Scutellum flat, bare, except for a few longish hairs ; the post-scutellum bears about ten, irregular, longitudinal keels. The basal third of the median segment is striated all over; in the middle of the remainder are three longitudinal keels; outside these on the middle part is a shorter keel ; on the sides are two keels with a shorter one in the middle at the base ; on the sides of the apical slope there is only one keel which ends in a short tooth ; the apical slope is more thickly covered with white pubescence than the rest. Pleuræ smooth and shining; the sternum is widely furrowed in the middle. Legs black ; the hinder femora red. Wings clear hyaline ; the stigma is testaceous ; the nervures dark fuscous. Abdomen smooth, shining and thickly covered with pale pubescence.

POMPILDÆ.

POMPILUS HERACLIDES, *sp. nov.* (Pl. fig. 3.)

Ferrugineo, abdomine late flavo-balteato ; pedibus rufis ; alis fere flavo-hyalinis, apice fumato. ♀

Length.—9 mm.

Habitat.—Deesa.

Antennæ rufo-fulvous, paler, more yellowish on the under-side ; bare. Head wider than the thorax; transverse behind, bluntly rounded in front. On the head the inner orbits to near the lower ocelli and the sides of the clypeus more broadly and the outer orbits narrowly yellow ; the yellow line on the outer side extending downwards to the mandibles and above across the occiput. Clypeus slightly projecting ; the middle transverse, the sides broadly rounded. Mandibles rufous, black towards the apex. The eyes converge distinctly on the top ; the hinder ocelli are separated from each other by a distinctly greater distance than they are from the eyes. Thorax ferrugineous, covered with a white down ; the apex of the pro-notum is broadly rounded. The median segment has a gradually rounded slope from the base to

the apex. Wings yellowish-hyaline; the yellow tint not very pronounced; there is a fuscous cloud on the apex, commencing at the end of the radial cellule, but not extending backwards to the third transverse cubital nervure; the third cellule is rather narrow, being at the top and bottom about half the length of the second; the first recurrent nervure is received near the base of the apical third, the second at the base of the apical fourth, of the cellule; the basal nervure is interstitial. In the hind wings the anal nervure is roundly and broadly curved at the apex and is received shortly beyond the cubital. Legs coloured like the body; the tarsi paler, more yellowish in tint; the tibiæ and tarsi have long, stout spines; the front tarsi are fringed on the outer side with long, stiff spines. Abdomen coloured like the body, but with the third and fourth segments lemon-yellow, except at the apex.

This species appears to agree closely in colouration with *P. infestus*, Bingham; that is a much larger species (15 mm.); the anterior tarsi are only feebly ciliated on the outer-side; the median segment has a steep slope on the apex, &c.

POMPILUS DEESÆ, *sp. nov.*

Long: 7-8 m.m. ♀.

HABITAT: Deesa.

This species comes close to *P. vivax*, Cam.; it is a shorter and stouter insect; it is much more densely and closely pruinose; the head does not project so much in front of the eyes; the apex of the pronotum is transverse, not angled in the middle; the radial cellule is narrower and the transverse median nervure is not interstitial, but is received distinctly beyond the transverse basal.

Antennæ short and stout. Head distinctly wider than the thorax, densely covered with silvery pubescence. Eyes almost parallel; the hinder ocelli are separated from each other by about the same distance as they are from the eyes; the head is rounded in front, transverse behind. Mandibles broadly rufous in the middle. Pronotum not quite so long as the head, it is transverse behind. The apex of the median segment has a steep, very slightly oblique, slope; its sides rounded, but not broadly. Wings fuscous-hyaline at the base; the apex from shortly behind the base of the radial cellule fuscous, much darker coloured than the base; there is no trace of a yellow tint. Radial cellule short and wide; the apical abscissa straight, oblique; the second cubital cellule is very narrow and is gradually narrowed from the bottom to the top, where

the nervures unite ; at the bottom it is slightly less in width than the space bounded by the first recurrent and the second transverse cubital nervures ; the first recurrent nervure is received shortly beyond, the second behind, the middle of the cellules. The transverse median nervure is received beyond the transverse basal ; the anal nervure is received behind the cubital. Legs black ; the spines and calcaria black ; the spines on the front tarsi are longer than usual.

POMPILUS CARYATIS, *sp. nov.*

Niger, abdominis basi rufo ; alis fusco-violaceis ; cellula cubitali 2ª fere longiore quam 1ª. ♀ et ♂.

Long : 8 m.m.

HABITAT : Simla.

Antennæ rather stout, about half the length of the body, almost bare. Head large, if anything, wider than the thorax ; the sides of the front and the clypeus covered with silvery pubescence ; it is well developed behind, the part there being as long as the space between the hinder ocelli and the eyes. The hinder ocelli are separated from the eyes by a distinctly greater distance than they are from each other. The eyes are large and converge above ; they are there separated by the length of the second and third antennal joints united. The front and vertex are covered sparsely with long fuscous hair. The pronotum is shorter than the head ; in the centre of the median segment is a distinct fovea, deep and broader than long. Wings fuscous-violaceous. The apex from the second transverse cubital nervure smoky ; the third cubital cellule is, if anything, longer on the top than the second ; the transverse median nervure is received distinctly on the outer side of the transverse basal ; the second and third transverse cubital nervures are roundly curved, with a slightly oblique slope above ; the radial cellule is wide and is shorter than the second and third cubital cellules united ; in the hind wings the anal nervure is received behind the cubital—not interstitial. Legs stout ; the spines large and black as are also the calcaria. Abdomen short and stout, black ; the petiole, except at the base, the second segment entirely and more or less of the base of the third, red.

The ♂ is similarly coloured to the ♀ ; its antennæ are short and thick. If anything, its wings are lighter coloured, not quite so violaceous as in the ♀. The first recurrent nervure is received distinctly beyond, the second more shortly in front of the middle of the cellules.

This species comes nearest to *P. detectus*, Cam.; that is a larger species; its head is not so largely developed behind the eyes, and is not so distinctly obliquely narrowed there; the second cubital cellule is differently formed, it being much more narrowed at the top, the nervures meeting there; the transverse basal nervure is interstitial, this being also the case with the anal nervure in the hind wings.

Bingham (Fauna of India, Hymen., p. 159) sinks *detectus*, Cam., as a synonym of *reflexus*, Sm., and *familiaris*, Sm. I cannot agree with this without an examination of Smith's types, the description not being precise enough for exact determination. *Reflexus* is from Japan and *familiaris* from Sumatra.

The species is not unlike *P. eanes* here described, but it is a larger and more robust species; the third transverse cubital nervure is more distinctly angled above; the transverse median nervure is received nearer the transverse basal, and the hinder ocelli are separated from each other by the same distance they are from the eyes; in *eanes* they are separated from them by a distinctly greater distance.

POMPILUS EANES, *sp. nov.*

Long: 7-8 m.m.

HABITAT: Simla.

This species has the colouration of *P. caryatis* and *reflexus*. It is a more slender species than *caryatis*; its wings want the distinct violaceous tint of that species; the head is not so strongly built and is not so well developed behind the eyes; the second cubital cellule is wider at the top, being there more than half the width of its lower part, whereas in *caryatis* it is not half its length; the second cubital nervure is not broadly rounded, but is more oblique and straight; the second recurrent nervure is received nearer the middle of the cellule, and the head and thorax are more densely pilose.

Antennæ stout, as long as the abdomen; the scape sparsely pilose. Head as wide as the thorax; the space behind the eyes as long as the second antennal joint; the hinder ocelli are separated from each other by about the same space as they are from the eyes. The pronotum is not quite so long as the head. There is an indistinct, impressed line on the centre of the median segment. Wings hyaline, the apex smoky; the radial cellule is as long as the lowerside of the second and third cubital cellules united; the second cubital cellule at the top is twice the length of the third; the first transverse cubital nervure is

not gradually rounded, but has an oblique slope on the upper half, as has also the third; the first recurrent nervure is received shortly behind; the second almost in the middle; the transverse median nervure is received distinctly in front of the transverse basal; the accessory nervure in the hind wings is almost interstitial. On the abdomen the first, the second and the basal fourth of the third are rufous.

POMPILUS SOLLICITNAS, *sp. nov.*

Niger, facie, clypeo, orbitis oculorum, prothorace, mesonoto cum scutello, pleurisque rufis; pedibus rufis, tarsis fuscis; abdominis apice flavo; alis hyalinis, apice fumatis.

Long: 6-7 m.m. ♂.

HABITAT: Simla.

Antennæ short, thick, distinctly tapering towards the apex; rufous darker above and underneath towards the apex; the scape paler, more yellowish in tint. Head dark-rufous; the greater part of the vertex black; the front and vertex thickly covered with white pubescence. Eyes large, slightly converging above. Ocelli more prominent than usual; the hinder pair are separated from each other by a distinctly greater distance than they are from the eyes. Thorax ferruginous; the median segment, the parts bordering the sides of the scutellum and the mesonotum, black; it is smooth, shining and thickly covered with a white pubescence. Scutellum prominent, narrowed towards the apex, which is rounded. The metanotum is thickly covered with white pubescence. Wings clear hyaline, the apex with a distinct cloud, which commences shortly beyond the third transverse cubital nervure, but does not reach to the extreme apex, which is hyaline; the third cellule is distinctly shorter than the second by about one-fourth; the third transverse cubital nervure has the upper half obliquely curved, which makes the top of the cellule narrower than the bottom; the first recurrent nervure is received at the base of the apical third; the second in the middle; the transverse basal nervure is interstitial. Legs coloured like the thorax; the hinder tibiæ and tarsi infuscated. The tibiæ and tarsi are distinctly, but sparsely, spined. Abdomen black; the basal ventral segment rufous; the apical segment is whitish-yellow.

Comes nearest to *P. lascivus*, Cam. That species has only the upper side of the thorax red; the basal half of the wings is hyaline; the metanotum is not black, and it is transversely striated; it is also a larger species.

POMPILUS ALCACUS, *sp. nov.*

Niger, abdominis basi late, tibiis femoribusque posterioribus rufis; alis hyalinis, apice fumatis. ♀

Long: 6-7 m. m.

HABITAT: Deesa.

Front and vertex shining, aciculated, almost bare; the face and clypeus densely covered with silvery pubescence; the apex of clypeus broadly transverse. Mandibles broadly rufous at the base. Antennæ short and thick. Thorax densely pruinose which gives it a white appearance. The pronotum is fully longer than the head. The median segment is more densely pruinose than the rest of the thorax; it has no longitudinal furrow. Abdomen smooth and shining; the basal three segments are entirely ferruginous. Wings hyaline, fuscous from the apex of the radial cellule. Radial cellule short and wide; there are three curves in the radius; the apical one being the larger and is itself slightly obliquely curved towards the apex; the second cubital cellule is large, the third small, narrow; at the top hardly one-fourth of the upper side of the second; it is narrowed at the top; the first recurrent nervure is received shortly beyond the apex of the basal third of the cellule; the second is almost united with the second transverse cubital. The transverse median nervure is received beyond the transverse basal, clearly separated from it. In the hind wings the apical nervures are faint, almost obliterated; the anal cellule is appendiculated.

Comes nearest, through its general colouration and alar neuration, to *P. zeus*, Cam. That species is larger (8-9 m. m.); the apical abscissa of the radius is rounded and is broadly curved downwards, the apex of the cellule thus not being acutely pointed and the median nervure is interstitial.

POMPILUS (PLANICEPS) CAROLI, *sp. nov.*

Niger, dense pruinoso; alis hyalinis, apice fumatis. ♀.

Long: 7-8 m. m.

HABITAT: Deesa.

The entire body densely covered with a silvery pile, which gives it a greyish appearance. Antennæ short; the scape covered with silvery pubescence. Head transverse behind; the eyes reach to the hinder edge; in front it is slightly rounded; the ocelli are in a curve (∴), not forming a triangle; the hinder are separated from each other by a slightly greater distance than they are from the eyes. Clypeus broadly

convex; its apex in the middle transverse and with a distinct depressed margin. The pronotum is shortly, but distinctly, longer than the head; the median segment has a gradually rounded slope. The mandibles are broadly rufous at the base. Legs long; the hinder tarsi and spurs have a brownish hue; the spines are stout. Wings clear hyaline; the apex from near the end of the radial cellule is smoky; the middle (second) cubital cellule is on the lower side longer than the others; the first recurrent nervure is received opposite the end of the first abscissa of the radius; the second at a less distance from the end. The anal nervure in the hind wings is almost, if not quite, interstitial, as is also the transverse basal.

POMPILUS (PLANICEPS) HALYS, *sp. nov.*

Long: fere 6 m. m. ♂.

HABITAT: Deesa.

This species agrees closely with *P. caroli* here described, but may be readily separated from it by the difference in the alar neuration; its radial cellule is distinctly shorter and does not reach half way between the end of the stigma and the apex of the wing, whereas in *caroli* it is distinctly longer, it extending beyond the middle; the middle cubital cellule is also much shorter, it being not half the length of the apical, whereas in *caroli* it is longer than it.

Antennæ short and thick, the joints clearly separated, the apical slightly dilated on the underside. Eyes slightly converging below, the hinder ocelli are separated from each other by a distinctly greater distance than they are from the eyes. Clypeus broadly convex; its apex transverse, the sides oblique. Occiput transverse. Pronotum slightly larger than the head. Legs black, the spines long and black. Wings hyaline, smoky from near the second transverse cubital nervure. Radial cellule short, scarcely longer than the middle cellule, its apex acutely pointed; the middle cellule is about one-half the length of the apical; the recurrent nervures are received about the same distance from the base and apex; the transverse median nervure is received on the outer side of the transverse basal and clearly separately from it; the anal nervure in the hind wings is received behind the cubital. The entire body is densely pruinose.

POMPILUS (PLANICEPS) SIMLAENSIS, *sp. nov.*

Long: 6 m. m. ♂.

HABITAT: Simla.

This species is very closely related to *P. caroli* and *P. halys*, having like them the wings clouded towards the apex; but the apical cloud is not so deeply tinted; it is broader, and it extends near to the first transverse cubital nervure; the middle cubital cellule is much shorter than it is in *caroli*; from *halys* it may be known by the longer and narrower radial cellule.

Head transverse behind, rounded in front; smooth and shining; it hardly projects beyond the middle behind; the eyes are parallel and hardly converge below; the hinder ocelli are separated from each other by a distinctly greater distance than they are from the eyes. The apex of the clypeus is transverse in the middle at the apex; it is rather flat, not convex to any extent. Mandibles broadly rufous in the middle. The radial and cubital cellules are smoky, but not deeply; the cloud also extending below the cubitus; in the cubital cellules the cloud is divided in two by a narrow hyaline band placed beyond the second transverse cubital nervure. Radial cellule elongate, lanceolate at the apex; it is distinctly longer than the middle cubital cellule, which is somewhat shorter than the apical abscissa of the cubitus; the basal nervure is roundly curved; the transverse medium is about interstitial. In the hind wings the anal nervure is received behind the cubital. The antennæ are stout; their middle and apical joints are distinctly and roundly dilated on the lower side.

POMPILUS (PLANICEPS) INDOSTANUS, *sp. nov.*

Niger, pruinoso; alis clare hyalinis. ♀.

Long: 7 m. m.

HABITAT: Deesa.

Antennæ as long as the abdomen; covered with a pale pile. Head rounded in front, behind not quite transverse, being slightly rounded inwardly. The eyes slightly converge above and reach close to the base of the mandibles; the head behind them is fairly well developed, being there about two-thirds of the width of the eyes; the hinder ocelli are separated from each other by a distinctly greater distance than they are from the eyes. The prothorax is not much longer than the head. The spines on the legs are long and black. Wings clear hyaline; the radial cellule is elongate, narrow, sharply lanceolate at the apex; the middle cubital cellule is distinctly longer than it, the transverse basal nervure is interstitial; in the hind wings the anal nervure is received distinctly behind the cubital.

Easily known by the clear hyaline wings.

APORUS EXCRUCIANS, *sp. nov.*

Niger, abdominis basi late rufo; alis fere hyalinis, apice fusco. ♂.

Long: 6 m.m.

HABITAT: Simla.

Head alutaceous, opaque; the face covered with silvery pubescence; the ocelli hardly form a triangle; the hinder pair are separated from the eyes by a slightly greater distance than they are from each other. The eyes converge very slightly towards the bottom; there is a slight curve on the inner side above. Mandibles rufous, black at the base. Thorax opaque, covered with a pale pubescence. Legs long, black, with a pale pubescence; the spines and calcaria are black. Wings fuscous-hyaline, with a slight, but distinct, cloud on the apex, from the end of the radial cellule. Radial cellule small; the apical two-thirds obliquely narrowed; the second cubital cellule is about the length of the radial; it is about as wide as long, rounded at the top; the cubital nervures there are separated by slightly less than the space bounded by the first transverse cubital and the first recurrent nervures, which is received near the apex of the apical fourth of the cellule; the second at a less distance from the apex. The anal cellule in the hind wings is short, its apex not reaching to the middle, the second has a rounded curve; the recurrent nervures are received near the middle of the cellules; the transverse basal nervure is received distinctly in front of the transverse basal. In the hind wings the anal nervure is interstitial or nearly so. On the abdomen, the basal, the second and the base of the third segment are red.

SPHEGIDÆ.

NOTOGONIA PULCHERRIMA, *sp. nov.* (Pl. fig. 7. 7*a*.)

Nigra, abdominis basi late, apice pedibusque rufis; alis flavo-hyalinis, apice fumatis. ♀.

Long: 17 m.m.

HABITAT: Deesa.

Antennæ covered with silvery pubescence; black. The scape red. Head black; the apex of the clypeus dull-red; the front and clypeus covered with depressed silvery pubescence; the lower part of the vertex is sparsely pilose. Mandibles broadly rufous in the middle; the base is covered with silvery pubescence; the apical joints of the palpi are dark-rufous. Thorax covered with a silvery pile, which has a more golden hue on the mesonotum. The median segment is transverse; the

metapleuræ obliquely closely striated. Wings yellowish-hyaline; fuscous from the base of the radial cellule. Legs red; the anterior coxæ and trochanters, the greater part of the middle coxæ and the base of the posterior coxæ, black; the spurs and spines on the front legs are dark-rufous; on the four posterior legs they are black. The basal two segments of the abdomen and the last segment are red; the segments are bordered with silvery pubescence, the pile on the pygidium is silvery.

The ♂ is similarly coloured, except that the scape is black. A distinct and handsome species.

GASTROSERICUS RUFITARSIS, *sp. nov.*

Niger, dense albo piloso, basi abdominis, geniculis tarsisque rufis; alis hyalinis, coste stigmateque testaceis, nervis fuscis. ♀.

Long.: 9 m.m.

HABITAT: Deesa.

Antennæ black, thickly covered with silvery pubescence; the apex of the scape pale-yellow. Head black; the front thickly covered with longish grey hair; the cheeks and clypeus with longish, depressed bright-silvery pubescence; the vertex is sparsely haired; the ocellar region is closely and distinctly punctured; behind with an oblique slope, and smooth and shining; the vertex minutely, but not very closely, punctured; it is obliquely depressed towards the centre, where there is a narrow longitudinal furrow. Mandibles pallid yellow at the base, where they are covered with depressed silvery pubescence; the apex black, rufous behind. Thorax thickly covered with white pubescence, it is longest and thickest on the apical slope of the median segment; the mesonotum and scutellum closely and distinctly punctured; the median segment rugose. Wings clear hyaline, with a steelly iridescence; the costa and stigma are rufo-testaceous, the nervures darker; the radial cellule is short, its apical abscissa is straight and has a slightly oblique slope; the lower abscissa projects beyond it as a short stump; the cubital cellule is much narrowed on the top; the recurrent nervures are united and are received near the basal fourth of the cellule. Legs thickly covered with silvery pubescence; all the tarsi and the base and apex of the tibiæ are rufous; the tibial and tarsal spines are pale. Abdomen black; the basal segment and the second, except at the apex, rufous; the apex of the segments marked with bright silvery pubescence; the pygidium is covered with depressed silvery pubescence.

A species closely related to *G. wroughtoni*, but distinctly smaller and more slenderly built. The differences between them may be expressed thus—

Length—11 m.m.

The tarsi for the greater part black; the upper part of the second transverse cubital nervure is straight and makes an elbow below with the larger lower portion; the lower part of the second recurrent nervure broadly rounded.—*Wroughtoni.*

Length—9 m.m.

The tarsi rufous; the upper part of the second transverse cubital not sharply elbowed on its lower end; the lower part of the second recurrent nervure. *rufitarsis*

OXYBELUS AURIFRONS, *sp. nov.*

Niger, flavo-maculato, fronte aureopiloso, pedibus posticis nigris, basi tibiarum tarsisque flavis. ♀.

Long: 5-6 m.m.

HABITAT: Deesa.

Scape of antennæ yellow, lined with black above; the flagellum rufous, the base blackish above. Head black; the front thickly covered with golden pubescence; the vertex closely punctured and covered with silvery pubescence, which does not hide the sculpture. Clypeus broadly projecting in the middle; the sides of the keel with an oblique slope on the sides; the apex has also an oblique, rounded slope above and does not project much. Mandibles more or less rufous, the base broadly yellow. Thorax black; a line on the pronotum, the scutellum, except down the centre and at the apex, the post scutellum with its spines, the tubercles and the tegulae, yellow. Mesonotum closely and strongly punctured; the scutellum is more strongly, but not quite so closely, punctured, and is stoutly keeled down the middle; the post-scutellum is broadly and roundly raised in the middle; the lateral laminæ are roundly curved outwardly; the apex sharp; it becomes gradually wider towards the base on the inner side; the spine is long, curved, of nearly equal width, hollowed above; the apex in the middle triangularly incised. The median segment is irregularly obliquely striated; the striæ are placed at irregular distances; the middle of the segment is hollowed and is free from striæ; its apex is sharply obliquely pointed. Legs black; the underside and apex of the fore femora, their

tibiæ and tarsi, the middle knees, the tibiæ, except broadly above, the base of the hinder tibiæ and the tarsi, yellow. Wings clear hyaline; the nervures and stigma black. Abdomen black, with two large broad marks on each segment.

PSEN CARINIFRONS, *sp. nov.*

Niger, mandibulis, scapo antennarum, linea pronoti, scutello, post-scutello, pedibus anterioribus tibiisque posticis flavis; abdominis medio rufo late maculato; alis hyalinis; nervis stigmateque nigris. ♂.

Long: fere 7 m.m.

HABITAT: Deesa.

Antennæ black, stout; the scape and second joint straw-yellow; the flagellum brownish beneath towards the apex and base. Head black; the vertex smooth, shining; the front minutely and closely punctured; the lower part of the face and the clypeus thickly covered with depressed silvery pubescence; between the antennæ is a stout, projecting keel, which becomes triangularly widened below the antennæ. Mandibles and palpi straw-yellow; the mandibular teeth black; the palpi yellow. Thorax shining; the edge of the pronotum, the tubercles, scutellum and post-scutellum straw-yellow. Median segment reticulated, broadly furrowed down the middle, the furrow not margined; the base of the segment is smooth; the narrow depression at the base is striated; pro- and meso-pleuræ smooth and shining; the furrows crenulated; the metapleuræ reticulated; the reticulations are closer and more regular than they are on the metanotum. The four front legs are straw-yellow, as are also the hinder tibiæ; the hinder coxæ, except at the apex, the femora, the apex of the tibiæ and of the tarsi, black. Wings clear hyaline; the first and second transverse cubital nervures are parallel and oblique; the first recurrent nervure is interstitial; the second is received shortly beyond the second transverse cubital, almost touching it. Abdomen black; the second segment is rufous to shortly beyond its middle; the petiole is longer than usual, being as long as all the rest of the abdomen united in the ♂; it is largely nodose at the apex.

This species is easily known by the presence of a pointed plate between the antennæ. The only species known, similarly armed, is *P. annulipes*, Cam., from Central America, for which Kohl. (Ann. d. k. k. Hof. Mus. Wien, 1896, p. 292) formed a distinct section of the genus. Apart from this structural peculiarity it differs from the other

species in having the median segment more regularly reticulated; the "enclosed area" at its base is not of a triangular form and extends to the sides, while in the other species it is confined to the centre and is more regularly bordered by furrows; the segment itself is larger compared to the rest of the thorax; the petiole is longer than usual and is more distinctly dilated at the apex. In the hind wings the apical nervures are obliterated; the transverse anal nervure is received behind the cubital, the discoidal nervure being obliterated entirely. In the fore-wings the transverse basal nervure is received shortly behind the transverse basal.

PSEN RETICULATUS, *sp. nov.*

Niger, nitidus, capite thoraceque dense albo pilosis; alis hyalinis, nervis stigmatique nigris. ♀ et ♂.

Long : 10-11 m.m.

HABITAT : Deesa.

Scape of antennæ bearing white hairs; the flagellum densely covered with white pubescence. Front and vertex smooth and shining; covered with longish white hair; the face and clypeus densely covered with silvery pubescence, which is more dense on the face than on the clypeus. The clypeus is broadly roundly convex; its apex broadly projects in the middle; the projecting part has a broad, shallow incision; its sides are oblique. Thorax smooth and shining; the basal area of the median segment is stoutly longitudinally keeled, except in the middle, where there is a wide shallow furrow, which is bordered by keels, becomes wider gradually towards the apex and bears a few transverse keels at the base; in the middle are a few stouter keels, from which the furrow is continued to the apex of the segment; on the apical slope is, on either side of this furrow, a large shallow somewhat semicircular furrow, bordered on the inner side by a stout keel; from the centre of this area two stout keels run to the sides, these being divided by an irregular curved one in the centre. The basal furrow on the mesopleuræ is crenulated, the longitudinal one is smooth and narrower. The apex of the metapleuræ is bordered by a keel, beyond which is another more irregular one, the two enclosing between them the stigma, below which are three or four stout keels. Wings clear hyaline; the second recurrent nervure is interstitial. Legs covered with long soft white hair; the spurs are pale. Abdomen smooth and shining; the long-curved petiole is covered with long white, soft hairs.

Comes nearest to *P. orientalis*, Cam.; is easily separated from it by the different form of the median segment; in it the enclosed space is finely, not stoutly, longitudinally striated, and the apical slope of the segment is not broadly and deeply furrowed. The black on the thorax has a plumbeous hue; the pygidial area is clearly defined; it is smooth and shining at the base; the apex is opaque and has some irregular punctures on the sides. The striæ on the median segment give it a reticulated appearance, especially on the sides.

ALYSON TESTACEITARSIS, *sp. nov.*

Niger, nitidis, scapo antennarum, mandibulis orbitisque oculorum infra albis; alis hyalinis, fusco bifasciatis. ♀.

Long: 6 m.m.

HABITAT: Simla.

Antennæ black; the scape pale-yellow beneath. Head black; a line on the inner orbits reaching from shortly above the middle to shortly below the base of the antennæ, a mark on either side of the middle of the clypeus and the mandibles, except the teeth, pale-yellow. Thorax entirely black, covered with short pale pubescence; the median segment irregularly, transversely and obliquely striated; the central area is elongate; it bears two keels in the centre at the base, which reach to beyond the middle and diverge outwardly at the apex; the space between and on either side of them is smooth; from its apex a stout keel runs down to the end of the segment. The base of the pronotum is depressed and clearly separated from the larger raised apical part. Pleuræ smooth and shining; the upper part of the mesopleuræ is raised; on the sides, at the top of the apical slope of the median segment, is a short, stout tooth. Wings hyaline, the nervures and stigma blackish; the latter pale at the base; there is a fuscous cloud along the outer side of the transverse basal nervure and a broader oblique one occupying the radial cellule, except its apex, and extending through the cubital cellules to the posterior border. Legs black; the anterior coxæ in front, the greater part of the front trochanters, the base of the fore femora and the whole of the front tarsi, pale-testaceous; the four hinder tarsi are of a darker testaceous colour. Abdomen smooth and shining; the two spots white; the pygidium is covered with depressed silvery pubescence and with some longish hair; its edges are testaceous. The head and thorax are covered with silvery pubescence; the apex of the abdomen and the ventral segment sparsely with long silvery hair.

Allied to *A. annulipes*, Cam., which, *inter alia*, differs in having the apical slope of the median segment areolated.

ALYSON ERYTHROTHORAX, *sp. nov.*

Niger, thorace rufo; scapo antennarum subtus, clypeo, mandibulis, lineaque orbitis oculorum flavis; pedibus nigris, tibiis anterioribus anticis basique tibiarum posticarum albis; alis hyalinis, apice fumatis. ♀.

Long : 4 m m.

HABITAT : Simla.

Antennæ black; the scape yellow below. Head thickly covered with silvery pubescence; the front closely and distinctly punctured; the lower half of the inner orbits, the clypeus and the mandibles, yellow; the apices of the mandibles piceous. Thorax rufous; the lower part of the mesopleuræ and the breast black: it is thickly covered with white pubescence; the propleuræ striated in the middle; the mesonotum closely and distinctly punctured; the scutellum more obscurely punctured. Median segment rather strongly and irregularly transversely striated; the central area is rounded at the apex; the apical slope is oblique; its central keel is stout; shortly below its middle is a transverse one, and below this is another shorter transverse keel. Legs black; the apices of the four anterior coxæ the apex of their trochanters, the four anterior tibiæ in front, and the base of the hinder tibiæ, white; the tarsi testaceous. Wings hyaline; the apex from the middle of the stigma smoky; the transverse cubital nervures are interstitial. Abdomen smooth and shining.

Allied to *Alyson ruficolle*, which may be known from it by the two keels on the median segment being not united at the apex; the propleuræ are not striated; the hair on the front and vertex is black and the wings have not a distinct cloud on the apex.

VESPIDÆ.

ZETHUS INTERSTITIALIS, *sp. nov.*

Niger, sparse flavo maculato, dense albo piloso; alis hyalinis, antice fumato; tegulis rufis; cellula cubitali 2ª appendiculata. ♀.

Long : 10 m.m.

HABITAT : Matheran, in March.

Antennæ black; the scape marked with yellow towards the apex; the flagellum rufous beneath at the apex. Clypeus sparsely punctured and covered with a microscopic down; on its top is an irregular

yellow mark which is broader than long ; the apex is narrowed in the middle and is broadly, but not deeply, incised. The front and vertex are strongly and closely punctured and covered with silvery pubescence. Mandibles smooth and shining ; keeled along the inner and outer sides above. Thorax closely, uniformly and rather strongly punctured ; the median segment more closely, and not quite so distinctly as the mesothorax. Shortly behind the apex of the middle of the scutellum are two curved yellow marks ; in front of it, on the mesonotum, is a short, longitudinal furrow. Legs black ; the apex of the four anterior femora, and the four anterior tibiæ, except behind, yellow. Wings hyaline ; the costal and the radial cellule for the greater part smoky ; the second cubital cellule is narrowed at the top, the two transverse cubital nervures being united there ; the third cellule is widest at the top ; the cubitus does not extend beyond it. The petiole is as long as the rest of the abdomen united ; it is not much widened towards the apex ; above it is irregularly punctured ; the sides are rufous except at the base and apex ; its apex and the apex of the second segment yellow. The second segment is bell-shaped, roundly narrowed at the base, the apex transverse.

The pronotum above is transverse ; its edges project sharply ; in addition to two short central furrows on the apex of the mesonotum there is a somewhat longer curved one on either side of them ; there is no groove or keel on the median segment, the apex of which is roundly incised, the sides projecting into bluntly rounded yellowish teeth ; its apex has a perpendicular slope ; the base of the petiole is not perceptibly narrowed.

The ♂ has the clypeus yellow except at the apex where it projects into two teeth ; the apical joint of the antennæ is short, longer than broad ; the spine is longer than it.

The form of the wing cellules is as in *Labus* ; the petiole is not narrowed at the base as in typical *Zethus* ; the antennæ are placed distinctly above the top of the clypeus ; the mandibles have a large, rounded sub-apical tooth, which is clearly separated ; they are of moderate length ; the scutellum is flat, separated from the mesonotum by a furrow ; its apex behind the yellow marks is stoutly, longitudinally striated.

This species cannot be referred to any described species of *Zethus* or *Labus*, with which genus or sub-genus it agrees better than it does with

typical *Zethus*. It differs from *Labus humbertianus*, Saussure, in its post-scutellum not being spined. *L. humbertianus*, Bingham (Fauna of India, Hymen., i., p. 349) is probably a different species from the *humbertianus* of Saussure. At least Col. Bingham in his description makes no mention of the presence of a scutellar spine.

I am inclined to agree with the opinion of Mr. W. J. Fox (Proc. Acad. of Nat. Sc. of Phil., 1899, p. 435) and of Saussure (Synop. of Am. Wasps, p. 56) that there is no valid distinction between *Labus* and *Zethus*.

MEMOIRS ON ORIENTAL RHYNCHOTA.

By G. W. Kirkaldy, F.E.S.

With Plates A, B and C.

(*Continued from page 58 of this Volume.*)

Group Eucerocoraria.

= Valdasaria auctt. (11)

Of this group, which is easily recognised by the doubly constricted pro-notum and the acutangular membrane cell, there are three Oriental genera :—

A. Scutellum, with a process arising more or less perpendicularly from the disk. ♂ Pro-notum blackish or brownish; ♀ pro-notum yellowish or reddish.

1. Helopeltis, Sign., type *H. antonii*, Sign.

Aa. Scutellum without a process—

♂ ♀ Similarly coloured.

B. Scutellum strongly sulcate.

2. Platypeltis, Sign., type *P. chinensis*, Sign.

Bb. Scutellum only superficially sulcate, often transversely rugulose.

(11) *Eucerocoris*, Westw., 1835, is the oldest genus in the division.

3. Disphinctus, Stål, type *D. sahlbergi*, Stål, Kirk.

Helopeltis has comparatively recently (12) been discussed by Waterhouse and Atkinson, while *Platypeltis* is unknown to me. *Disphinctus humeralis* has been recorded (13) as attacking cinchona in Mungphu in Sikkim. Mr. Green has sent me two species from Ceylon—one from *Mœsa indica* and another closely allied to *D. humeralis* from a number of plants. Walker's three oriental species of *Monalonion* (1873, Cat. Heter. VI, 161—3), were placed by Atkinson (1889, Journ. As. Soc., Beng., LVIII, pt. 2, Suppl., p. 51) in *Disphinctus*, but *M. divisum*, Walk., is certainly not a *Disphinctus*, and does not apparently belong to any described genus; as the unique type, however, is headless, its exact systematic position must remain doubtful.

(12) Waterhouse, Trans. Ent. Soc., 1886, pp. 457—60, Plate XI; 1888, p. 207; and 1894, pp. 31—2.

Atkinson, 1890, Ind. Mus. Notes, I, pp. 175—87, Plate XII, figs. 2—4.

(13) 1889, Ind. Mus. Notes, I, p. 4 (Atkinson, Notes on Indian Insect Pests—Rhynchota).



ORIENTAL RHYNCHOTA



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ORIENTAL RHYNCHOTA

DISPHINCTUS MÆSARUM, sp. n.

Very hairy; second segment of antennæ four times as long as the first. (14) Pro-notum laterally rounded, subsinuate, furnished with pale yellow hairs.

(14) I regret that I have seen only two examples of this distinct species. Of the mal the antennæ and elytra are missing, ; of the female, the apical two segments of the antennæ.

Head yellowish-brown with a black clouded band at the base; pro-notum blackish-brown, anterior half more or less yellow-red-brown, postero-lateral angles and a wedge-shaped longitudinal median line on the basal half of posterior lobe, flavous. Scutellum flavous, apical margin ("base" auctt. !) and lateral margins, black. Elytra cinereous, basal half of clavus, apical third of corium and apex of cuneus, blackish. Membrane infuscate. Beneath sordid reddish or brownish-flavous; pleura, posterior coxæ, genital segments, &c., black. Antennæ black, except base of first segment. Apical fourth of posterior and intermediate femora and the tarsi, black. Anterior lobes of pro-notum with black hair tufts.

Long. ♂ 6½ mill.; ♀ 8½ mill.

CEYLON: Pundaluoya (E. E. G., Feb. 1899); punctures leaves of *Mæsa indica*.

D. FORMOSUS, sp. n.

Pl. A., fig. 10*; and Pl. C., fig. 2.

Second segment of antennæ four times as long as first, which is incrassate; third four-sevenths longer than the second and twice as long as fourth. Elytra very hairy (long, thick, pale hairs). Scutellum transversely striate. Rostrum reaching to the middle of the meso-sternum, which is produced posteriorly in an acute spine. Head, pro-notum and scutellum rufo-testaceous, anterior margin of pro-notum ruddier. Eyes and antennæ (except whitish or brownish basal third of first segment) black. Elytra cinereo-flavous; apical third of corium, apex of cuneus and entire membrane, infuscate. Legs testaceous, rufo-testaceous apically; tarsi blackish. Posterior lobe of pro-notum usually immaculate, but occasionally clouded at the base.

♂ Abdomen slightly constricted longitudinally in the middle, broadened out at base of fourth segment; carinate longitudinally beneath; connexivum subvertical, scarcely extending laterally beyond elytra. Long. 5 mill., lat 1·5 mill.

♀ Connexivum very broad, extending noticeably laterally beyond elytra. Sheath extending to apex of fourth abdominal segment. Long. 5·5 mill., lat 1·6 mill.

CEYLON: Punctures, leaves of *Solanum*, sp. (Peradeniya [Reg. No. 145], March 1900, E. E. Green); punctures, young leaves and shoots of *Peperonia*, sp. (Kandy [Reg. No. 78], Dec. 24, 1899, E. E. G.); punctures, young leaves of common Guava, *Psidium guyava* (Peradeniya [Reg. No. 123], Jan. 1900, E. E. G.); punctures, young leaves of *Acalypha*, sp. (Badulla [Reg. No. 145] Feb. 1900, E. E. G.).

This species is allied to *D. humeralis* (Walk.), but beyond the difference in antennal proportions, the posterior margin of the pro-notum in *D. formosus* is nearly always immaculate, or at least only slightly clouded, while in *D. humeralis* (of which there are a number of specimens in the British Museum) there appear to be always two deep, shining black, small, but very clearly and sharply defined, round spots, one on each side, near the basal margin.

D. DUDGEONI, nom. n.

In the "Indian Museum Notes", 1894, III, No. (5), pp. 33—8, Mr. G. C. Dudgeon published some exceedingly interesting "Notes on the Oviposition of *Helopeltis theivora*, Waterhouse ("Mosquito Blight")." It is there noted that three species of *Mœsa*, "occurring in the Darjeeling District, from 1,500 feet to 5,000 feet, are blighted in much the same manner as tea." It is not necessary to reprint the notes here, as the paper will be in the hands of everyone interested in Oriental Rhynchota. It is evident from the careful and lucid description that the bug described without a name—an omission which I have pleasure in remedying by proposing that of the author of the valuable observations—belongs to *Disphinctus*, differing by the proportions and colour of the antennæ, &c., from the other known species. The following is the original description (l. c. No. 5, p. 37):—

"♂: Orange-red; abdomen broad and concave on the upper side, "unmarked; head transverse, short; eyes black and prominent: "rostrum paler orange, thickened for the basal third of its length, "rather short, reaching just beyond the coxæ of the anterior legs when "folded beneath; antennæ almost the same length as the whole body; "first joint thickened, short reddish; second long; third shorter than "second; fourth short, all three black; pro-notum and scutellum un-"marked, orange red, the former lengthened, forming a rather long

"neck, the latter triangulate ; legs pale, semihyaline yellow, barred "with orange red on the femora ; the bases of the tibia also reddish ; "hemelytra with the basal two-thirds corneous and orange red, with a "triangular black spot on the costa ; the apical third fuscous, hyaline "with a discal nervure orange; wings fuscous with the bases transparent: "costal and discocellular nervures reddish. The hemelytra project far "beyond the abdomen longitudinally. Total length of insect ♂ $\frac{5}{16}$ of "an inch [= nearly 7 mill.]. The female only differs from the male "in being slightly paler in colour and in the underside of the abdomen "having a curved, corneous, black, shining ovipositor rising, as in *H.* "*theivora*, Waterhouse, from the centre of the sixth segment and "reaching to the eighth. The fertilised ♀ is streaked with whitish on "the underside of the abdomen. Total length, ♀ $\frac{1}{4}$ to $\frac{11}{32}$ of an inch."
The ova are described and figured.

"*Habitat.*—Sikkim and Bhutan Himalayas, from 1,500 feet to 5,000 "feet (G. C. Dudgeon). Foodplant, the young leaves of *Mæsa mon-* "*tana* (D. C.), *Mæsa ramentacea* (A. D. C.) and *Mæsa indica* (Watt.). "Some species of Convolvulus is also attacked by this or an allied "form."

It is noteworthy that while the sexes are dissimilarly coloured in *Helopeltis*, the males in that genus being characterised by a more sedate appearance than that of their partners, in *Disphinctus* both sexes are very similar, if not indeed indistinguishable, in that respect. In *Helopeltis* the pro-notum, &c., of the male is always, so far as known, blackish ; that of female, reddish or yellowish. In *Disphinctus*, on the other hand, both sexes of *D. mæsarum* are blackish in general aspect; those of *D. humeralis*, *D. dudgeoni* and *D. formosus*, reddish.

Family TINGDÆ.

† ELASMOGNATHUS GREENI, Kirby, l. c., p. 109, Pl. IV, fig. 5.

† = *E. pallida*, Kirby, l. c., p. 110 (*nov. syn.*).

I do not think there is any doubt as to the correctness of this synonymy.

GALEATUS DARTHULA, sp. n.

Brachypterous: head armed with long spines, extending well beyond its apex ; first segment of antennæ reaching far beyond apex of head, three times as long as second, third segment eight times as long as second, and three times as long as fourth. Lateral margins of pronotum and elytra with a single series of areoles, carinæ of the former

simple. Pro-notal vesicle spherical, anteriorly obtuse, not (or very slightly) extending beyond apical margin of head or beyond the obtuse anterolateral angles of pronotum.

Long. $3\frac{1}{6}$—$3\frac{1}{3}$ mill.

CEYLON: Peradeniya (April 1900, E. E. Green), destructive to foliage of *Barleria cristata*, an ornamental shrub. [Reg. No. 197.] Type placed in British Museum.

Brownish-black; vesicles, elytra, &c. (except nervures), transparent, colourless or slightly tinged with brownish; antennæ (except apical segment) and legs (except tarsi) pale testaceous.

This is, I believe, the first species of *Galeatus* recorded from the Oriental Region, none of Walker's species of *Tingis* or *Monanthia* belonging to this genus.

SAKUNTALA, gen. nov.

Subfamiliæ Tinginarum [= Tingitariorum Stal] genus, *Seephanitidi* Fieb. [= *Tingitidi*, Leth., et Sev., nec Fabr.] subaffinis. Sulco rostrali anteriorim occluso. Pro-noto tricarinato; lateribus laminato-productis; vesicula subglobosa; processu postico posteriorim acuto; sulco sternali longitudinali carina transversa haud interrupta. Orificiis repugna torialibus distinguendis. Elytrorum areis discoidali ac costali haud conjunctim elevatis, areolis permultis subirregulariter instructis. Typo *S. ravana*, Kirkaldyi.

Rostral channel anteriorly closed. Capital spines not extending beyond apex of head; basal segments of antennæ almost contiguous. Pro-notum tricarinate, central carina anteriorly entire, longitudinally traversing vesicle, posteriorly evanescent; sublateral carinæ anteriorly evanescent. Vesicle subglobose, about one-fifth of total length of pro-notum. Pro-notum laminately expanded as far laterally as lateral margins of abdomen, the anterolateral angles being on a line with the base of the head: the margins of this lamination are reflexed and sinuate, irregularly quadrilateral. Pro-notal posterior process acute-angled. Stink orifices distinguishable, but not strongly marginate. Sternal sulcus not transversely interrupted. Discoidal and costal areas of elytra not conjointly elevated, costa dilated, irregularly reticulate, base of membrane contiguous with the posterior angle of pro-notal process. In our present ignorance of Oriental Tingidæ (probably less than a twentieth of the Tingid Fauna of that Region being known) it is

not possible to indicate exactly the natural alliances of this genus, which, however, seems to be structurally related to *Stephanitis*, Fieber, (*Tingis* of Lethierry and Severin's Catalogue.)

S. RAVANA, sp. n.

Macropterous: rostrum reaching to posterior coxæ; antennæ: two basal segments very short, third nearly three times as long as the fourth. Hind wings extending well beyond apex of abdomen, elytra extending as far beyond hind wings.

Long. 6½ mill.; lat. 3¼ mill.

CEYLON: Peradeniya (July 1897, E. E. Green).

Antennæ (except black apical segment), legs and underside of abdomen reddish-brown. Eyes black. Capital spines pale flavous. Pro-notum (except pale flavous posterior process) blackish-brown, with very short deep bronze pubescence; carinæ, vesicles and elytra pale golden flavous; elytra spotted and clouded with blackish (forming an irregular transverse band across the middle), especially on the membrane. Hind wings infuscate.

The nymph is remarkable for being laterally greatly expanded, each thoracic and abdominal segment (except the last two abdominal) sending out a stout subcylindric, long, prickly, lateral spine.

Family REDUVIIDÆ.

ECTRICHODIA, Lep. Serv.

The genera *Ectrichodia*, *Ectrychotes*, and *Physorhynchus* have been admitted in the third volume of Lethierry and Severin's Catalogue for (say) *lateralis*, Lep. Serv., *hæmatogaster*, Burm., and *lucidus*, Lep. Serv. respectively. However much authors may disagree as to certain details of procedure in the fixation of genotypes, there are surely two cases in which no doubt can arise, *viz.*:—

(1) when a new genus is proposed for a single species; and
(2) when, at the erection of a new genus, the author indicates a certain species as the type.

Ectrichodia was founded by Lepeletier and Serville (1825, Enc. Meth., X, p. 279) for a single species, *viz.*, their previously described *Reduvius cruciatus* (= *Cimex crux*, Thunb., 1783), and this species must therefore be the type. *Ectrychotes* cannot stand, since it was avowedly an orthographical alteration of *Ectrichodia*, and was intended by Burmeister merely to replace that name. *Physorhynchus*, Am. Serv. (founded for *crux*, Thunb., *lucidus*, Lep. Serv., and *barbicornis*, Fabr.), is co-extensive (? syntypical) with *Ectrichodia*, Lep. Serv.

The following synonymy is therefore necessary :—

(L) RHIGINIA, Stål., 1859.

= *Ectrichodia*, Stål., 1874; Leth. Sev., 1896,
type, *crudelis*, Stål = *ruficolis*, Stål.

(B) LARYMNA, Stål, 1859.

= *Loricerus*, Hahn. (p.p.), 1831 (invalid as not described, also name preoccupied).

= *Ectrychotes*, Leth. Sev., 1896,
type *albipennis*, Guer., = *violacea*, Hahn.

(V) *Ectrichodia*, Lep. Serv., 1825.

= *Loricerus*, Hahn. (p.p.), 1831, not described.

= *Ectrychotes*, Burm., 1835.

= *Physorhynchus*, Am. Serv, 1843; Leth. Sev., 1896.

= *Hæmatorrhophus*, Stål, 1874.

Type, *crux*, Thunb. = *cruciatus*, Lep. Serv.

ECTRICHODIA HORRENDA, sp. nov.

Shining, smooth, polished, the abdomen rugose only on the connexiva and on the 6th abdominal segment above and sparingly on the 3—5th segments above laterally. Apical margins of abdominal segments 1—4 serrulate along their entire length. Pro-notum constricted at the basal fourth. Anterior femora with one strong spine in the middle beneath, intermediate femora with two rows of two, posterior with a double row of one. Beneath, smooth, polished. Pro- and meso-sterna sulcate, the sulcation transversely striate. Meta-sternal tubercle lightly carinate.

Long. 22½—23 mill. ; lat. 10½ mill.

INDIA : (Colls., Edwards and Kirkaldy).

Upper surface bronze-green ; legs (except coxæ), sterna, &c., violet-black. Ventral surface greenish-black.

Distinguished by the colour and the comparative smoothness of the abdominal segments above.

E. LINNÉI, Stål.

Ectrichodia linnéi, Stål, 1859, O. V. A. F., p. 178, ♂ macr.

† *E. discrepans*, Walker, 1873, Cat. VIII, p. 46, ♂ macr., ♂ ♀ apt. (*nov. syn.*).

Physorhynchus linnæi and *tuberculatus*, Stål, 1874, Svensk, daka. Handl., p. 49; Reuter, 1881, Act. Sci. Fenn., XII., p. 32. ♂ ♀ apt. (*nov. syn.*).

The pilosity of the antennæ is a sexual character, and the difference in the structure of the pro-notum (in '*linnéi*' and '*tuberculata*') is doubtless due to the fact that *linnéi* represents the macropterous form, and *tuberculata* the almost or quite apterous form. I have examined a series of *Ectrichodia* in the British Museum, and have now before me 2 ♂ ♂ *linnéi* and three quite apterous ♀ *tuberculata*; I have no doubt but that they are the same species. They are all from Ceylon. The colour of the connexiva varies somewhat; in some individuals entirely bright scarlet, in others black with a sharply defined narrow exterior margin of scarlet, while in others the colours are confused, a neutral tint occupying the greater part of the connexiva.

Family GERRIDÆ.

A synoptic revision of the Oriental Gerrinæ (*Gerris*, *Cylindrostethus*, *Ptilomera*, *Metrocoris*, &c.) is nearly completed, and I ask Oriental Collectors to favour me with their duplicates (a few of each in alcohol, if possible). I want particularly fresh examples of *Gerris fluviorum*, Fabr. (? = *armatus*, Spin.).

Family PYRRHOCORIDÆ.

DYSDERCUS, Am. Serv.

A number of species have been recorded from the Oriental Region, but have not yet been revised on structural characters. The worker in India and Ceylon will probably be correct, however, in referring his captures to D. CINGULATUS (Fabr.). The principal synonyms are appended:

D. CINGULATUS (Fabr.).

Pl. A, figs. 11 and 12.

= *Cimex cingulatus*, Fabr., 1775, Syst. Ent., p. 719.
= *C. kœnigi*, Fabr., l. c., p. 720.
= *Lygæus olivaceus*, Fabr., 1798, Ent. Syst. Suppl., p. 540.
= *Pyrrhocoris kœnigi*, Hahn., 1834, Wanz. Ins., II, fig. 122.
= *P. poecilus*, H. Schäff, 1844, l. c., VII, fig. 699.
= *L. solenis*, H. Schäff, l. c., fig. 700.
= *P. pyrrhomelas*, H. Schäff, l. c., fig. 702. (*nov. syn.*)
= *Dysdercus Sidae*, Montr. 1861 Ann. Soc. Ent. France p. 68. (*nov. syn.*)

Normally (in Ceylon) deep scarlet ; antennæ (except the base of the first segment), eyes, membrane and a spot of variable size on the corium, tibiæ, tarsi, &c., black ; anterior margin of pro-notum pale yellowish-red. Sterna and venter adorned with ten transverse white stripes. In some examples the femora and the sublateral stripe on the anterior part of the pro-notum are more or less blackish ; in others the elytra, pro-notum, &c., are yellowish or yellowish-green instead of red.

Long. ♂ 10—14 mill., ♀ 14—16 mill.

India : Cawnpore, Seringapatam, Cossipore, Kirkee, &c. Ceylon : Peradeniya, Hambantotta, Pundaluoya, &c. Java, Sumatra, Borneo, New Guinea, Cochin China, China, Philippines, New Caledonia, New Hebrides, Loyalty Islands, Australia, &c. Principally from Cotton (*Gossypium herbaceum*), but also recorded from Bottle Gourds (*Lagenaria vulgaris*), Muskmallow (*Hibiscus abelmoshus*) and Cabbage (*Brassica oleracea*).

The genus *Dysdercus* is well known for the injury it causes to Cotton, though more notorious perhaps in the New World than in the Old. In the former, *D. suturellus* (Schäff) and *D. andreæ* (Linn.), and in the latter, *D. cingulatus* (Fabr.), are "cotton-stainers." Having received nymphs in three instars from Mr. Green, I have been able to construct a skeleton life history of the last-named, filling in some of the gaps from the details known of the American species (15) ; but as a good deal still remains to be done, and I hope to be able to examine other stages later on, the instars actually examined have not been described here. It may, however, be interesting to note that these three stages are apparently structurally separable from the corresponding stages of *D. suturellus*, figured and described by Riley and Howard.

Family Lygæidæ = Coreidæ auctt.

Sub-family Neidinæ.

= Berytidæ, Leth. and Sev.

Huebertiella, gen. nov.

Cardopostetho, Fieberi affinis, capite supra convexo, rostro meta-sterni marginem apicalem attingente, segmento-primo capite breviore. Pronoto posterius elevato, tuberculato posterius ; meso-sterno ac meta-sterno sulcatis orificiis, meta-sternalibus permagnis. Scutello brevi, subhemisphæricali, spina longa ac curvata basim terminata. Typo *H. cardamomi*, Kirk.

(15) *See* Riley and Howard "The Redbug or Cotton-stainer," 1889, Insect Life, I, pp. 234—42.

Head above convex, arched, prolonged in front over the frons; rostrum reaching to apical margin of meta-sternum, basal segment shorter than head, reaching about as far as base of ocelli. Antennæ: first segment twice as long as second, third one-third longer than second and one-half longer than fourth which is thickened. Pro-notum posteriorly elevated, trituberculate posteriorly, also tricarinate, the carinæ not reaching the sinuate posterior margin. Meso-and meta-sternum sulcate, meta-sternal pneustocera (16) very large. Scutellum short, subhemispherical, terminated basally by a long, curved spine. Tarsi trisegmentate, first segment longer than the other two together, third longer than the second.

Apparently allied to *Cardopostethus*, Fieb., but differing in the points enumerated.

H. CARDAMOMI, sp. n.

Pl. X, fig. 16, and Pl. C, fig. 5.

Head and anterior lobe of pro-notum brown with yellowish hairs, posterior lobe yellow with large golden punctures; antennæ and legs yellow, thickly granulated with black; fourth segment of antennæ black except at the apex. Eyes black. Head beneath and sterna blackish with yellow hairs. Elytra hyaline, membrane infuscated. Abdomen dorsally pale red-brown; ventrally the same colour with an obscure sublateral fuscate line, the whole thickly covered with very short pale hairs.

Long. 6 mill.

CEYLON: Pundaluoya (June 1898, E. E. G.) "Common on the under-surface of leaves of Cardamom, *Elettaria cardamomum*" (E. E. G.).

Sub-family HYGINÆ.

= Lybantaria, Stål, 1873.

DISTANTIDEA, gen. nov.

Colpura, Berge, affinis, sed magis depressa; capite subporrecto, multo longiore quam inter oculos latiore; rostro longissimo, segmento primo pone capitis basin distincte extenso; antennarum segmento quarto tertio multo breviore. Pronoti marginibus lateralibus apicem versus inerscutello plano. Elytris completis, membranæ venis furcatis, hic et illic mibus; anastomosantibus. Femoribus posticis nec inerassatis nec denticulatis Abdomine sulco destituto. Typo *D. vedda*, Kirk.

(16) "Athemhörner" of Fieber 1870, Wien. Ent. Mon. III, 207, but they appear to be the orifices of the stink glands.

Depressed, head subporrect, much longer than wider between the eyes; juga and tylus well produced; slightly constricted behind the eyes. Eyes prominent, globose, situated at some distance from the base of the head. Ocelli distinct, nearer to the eyes than to one another. Antennæ slender, long (except the shorter, subincrassate fourth segment); rostrum very long, first segment extending distinctly beyond the base of the head. Lateral margins of pro-notum unarmed, but slightly prominent anteriorly; scutellum unarmed. Meso- and meta-sternum widely and deeply furrowed, elytra complete, nervures of the membrane fumate, here and there anastomose. Posterior femora neither incrassate nor denticulate. Apical angles of the abdominal segments obsoletely prominent; abdomen ventrally not sulcate. Connexiva extending beyond lateral margins of the elytra. This remarkable genus, which is named after my friend, Mr. W. L. Distant, to whose labours so much of our knowledge of Oriental Rhynchota is due, appears to be very distinct both in structure and facies from any other Lybantine.

D. VEDDA, sp. n.

Plate A, fig. 15, and Plate C, fig. 3.

Finely and coarsely granulate and covered with short golden pubescence. Tylus very slightly longer, and much more elevated than the juga; antennæ (inserted at sides of head between the apex and eyes, distant from either) four and a third times longer than the head; second segment one-half longer than the first and one-third longer than the third, which is two-thirds longer than the fourth. There is a transverse furrow in front of the eyes, and at right angles to it, a short, longitudinal median furrow which forks right and left in semicircular furrows. Lateral margins and base of pro-notum sinuate, the former reflexed. First segment of anterior tarsi one-fourth longer than the second and third together; third twice as long as second apex of corn imacute.

♂ Rostrum reaching to apex of 6th segment; connexiva more parallel-sided, not extending far beyond lateral margins of elytra, which generally extend as far as apex of abdomen. Long. 16 mill.

♀ Rostrum reaching to apex of 5th segment; abdomen laterally rounded, connexiva extending farther beyond lateral margins of elytra which do not in general extend so far as the apex of the abdomen. Long. 19½—20 mill.

Pale fuscous, mottled and spotted with dark fuscous and black. Base of 2nd and 3rd middle of 4th antennal segments pale greenish, testaceous. Connexiva and legs banded with dark fuscous, pale fuscous, and testaceous. Base of elytra narrowly sanguineous (concealed by pro-notum); membrane pale purplish-brown, at the base pale fuscous with four large irregular black spots. Venter sordid fuscous, with a broad blackish sublateral longitudinal band; spiracles pallid-bordered. Abdomen dorsally sanguineous.

CEYLON: Kandy (E. E. G. XI, 1897.—) Collns., Green and Kirkaldy. The types (♂ ♀) have been placed in the British Museum.

Sub-family BRACHYTINÆ.

= Daladeridæ, Leth. and Severin.

BRACHYTES BICOLOR, Westw.

Plate A, fig. 13, and Plate C, fig. 4.

The type of the genus, occurring in India and Ceylon. Specimens were sent me by Mr. Green, with the information that they were "swarming in a tangled mass of *Asparagus falcatus*" in the Royal Botanic Gardens at Peradeniya [Reg. No. 10]. "During the daytime they congregate in a mass in the very centre of the plant." The stinkglands in the imago emit a "strong—rather sweet—scent of Jargonelle," which perfumed the alcohol in which the specimens were preserved, and the bugs themselves retained the odour for several weeks after transference to my cabinet.

Three nymphs were also sent, which, despite the difference in their size and in the development of the wing cases, clearly belong to the same instar, doubtless the last. One of the larger is depicted on Pl. 1, fig. 14, and the following description is added :—

Head, antennæ, legs, &c., strongly granulate. Head sulculate anteriorly just behind and between the antenniferous tubercles which are stout and very prominent. Second segment of antennæ one-half longer than first, very slightly longer than third which is very slightly longer than fourth. Rostrum reaching to apical margin of meso-sternum. Pro- and meso-notum very narrowly and superficially sulculate longitudinally, the former sparingly granulate, more strongly laterally and posteriorly. Pro-notum widened and elevated posteriorly 2½ times as wide posteriorly as anteriorly; lateral and posterior margins sinuate: apex of elytral cases reaching (in the largest specimen) to about the middle of the second abdominal segment. Each of the femora

with a small spine near the apex. Tarsi 2-segmentate, the segments subequal. Abdomen notably rounded laterally, twice as broad across centre as the pro-notum between posterior angles; finely and sparingly granulate above, also very closely punctured *beneath* the nymph-skin; apical margin of second segment very slightly and narrowly excavated medianly, third and fourth narrowly, but deeply, excavated, a large glandflap being present (17), 5th sinuate widely, but superficially, 6th roundly and superficially excavate. Three genial segments present, the third truncate posteriorly. Spiracles large, round near the lateral margins of the abdomen.

Long. (No. 1) 11½ mill., (Nos. 2 and 3) 18 mill.; lat. (No. 1) 7 mill., (Nos. 2 and 3) 11 mill.

Somewhat dull scarlet, lighter on abdomen. Antennæ, lateral margins of head, lateral and posterior margins of pro-notum, legs (except coxæ), lateral margins of wing-cases, apical margins of abdominal segments, stinkgland flaps, and lateral margin (in part) of abdomen black.

Sub-family MYODOCHINÆ.

Myodochus, Latr.

The type of this genus was fixed by Leach in 1815 as *tipuloides* (de Geer), although authors have almost to a man accepted for this position *serripes*, a totally different bug, belonging indeed to another family, and despite the fact that *serripes* is not an original species and therefore cannot, under any circumstances, become the type of the genus. The following synonymy will be noteworthy :—

1. Family GEOCORIDÆ = Lygæidæ, Auctt.

Genus CHIROLEPTES, Kirby, 1837.

= *Myodochus*, Oliv., 1811.

= *Myodocha*, Auctt.

Type *raptor*, Kirby = *serripes* (Oliv.).

2. Family LYGÆIDÆ = Coreidæ, Auctt.

Genus MYODOCHA, Latr., 1807.

= *Leptocorise*, Latr., 1825.

= *Leptocorisa*, Latr., 1829, et auctt.

Type *tipuloides* (de Geer).

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(17) From the abdominal glands, these nymphs "pour forth a viscid, brownish-orange, stinking fluid which dissolves readily in alcohol, staining it the colour of Iodine."—(E. E. G. *in litt.*, Oct. 24, 1899.)

The well-known rice-pest, formerly termed *Leptocorisa acuta* (Thunb.), belongs to this genus, and should now be known as *Myodocha acuta* (Thunb.).

Localities.

Dundubia spinosa (Fabr.), British Borneo (a fine ♂ of the var., with somewhat spotted tegmina, expanding 137 mm., Coll., Edwards).

Phymatostetha stellata (Guér), British Borneo (Coll., Edwards).

Cosmoscarta octopunctata (Am. Serv.), BritishBorneo (Coll., Edwards).

Aspongopus brunneus (Thunb.). CEYLON: Pundaluoya (Sept. 1897, E. E. Green, one specimen), not previously recorded from Ceylon.

ADDENDUM.

On p. 49, *Polydictya Krisna* was described (Pl. A., fig. 4). Although according with the short descriptions of Burmeister and Stål, it is evidently not a true *Polydictya*; the latter genus having much broader elytra and wings (the latter also more lobate) and a differently shaped head, while the wings are much more densely reticulate. It is therefore necessary to erect a new genus.

THAUMASTODICTYA.

Vertice oculis circiter quadruplo latiore, basi leviter obtuse emarginato. Fronte aeque lata ac longa, basi obtusa, levissime reflexe, processu destituta, marginibus lateralibus sat sinuatis, sursum subangustata, apicem versus utrimque sublobata; basi obtusangulato, apice ampliata et clypeo distincte latiore. Elytris apicem versus paulo ampliatis, triplo longioribus quam mediatim latioribus, reticulatis Venis duabus clavi posterius in unam conjunctis, hac vena pone apicem apertum clavi; longe continuata. Alis reticulatis.

Tibiis anticis hand dilatatis, femoribus longitudine fere aequalibus.

Type T. KRISNA (Kirkaldy).

† *Polydictya Krisna*, Kirk, 1902, J. Bomb. Nat. Hist. Soc., XIV, p. 49. Pl. A, fig. 4.

EXPLANATION OF PLATES.

Plate A.

1. *Pyrops maculatus* (Olivier), 1ª head in profile.
2. *P. coccineus* (Walker), 2ª head in profile.
3. *Zanna dohrus* (Stål), 3ª head in profile.
4. *Thaumastodictya krisna* (Kirk).
   (= *Polydictya krisna*, Kirk, olim.)
5. *Flata ocellata* (Fabr.).
6. *Thaumastomiris sanguinalis* (Kirk).
7. *Berta lankana* (Kirby).
8. *Hyalopeplus rama* (Kirby).
9. *Isabel ravana* (Kirby).
10. *Disphinctus formosus* (Kirk).
11. *Dysercus cingulatus*, var. *olivaceus* (Fabr.).
12. *D. cingulatus* (Fabr.).
13. *Distantidea vedda* (Kirk).
14. *Brachytes bicolor* (Westw.).
15. „ ultimate instar of nymph.
16. *Hubertiella cardamomi* (Kirk).

Plate B.

1. *Dichoptera hampsoni*. Distant—tegmen.
2. *Pibrocha egregia* (Kirby) „
3. *Pundaluoya ernesti* (Kirby) „
3*a*. „ antenna
4. *Thaumastomiris sanguinalis* (Kirk.), head.
4*a*. „ elytron.
4*b*. „ wing.
5*a*. *Berta lankana* (Kirby), head.
5*b*. „ elytron.
5*c*. „ wing.
6*a*. *Hyalopeplus rama* (Kirby), head in profile
6*b*. „ elytron.
6*c*. „ wing.
7. *Isabel ravana* (Kirby), elytron.

Plate C.

1. *Isabel ravana* (Kirby).
1*a*. „ antenna.
2. *Displinctus formosus* (Kirk), elytron.
2*a*. „ wing.
3. *Distantidea vedda* (Kirk), wing.
4. *Brachytes bicolor* (Westw.), wing.
5. *Hubertiella cardamomi* (Kirk), elytron.
5*a*. „ wing.

NOTES ON THE HOG DEER IN BURMA.

By Veterinary Captain George H. Evans, A.V.D.

(*Read before the Bombay Natural History Society on 18th Feb.*, 1902.)

(*With 2 Plates.*)

CERVUS PORCINUS.

Burmese names.—Dayai or Daral.

Hog deer are plentiful in many parts of Lower Burma, particularly so on the grassy plains and grass-covered islands in the delta; they are also met with in suitable localities in Upper Burma, and are numerous on the Pedaing Plain, Myitkyina District, where, I understand, many may be seen out grazing in the early mornings and evenings.

They are confined to the plains, never, as far as I am aware, being found in the hills, or in heavy jungles, though they will frequent grass land in open jungle. They are often found in the belts of long grass, seen on the banks of some rivers, and many inhabit the stretches of grass and mangrove jungle near the sea. In my experience, wherever Thetkai grass (*Imperata cylindrica*) abounds, they show a preference for it, possibly because not being so dense as the Kaing (*Saccharum spontaneum*), it is cooler; but where grounds are much disturbed, they take shelter in the heaviest elephant grass cover available. Though many deer of both sexes may live in a particular stretch of grass country, they never, as far as I know, collect in herds, but are generally found solitary, though at times two or three may be put up not far apart, or may even be seen grazing together.

As a rule, they graze from about 5 p.m. till 7 a.m., though in secluded and undisturbed localities they may begin to feed earlier, and leave off later. I have never found them grazing far from cover, apparently preferring to keep to the small hidden glades or kwins, and the depressions or yôs, sometimes met with between patches of long grass.

The deer without doubt graze on the large kwins (plains) during the night, as their tracks may frequently be seen in such places in the early morning. Their food consists chiefly of grasses, such as Myet-za (*Cynodon dactylon*), the tender shoots of the Kaing, which springs up soon after it is fired, Doung Sa-ba, Nat Sa-ba or wild rice (*Oryza coartata*) and others. I have frequently found them grazing on a leguminous plant, the Nyan Bin (*Desmodium reptans*) which grows



Mintern Bros. Photo-engr. London.

THE HOG-DEER.

(Cervus porcinus)

luxuriantly in many places in Lower and Upper Burma, and to which brow-antlered deer are also partial. Burmans have informed me that hog deer will under cover of darkness enter cultivation if in the immediate vicinity of cover.

These animals usually go to water just before or shortly after dark. When returning to camp late in the evening, several deer may be put up in the grass leading up to the water-supply. During the day they lie concealed under the grass, and do not, like the Thamin stags, leave it to wallow in the mud and slush of drying up pools.

The hot weather (about the middle of March) is, perhaps, the best time of year to hunt them ; the greater portion of the heavy grass has by that time been burned, and the water-supply is limited. Hog deer may occasionally be stalked, but, in order to obtain such sport, a knowledge of all the likely places to find them is requisite ; these can then be visited during the early hours of the morning, and, with luck, one or two may be discovered grazing, in which case, with ordinary care, a successful stalk may be made, as they are not more difficult to approach than other deer. Shooting from elephants may also be tried, but as well-trained *shikar* elephants are distinctly rare over here, it cannot be recommended. I certainly have not had the good fortune to find one. A few years ago, a friend and I, being anxious to try this method, procured two elephants—ordinary timber-working animals ; the only thing to recommend them was that they stood fire fairly well, but were, nevertheless, nervous and easily scared. Having no howdahs, we were obliged to sit in ordinary Burmese elephant baskets which were most uncomfortable. The elephants afforded us plenty of excitement, and we obtained many shots ; but owing to their everlasting antics and the fact that we used rifles, the bags were extremely small. We hoped in the following year to make better arrangements, but were not given the opportunity, as some one stole the elephants. Other means had to be devised for circumventing them. After consultation with the *shikaris*, it was decided to construct a moderately high seat, or small platform, and to fix it into a bullock cart ; to lessen the effects of the terrible jolting, pillows (gunny bags filled with straw) were used. A steady pair of bullocks with a *shikari* as driver rendered this contrivance an admirable substitute for an elephant. Close, but not always easy, shots were obtained, and my experience is that a bolting hog deer is an uncommonly hard target to hit. The great objection to the use

of the bullock cart is that bullocks are so dreadfully slow over rough ground. Some hog deer lie so close as to get up almost under an elephant's feet or just in front of the bullocks. If a stag happens to be bolting in the direction of low grass near by, it is advisable not to fire, for, not infrequently after rushing for some thirty or forty yards, he may pull up for a few seconds, in which case an easy shot is obtained.

Stags may be decoyed to leave cover by imitating "calls," at which some Burmans are very clever. This is usually done by placing a blade of grass between the thumbs, closing the hands, and blowing into them. Professional *shikaris*, who go in for selling flesh to villagers, take every advantage of this method, and thus kill many deer. Another plan employed by the Burmans is as follows.—On a very dark night two or three men proceed to grounds frequented by deer. The leader carries a light on his head (the light is usually placed in a basket or pot with the front removed); this man also has bracelets, and at times anklets, to which small bells are attached. The confederates follow close behind. The tinkling of the bells no doubt attracts the attention of the deer who stands in astonishment at the glare of the light, and even advances towards it, and, when close enough, is cut down or speared. When Burmans were permitted to carry firearms, they shot the deer.

During the hot season, and also towards the close of the rains, villagers often hunt hog deer with dogs, so called Pegu hounds, and at times have excellent sport, as the deer cannot sustain a high speed for any length of time. I have known the dogs to run three deer down by 8 a.m. This form of sport is most exciting, but, unless one is in the "pink" of condition, owing to the heat the strain is too great on an European.

The name hog deer, no doubt, originated from their peculiar action when running which is certainly hog-like. When alarmed or disturbed they go off with a rush, galloping low, carrying the head well down, with the tail erect, and the constant bobbing of the tail is very often the only visible portion of the beast as he rushes wildly through the long grass. The Burmans believe that there are two kinds of hog deer—one they call the Dayai-pyauk (spotted), the other, Dayai-nyo (brown); the latter is said to be smaller than the former. For my own part, I do not believe the statement to be correct; and, in my opinion, the idea is founded on the fact that an occasional adult like many fawns is distinctly spotted.

The rutting season is April and May. Tame stags sometimes show a tendency to be vicious during this period. In the natural state, however, I do not think they can be very combative, for the simple reason that they do not collect in herds, and thus males have not to fight for the hinds ; and, further, if fights were of frequent occurrence, head with broken points would constantly be met with, whereas it is in my experience unusual to find an imperfect head.

The hinds, I think, commence to breed during their second year. The period of gestation is from six to seven months ; the young ones are born in the long grass during October and November. There is usually one calf at a birth. I have never heard of twins. In the gardens here the hog deer sometimes drop their young as late as March and April.

The majority of stags cast their antlers during the months of July and August, though some retain them as late as towards the close of September, and at the present time (20th October) there are three young stags in the gardens here still with their horns on (prongs), while all the old stags are showing from 2″ to 4″ of their new antlers in velvet. I have met with stags in velvet as late as the first week in March and one stag as late as the 3rd of May.

Description.—These deer are rather long in the body and low on the legs. The relative shortness of the fore limbs gives them a peculiar appearance, *i.e.*, they are low in front, the croup is slightly arched, and the hind legs are carried well under the body. The stags have neither mane nor ruff. Hog deer gallop low, and, when running, the tail is invariably erected by a strong muscle, in many animals curling so much as to touch the back. While moving in the open, the head is not carried low, as is the case when moving through cover.

Colour.—General colour darkish-brown, with a more or less decided yellowish or chestnut tinge, and a faint speckling or mottling through the coat. There is a certain similarity of the coat to that of the ordinary Indian mungoose. The under-parts and the legs from the shoulders and thighs down are much darker in colour than those of the upper parts of the body, and are especially marked in old stags. The colour of the hair on the under-surface of the tail, perineum, and inside thighs is white, as also is the hair lining the inside of ears and that of the chin. The colour of the hair covering the face and head is generally slightly paler than that of the body, while that surrounding

the orbits is often lighter. The cause of the mottling will be evident on examination of hairs from various parts of the body. In some parts the hairs will be noticed to be white at the base, then pale brown, then white, the tips being very dark-brown. There is, of course, considerable difference to the extent to which the alternate pale and dark rings are developed—for example, in the very dark stags the pale rings are very narrow indeed.

These deer show a remarkable tendency to develop spots through the coat. The young, like those of many other varieties of deer, are frequently menilled; but in this country, at any rate, it is by no means rare to find one or more adult stags and hinds distinctly spotted. The spots are so evident, and disposed in such a manner, as to give the animal the appearance of a small Cheetal (*Cervus axis*). I have also met with animals marked with pale brown spots disposed in rows on either side of a faint dorsal stripe. The spots in the coat are not constant in the same animal. I have from time to time kept these deer as pets; two stags were in my possession eight years—one, a very dark stag, only during one season showed distinct menilling, while the other stag during two or three seasons was almost as prettily spotted as a Cheetal. The spots appeared at the moult, and, as a rule, grew fainter and fainter till they almost or quite disappeared.

The ears are moderate in size, the eyes full and bright, and the muzzle rather narrow. The tail is long and covered with long hairs, some of the under white hair of the tuft being longer than the brown hair above.

Heads.—In size and shape the horns vary. Normally there are six points, *viz.*, those of the brow tines and terminal forks. The horns are very free of sports and snags, and are not rough or rugged.

The antlers are mounted on bony pedicles varying from 1″ to 2″ in length. The basal or brow tine is given off immediately above the burr, and is directed upwards so as to form a more or less acute angle with the beam. The beam generally runs up, taking a slight outward curve about a third to half of the way up; there are, however, many heads in which a few inches above the burr the beam takes a fine outward curve, thus giving the heads a beautiful sweep.

The upper tine is given off from the inner, and slightly towards the posterior surface of the horn, at about two-thirds the length of the beam with which it forms almost a right angle, and is directed usually



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THE HOG-DEER.
(Cervus porcinus)

more inwards than backwards. In some heads this tine springs more from the posterior than the inner surface of the beam, and in such cases it is usually directed backwards. The front tine of the fork, which is the continuation of the beam, is always the longer.

With regard to the size of heads, I should class antlers from 12″ to 14″ as good, anything between this and 20″ as very good, and any measurement over, exceptionally so. I have been fortunate in bagging some fine specimens of this deer, the best head measuring 23½″ on the outside curve.

The Burmans state that the stags develop prongs during their second year, when they are known as "Gyo-soo," *i.e.*, needle points, and that the full number of points are not acquired till they enter their fourth year, when they are described as "Gyo-hnit-kwa" (referring to the terminal fork).

The voice of the Dayai stag is a rather sharp, short bleat; that of the hind is more plaintive.

Height.—23″ to 26″.

The following are measurements taken of four ordinary stags and one hind. Nos. 1 and 4 were spotted, and Nos. 2 and 3 without spots, and in better condition than No. 1 :—

	♂ 1	♂ 2	♂ 3	♂ 4	♀ 5
Height at shoulder	24½″	26″	27″	25½″	24½″
Girth behind shoulder... ...	32¼″	33½″	32½″	28½″	29½″
Girth base of neck	19″	...	20″	...	...
Length from muzzle to dock ...	41″	42½″	49″	48″	46½″
Length of tail	...	...	4½″	6¼″	4″
Do. with tuft ...	6½″	7⅝″	6″	9½″	7″
Length of head	...	...	11″	9⅛″	10⅛″
Breadth between eyes... ...	3″	...	3¼″	3½″	3″
Horns	14½″	11⅝″	Velvet.	6″	*Nil.*

I have to thank Mr. D. J. Morrison for the accompanying photograph of a typical pair of horns of the hog deer, and Mr. W. Stikeman for the picture of a dead specimen of this species.

THE EARWIGS OF CEYLON.

By Malcolm Burr.

With Plates A., B. (*reproduced by permission of the Entomological Society of London*).

(*Continued from page* 78 *of this Vol.*)

LABIDURA, Leach.

Body stout, flattened in front; abdomen convex; antennæ with more than twenty segments. Elytra and wings well developed, the latter sometimes absent by aberration; first tarsal segment equal to the other two. No lateral tubercles on the abdomen. Second tarsal segment simple. Forceps, ♂, with the branches remote at the base, simple, slightly arcuate, toothed on the inner margin in some species; in the ♀ simple, straight, conical, incurved at the tip.

Labidura, Leach., 1815, Edinb. Enc., ix., 118.
Dohrn, 1863, Stett. Ent. Zeit, xxiv., 309. Borm. 1900, Forf. 31.

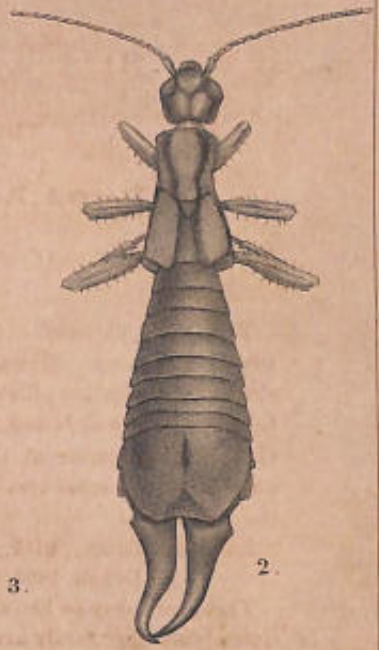
This genus may be known by its long antennæ, well developed wings and elytra (only very rarely are the wings abortive).

Table of Species.

1. Size middling or large. Colour red or reddish-brown.
   Forceps toothed on the inner margin in the ♂; pronotum with hinder border straight, with the angles rounded.
   2. Abdomen dilated near the apex in a straight line from the shoulders of the elytra to the bases of the forceps ..... 1. *RIPARIA*, Pall.
   2·2. Abdomen strongly dilated at the apex, but not in a straight line from the shoulders of the elytra. The anal segment is always very considerably dilated ..... 2. *BENGALENSIS*, Dohrn.
1·1. Size very small. Colour dull-fuscous. Forceps not toothed on inner margin in the ♂. Pronotum regularly rounded entirely behind ..... 3. *DUFOURII*, Desm.

LABIDURA RIPARIA (L).

Reddish-testaceous; antennæ paler. Pronotum with the margins pale, the posterior margin slightly rounded. Elytra reddish on the inner margin. Wings not very prominent, or not even projecting, pale. Feet pale. Abdomen dark above and beneath, the sides somewhat paler, all the segments rugose, slightly hairy on the hinder margins. The pygidium is flat and depressed. In the ♂ the anal segment is slightly depressed in the centre








1. 2. 3. 4. 5. 6. 7. 8. 9.

Z. H. J. Schuster del. Mintern Bros. lith. London.

CEYLON FORFICULARIA

above, with a small tubercle on each side at the insertion of the forceps, the hinder margin with two teeth, or rarely unarmed; the branches of the forceps testaceous, darker towards the apex, remote at the base, slightly curved, upwards towards the apex, and inwards; the whole inner margin is denticulate, and armed with a large tooth beyond the middle. In the ♂ the anal segment furnished with two tubercles, the posterior margin smooth, the branches of the forceps are not contiguous, curved gently inwards, unarmed, denticulated all along the inner margin.

This species varies very considerably in size, colour, and armature of the forceps.

	♂	♀
Length of body	13-19 mm.	13-19 mm.
„ „ forceps	6-11	4·5-6

Forficula riparia, Pallas., 1773., Reisen., II., Anhang 727.
Labidura riparia, Dohrn, 1863, Stett. Zeit. XXIV., 313.
Scudd., 1876, Ent. Notes, V., 63.
Brunner, 1882, Prod., Our. Orth., 5, fig. 1.
Borm. 1900, Forf. 33.
Forficula gigantea, 1 Fabr. 1793. Ent. Syst. II,
Fischer, 1853, Orth. Eur., 65., tab. L., fig. 1, 1a—f.

The references to this species in literature are so numerous that I have only given the more important. Brunner and Scudder give the full synonymys. It is a species which varies to such an extent that it has been quoted under very many names, such as *pallipes*, *dentata*, *bilineata*, *maxima*, *bidens*, *crenata morbida*, *bicolor*, *fischeri*, *herculeana*, etc., and others.

It is a cosmopolitan species, but probably Palæarctic in origin. Mr. Green has given me a specimen from Ambegammoa, February, 1899, where it was found in a bungalow. Its natural haunts are the banks of rivers, and shingle by the sea-shore.

Dohrn gives a synopsis of its varieties with their synonymy, and de Bormans gives to subspecies.

LABIDURA BENGALENSIS, Dohrn.

Large, reddish. Head dark-red, the eyes black, and antennæ paler. The pronotum square, with rounded angles, slightly narrower than the head, black. Elytra broad, well developed, black, with a bright chestnut stripe on each along the suture. Wings projecting well beyond the elytra, pale-testaceous, dark at the apices on the inner margin. Feet uniform testaceous. Abdomen dark-red, smooth. In the ♂ it is dilated considerably towards the apex; the anal segment is very large and smooth, armed with two indistinct tubercles at each side at the base of the branches of the forceps; in the ♀ the abdomen is cylindrical, not dilated. Beneath it is pubescent above bare in ♀. In the ♂ the forceps are stout, the branches widely distant at the base, slightly diverging at first, then gradually converging inwards until they almost meet at the apices, armed with a tooth on the

inner margin near the base, and two or three blunt denticulations in the ipræ-apical third ; the branches are reddish, but darker at the apex. In the ♀ the branches are stout, not contiguous, straight, reddish at the base, black at the apices where the points curve in and meet ; they are armed with strong denticulations throughout their length. ♂ ♀.

	♂	♀
Long. corporis.....	22-26·5 mm.	19·5-22·5 mm.
„ forcipis	9-2·5	7

Labidura bengalensis, Dohrn, 863, Stett. Ent. Zeit., xxiv., 312.
Borm. 1900, Forf. 33.

Psalis bengalensis, Scudd, 1876, Ent. Notes, V., 67.

Habitat.—Bengal (Dohrn).

In the Brussels Museum there are two males and one female labelled "Ceylon." They seem to be larger and finer than specimens from Calcutta.

LABIDURA LIVIDIPES, Duf.

Small, dark castaneous, the whole body pubescent. Antennæ with 17-21 segments. The pronotum is more or less elongate, the lateral margins pale, sometimes bluish. The elytra are long, the posterior margin truncated, fuscous. The wings are fuscous, prominent, sometimes thinly bordered with light-blue. Sternum pale ; feet shining, pale, the femora darker towards the apex. In the ♂ the anal segment is plain and unarmed, the branches of the forceps are not curved upwards, not very long, incurved to meet at the apices, with a small tooth on the inner margin, at the apical third. In the ♀ the branches of the forceps are not contiguous, unarmed on the inner margin.

	♂	♀
Length of body.....	8-9 mm..	...8 mm.
„ „ forceps.....	2·3-3·2	2·2

Forficula lividipes, Dufour, 1828, Ann. Sci. Nat. XIII, 340.

Forficula dufourii, Desmarest, 1820, Faune franc., Orth., pl. I., fig. 27.
Scudd., 1876, Ent. Notes, V., 62.

Forficula pallipes, Duf., Ann. gén. des sc. phys. de Bruxelles, VI., 316, tab. 96, fig. 7, a,b.

Labidura pallipes, Dohrn, 1863, Stett. Ent. Zeit., XXIV., 317.
Bol., 1878, Ort. de Esp., 22, tab. I., fig. 9, a, b.

Labidura lividipes, Borm. 1900, Forf. 36.

Forficesila meridionalis, Serv., 1839., Orth., 26.

Forficula (Labidura) meridionalis, Fisch., 1853, Orth. Eur., 67, tab. 6, fig. 3a.
Fieb., 1853, Syn., 72, Erganzungsbl. Lotos., V., 90.

Forficesila vicina, Luc. 1846, Expl. de l' Alg. Orth., p. 5, tab. I., fig. 2.

Labidura dufouri, Brunner, 1882, Prod. Eur. Orth., p. 7.
Borm., 1888, Ann. Mus. Civ. Gen. (2), vi., 434, id., 1894 op.cit. (2), xiv., 378.

This is another cosmopolitan species, originating almost certainly from the Mediterranean Subregion. I have received numerous examples taken in Ceylon by Mr. Green, and it is common also in India and in Burmah. It occurs in fact in all tropical districts, where it has been spread by shipping.

Punduloya, Chilaw, xi., 97, caught at light.

ANISOLABIS, Fieb.

Body long and slender. Colour black, shining, varied with testaceous or reddish. Antennæ with about 20 segments, first and third tarsal segments of about equal length. Elytra entirely absent or represented by barely distinguishable rudiments. Wings entirely absent. Lateral plications of the abdominal absent or very faint. Forceps short, stout, in the ♂, often strongly curved in, semicircular, with right branch more strongly curved than the left, or conical, strongly arcuate, pointed, not toothed ; in the ♀ the branches are contiguous, simple, conical.

Anisolabis, Fiebr., 1853, Lotos,, iii., 257.

This genus may be recognised by its shining black or very dark brown colour, total absence of organs of flight and simple forceps. The feet are usually testaceous, sometimes varied with black bands ; the antennæ often have white rings, but this is a very variable and unstable character.

de Bormans retains *Brachylabis*, Dohrn, for *B. punctata*, Dubr., and *B. chilensis*, Blanch.

Dohrn's names, *Forcinella* and *Brachylabis*, fall before the prior *Anisolabis*, Fieber.

TABLE OF SPECIES.

1. Mesonotum bearing rudiments of elytra. Forceps contiguous at the base ..... 1. *GREENI*, Burr.

1·1. Mesonotum with no rudiments of elytra.

2. Forceps, ♂, strongly incurved, remote at base. Size large, insects stout ..... 2. *KUDAGÆ*, sp. n.

2·2. Forceps of ♂ gradually incurved or nearly straight. Size smaller, more slender and narrower insects.

3·3. Antennæ and feet ringed ..... 3. *ANNULIPES*, Luc.

3·3. Antennæ and feet unicolorous ..... 4. *BRUNNERI*, Dohrn

ANISOLABIS GREENI, Burr.

Medium size. The body entirely very finely granulated, clothed with a few long pale hairs ; antennæ with fifteen segments, the pronotum square, slightly narrower than the head, very slightly broader posteriorly than anteriorly ; the mesanotum bears on each side prominent rudiments of elytra. Anal segment attenuated, sulcate in the middle, furnished with a small tubercle on each side above. The head is black and shining, the palpi and mouth parts brick-red ; antennæ with the first segment brick-red, the rest black, except the four apical segments which are pale. Thorax shining-black. Abdomen shining-black, reddish beneath. Feet brick-red, the tarsi testaceous ; the

femora banded with fuscous at the base and at the apex. Forceps black. In the ♂ the subgenital lamina is triangular, obtuse ; the branches of the forceps stout, contiguous, conical, unarmed, strongly decussating at the apex, the right branch curved more strongly than the left and above it. In the ♀ the subgenital lamina is obtuse and triangular ; the branches of the forceps straight, and stout, distant at the base with a small tooth on the inner margin in the middle, attenuated towards the apex, incurved, and touching, or slightly decussating.

Length of body, 11·5-13 mm ♂., 17 mm ♀ ;

„ of forceps 2 mm. ♂, 3·25 mm. ♀.

Anisolabis greeni, Burr., 1899, Ann. Mag. N. H. (7), IV, 257.

This handsome species, which I was very pleased to dedicate to Mr. E. E. Green, seems to be fairly common in Ceylon, especially at Punduloya, whence Mr. Green has sent me a good number of specimens at various times of the year ; it seems to be found chiefly under stones.

ANISOLABIS KUDAGÆ, sp. n.

Statura magna. Colore nigro, rubrescente ; antennæ fuscæ, basi atque apice rufo-annulatæ, 17-segmentatæ. Pronotum rectangulam, quam caput tam atque latum, postice paullo latius. Elytra nulla. Abdomen segmentis minutissime punctulatis, tuberculis lateralibus minimo impressis, vix vel haud distinguendis. Pedes fortiores. Abdomen apicem versus paullo dilatatum, apice ipso paullo attenuatum ; segmentum ultimum magnum, læve, medio impressum, quadratum. Forceps ♂ bracchiis basi valde distantibus, triquetris, fortibus, basi paullo dialatatis, valde incurvis, bracchio dextro quam sinistro fortius, superne sursum decussato. ♂. ♀ rectis subcontiguis, apice decussatis, margin interno denticulate ♂ ♀.

	♂	♀
Long. corporis.....	15·75 mm.	15 mm.
„ forcipis	3	3·5

Large ; colour shining-black, shading off into dark-red on the pronotum and abdomen.

HEAD shining-black ; antennæ with 17 segments ; the first and second red ; 15 and 16 inclining to lighter-reddish ; the remaining segments black. Mouth parts brown.

PRONOTUM square, slightly narrower anteriorly than posteriorly ; angles sharp, rectangular ; the sides slightly upturned, reddish ; about as broad as the head anteriorly ; posterior angles rounded ; there is a longitudinal impressed line which continues across the mesonotum. Mesonotum narrow with a median impressed line. Metanotum arched.

FEET stout, clothed with a few bristles, dark-fuscous, the tibiæ and tarsi paler, reddish.

ABDOMEN broadest at the sixth and seventh segments, black, with a red tinge the lateral tubercles extremely faint, barely distinguishable ; the segments are very finely punctulated. The last segment is not so broad and the

few immediately preceding smooth, with a median line, slightly broader than long, with a tubercular ridge at each side above the insertion of the forceps. Penultimate ventral segment completely covering the last, except at the angles, bluntly triangular, emarginate at the apex.

The FORCEPS, ♂, are stout, the branches, slightly dilated on the inner margin at the base with a blunt tooth-like tubercle above at the base, strongly incurved almost immediately, the apices crossing; the right branch is much more strongly curved than the left, and crosses above it. Seen from the sides the forceps are pointed somewhat strongly upwards.

The ♀ resembles the ♂ in size and colour; the abdomen also dilated and then attenuated posteriorly; the branches of the forceps are subcontiguous, stout, straight, curved upwards and decussating at the apex, the inner margins denticulated. In the ♀ I can distinguish no signs of the lateral abdominal tubercles.

Habitat.—Hatton, Ceylon, July, 1897 (O. O. W.)

This species approaches to *A. maritima* and *A. mauritanica* is the somewhat dilated abdomen and in the form of the male forceps. The absence of a bifid pygidium, and the more strongly curved forceps distinguish it from *A. rufescens*, Kirb., which seems to be closely allied. It is a noticeable species and not likely to be confused with others that occur in the island. The impressed line down the mesonotum gives it at first the appearance of possessing rudimentary elytra, but as the line is a continuation of the line on the pronotum, it can be seen that elytra are entirely wanting.

ANISOLABIS ANNULIPES, Luc.

Medium sized, black shining. Head black; antennæ with basal segment reddish, the rest greyish-brown, except the two penultimate segments which are whitish. Pronotum as broad as the head, sometimes paler in colour, quadrate; elytra entirely absent. Abdomen with sides more or less parallel, with no tubercles upon the sides of the second and third segments. Last dorsal segment larger than the others, slightly impressed in the middle. Feet testaceous, the femora banded with black, as are also the tibiæ. The depth and intensity of this banding varies very considerably. Branches of the forceps in the ♂ remote at the base, stout, strongly incurved, the right branch crossing above the left at the apex; in the ♀ the branches are straight, conical, subcontiguous.

Length of body ♂ 11mm..... ♀ 12-14 mm.

„ of forceps ♂ 2mm..... ♀ 3-3·5 mm.

Forficesila annulipes, Luc. 1847, Ann. Soc. ent. Fr. (2) V. Bull 84.

Anisolabis annulipes, Borm. 1900, Forf. 48. (q. v. for synonymy.)

Habitat.—This species is entirely cosmopolitan. From Ceylon I have received specimen from Mr. Green from Pundaloya and from Hatton.

It is difficult to distinguish the various small species of *Anisolabis*, especially if only females and undeveloped specimens are to hand. *A. annu-*

lipes differs from *A. brunneri* in having the antennæ ringed with white, and the feet with black; in *A. brunneri* they are uniform in colour. A similar species is *A. Stali*, in which rudimentary elytra may be detected.

ANISOLABIS BRUNNERI, Dohrn.

Piceous, the head black; clypeus and labrum dark, the rest of the mouth parts and the antennæ basal segments ferruginous, the rest of the antennæ greyish-brown; pectus and feet dirty-testaceous; abdomen posteriorly very shortly attenuated.

Length of body 12 mm, of forceps 2 mm. ♀.

Forcinella brunneri, Dohrn., 1864, Stett. Ent Zeit., xxv., 291.

Anisolabis brunneri, Borm. 1900, Forf. 48.

I have received from Mr. Green from Punduloya some females which M. de Bormans has identified, with doubt, with this species.

BRACHYLABIS, Dohrn.

Body cylindrical, convex punctate, more or less pubescent. Antennæ with from 9 to 15 segments, segment 2 smallest, 3 equal to the two following, all segments stout; pronotum elongate, broader behind than before, broader than the head. Mesonotum strongly depressed on each side, forming thus an angled keel. Elytra and wings entirely absent. Femora elongated, especially the posterior pair. Abdomen with lateral tubercles very distinct. Forceps, ♂, with branches short, slender, equally incurved unarmed; ♀ branches slender, straight, subcontiguous, decussating.

Brachylabis, Dohrn, 1864, Stett. Ent. Zeit., xxv., 292.

Borm., 1883, Ann. Soc. Ent. Belg., xxviii,, 64.

This genus, as used by Dohrn, falls before the prior *Anisolabis*, but de Bormans retains it for *B. chilensis*, Blanch, which is the type *B. punctata*, Dubr., and *B. biforcolata*, Bol. It differs from *Anisolabis* in the form of the forceps, abdomen, thorax and distinct lateral tubercles.

B. punctata is found widely distributed in the Oriental Region and will probably turn up in Ceylon.

BRACHYLABIS PHILETAS, sp. n.

(*Philetas*, a historic dwarf).

Parva, nigra, punctata. Antennæ breves, 9 segmentatæ, 1 longo, fusco, 2 oblongo rufescenti, 3-6 nigris brevibus, rotundatis, 7-8 majoribus, rotundatis, albis, 9 breviori, rotundato, nigro. Mesonotum medio profunde transverse impresso, abdomen forcipeque typico; pedes testacei, femoribus late nigro-vittatis, tibiis tarsisque testaceis, segmentum primum tarsorum duobus sequentibus unitis longius. ♂ ♀.

	♂	♀
Long. corporis	6 mm	7·5 mm.
,, forcipis	1·25	1

Size small; colour black, the whole body punctulate, with a few stiff hairs

ANTENNÆ with 9 segments, black; No. 2 reddish, Nos. 7-8 white, the rest black segments 1 long, 2 shorter, the rest quite round, as broad as long, gradually; larger, the ninth a little smaller than the eighth, which is the largest.

PRONOTUM broader than the head, elongate, trapezoidal, the sides raised; mesonotum narrow, strongly impressed anteriorly, the posteriorly part being therefore slightly elevated, the sides are keeled and the anterior angle slightly broader than the pronotum; metanotum as broad as the mesonotum, and exposing only a small part of the first abdominal segment.

FEET long; tibiæ and tarsi testaceous; femora testaceous, with a strong broad black band; first tarsal segment longer than the second and third together; abdomen cylindrical, the lateral tubercles very distinct on the second and third segments; last segment very small in both sexes.

FORCEPS very short, slender; in the ♂ the branches, are remote at the base, slightly incurved, meeting at the apex, unarmed; ♀ subcontiguous, almost straight, crossing at the apex. ♂ ♀.

Habitat.—Pundaloya, Ceylon, ♂ and ♀ in coitu (E. E. Green).

This little species is considerably smaller than *B. punctata*, from which it may be distinguished by its deeply impressed metanotum, much shorter and rounder antennal segments; it may be separated from *B. bifoveolata*, from Trichinopoly, by the presence of tubercles on the second as well as the third abdominal segments, by its smaller size, black banded femora, and shorter antennæ. The 9-segmentate antennæ with very small round segments are characteristic.

The extreme brevity of the antennæ led me at first to consider them mutilated, but Mr. Green writes that when freshly taken the "penultimate and antepenultimate" were white.

FORCIPULA, Bol.

Large insects. Abdomen with segments on each side tuberculate or spined; branches of the forceps very long, little shorter than the body, slender, smooth or finely denticulate, nearly straight, the apices crossing in the ♀, strongly incurved in the middle, then straight and parallel, then incurved at the apex, sometimes with a strong internal tooth in the male.

Forcipula, Bol., 1897, Ann. Soc. Ent. Fr., p. 283.

This genus which can be easily recognised by its form and the shape of the forceps, and especially by the tubercles or spines on its sides, included the large spiny earwigs previously referred to, *Labidura*, to which it is otherwise closely allied.

FORCIPULA QUADRISPINOSA, Dohrn.

Dark or castaneous; abdominal segments (in the ♂) Nos. 2-5 with strong lateral spines; forceps long, the branches distant at the base, gently curved, keeled above, flat beneath, denticulated on the inner margin, with a strong tooth in the middle, then attenuated, almost parallel, curved in at the apex. Head black or dark-brown; feet brown or yellowish, the ends of the

femora and the bases of the tibiæ darker, the tarsi and end of the tibiæ clear-yellow. The general colour of the upper surface varies from brownish-black to reddish-brown. Length of the body 15-18 mm., of the forceps 9-12 mm. ♂.

Habitat.—Eastern India; Tranquebar (Dohrn); Madras (Mus. Hope); Ceylon (Dohrn).

I have never seen specimens of the fine earwig from Ceylon. It should be sought for under stones in damp places.

Labidura quadrispinosa, Dohrn, 1863, Stett. Ent. Zeit., xxiv., 310.
Scudd., 1876, Ent. Notes, V.
Borm., 1882., Ann. Mus. Civ. Gen. (2), vi., 434, id. op. cit., 1894, xiv., 377.

Forcipula quadrispinosa, Bol., 1897., Ann. Soc. Ent. Fr., 283.
Borm. 1900, Forf. 30.

LABIA, Leach.

Size small. Body flattened, slender; antennæ with 10-15 segments, the segments conical; elytra well developed; wings usually well developed. First and third tarsal segments equal, the second very small, simple. Second and third abdominal segments with lateral tubercles; forceps usually short, slender, the branches remote at the base in the male, arcuate, horizontal, simple in the female, straight and crossing at the apex.

Labia, Leach, 1815, Edinb. Enc., ix., 118.

This genus may be generally recognised by its small size. A universally distributed and closely allied genus is *Spongophora*, Serv., they may be separated as follows.

Labia.—Antennæ with 10-15 segments, which are short, distinctly conical, that is to say, considerably larger at the apex than at the base. The first tarsal segment is slightly longer than the third, or equal to it; the second cylindrical and very short. Penultimate ventral segment ♂ rounded, *Spongophora*. Antennæ with at least 15 segments, these, except the fourth, short and conical, nearly cylindrical; first tarsal segment considerably longer than the third; the second cylindrical but slightly longer than in *Labia*. Penultimate ventral segment ♂ nearly rectangular (after de Bormans).

LABIA MUCRONATA, Stål.

Very small. General colour dark-brown. Head shining black. Antennæ yellowish, darker towards the apex, with 14 segments. Pronotum quadrate, narrower than the head, black, the sides paler, the angles rounded, slightly broader posteriorly than anteriorly. Elytra long, dark-brown, with a broad testaceous stripe on the outer margin from the shoulder to the apex. Wings varying in length, but projecting beyond the elytra, testaceous, with a broad dark stripe on the suture. Femora black, testaceous at the apex; tibiæ testaceous, black at the base; tarsi testaceous. Abdomen more or less dilated, shining black, or dark-brown; the last segment considerably narrowed. In the ♂ the pygidium is short, stout, triangular, obtuse, in the ♀ it is not noticeable.

The forceps of the ♂ have the branches very slender, yellow, straight, remote at the base, with a long sharp fine tooth or spine on the inner margin at the base, pointing downwards; the branches are gently curved in to meet at the apex. In the ♀ the branches are contiguous, slender, straight, pale-yellow, slightly decussating at the apex.

Length of body.....3·75 mm. 5 mm.
„ of forceps .....1·25 1.

Forficula mucronata, Stål., 1860, Eugenies Resa, 303.

Labia mucronata, Dohrn, 1864, Stett. ent. Zeit., xxv., p. 423
Borm., 1888, Ann. Mus. Civ. Gen. (2), vi., 439, id., 1894, l. c., xiv., 386., id. 1900, Forf. 68.

Habitat.—Java (Stål). Philippines; New Guinea (Dohrn); Burmah and Eastern India (Borm.).

In Ceylon, Colombo, 1·97, from decaying pod of *Poinciana*, 1 ♀, and Matale, in decaying cocoa pods, and crevices in the bark of cocoa trees, ♂ and ♀ (Green).

This pretty little species may be recognised by the sharp downward tooth or spine at the base of the forceps of the male. The colour of the forceps varies from pale-yellow to black. It appears to be common in Ceylon, and is abundant throughout the Oriental Region.

LABIA CURVICAUDA, Motsch.

Head black or dark-brown; mouth parts paler; antennæ brown, the tenth or eleventh segment whitish. Pronotum longer than broad, broader posteriorly than anteriorly, dark-brown, or by variety reddish in the anterior portion. Elytra and wings dark-brown, the latter not very prominent. Feet testaceous, the femora black at the base. Abdomen slightly dilated, dark reddish-brown, the last segment brighter, impressed in the middle, narrow, with a small tubercle above the insertion of the forceps on each side. Branches of the forceps ♂ remote at the base, where they are dilated, then strongly incurved and attenuated, meeting at the apex, forming a semicircle; in the ♀ the branches are straight, contiguous, unarmed, the same colour as the abdomen, or reddish by variety.

Length of body ....♂ ♀ 5·5 mm.
„ of forceps ....♂ ♀ 1 mm.

Forfiscelia curvicauda, Motsch, 1863, Bul. Soc. Imp. Nat. Moscou, xxvi., Part 2, No iii., p. 2, Tab. II, Fig. 1. (♂)

Labia curvicauda, Dohrn., 1864, Stett. Ent. Zeit., xxv., 428.
Borm., id., 1900. Forf. 70. Ann. Mus. Civ. Gen. (2), vi., 440; id., l. c., xiv., 387.

Habitat—Ceylon, Mts. Nura Ellia, (Motsch.). Numerous in Burmah (Borm.) Western Java (coll. mea). Ceylon (Thwaites, in coll. Hope).

I possess a male of this species from Java, which differs slightly in colour from the type. It may be known by the semi-circular forceps of the male which recall the forceps of certain *Anisolabis*.

LABIA PILICORNIS, Motsch.

Reddish, antennæ and mouth parts greyish-yellow, feet yellowish; fourth segment of the antennæ much smaller than the following segments, oblong; pronotum longer than broad, hinder edge of last abdominal segment smooth; forceps straight, short, unarmed. ♀.

Length of body..... 4 mm.

" of forceps..... 1 mm.

"Only a single female from Motschulsky's collection is known to me. It may be distinguished from *L. minor* L., by the following points: the pronotum is longer than broad, so that the hinder margin projects further over the basis of the elytral; the elytra and wings are shorter, but that may be merely an individual variation. The fourth antennal segment is distinctly smaller than the fifth." (Dohrn).

Forficelia pilicornis, Motsch., 1893, Bull. Soc. Imp. Nat. Moscou., xxvi.; No. III., p. 2.

Labia pilicornis, Dohrn., 1864, Stett. Ent. Zeit., xxv., 437.

Borm. 1900, Forf. 72.

Habitat in insule Ceylon montibus Nura Ellia dictis (Nietner).

This species is totally unknown to me, so I have given Dohrn's remarks word for word.

CHELISOCHES, Scudd.

Antennæ with at least 15 segments; the first is broadly conical, the second round, the third cylindrical, the fourth and fifth short, oblong; the following segments gradually oblong and conical. Pronotum scarcely as broad as the head, with hinder angles rounded. Elytra always, wings almost always, well developed. Abdomen with the sides parallel, the lateral tubercles well developed. The last segment is rectangular in the ♂, narrowed in the ♀. The penultimate ventral segment is large and covers the greater part of the last, rectangular, with rounded angles. Forceps flattened, the branches of ♂ remote at the base, more or less dilated, incurved, with varying teeth on the inner margin. In the ♀ the branches are subcontiguous, straight, crossing. Feet stout; the second tarsal segment short, with a long, pubescent lobe, produced beneath the third segment.

Lobophora, Serv., 1839, Orth., 32, Dohrn.

Chelisoches, Scudd., Borm. Kirb. Burr.

This genus is characterised by its antennæ and second tarsal segment.

The two species known to occur in Ceylon are not likely to be confused, being very different in appearance.

CHELISOCHES MORIO, Fabr.

Large, black, shining, glabrous. Head black; antennæ with at least 22 segments, black at the base; segments 15-16 white, the apical segments pale; the first few segments are short, then from the seventh they gradually lengthen, the apical segments being very long and slender. Pronotum slightly broader than the head, the hinder border rounded

and the anterior border straight. Elytra long, smooth, shining black sometimes with a bronze sheen, emarginate at the apex; wings prominent, the same colour as the elytra. Feet black, the tarsi reddish or testaceous, pubescent. Abdomen cylindrical, finely granulated, the lateral tubercles very distinct. Anal segment large, smooth, the hinder margin straight, tuberculated and folded, impressed in the middle. Forceps, ♂ with the branches remote at the base, stout, of two forms, either long with a jagged dilatation at the base on the inner margin, attenuate, straight, gently incurved to meet at the apex, with a strong tooth on the inner margin nearer to the apex than to the base, or else short, stout, dilated, crenulated inside at the base, strongly incurved, unarmed. In the ♂ the branches are slender, unarmed, gently incurved to meet at the apex, where they sometimes decussate. In the ♂ a pygidium is sometimes visible, short and obtuse; in the ♀ the pygidium is distinct, short, obtuse, truncate.

	♂	♀
Length of body	13·5-17 mm	17-22m.
„ of forceps	3-7	8

Forficula morio, Fabr., 1775, Syst. Ent., 270. Burm., 1839, Handb. II., 752.
Lobophora morio, Dohrn, 1865, Stett. Ent. Zeit., xxvi., 71.
Lobophora rufitarsis, Serv., 1839, Orth., 33.
Forficula (*Psalidophora*) *rufitarsis*, de Haan., 1842, Verh. Nat. Gesch. Ned Bezitt., Orth., 241.
Lobophora negronitens, Stål., 1858, Eug. Resa., 305.
L. tartarea, *L. cincticornis*, Stål., l. c.
Chelisoches morio, Scudd., 1876, Proc. Bost. Soc. N. H., xviii., 308, Borm. 1900, Forf. 85.

Habitat.—The Islands of the Pacific Ocean and also the neighbouring mainland. India, Mauritius, Pulo Penang, Java, Celebes, Luzon, Fiji, Tahiti, Owaihi, New Guinea, Roon, Batchian, Sumatra, Dorey.

In Ceylon, Dohrn., I have an immature specimen from Punduloya (Green). In the Hope Collection at Oxford there are numerous examples (Thwaites), and in the Brussels Museum there are many others. Dohrn, too, records it from Ceylon. It is distributed throughout the Oriental, and part of the Australian Regions. The two forms appear to be equally common, and these numerous gradations between them.

CHELISOCHES PULCHELLUS, Gerst.

Of small size; the general colour dark. The head is reddish, the eyes black; the antennæ have 13 segments (Gerstaecker), dark testaceous in colour, the first segment considerably paler. Pronotum straight in front, rounded behind, dark shining brown in colour, the sides paler. Elytra and wings perfectly developed; the former rich dark-brown in colour, with a bright testaceous oval spot at the shoulder; wings prominent, bright testaceous with the suture and apices dark-brown. Abdomen rich shining brown; the

last segment is large, with a lumpy tubercle above the base of the insertion of the branches of the forceps. Feet testaceous. Forceps in the ♂ dilated at the base and subcontiguous, then slender, gradually curved in, to meet at the apices; the dilated part is crenulated. In the ♀ the branches are straight and stout, subcontiguous throughout their length, flattened and unarmed. A small pygidium is visible in the ♀ when the branches of the forceps are opened outwards. ♂♀.

	♂	♀
Length of body.....	10mm.	8-8·5mm.
„ „ forceps.....	2·5mm.	2-2·5mm.

Chelisoches pulchella, Gerst, 1883, Beitr. Zur Kennt. Orth., Fauna Guineas, p. 42 (p. 4, in reprint).

Chelisoches pulchellus, Borm. 1900, Forf. 88.

Habitat.—Common at Abo in the Cameroons in December, and at Ogowe at Limbareni in May and June, in West Africa. In Ceylon, apparently fairly common at Punduloya, in February, and at Ambegammoa (Green).

This pretty species has hitherto only been known from West Africa, where Buchholz discovered it in some numbers. Mr. Green has sent me several examples taken in bungalows, and one from an empty gall on *Antidesma*. Its occurrence at two such widely separated localities is very interesting, and may be compared with *Diplatys macrocephala* (Beauv), which is found in West Africa and again in Burmah, or with *Anisolabis læta*, which occurs at Zanzibar and also in Burmah. Further collecting may turn these species up in some connecting locality, or they may continue to be a problem in discontinuous distribution.

Ch. pulchella may be recognised by its dark-brown colour, with four pale spots on the elytra and wings, and also by the form of the forceps of the male, which resemble the forceps in shape of the common European *Forficula auricularia*.

CARCINOPHORA, Scudd.

Shining black. Pronotum somewhat narrower than the head; antennæ with 13 segments. Elytra free, well developed, truncated posteriorly, wings absent; abdomen stout, lateral tubercles very indistinct, barely visible, or entirely absent. Forceps simple, short, conical, slightly curved in at the apex.

Carcinophora, Scudd., 1876, Proc. Bost. Soc. N. H., xviii., 291.
Borm. 1900, Forf. 40.

This species is practically an *Anisolabis* with free elytra, or *Psalis*, without wings.

CARCINOPHORA DOHRNI, Kirb.

Medium sized, bright shining black, the abdomen more or less reddish. The head a little broader than the pronotum, shining black, the eyes paler; the antennæ have at least 13 segments, probably more. (Dubrony suggests

18); the first three segments are pale, the rest black except the two penultimate segments which are pale. The pronotum is straight in front, rounded behind, shining black, except the sides which are somewhat paler. The scutellum is very small and difficult to distinguish. The elytra are perfectly developed, shining brown, with more or less strongly developed purple or blue metallic sheen, which is variable, and sometimes barely distinguishable. They are longer than the pronotum, truncated at the apex. Wings absent. The feet are pale-testaceous, the femora strongly banded with black. The abdomen is very slightly dilated, black, or blackish-brown, occasionally even dark-red, bright-shining, clothed with a few bristles, the folds of the second and third segments are absent or very faintly developed. The abdomen is paler beneath; the last segment is somewhat narrower than the others, square. The forceps have the branches stout, almost contiguous at the base, cultriform, finely denticulated on the inner margin, nearly straight, but curved in towards the tip, the right branch more strongly curved than the left. In the ♀ the branches are stout, contiguous, decussating at the apex.

Length of body..... ♂ ♀ 10-12 mm.

„ of forceps ♂ ♀ 2-2·5 mm.

Nannopygia dohrni, Kirb., 1890, Linn. Soc. Journ. Zool., xxiii., 508.

Labidura femoralis, Dubr., 1879, Ann. Mus. Civ. Gen., xiv., 353. (nec Dohrn).

Carcinophora cæruleipennis, Borm., 1900, Forf. 40.

Habitat.—Ceylon (Kirb., Brit. Mus.); Galle, Ceylon (Dubr.); Ceylon (Thwaites, in Mus. Hope, ex coll., Westw.); Kandy (Simon, in coll., Bolivar).

C. castetsi, Bol., from Southern India is not very different in appearance; the branches of the forceps are more slender and strongly curved, and the body is more dilated.

This species does not appear to be rare in Ceylon, but I have received no specimens from Mr. Green. In the Hope Collection at Oxford there are nine specimens, from Westwood's Collection, captured by Thwaites. Thanks to the kindness of Senor Bolivar, I have been able to examine two females in his collection, determined by M. de Bormans as *Carcinophora cæruleipennis* (Borm.).

APTERYGIDA, Westw.

Medium sized insects, or small. Antennæ with 10-14 segments; pronotum narrower than the head. Elytra well developed; wings well developed or abortive. Abdomen with lateral tubercles developed. Penultimate ventral segment with semi-circular border, almost (♂) or entirely (♀) covering the salt. Forceps ♂ with branches remote at the base, slender, incurved to meet at the apex, with varying teeth on the inner margin. In the ♀ contiguous, slender, more or less flattened.

Apterygida, Westw. 1839, Introd., Mod. Class. Ins., 1, 42.

Borm. 1900, Forf. 109.

Forficula, Dohrn.
Sphingolabis, de Bormans, auctt.
Chelidura (partim), Brunner.

This genus can only be distinguished by the shape of the ♂ forceps from *Forficula*, the typical genus of the group. In *Forficula* the forceps have the branches strongly flattened and dilated at the base, and then slender and converging.

I have given my reasons* for retaining Westwood's names.

1. Size small. Elytra dark-coloured. Forceps short (simple in ♀). (Wings abortive) .....1. *ARACHIDIS*, Yers.
1·1. Size medium. Elytra golden-yellow. Forceps long .....
2. Wings developed. Forceps ♀ with no tooth. Lateral folds well developed .....2. *BIPARTITA*, Kirb.
2·2. Wings abortive. Forceps ♀ with a blunt tooth near the apex, lateral folds faint .....3. *CINGALENSIS*, Dohrn.

APTERYGIDA ARACHIDIS (Yers.).

Dark-brown or castaneous, hairless. Antennæ with 12-13 segments. Pronotum squared, with the lateral margins paler, and the posterior margin straight. Elytra free, black or reddish, the hinder margins truncate. Wings abortive. Feet testaceous. Femora sometimes with a blackish band near the base. Abdomen glabrous, each segment with a very short pubescence at the hinder margin, segments 5 to 8 in the ♂ and sometimes also the forceps, slightly punctulated. In the ♂ the anal segment is subquadrate, impressed in the middle, with no tubercles; the forceps have the branches remote at the base, short, slender, cylindrical, gently incurved with a very small tooth on the inner margin at the base itself, and another in the apical third. In the ♀ the anal segment is the same as in the male; the branches of the forceps are short, curved in towards the apex.

	♂	♀
Length of body.....	8 mm.	
„ of forceps	...2-2·5	1·75

Forficula arachidis, Yersin, 1860., Ann. Soc. Ent. Fr., III., S. VIII., p. 509. Tab. 10, fig. 33-35.
Forfiscelia nigripennis, Motsch., 1863, Bull. Soc. Imp. Nat. Moscou., XXXVI., No. 3, p. 1.
Forficula nigripennis, Dohrn., 1865, Stett. Ent. Zeit., xxvi., p. 89.
Scudd., 1876, Proc. Bost. Soc. N. H., xviii., 315. Ent. Notes, V., 55 (1876).
Forficula wallacei, Dohrn., 1865, 1, c. p., 88.

* Ann. Mag. N. H. (7), vol. iv., 255, 1899.

Scudd., 1876, 1, c., 318, Ent. Notes, V., 58.

Sphingolabis wallacei, Borm., 1888, Ann. Mus. Civ. Gen. (2), vi., p. 448.

Forficula (*Apterygida*) *gravidula*, Gerst., 1869, Arch., f. Nat., xxxv., i., 221.

——— 1873, Glied-Fauna. Sans., 50, pl. 3, fig. 9.

Spingolabis gravidula, Borm., 1894, Ann. Mus. Civ. Gen. (2), xiv., 407.

Forficula arachidis, Scudd., 1876, P. c., 311., Ent. Notes., V., 51.

Chelidura arachidis, Brunner, 1882, Prod. Eur., Orth., 21.

Sphingolabis arachidis, Borm., 1893, Biol. Cent. Amer., Orth., 12.

——— 1894, Ann. Mus. Civ. Gen. (2), xiv., 406.

Apterygida arachidis, Burr., 1897, Brit., Orth., 17, pl. I., fig. 8, Walker, 1897, Ent. Mo. Mag. (2), viii., 132.

Borm. 1900, Forf. 117.

Apterygida gravidula, Borm., 1900, Forf. 117.

Habitat.—Ceylon (Thwaites, in coll. Hope). Montibus Nura Ellia (Motsch.); New Guinea (Dohrn), Marseilles in pea-nuts (Yersin), Queenboro', in Kent, among old bones (Walker Burr.,), Mombasa (Gerst.), Burmah, Phillipines, Aru Islands, North Australia, Madagascar, Java, Sumatra, New South Wales, Mexico, Porto Rico, Cuba (Borm.).

This species is entirely cosmopolitan, and occurs in all ports almost throughout the world. In temperate climates it appears only to be able to live under conditions of artificial heat, and so is probably of tropical origin. It seems to be extremely numerous everywhere. The synonymy has been established by de Bormans. In his later work (1900) de Bormans separates *A. arachidis* and *A. gravidula*.

APTERYGIDA BIPARTITA (Kirb.).

Slender, elongate. Head shining, red; eyes black; antennæ darkish-testaceous, with 12 segments. Pronotum slightly narrower than the head, and of the same colour, sometimes varied with testaceous. Elytra long, golden-yellow, with a darker band on the suture and outer border. Wings projecting well beyond the elytra, and of the same colour. Feet pale, testaceous. Abdomen of a rich dark-red, shining, all the segments, and to a less extent, the forceps also, finely and densely punctulated; the glandular folds of the second and third segments are very distinct and black. The anal segment is narrow, impressed in the middle, the angles sharp. The forceps in the ♂ are dimorphic; the branches are slender, wide apart and straight with a flattened triangular dilatation in the form of a tooth at the base on the inner margin; after that they are simple and unarmed; in one form they are short, and straight, very slightly incurved at the apex, where they scarcely meet; in the other form they are much longer, and the apices meet, and are more or less strongly curved upwards. In the ♀ the branches are stouter, contiguous, straight, conical, and unarmed.

	♂	♀
Length of body.....	9·75-10·75 mm.	...8·75-9 mm.
„ of forceps.....	3-6.....	.....2·25

Sphingolabis bipartita, Kirb., 1890, Linn. Soc. Journ. Zool., xxiii., p. 526.

Habitat.—North India (Kirby); Ceylon, Punduloya, caught in a bungalow, x, 97. ♂ (type form), and ♀ attracted by light. The same, iv., viii., ix., 97, attracted by light. Second form of ♂ less commonly, viii. 97. ♀♀ at Punduloya, v. and vi., 97 (dark variety).

This very pretty species seems to be fairly common in the neighbourhood of Punduloya. Of the two forms of the male, the type form, with long forceps, appears to be the commonest. The forceps of the second form, with the basal dilatation, approach more nearly to the typical *Forficula*, and represented an intermediate stage between such forceps as those of *F. escherichi*, Kr., and the typical *A. bipartita*, Kirb. That the form of the forceps of the male is the only means of separating *Forficula* and *Apterygida* is extremely unfortunate, and upon seeing only the second form of the male of this species, it would be purely a matter of opinion in which genus to range it. The forceps of the type form recalls certain Neotropical species of the genus.

In the type form, the anal abdominal segment is less completely punctulated, and brighter in colour than in the second form.

To a male of the type form Mr. Green has attached the following note—"Glandular folds strongly developed; the insect when handled gave off a pungent odour, like that of the Bombardier Beetle."

APTERYGIDA CINGALENSIS (Dohrn).

Golden-yellow, the abdomen less brilliantly coloured; the prothorax and elytra posteriorly dilated, with the sides not deflexed; forceps almost straight, the branches remote at the base, with an obsolete tooth on the inner margin beyond the middle. ♀.

Long. 8½., lat. 2½., forc. long. 3½ mill.

In Berlin Museum ♀ and Ceylon (Nietner).

Head arched, without impressed lines, shining; the antennæ are 15-segmentate, yellow. Hinder margin of the head in the middle slightly emarginate. Pronotum anteriorly narrower as broad as the head, posteriorly broadened, the sides not turned, transparent horn colour; hinder border round, shining, smooth. Elytra scarcely longer than the prothorax, slightly broadened posteriorly, the hinder border rounded, smooth and shining like the head and prothorax. Abdomen posteriorly slightly narrowed, the tubercles of the second and third segments very small, the last dorsal segment fairly large, with a central line, the penultimate ventral segment entirely covering the ultimate. Branches of the forceps slightly caniculate (*gutrenn*), at the base nearly straight, incurved at the apex, with a blunt tooth on the inside beyond the middle. Abdomen and forceps reddish-brown, pubescent. Sternum yellow; feet, like the head, fairly long, the femora and tibiæ slightly, the tarsi strongly pubescent; the first and third tarsal segment of the same length, the second very short, barely lobed.

Forficula cingalensis, Dohrn., 1865, Stett. Ent. Zeit., xxvi., 89.
Borm., 1900, Forf. 128.

This species is totally unknown to me, and so I give Dohrn's description in detail. Dohrn includes it in his section of *Forficula*, which corresponds to *Apterygida*, but until the male is discovered it is impossible to locate its position with accuracy; the most noticeable points in the description are the form of the forceps, (♀), the pronotum and elytra more or less dilated posteriorly, the absence of wings, and the small size of the glandular folds.

OPISTHOCOSMIA, Dohrn.

Small or medium-sized insects; body convex, not greatly flattened. Antennæ, with the exception of the first, which is long and conical, and the second, which is short, with long cylindrical segments. Pronotum considerably narrower than the head, quadrate. Elytra well developed, projecting well beyond the pronotum at the rounded shoulders. Wings usually well developed. Abdomen, more or less dilated in the middle, attenuated posteriorly; last abdominal segment small. In the ♂ the forceps are long, slender, more or less complicated, twisted into various directions, armed variously with teeth; in the ♀ the branches are slender, straight and subcontiguous. Legs long and slender; first tarsal segment slightly longer than the third, the second short and lobed.

Opisthocosmia, Dohrn., 1865, Stett. Ent. Zeit., xxvi., 76, Dorm., Kirb.

This genus distinguished easily, by the long cylindrical antennal segments, the slender legs, the broad shoulders of the elytra, and by the slender forceps, which are of remarkable shapes in the male.

Table of Species.

1.	More or less stout insects; forceps comparatively stout; general colour dark-brown, varied with red.....	1. HUMERALIS, Kirb.
1·1.	Smaller and slender insects; forceps very slender; colour testaceous.....	
2.	Wings perfectly developed.....	
3.	Abdomen unarmed. Forceps ♂ with one tooth (sometimes obsolete), and no basal tubercle...	2. SIMPLEX, Borm.
3·3.	Penultimate abdominal segment toothed. Forceps ♂ with two teeth on each branch, and a basal tubercle above...	3. CEYLONICA, Motsch.
2·2.	Wings abortive	4. NEOLOBOPHOROIDES, n.

OPISTHOCOSMIA HUMERALIS, Kirb.

Glabrous, shining. Head red, the eyes greyish-black, antennæ with 11 segments dark, except the first which is pale. Pronotum, elytra and wings fuscous, with the lateral margins of the pronotum, an oval spot on the elytra

and a large round basal spot on wings, yellow; feet and forceps testaceous; abdomen castaneous. Forceps of the ♂ with the branches stout, remote at the base, gently arched outwards for the first third of their length, dilated on the inside, rounded; then more slender, depressed, curved in an oval for the second third of their length, with a sharp tooth on the inner margin, the tooth being triangular and horizontal; beyond this the points are sharp and decussate. The basal third is horizontal, the remainder slightly pointing upwards.

♂

Length of body..... 9-10 mm.

„ of forceps .... 3 mm.

Opisthocosmia humeralis, Kirb., 1890, Linn. Soc. Journ. Zool., XXIII, 523 (♀).

Borm., 1894, Ann. Mus. Civ. Gen. (2), XIV, 400, (♂). id., 1900, Forf. 95.

Habitat.—Ceylon. (Kirb., Mus. Hope); Palon in Pegu, Burmah (Borm.) Easily recognisable by its form and colour.

OPISTHOCOSMIA SIMPLEX, Borm.

Darkish-chesnut, glabrous, shining. Head reddish or testaceous; antennæ 12-segmentate, brown, the 8, 9 or 10 sometimes paler. Pronotum brown, as broad as the head, nearly semi-circular, anterior border straight, posterior border rounded, convex in the middle, the sides flat and transparent. Elytra reddish-brown, smooth, considerably broader than the pronotum at the shoulders, which are well rounded, narrowed towards the apex, and truncated there. Wings projecting well beyond the elytra, of the same colour, with a pale-testaceous spot at the base on the outer border (sometimes absent by variety), and at the apex, on the inner margin, at the suture, a very small yellow spot. Feet slender, clear brownish-yellow. Abdomen brown, smooth, oval, elongated, and dilated in the middle, last dorsal segment trapezoidal, twice as broad at the base as at the apex, smooth, slanting downwards, the sides always smooth in the ♀, sometimes finely denticulated in the ♂. Pygidium not visible. Branches of the forceps in the ♂ clear brown, rounded, nearly contiguous at the base, then curved upwards, compressed and touching in the basal third, then horizontal and faintly diverging towards the points, which are incurved and cross; outside they are faintly bisinuate, very finely denticulate on the inner margin, with a horizontal internal tooth near the apex (almost obsolete in some specimens); in the ♂ the branches are shorter, unarmed, nearly straight, and subcontiguous attenuated at the apex, where they cross.

Length of body.....11-115 mm., ♂ ♀.

„ of forceps ♂ 5·5 mm., ♀ 4·5.

Opisthocosmia simplex, Borm., 1894, Ann. Mus. Civ. Gen. (2), xiv, 396. id. 1900, Forf. 98.

Habitat.—Burmah (Borm.); Ceylon, one mutilated female (Thwaites, in coll. Hope).

I include this species on the list on the strength of a female in very bad condition in the Hope Collection. I refer it to this species, which is otherwise unknown to me. It may be a variety of *O. dux*, Borm., also from Burmah.

OPISTHOCOSMIA CEYLONICA (Motsch.)

Small, slender, brown. Antennæ 12-segmentate, brown. Pronotum narrower than the head, hinder border rounded, anterior border straight, the sides strongly turned, shining brown. Elytra twice as long as the pronotum, uniform brown, truncate at the apex. Wings projecting well beyond the elytra, brown, with a faint yellow spot on the outer side at the basis and at the apex at the suture. Abdomen darker-brown, the glandular folds very prominent, black. In the ♂ the antepenultimate segment is armed on each side with a short tooth, the penultimate and ultimate segments are narrowed, the latter with a deep impression in the middle, the penultimate ventral segment semi-circular, covering only half the last segment. The forceps are long, with the branches contiguous at the base, parallel, then curved moderately outwards, incurved to meet at the apex, flat beneath, above with a long narrow, crest-shaped lump near the base, in the middle with two teeth, the first fairly long, the second shorter. In the ♀ the abdomen is simple, narrowed posteriorly, unarmed, the penultimate ventral segment as in the male, the forceps with the branches slender, straight, contiguous, crossing at the apex. The sternum and feet are paler than the abdomen, the latter very long and slender, the first tarsal segment as long as the third. The whole body is shining, only the antennæ, feet, underside of the body, and the forceps of the ♂ pubescent.

	♂	♀
Length of body.....	7·5 mm.	7·5-8 mm.
„ of forceps.....	5	2·25-2·5.

Labia ceylonica, Motsch, 1863, Bull. Soc. Imp. Nat. Moscou, xxxvi, part 2, No. 3, p. 4.

Opisthocosmia ceylonica, Dohrn., 1865, Stett. Ent. Zeit, xxvi, 83.
Borm. 1900. Forf. 96.

Habitat.—Ceylon (Dohrn, Mus. Berol); Punduloya, 4 ♀ ♀ (Green), x., 97, caught in bungalow, attracted to light, and iii., 98, in bamboo.

I only know the female of this species, and so have taken the description of the male from Dohrn. It may be recognised by its slender, graceful form, shining brown colour and well developed wings, as well as by the form of the forceps of the male and the abdominal tooth.

OPISTHOCOSMIA NEOLOBOPHOROIDES, sp.n.

Parva, glabra, fusca, nitida; caput suturis nullis; antennæ fuscæ, 12 segmentatæ. Pronotum capite angustius, quadratum; elytris brevibus, apice truncatis; alis nullis. Abdomen medio dilatatum, apice attenuatum tuberculis lateralibus perspicuis; forceps ♂ bracchiis basi contiguis, paullo deplanatis, dehinc curvatis, primum extus, deinde intus orbem ovalem

formantibus, apice attingentibus, gracilibus, inermibus, margine interno minutissime crenulatis ; ♀ rectis, gracilibus, contiguis, inermibus, apic decussatis. ♂ ♀.

	♂	♀
Long. corporis	7·25 mm.	8 mm.
„ forcipis	4·35	3

HEAD shining brown, eyes black ; antennæ with 12 long segments, Nos. 3 and 2 very slightly shorter than the others.

PRONOTUM narrower than the head, square, the angles rounded, the sides slightly turned, brown, the sides paler.

THE ELYTRA are short and square, brown, truncated at the apex. Wings absent.

ABDOMEN slender, dilated in the middle, the glandular folds very distinct ; dark-brown, the folds still darker ; from the sixth segment strongly attenuated, the last dorsal segment narrower, more so at the apexthan at the base, with a faint median impression, the hinder border straight with a tubercle above the insertion of the forceps on each side, more strongly in the ♂ than in the ♀.

FEET very slender and long, dark-testaceous, very faintly pubescent, the tarsi more strongly so ; the first tarsal segment is as long as the third ; the second short, very distinctly lobed.

FORCEPS of the ♂ with the branches subcontiguous at the base itself, then slightly flattened and contiguous, then suddenly strongly arched outwards, very slender, gradually incurved to meet at the apex ; on the inner margin of this oval enclosed part there are a few faint crenulations. In the ♀ the branches are simple, straight, unarmed, slender, contiguous throughout their length, crossing at the apex.

Habitat.—Ceylon, Hatton, vii., 97 (O.S.W.)

I received a male and a female of this species from Mr. Green. It is to be distinguished from *O. ceylonica* by the form of the forceps of the ♂, by the much shorter and truncate elytra and absence of wings by the square pronotum absence of the abdominal tooth of the male, shorter and stouter legs.

It approaches very nearly to *Neolobophora tamul*, but may be distinguished by the free elytra ; the forceps are almost exactly the same shape. I cannot distinguish a clear scutellum between the elytra at the base, but the species may have to be removed, when better known, to *Neolobophora*.

It appears to be allied to *O.* (?) *dubia*, Borm., from Burma, but differs in the colour of the head, femora and the form of the elytra, which are narrower at the base than at the apex, which are scarcely broader than the pronotum at the shoulders. In *O. dubia* the elytra are considerably broader than the pronotum and have the sides parallel. From their shape, in this species, the sides are slightly diverging.

AIDS TO THE DIFFERENTIATION OF SNAKES.

By Capt. F. WALL, I.M.S.

(*Read before the Bombay Natural History Society on 18th February* 1902.)

The most important factor in popularising and thereby advancing a subject lies in simplifying it, so that the veriest novice may grasp it with ease instead of suffering discouragement at the threshold of his enquiries, as is so often the case. I have frequently, in India, seen a man bring some natural history object to identify which has aroused his interest. He borrows a book, but though he knows the creature is probably described therein, he is at a loss to know where to begin his search. He discovers a key, however, and gaily sets to work. Sooner or later, he is frequently confronted with some unintelligible technicality, or what is worse, finds that he has to unravel some detail which perhaps only a careful and skilful dissection, or the preparation of a skeleton, will elucidate. At such a point his enquiries must, in many cases, come to a dead-lock, and it is not surprising that he throws down the book disgusted and has to resign himself to a further term of ignorance till, perhaps, some friend (not always forthcoming) can give him the information he requires and help him through the intricacies of identification.

There are scores of men in India with a bent towards natural history in some branch or another, many of whom have abundant leisure and abundant opportunities for observation, and who would welcome a hobby that would relieve camp life of some of its solitude and monotony, and introduce an interest throughout many a wearisome journey in the district. Many of these men have made an attempt to acquire information, and have been baffled in their early endeavours owing to the unsatisfactory and complicated nature of some key.

Many authors, while elaborating the descriptive parts of a work, frustrate the object of that work in great measure by bestowing far too little attention to the compiling of the keys, which are really the essential part, since it is by these that identification is rendered feasible or otherwise. The book which can afford the surest and most lucid guides to identification is the book that will command the largest sale and produce the most far-reaching and useful results, and it is such a work that so many men feel the want of. If the keys are to be made of real utility, they should be simplified, firstly, by purging them of all technicalities, or, where this is impossible, explaining them by diagrams in *all* cases. Secondly, by discarding reference to points which can only be elucidated by investigating anatomical peculiarities, substituting those observed in external characters alone, and always selecting those that can be most easily appreciated and put into practice. Such considerations as the plumage of the nestling in birds, the hypapophyses of vertebræ in snakes, &c., &c., though of interest and utility to the comparative anatomist, can have little, if any, practicable value to the generality of knowledge-seeking individuals, and the mere fact that such abstruse and occult differences are incorporated in the keys, leads one to infer that there is no

better means of differentiation in such cases, and that could simpler methods be discovered from external characters alone, these would be welcome and employed in preference ; but one has only to know a little of natural history matters to realise that to discover such means is much more easily said than done. It is with this object in view that I have been persuaded in this paper to endeavour to simplify the means at our disposal of differentiating between snakes, hoping that the results of my observations may be of use to those who, by reason of their access to large and fully representative collections, have it in their power to compile works—a possibility forbidden to one in my position who only sees at most a limited number of species and genera.

Many of the points I have made reference to may be found of doubtful utility in some genera, but the same may be said of all scales, and this should not detract from their value in others. Even such important scales in diagnosis, as labials for instance, have not an equal value in all genera. In *Bungarus* and *Naia* I have never yet seen one departure from the normal, whereas in *Chrysopelea* and many *Tropidonotus*, &c., these are not infrequent, and in many *Hydrophinæ* these scales are particularly unreliable owing to their inconstancy. Similar instances may be cited with reference to almost every scale.

I have adopted the nomenclature in usage in Boulenger's work, "Fauna of British India"—"Reptilia and Batrachia."

The Dorsals.

These scales are perhaps the most useful of all guides in enabling us to differentiate between species and genera, but authors have not availed themselves of their full value. It is usual for them to record the number of the rows in the middle of the body and at this point only, but observation has revealed to me that information as valuable is to be obtained by counting the rows in other situations as well. The rows which can be counted from the ventrals on one side over the back to the ventrals on the opposite side in far the majority of snakes total in the aggregate an odd number. In the neck these are more numerous than in the body, and these rapidly decrease, so that very shortly after the neck they dwindle to a definite and constant number in like species, though it may be very different in different species. This number once established is retained for a variable distance in the length of the snake. As far as my observations serve me, the number is preserved to a point at least well behind the middle of the body (not including the tail, which begins at the vent), after which the arrangement differs according to the species. In many cases the number peculiar to the species is preserved in the whole length of the body. On the other hand, in many other snakes the number peculiar to the species once established remains so to a somewhat variable point behind the middle of the body, after which, by the absorption of a row on each side, the number is diminished by two, which number remains constant to the vent, or in some cases a second or third absorption of rows may occur before the vent. These steps occur at intervals which are

quite as constant in like species as the number of rows in the middle of the body. (The method of absorption, though fairly constant, does not seem to me to be sufficiently so to merit special attention. In *Zamenis mucosus* and *korros* the second and third rows from the ventrals are the ones to fuse usually at each step. In many *Simotes* the fourth and fifth become blended, &c., &c.) About the region of the vent the numbers of rows dwindles rapidly and inconsistently. In order to avoid conflicting results, I count the rows in three situations :—(1) at a spot one head's length behind the head ; (2) midbody ; (3) one head's length in front of the vent. The value of the results derived from points (1) and (3) is quite equal to that at point (2), and, when the three are taken together, the value of the information acquired is augmented threefold.

The number is the same in all three localities in some snakes, such as *Bungarus, Callophis, Oligodon, Hydrophobus, Amblycephalus, Xenopeltis*, &c., &c. In other snakes the number in site (1) is greater than at site (2) as in *Naia*. Again, in other snakes the number at site (3) is less than at site (2). When this occurs, it is usually less by two only, as in *Psammodynastes, Lycodon*, &c. ; by three in one instance at least, *viz.*, *Zamenis mucosus*, where the original odd number 17 falls to an even one 14 ; by four rows as in many *Simotes, Psammophis condanarus, Chrysopelea*, &c., and by more than four in *Tropidonotus plumbicolor, Naia tripudians, Vipera*, and many *Trimeresurus*. In some snakes, again, the numbers are nowhere quite constant in the same specimen, not even in the middle of the body as in *Coluber oxycephalus* and many *Trimeresurus*, &c. It seems probable from my notes on many hundreds of specimens, that these peculiarities are of generic importance and, if so, such closely resembling genera as *Oligodon* and *Simotes* or *Hydrophobus* and *Lycodon* can be separated with ease and certainty.

The Supracaudals.

In speaking of the dorsals I pointed out that the rows of scales were generally in *odd* numbers, and also made an allusion to the rapid diminution of rows about the supraanal region. The rows at this site are very variable, but close to the base of the tail arrange themselves in *even* numbers. As the tail attenuates, these rows diminish by the absorption of two rows (one on each side) at certain steps, the even numbers being retained throughout. The absorption at each step is affected by a fusion of the two rows nearest the median line on each side (and is different in this respect from the supracaudals of many lizards I have examined where rows nearer to the subcaudals blend). There are exceptions to this rule. In all the many *Bungarus* I have examined, the supracaudals arrange themselves in an odd series of rows to the tip of the tail, and I have also found a similar peculiarity in the very few specimens of *Calamaria* I have seen.

Another important character referable to the supracaudals lies in the fact that in nearly all snakes which have the vertebrals enlarged on the body, such as *Dipsas, Dendrophis*, &c., this peculiarity ceases in the supraanal

region, and the supracaudals behave as is the rule with other snakes, and which I have just mentioned. In *Bungarus*, however, the enlarged and hexagonal characters of the vertebral row are preserved in the median row of the supracaudals, subject to some modification in size at the various steps where blending occurs.

KEELS.

The carination of scales is so capricious in the same specimen, though fairly constant in like species, that it deserves far more mention than has been conceded to it. Such remarks as "keels present" or "absent" have little weight unless these remarks are qualified. In some snakes they are present on every scale from the parietals to the tip of the tail (excepting perhaps a few in the forepart of the ultimate row), as in *Ancistrodon himalayanus, Cerberus, Echis,* &c.; in others they cease before the supracaudals have dwindled to two rows as in *Tropidonotus piscator* and *stolatus,* and in others they cease before the fours are established as in *Trimeresurus gramineus,* &c. In others they disappear before the sixes as in *Zamenis mucosus* and *korros.* The numbers of rows that are keeled should be recorded in all the three sites where scales are counted (see above). Before deciding whether keels are present or absent, the supraanal region is *the* part to be specially examined. Often scales are keeled here where they are smooth elsewhere as in *Dryophis,* where the median rows are specially so distinguished, and in *Hypsirhina plumbea* and some *Aspidura,* where the lateral rows exhibit this character. In all cases where faint keels are present these are most apparent in the supraanal region.

THE ROSTRAL.

Such expressions as "visible from above" are not precise, since all rostrals are more or less visible from above and the degree of visibility is subject to some variation. It is better to compare the portion visible from above with the scale or suture in the median line immediately behind it. Thus it is often twice as long as the suture between the internasals, as in many *Simotes* and *Oligodon,* often about equal to that suture, as in *Xenopeltis,* &c., and often half or less, as in *Ancistrodon.* The number of sutures it makes with adjacent scales should be mentioned. In a key such a remark as "rostral in contact with four scales" is easily grasped and as easily investigated. These sutures may be four only, as in the majority of the *Hydrophiinæ* (except the genus *Platurus*), *Xenopeltis* and many *Uropeltidæ;* five as in *Typhlopidæ, Helicops, Gerardia, Fordonia,* and *Hipistes;* six, as is the rule, such as in *Zamenis* and *Dipsas;* and rarely eight, as in *Simotes splendidus.*

Another point is the relative length of these sutures. When they are six, which is usually the case, the nasal is usually the largest as in many *Bungarus, Zamenis,* &c. In some snakes this suture may be twice that of the internasals, or more, as in *Dryophis, Ancistrodon himalayanus,* and *Vipera russellii.* Sometimes the internasal and nasal sutures are sub-equal, and this

is usually so in the genus *Simotes*. In other cases the internasal suture is decidedly larger than the nasal, constituting a generic distinction in *Naia*. The first labial suture is usually the smallest; however, in some *Psammophis* and *Tropidonotus* it is larger than the internasals, and in the genus *Platurus* is the largest of the six sutures.

INTERNASALS.

It is more precise to compare the suture between the two fellows in the median line with the suture each forms with the præfrontal than to compare the length of these scales with their breadth, for, laterally, they are reflected on to the face to a variable degree, and, again, as the snout narrows anteriorly, the breadth is not consistent throughout. In the same way the suture between the præfrontal fellows should be compared with the suture each makes with the frontal.

The variations in the sutures arising between these four scales are of some value in differentiation. As a rule, the length of the suture between the two internasals is less than the suture each makes with the præfrontal, and the length of the suture between the præfrontals is greater than the suture each makes with the frontal, as is seen in many *Callophis*, *Lycodon*, *Naia*, &c. In *Simotes* and *Amblycephalus*, however, the suture between the internasals is about half that made with the præfrontals; and the suture between the præfrontals, half that made with the frontal. In *Tropidonotus*, as a rule, the suture between the internasals is sub-equal to that made with the præfrontals, and the suture between the præfrontals sub-equal to that made with the frontal. One instance may be mentioned where these measurements will separate species. In *Dryophis mycterizans* the suture between the internasal is about twice that made with the præfrontals, whereas in *Dryophis prasinus* these sutures are about equal. In both the suture between the præfrontals is about twice that made with the frontal. My notes in other cases seem to point to similar differences in some species, but one requires so many of a kind before laying down a rule that I hesitate before giving other examples.

Again, with regard to the præfrontal, its relations on its anterior, external and posterior aspects are of such variability and importance in different genera and species that it is the most important scale on the head for diagnostic purposes.

Anteriorly when internasal scales are present they are always in contact with the præfrontals, but when absent, this relationship may be substituted by the rostral, as in *Calamaria*, or more commonly the nasals, as in the family *Hydrophiinæ* (except the genus *Platurus*), &c.

Externally (1) *the nasals* meet the præfrontals in the vast majority of species, but there are exceptions. (*a*) In *Naia tripudians* and *Hypsirhina enhydris* a departure from the above is brought about by a meeting between the præocular and internasals, and is a useful feature in separating these species from their allies. In other instances this peculiarity is inconstant and valueless, as in *Xylophis perroteti*, *Cerberus* and *Hypsirhina sieboldii*,

&c. In *Amblycephalus* the same peculiarity is observed, and it appears to me a family characteristic since all the species I have had access to, elicit it. (*b*) In some of the genus *Lycodon*, notably *aulicus*, &c., and also in *Trachischium* the rule is again infringed by the meeting of the loreal with the internasals, and this is of particular importance in differentiating between species in the former.

(2) *The loreal.*—When a loreal exists, the præfrontal always comes into contact with it, but it is often absent, and leads to a variety of other relations.

(3) *Labials.*—This is an unusual relationship. It may exist with the presence of a loreal as an inconsistent occurrence in some *Dryophis*. In some snakes where the loreal is absent, the præfrontals effect a contiguity with certain labials, though it is far commoner in these cases to find the præocular meeting the nasals. In *Blythia*, *Calamaria*, and *Aspidura* this feature appears to be of generic importance, and in *Uropeltidæ* and *Ilysiidæ* a family peculiarity.

(4) *Præocular.*—When this scale is present, which is usually the case, it always forms a suture with the præfrontal.

(5) *The eye.*—This relationship is most unusual, for, as a rule, the præocular by meeting the supra-ocular effectually frustrates such a contingency; however, sometimes the præfrontal is permitted to contribute to the circumference of the orbit. This occurs in some *Lycodon*, *Callophis bibronii*, &c., where it serves to differentiate between species, and also in *Blythia*, *Cylindrophis*, *Xylophis*, *Calamaria*, and *Aspidura*, where it is equally valuable in characterising genera, and in *Amblycephalus* constitutes a family feature.

Posteriorly, the supra-ocular nearly always meets the posterior part of the præfrontal, but exceptions occur in *Coluber oxycephalus*, *Lycodon aulicus*, &c., of special importance, and in the genus *Dryophis* where contact with the supra-ocular is denied by the meeting of the præocular with the frontal and also in *Python* and *Zamenis diadema* where a supernumerary row of small scales frustrates the normal arrangement.

The frontal is nearly always one of the posterior relations of the præfrontal, but exceptions occur in *Python* and *Zamenis diadema* where a supernumerary row of scales prevents such contact.

The following examples will demonstrate some of the numerous variations in relationship this scale is subject to :—

Calamaria.—Rostral, 1st and 2nd labials, præoc., supraoc., frontal.

Cylindrophis.—Nasal, 2nd and 3rd labials, eye, supraoc., frontal.

Blythia.—Internasal, 2nd and 3rd labials, eye, supraoc., frontal.

Hydrophis.—Nasal, 2nd labial, præoc., supraoc., frontal.

Zamenis diadema.—Internasal, nasal, two or three loreals, præoc., supernumerary præfrontals.

Hypsirhina enhydris.—Internasal, loreal, præoc., supraoc., frontal.

Lycodon aulicus.—Internasal, loreal, præoc., frontal.

Aspidura.—Internasal, nasal, 2nd and 3rd labials, præoc., supraoc., frontal.

Coluber oxycephalus.—Internasal, nasal, loreal, præoc., frontal.
Hydrophobus nympha.—Internasal, nasal, two præoc., supraoc., frontal.
Dendrophis.—Internasal, nasal, loreal, præoc., supraoc., frontal.
Callophis bibronii.—Internasal, nasal, 3rd labial, eye, supraoc., frontal.
Naia tripudians.—Internasal, præoc., supraoc., frontal.
Bungarus.—Internasal, nasal, præoc., supraoc., frontal.
Amblycephalus.—Internasal, præoc., eye, supraoc., frontal.

THE FRONTAL.

This scale exhibits many important differences, and its characters are so well preserved in species of a like genus that, from the shape alone, with a little practice, one may often make a shrewd guess at the genus a given specimen belongs to. The number of scales with which it contracts a relationship is variable, and though this may generally be worked out from descriptions usually given in books, the due prominence this variability demands can only be attained by an expression of that number. Thus it is most usually six, as in *Zamenis, Simotes*, &c. It may be seven, as in *Platurus colubrinus*; eight, as in *Lycodon aulicus*,(normally), *Coluber oxycephalus, Simotes splendidus, Zamenis arenarius*, and *Hipistes*; and nine, as *Xenopeltis* and *Zamenis diadema* (normally).

Certain measurements are useful guides in differentiation. Of these one most usually quoted, *viz.*, that of its length compared with its distance to the end of the snout, I consider of little value. I find this very variable in like species of like size, and still more pronounced in young specimens compared with adults, and I have for this reason ceased to record it in my notes. The measurements I think of value are as follows:—(*a*) The breadth of the scale compared with the total breadth of the crown between the eyes, and to obtain precise results, an imaginary line is drawn across the crown connecting the *centres* of both eyes. In *Dryophis* and *Psammodynastes* it is about one-quarter the width or less; in *Naia* about one-third; in *Bungarus* and *Callophis*, about a half or more; in *Simotes* and *Lycodon*, about three-fifths; and in *Amblycephalus, Lytorhynchus, Xylophis, Cantoria*, &c., about two-thirds. (*b*) Its greatest length compared with that of the supra-ocular is useful in some cases. The three scales are usually sub-equal, but in many *Lycodon*, and in *Platurus*, the frontal is one-third longer, and in *Cantoria, Xenopeltis, Xylophis*, &c., it is twice the length of the supra-oculars. (*c*) The relative lengths of the sutures, especially when these are six, are of great importance. As a rule, the supra-oculars are the largest, as in *Zamenis, Dipsas*, &c. Sometimes they are even twice the suture made with the parietals, as in *Dryophis*, and some *Psammophis*, many *Coluber*, and many *Tropidonotus*. In *Cantoria, Xylophis*, &c., the supra-oculars are the smallest sutures. The parietals are usually the smallest sutures, as in *Chrysopelea*, and *Dryophis*, but they may be the largest as in *Fordonia*, and many *Hydrophiinæ*. Again, sometimes the præfrontals are the largest sutures, as in some *Amblycephalus*, sometimes the smallest sutures, as in many *Distira*.

The Nasals.

The nasals are, I consider, of great value in differentiation. It is in their relations with labials particularly that they desire special importance. The number of labials which usually touch these scales is far most frequently two, *viz.*, the first and second ; but in some cases the first labial is the only one to touch the nasals, and this is a peculiarity which all the *Homolopsidæ* occurring in Indian limits, except *Hypsirhina plumbea*, share. In *Tropidonotus piscator*, it is an inconstant feature. Equally unusual is it for three labials to touch the nasals, but this peculiarity exists in *Naia*, *Xenopeltis* and *Callophis*.

The Nostril.

This has certainly escaped the due notice it deserves. In some snakes it occupies the whole depth of the suture between the nasal scales, as in many *Coluber*, *Naia*, *Zamenis*, &c. ; whilst in others it only occupies a portion of the depth, leaving some of the suture unimplicated above or below, or both above and below, as in *Dipsas*, *Simotes*, *Hydrophobus*. In some cases it is contained far more in the posterior scale, the anterior contributing but little to its circumference, as in *Naia*, *Coluber*, *Polyodontophis collaris*, &c., and, on the other hand the converse holds good in the case of *Xenopeltis*, *Dipsas*, &c. In *Tropidonotus piscator*, it is crescentic (convexity forwards) and placed obliquely in the upper half of the anterior scale, so that the lower horn of the crescent infringes upon the posterior scale. The lower suture nearly always runs to the first labial, except in *Hydrophiinæ*, where the rule is for it when present to run to the second labial.

The Loreal.

I have already discussed the confusion with regard to this scale in a footnote on page 94, B. N. H. S. Journal, Vol. XIV, No. 1.

Præoculars and Postoculars.

Some confusion exists in what to consider præoculars and postoculars, and for the sake of consistency I prefer to regard any scales touching the front of the eye, anterior to a labial which contributes to the orbit præoculars, and in the same way apply the term postoculars to all scales touching the eye behind, which are posterior to a labial which contributes to the orbit.

Temporals.

The only temporals which can be said to be of any importance are those in the anterior row, the arrangement of the postjacent rows being most inconstant. It is of some importance to notice how many and what labials touch these scales (or the inferior of these when more than one is present). As a rule, the number is two, but in some instances it is one only, as in *Polyodontophis collaris*, *Dipsas cyanea*, *Cerberus*, *Fordonia*, *Platyplectrurus*, &c. Sometimes three labials come into contact, as in *Naia bungarus*, (normally), *Callophis nigrescens* and *Callophis maculiceps*, etc.

The Sub-linguals.

It seems inconsistent that when all other scales worthy of a special name have received scientific titles, the "chin shields" so called, should be exempted, and I always refer to them in my notes as sub-linguals. The number of lower labials that touch the anterior pair is usually recorded, but not so those that touch the posterior pair, though these are as useful as the former. As a rule, two labials touch the posterior pair, but in some *Tropidonotus*, three come into contact; in *Bungarus cæruleus* and many *Callophis*, only one; and in *Platurus colubrinus* and *Latifasciatus*, none at all.

Lower Labials.

There are one or two points touching the lower labials which have escaped notice. The suture between the first pair (when such is present) varies in length compared with the suture between the anterior sub-linguals. It is nearly always considerably less, varying from one-third to a half as a rule, but in many of the genus *Dipsas* it is unusually long, and usually fully equals that between the anterior sub-linguals. The relative size of some of these scales requires special mention. One in particular which is usually the largest of the series, and peculiar in having genuate posterior border, is important. In *Fordonia* and *Xenopeltis*, &c., this is the third of the series; in *Bungarus* and *Callophis*, &c., the fourth; in *Psammophis condanarus*, and some *Dryophis*, the fifth; in many *Zamenis*, the sixth; and in *Cerberus*, and many *Tropidonotus*, the seventh. Again, sometimes no lower labial exhibits this peculiarity, as in *Python*, and *Amblycephalus*. This scale I generally refer to as the "genuate" on account of its posterior border.

The Eye.

Such terms as "small," "moderate," and "large" can at best only convey an uncertain meaning even to those well acquainted with the subject. I record two measurements which are much less indefinite—(1) The horizontal diameter which is compared with its distance towards the nostril. In many snakes this diameter about equals the distance to the nostril, as in *Bungarus*, &c. In some it falls far short, as in *Coluber oxycephalus*, &c., and in some is even as little as a third the distance as in *Xenopeltis*. In some *Dipsas*, and *Amblycephalus* it is greater than the distance to the nostril. (2) The vertical diameter is compared with its distance to the labial margin. In some snakes, such as *Simotes*, it about equals the distance; in others it is less, amounting in *Erys johnii* to as little as half or even less; and again in others it is distinctly greater, amounting in *Chrysopelea* to about twice the distance.

I am aware that, owing to the early development of the eye, this organ is relatively larger in the young than in the adult; hence the above measurements must be considered as proximately correct only.

A CATALOGUE OF THE *HETEROCERA* OF SIKHIM AND BHUTAN.

By G. C. Dudgeon, F. E. S., &c.

With Notes by H. J. Elwes, F. Z. S., F. E. S., &c.,

and

Additions by Sir George F. Hampson, Bart., B. A., F. E. S., &c.

Part XII.

(*Continued from page 19 of this Volume.*)

Family ARCTIADÆ—continued.

Sub-family LITHOSIANÆ—continued.

Genus Chionæma, Herr Schäff.

1281*a*. *C. alborosea*, Wlk.

Sikhim, 1,800 feet; Bhutan, 2,500 feet. Females of this are very common, attracted to light. I have twenty of this sex, but only two males. I have two aberrant females, one of which has all the red markings replaced by yellow ones and the other which has veins 4 and 5 of the forewing arising from the cell. I do not think that *C. puella*, Drury, extends as far East as this, though it is a very common insect in the N.-W. Himalayas.

C. obliquilineata, Hmpsn.

Sikhim, 1,800 feet. This species has a large, erectile tuft on the costa of the forewing on the upperside from the ante-medial line to two-thirds of the costal length and a very large oval, brownish, unilobate fold on the underside. The apex of the forewing is quadrate, the costa distorted, and the submarginal pink band bent inwards along the costa. The ante- and post-medial bands are outwardly oblique. Veins 2, 3, 4, 6 and 7 of the forewing are curved upwards, and veins 3, 4, and 6, 7 of the hindwing are stalked. I took four males in July and August at Punkabaree, but the female is as yet unknown.

1284. *C. effracta*, Wlk.

Sikhim, 1,800—4,000 feet. I have three males and three females taken at light in June, August and September.

C. adita, Moore.

Sikhim and Bhutan, 6,400 feet up. This species appears in Sikhim collections as *C. signa*, Wlk. It, however, differs from that species in having the two discoidal spots on the forewing of the male separate

and the post-medial line on the forewing of the female bent outwards to the costa. I have taken it at Rissoom and Pasheteng in September and have a male from Col. Pilcher's collection, marked "August Sikhim 10000 feet."

1291. *C. guttifera*, Wlk.

Sikhim and Bhutan. A common insect at low elevations. The females, as well as the males, have three black spots. I have a single female with the spots yellow instead of black. It occurs everywhere from the foot of the hills up to 3,000 feet in July, August and September.

1294. *C. mölleri*, Elwes.

Sikhim, 1,800 feet; Bhutan, 2,500—3,000 feet. A well-marked species, generally larger than *C. guttifera*, with the hindwings white instead of yellow and the spots on the forewing large. I have two males and six females taken by me at light in January and August.

1285. *C. perornata*, Wlk.

Sikhim and Bhutan, 1,800—2,500 feet. A rare insect which I have only taken in August. Mr. Elwes remarks that although he has never taken it, he inclines to think that it is not so rare.

1301. *C. arama*, Moore.

Sikhim, 4,000—6,000 feet. A common insect at Kurseong from July to October. (I never took this at Darjeeling, and presume it is confined to the outer hills.—*H. J. E.*)

1293. *C. divakara*, Moore.

Sikhim, Yatung, 10,000 feet. I have a female from the latter locality, which has the black spots very small. (I found it abundant at Darjeeling in July.—*H. J. E.*)

1302. *C. dohertyi*, Elwes.

Sikhim, 4,500 feet. Rare in May and August.

1292. *C. sikkimensis*, Elwes.

Sikhim, 7,000—10,000 feet. I have one doubtful specimen which may be only *C. dohertyi* without the terminal yellow band on the forewing. (This was common on Tongloo at light in July 1886, and is easily distinguished from *C. dohertyi* by the position of the bands and spots.—*H. J. E.*)

1288. *C. candida*, Feld.

Sikhim, Yatung, 10,000 feet. Rather scarce, I think. I have one specimen from the latter locality. (Knyvett and Möller both got this at about 7,000 feet, but I do not know the exact locality.—*H. J. E.*)

1290. *C. puer*, Elwes.

Sikhim and Bhutan. I have only one female from the latter locality, taken in June. (I took one male of this at Darjeeling at light in July 1886, and have others from the Khasias, Nagas and Manipur.—*H. J. E.*)

1295. *C. detrita*, Wlk.

Sikhim and Bhutan, 5,000—7,000 feet. Occurs commonly in August at Labah, where many may be taken settled on the wet mossy rocks during the day. It is also common in the Kangra Valley, Punjab. (My specimens are marked April and October, but I never took it myself.—*H. J. E.*)

1296. *C. belissima*, Moore.

Sikhim, 6,800 feet up. Rare in May and June. I have two females only in my collection. (A rare species in Sikhim, whence I have two males only.—*H. J. E.*)

1284*a*. *C. dudgeoni*, Hmpsn.

Sikhim, 1,800 feet; Bhutan, 2,500 feet. I have one male and seven females in my collection, taken at light in May, July, August and September. The male has no costal fold or a very minute one. The hindwings and lines on the forewings are pale pink. (This seems commoner in the Khasias than in Sikhim.—*H. J. E.*)

1298. *C. coccinea*, Moore.

Sikhim, 1,000—3,000 feet. The males of this species vary greatly in colour. My darkest specimen is scarlet with a sub-basal orange patch and the three black spots surrounded with orange. My palest male has the sub-basal patch white, a white patch round the black spots, narrowing towards the inner margin, where it becomes yellowish, and a broad white border to the black post-medial line exteriorly. The females have only two black spots, and were formerly thought by me to be that sex of *C. bianca*, Wlk. I have reared both sexes of this species from the larvæ. The cocoon is formed of the long hairs of the larva, joined together in a regularly constructed net, and the pupa is suspended within it by a few transverse webs.

1286. *C. bianca*, Wlk.

Sikhim, 1,800 feet. Rarely taken. I cannot distinguish the female. The two-spotted female, which has been identified by Mr. Moore as this species, I have proved by breeding to belong to *C. coccinea*, Moore. (I have four females, of which three by their smaller size and paler colour of the hindwings seem to belong to this species rather than to *C. coccinea*.—*H. J. E.*)

1296. *C. gelida*, Wlk.

Sikhim, 1,800 feet up. This occurs, but not commonly, in September and November. I have also taken it in the Kangra Valley. (There were many specimens in Möller's collection, dated March. I never took it myself.—*H. J. E.*)

1300. *C. gazella*, Moore.

Sikhim, 5,500—7,000 feet. A rare species, of which I have only two females taken in May and June.

Genus Siccia, Wlk.

1385. *S. taprobanis*, Wlk.

Sikhim and Bhutan, up to 6,000 feet. A common species attracted to light in August and September. I have also specimens which I took settled on damp rocks and mossy places in May and June.

1387. *S. guttulosana*, Wlk.

Sikhim, 5,000 feet. I have only procured this on one occasion, my specimen being obtained at Tukvar in August.

1391. *S. sagittifera*, Moore.

Sikhim, 7,000 feet. I have never taken this, but it has been obtained by Col. Pilcher in Darjeeling.

1388. *S. nilgirica*, Hmpsn.

Bhutan, 2,500 feet. I took one specimen of the variety *cinereicolor*, Hmpsn., at Fagoo in May.

Genus Hyposiccia, Hmpsn.

H. punctigera, Leach.

Bhutan, 6,400 feet. I took two specimens at light at Rissoom in September. It seems to be a rare species.

Genus Parasiccia, Hmpsn.

1386. *P. maculifascia*, Moore.

Sikhim and Bhutan, 6,000—7,000 feet. Not uncommon at light in Darjeeling. My specimens were taken in June and July.

Genus OVIPENNIS, Hmpsn.

1416. *O. dudgeoni*, Elwes.

Sikhim, 5,500 feet. The only specimen I ever took was attracted to light at Tukvar. This is the type in Mr. Elwes' collection.

Genus ASURIDIA, Hmpsn.

1645a. *A. nigriradiata*, Hmpsn. (Plate II, Fig. 15.)

Bhutan, 2,500 feet. I took three in July 1895 at Fagoo attracted to light, one of which, the type, had the ground colour of the forewing pale pink; the other two are ochreous-yellow, with the same markings.

A. metaphœa, Hmpsn.

Sikhim and Bhutan, 2,000—3,000 feet. I have one male which I took at Fagoo in August at light. It measures considerably less than the female described by Sir Geo. Hampson, and has the forewings narrower than *A. nigriradiata*, Hmpsn.

Genus ASURA, Wlk.

1477. *A. nubifascia*, Wlk.

Sikhim, 10,000—12,000 feet. I have never taken this myself, but have several specimens taken by my collectors in June and July at high elevation.

1478. *A. melanoleuca*, Hmpsn.

Sikhim, 9,000 feet. I possess only one specimen given me by Col. Pilcher and taken in July.

A. umbrifera, Hmpsn.

Yatung. This I have not seen, but most probably it occurs in Sikhim proper also.

1459 (part). *A. dasara*, Moore.

Sikhim, 5,500 feet. I have only taken this on four occasions at Tukvar and Badamtam. All my specimens are females, and two bear dates September and October; the other two are in the British Museum collection.

1426. *A. undulosa*, Wlk.

Sikhim and Bhutan, 3,000—5,000 feet. Very common from May to October.

1429 (part). *A. obsoleta*, Moore.

Sikhim, 1,800 feet; Bhutan, 2,500 feet. I have only three examples which I took at light in July. It is distinctly scarce.

1463. *A. euprepioides*, Wlk.

Sikhim and Bhutan, 1,800 feet. The sub-species *interserta*, Moore, is not uncommon at low elevations in the Daling Division, occurring in June, August and September.

1462. *A. conjunctana*, Wlk.

Sikhim and Bhutan, 2,500—4,000 feet. Not uncommon in May, July and August. I have procured the larva upon the bark of the Guava, where it was probably feeding on minute mosses.

1476. *A. flavivenosa*, Moore.

Bhutan, 2,500 feet. I have only two males taken at light at Fagoo in September.

1429. *A. semifascia*, Wlk.

Sikhim and Bhutan, 2,500—3,000 feet. Scarce in June and October.

1459 (part). *A. nebulosa*, Moore.

Sikhim. I have never procured this. From the figure in the Cat. Lep. Phal. it appears to be a very distinct species from *A. humilis*, Wlk., with which it was placed as a synonym in the Moths of India. It is a third larger in expanse than *A. humilis*.

1440. *A. rubricosa*, Moore.

Sikhim. This is recorded by Col. Swinhoe from Sikhim, but I have never seen a specimen.

1454. *A. congerens*, Feld.

Sikhim. I have not taken this.

1456. *A. floccosa*, Wlk.

Sikhim. This also I have not met with.

1437. *A. strigipennis*, Herr Schäff.

Sikhim and Bhutan, 1,800—4,500 feet. This is found commonly from June to September, and shows considerable variation in the markings of the forewing, some examples having no marginal series of specks and occasionally wanting the medial oblique line.

1459. *A. humilis*, Wlk.

Sikhim and Bhutan, 2,500 feet. Considerably rarer than the last, and exhibiting some variation also chiefly with regard to the fusion or separation of the streaks on the forewing. My specimens were all taken at light in July, September and October.

1459 (part). *A. calamaria*, Moore.

ikhim and Bhutan, 2,500—4,800 feet. An easily recognised form which is somewhat scarce in these localities, but is quite common in the Kangra Valley. The forewings have only a black speck at the base and one at the end of the cell. I have taken it at light in August and October.

1417. *A. anomala*, Elwes.

Sikhim. I have not taken this.

1415. *A. rubrimargo*, Hmpsn.

Sikhim, 7,000 feet. The only specimen I have seen was in Colonel Pilcher's collection.

1423. *A. frigida*, Wlk.

Sikhim and Bhutan, 2,500 feet. This is a common species in the Daling District, occurring from May to July and again from October to December.

Genus MILTOCHRISTA, Hübner.

1317. *M. flavicollis*, Moore.

Sikhim. I have never seen a specimen.

M. cardinalis, Hmpsn.

Sikhim and Bhutan, 1,500—5,500 feet. This is a rare species of which I have only taken about half a dozen examples in fourteen years' collecting in these districts. It superficially resembles *Asura anomala*, Elwes, with which it was identified by me before Sir George Hampson pointed out the difference. My specimens were taken during the day settled on leaves of tea bushes and other plants, in June, July and August.

1472. *M. postnigra*, Hmpsn.

Sikhim, 1,800 feet. I have only obtained this species on one occasion at light at Punkabaree in September; it appears to be rare. There was a specimen in Col. Pilcher's collection.

1469. *M. punicea*, Moore.

Sikhim and Bhutan, 1,800—2,500 feet. I have a series of females of this species, and as this sex is not at all uncommon, whereas, as far as I can ascertain, the male is unknown, I am inclined to think that *M. postnigra*, Hmpsn., will be found to be that sex of the species. I have taken it at light from June to September.

1468. *M. cuneonotata*, Wlk.

Sikhim and Bhutan, 2,500 feet. A common insect at low elevation in Bhutan, where it may be found in July and August settled on walls of houses even in bright sunlight.

1470. *M. cruciata*, Wlk.

Sikhim and Bhutan, 6,000—7,000 feet. I think this must be rather a scarce insect; the only specimen in my collection was captured in September.

1471. *M. inflexa*, Moore.

Sikhim, 5,000 feet. I have only taken two specimens of this in May; it seems to be scarce.

1277. *M. roseata*, Wlk.

Sikhim. A handsome large insect which I have never seen.

1473. *M. gratiosa*, Guer.

Sikhim and Bhutan, 1,800—3,000 feet: var. *flammealis*, Moore, 6,800 feet. A very variable insect, occurring commonly, attracted to light from April to September. I am inclined to think that *flammealis*, Moore, is distinct, but it is not easy to define any feature which is sufficiently characteristic to separate it.

1464. *M. radians*, Moore.

Sikhim. I do not know this.

1465. *M. zebrina*, Moore.

Sikhim and Bhutan, 1,800—2,500 feet. A common insect at light at Fagoo in May and from July to September.

1428. *M. prominens*, Moore.

Bhutan, 2,500 feet. I have never taken this in Sikhim, but I have no doubt that it will be found there subsequently. My specimens I took at light at Fagoo in June and July.

1434. *M. delicata*, Moore.

Sikhim. I never received this. The type in the British Museum is a female, and the male appears to be as yet undescribed.

1433. *M. linga*, Moore.

Sikhim and Bhutan, 1,800—2,500 feet. A fairly common insect, occurring at light in June and September.

M. proleuca, Hmpsn.

Sikhim. I have not taken this.

1447. *M. spilosomoides*, Moore.

Sikhim. Recorded from this locality, apparently on the existence of a specimen so marked in Dr. Staudinger's collection.

1445. *M. perpallida*, Hmpsn.

Sikhim and Bhutan, 6,700 feet. I have only one specimen taken by me at light in September.

1445*a*. *M. hololeuca*, Hmpsn.

Bhutan. I have only taken this on one occasion at Fagoo attracted to light.

Genus CYCLOMILTA, Hmpsn.

C. melanolepia, Hmpsn. (Plate II, Fig. 14.)

Sikhim, 1,800 feet. The type is the only specimen I have taken, and is now in the British Museum. It was attracted to light at Punkabaree.

Genus SCHISTOPHLEPS, Hmpsn.

1492. *S. bipunctata*, Hmpsn.

Sikhim and Bhutan, 1,800—2,500 feet. This is rather scarce, but I have taken it attracted to light at Punkabaree and Fagoo in June and November.

Genus HEMIPSILIA, Hmpsn.

1289. *H. coa-vestis*, Hmpsn.

Sikhim and Bhutan, 6,400 feet. I have never taken this in Sikhim, but I took one specimen attracted to light at Rissoom in September. I also saw another settled on a leaf beside the road between Sumeabeong and Labah in the Daling Division.

Genus NUDARIA, Haw.

1487. *N. fasciata*, Moore.

Sikhim and Bhutan, 6,700—10,000 feet. I obtained one specimen at Pasheteng in Daling in October, but have not seen another.

1488. *N. margaritacea*, Wlk.

Sikhim, and Bhutan, 6,400—9,000 feet. This is a rather common and variable insect which occurs in Darjeeling and at similar elevations elsewhere in the district in June, August and October.

1486. *N. suffusa*, Hmpsn.

Sikhim, and Bhutan, 6,400 feet. I took this at Rissoom in September. Col. Pilcher also had specimens from Darjeeling.

1488*a*. *N. fumidisca*, Hmpsn.

Sikhim, 7,000 feet. Col. Pilcher took this in Darjeeling, but I have never received it.

1488*c*. *N. discipuncta*, Hmpsn.

Bhutan. The only specimen obtained by me was taken at light at Fagoo at a lower elevation than most of the species of this genus.

Genus DIDUGA, Moore.

1397. *D. flavicostata*, Snell.

Bhutan, 2,500 feet. I caught two specimens of this at light at Fagoo in May and July. It is so small and inconspicuous that it has probably been often overlooked by collectors.

Genus EUGOA, Wlk.

1402. *E. bipunctata*, Wlk.

Sikhim, and Bhutan, 1,800—3,000 feet. A common insect at light, varying much in the extent of the suffusion beyond the postmedial line and the ground colour of the forewing. My specimens were taken by me in May, July, August, September and October.

Genus STIGMATOPHORA, Staud.

1435. *S. palmata*, Moore.

Sikhim, 1,800 feet. I took three specimens of this species at light in May, July and September at Punkabaree. The black markings are much reduced in Sikhim specimens compared with those of a specimen I took in the Kangra Valley, Punjab; the former are also slightly smaller, and have yellow patches on the antemedial area of the forewing.

Genus TROPACME, Hmpsn.

1410. *T. cupreimargo*, Hmpsn.

Bhutan, 2,500 feet. I took one specimen of this well-marked species at Fagoo in July, but have never seen another.

Genus HEMONIA, Wlk.

1383. *H. orbiferana*, Wlk.

Sikhim and Bhutan, 1,800—5,500 feet. This I found very commonly attracted to light at Fagoo in May and from July to October. It varies considerably in size.

NOTES ON SOME OF THE PLANTS INTRODUCED INTO THE VICTORIA GARDENS, BOMBAY, DURING THE PAST 8 YEARS.

By Cavasji D. Mahaluxmivala.

Part II.

(*Continued from page* 131 *of this volume.*)

16. Phaseolus caracalla,* *L.* (Leguminosæ), Snail Flower creeper. It is a twining plant of the Tropics, believed to be a native of Brazil, and long grown in Indian gardens. I have known this creeper growing in Poona for many years past, but it has never been very common there. It is an interesting plant from the peculiar shape of its fragrant purplish flowers turning yellowish when old, the corolla of which is spirally twisted like a corkscrew, giving the unopened buds a curious resemblance to snail-shells. It flowers in August and September. Plants were obtained from Messrs. Vishnoo Sadashiv & Co., Poona, in February, 1896, and again in August, 1900, from the Empress Botanical Gardens, Poona, but they do not seem to stand the climate of Bombay well, and several plants raised from seed this year also seem to be dying without flowering.

17. Euryale ferox,† *Salisb.* (Nymphæaceæ). It is an annual aquatics native of India and China. It is remarkable for its large circular puckered leaves with strong spiny ribs, about two feet in diameter, green above and purple beneath. The flowers are small, violet, prickly, and being partially submerged are inconspicuous. The seeds are eatable when roasted. It is no doubt a noble plant on account of its very large leaves, second only to the *Victoria regia* in this respect. Two plants raised from seeds obtained from the Superintendent, Baroda Gardens, in April, 1896, were planted in one of the ornamental ponds in the Garden, but were destroyed by the large fishes that are plentiful in this particular pond. They were again obtained from Baroda in August, 1897, and the plants flowered then, but were again destroyed by the fishes, &c., before seeding. Plants lately presented by Mr. G. H. Krumbiegel, Superintendent of the Baroda Gardens, were planted in a new water pond specially made for growing aquatics, but they have not survived, having suffered irreparable damage during the transit by rail.

18. Swietenia macrophylla,‡ *King* (Meliaceæ). Large-leaved Mahogany. Plants raised from seeds presented by the Superintendent, Royal

* The name is derived from the old Greek name, probably from *Phaselus*, a little boat from the fancied resemblance of the pods, and from *caracol*, its native name in South America.

† The name is derived from *Euryale*, one of Ovid's Gorgon's of fierce aspect, and from *ferox*, fierce, both in allusion to the prickly nature of the plant.

‡ It is named after Von Swieten, a Dutch botanist, and from *macros*, long, and *phyllon*, a leaf, the leaves of this species being larger than those of the true mahogany.

Botanical Gardens, Calcutta, in April, 1896, and afterwards all seem to be doing very well in Bombay. It appears to be a straight, tall tree of rapid growth. It has not yet flowered here. Dr. A. V. Gage, Curator of the Herbarium of the Royal Botanic Gardens, Calcutta, has kindly supplied me with the following information about its introduction in India :—

"*Swietenia macrophylla* is a large-leaved species of mahogany which was sent over as seed, a good many years ago, from the West Indies. It was supposed to be *Swietenia Mahogani* seed that had been sent. Dr. King, as he then was, discovered that the plants resulting from the seeds were quite different from the *Swietenia Mahogani*."

19. EUCALYPTUS GLOBULUS,* *Labill.* (MYRTACEÆ). Blue Gum Tree. This well-known Australian tree, growing to a height of about 300 feet, is reputed to possess febrifugal properties, and is extensively planted on that account in malarious districts. The oil obtained from the leaves is antiseptic, and the antimalarial properties of the tree are considered to be due partly to the antiseptic vapours given off by the leaves into the surrounding air, which are supposed to kill the germs of malaria. The leaves and branches which cover the soil containing a large proportion of eucalyptol may also prevent the development of the germs. But its action in this respect is also ascribed to the absorption of large quantities of water by its roots during its rapid growth and passing it off through the leaves as healthy vapour and thus rapidly draining swampy land and making it unsuitable for malarial germs. This latter hypothesis receives some confirmation from the recent researches on the connection of malaria with mosquitos which breed in shallow pools and swampy land. This tree has been tried by me over and over again, but has never survived for more than two or three years at the most. The seeds germinate freely and the plants grow well for some time in pots, but after making some growth both the plants in pots and those planted in the ground die during the rainy season. As the tree only grows and thrives at very high elevations and in soil which is neither too dry or too wet, there is no chance of its thriving in a place like Bombay.

Another species EUCALYPTUS CITRIODORA, *Hooker*, called Lemon-scented Gum Tree on account of the leaves emitting, when rubbed, a powerful odour resembling that of the lemon-scented verbena (*Aloysia citriodora*), is said to succeed in tropical climates. This has also been tried here, but without much success. It has, however, not failed so completely as *E. globulus* and is likely to succeed well in Bombay on a somewhat drier soil than that of the Victoria Gardens.

The only other species which has entirely succeeded in the gardens is EUCALYPTUS SIDEROPHLOIA, *Benth.*, called the White Iron-bark Tree, which

* The name is derived from *eu*, well, and *kalyptos*, covering, on account of the bud of its flower being covered with the lid-like limb of the calyx which falls off as soon as the flower opens, and from *globulus*, a little globe.

furnishes one of the strongest and most durable timber of New South Wales suitable for railway sleepers, spokes of wheels and handles of tools and implements.

Another species which is likely to thrive here is EUCALYPTUS ROSTRATA, *Schlecht.*, called the Red Gum Tree, which is said to grow at low elevations and on moist clayey grounds.

20. KÆMPFERIA ROSCŒANA,* *Wall.* (SCITAMINEÆ). A very beautiful dwarf, stemless, herbaceous perennial, native of Burmah. The leaves are tufted, large, undulated, roundish, spreading flat on the ground and marked on the upper surface with bands of dark and light green and dark purple or black. The flowers described in Hooker's "Flora of British India" as white are entirely white outside, but the inner side of the limb is bright pale purple with a white or creamy eye in the centre. They are sessile appearing in the centre of the plant in succession. The plant was purchased from the Agri-Horticultural Society of India, Calcutta, in August, 1899, and seems to do very well in Bombay. It starts into growth in the beginning of the rains, and should be gradually dried up after the rains are over.

21. KÆMPFERIA GILBERTI,† *Hort.* (SCITAMINEÆ). This is also an attractive dwarf, stemless, herbaceous perennial, native of Burmah. The leaves are dark green, lanceolate, with wavy margins and bordered with broad cream-coloured bands. The flowers are fugitive, sessile, white, with a bright purple lip.

22. KÆMPFERIA GALANGA, *L.* (SCITAMINEÆ), *Chanda Mula.* This very dwarf *Kæmpferia* is a native of India and Malaya. The leaves are large, tufted, roundish and spreading flat on the ground like those of *K. roscœana*, but are entirely dark green. The flowers are fugitive, white with lilac throat.

All the three *Kæmpferias* described above were purchased in 1899 from the Agri-Horticultural Society of India, and seem to do very well in Bombay.

All of them flower after the leaves come out, and are therefore unlike the more generally known and commonly cultivated *Kæmpferia rotunda*, *L.*, *Bhui champa*, whose lovely sweet-scented flowers appear at the end of the hot weather before the leaves come out.

23. ZINGIBER DARCEYI ‡ (SCITAMINEÆ). It is a perennial herb from two to three feet high, introduced in England in 1890 from the Sydney Botanical Garden. The leaves are large, shining green, with a broad creamy white margin and oblique stripes of the same colour. The flowers appearing in September are radical in large dense oblong spikes with persistent bracts

* Named after a German naturalist, E. Kæmpfer, and after Roscoe.

† Named after Kæmpfer and after Gilbert.

‡ The name is derived from Greek *Zingiberis*, originating from Sanscrit *cringavera*, horn-shaped, probably in reference to the form of the rhizomes and after D'Arcy.

which are green at first, turning scarlet afterwards. The calyx is white, translucent, and the corolla cream-coloured with a pale yellow lip. The plant was obtained as a present from Mr. Krumbiegel, Superintendent, Baroda Gardens, in December, 1896.

24. OXYSTELMA ESCULENTUM * *Br.* (ASCLEPIADEÆ), *Dudhika* or *Dudhani*. It is a deciduous leaved, very slender, herbaceous, twining perennial found throughout the plains and lower hills of India. The leaves are membranous, linear lanceolate. It begins to flower in July, the flowers being saucer-shaped, entirely white outside, and spotted and veined with purple inside, and are inflated in bud. The plant was collected by my Overseer from near Bassein in 1900. It seems to do well in Bombay.

25. SOLANUM SEAFORTHIANUM† (SOLANACEÆ). It is a beautiful herbaceous climber of the West Indies. The leaves are pinnately divided into about nine segments. The flowers are light purple outside and violet blue inside, and are produced in gracefully hanging panicles, succeeded by beautiful bunches of cherry-red round berries. It begins to flower here in July, flowering in succession afterwards till December. After flowering and fruiting it appears to drop the leaves and to go to rest in the hot weather, when care is necessary to water it sparingly. It can be propagated easily from seeds.

26. SOLANUM WENDLANDII, *Hook. f.* (SOLANACEÆ). An herbaceous climber of Costa Rica, somewhat similar to the above, but of thicker and stronger growth in stem, leaves, &c. The flowers are large, about two inches in diameter, and of a beautiful pale lilac-blue colour. It is propagated by cuttings.

Both the above creepers were purchased from the Agri-Horticultural Society of India, Calcutta, in January, 1898, and appear to do very well in Bombay.

27. KLEINHOVIA HOSPITA,‡ *L.* (STERCULIACEÆ). It is a native of Malay Archipelago and doubtfully of India, but is widely distributed in India, Ceylon, Java, Mollucas, &c. It is a medium sized tree with large heart-shaped light-green leaves and terminal panicles of handsome pale pink flowers which begin to appear in August and continue flowering till November. The fruit is an inflated, top-shaped, five-winged, membranous capsule. The plants were raised from seeds obtained from the College of Science Garden, Poona, in October, 1898, and they seem to do well. One of them planted in the ground began flowering in 1900, when it was about 10 feet high. Another has grown about 16 feet high, but has not flowered yet.

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* The name is derived from *Oxys*, sharp, and *stelma*, a girdle, on account of the acute segments of the corona, and from *esculentum*, edible, on account probably of its follicle or fruit being said to be eaten in Sind. The fruit and the leaves are also said to have been eaten by the poorer classes in Poona and Khandesh during the famine of 1897-98.

† The name is derived from the old Latin name used by Pliny, probably from *Solar* to comfort, from the soothing narcotic effect of this family, and after Seaforth.

‡ Named after Kleinhoff, a Dutch botanist, and probably from *hospitalis*, pertaining to a guest.

28. EPISCIA CHONTALENSIS,* *Hook. f.* (GESNERACEÆ). It is a beautiful, very dwarf, herbaceous perennial, native of Nicaragua. It is very similar in appearance and habit to the other species, *Episcia fulgida*, commonly grown in our conservatories under the synonymous name of *Cyrtodeira fulgida*. The leaves are very hairy, bullately reticulated or puckered between the veins, the upper surface being of a dull light brownish-green colour with a bright green band along the midrib, and the underside bright purple. The flowers are white suffused with lilac with a yellow throat. Like the *Episcia fulgida* it is a very handsome conservatory plant suitable for rock-work and hanging baskets. It is propagated from the creeping shoots which take root when pressed in the soil. The plant was obtained as a present from Mr. C. Maries, Superintendent, State Gardens, Gwalior, in October, 1895. It appears to be a more delicate plant than *E. fulgida*, as it does not seem to thrive so well in the Gardens.

29. ARISTOLOCHIA LEUCONEURA, † *Linden.* (ARISTOLOCHIACEÆ). It is a handsome climber, native of Columbia. The leaves are large, heart-shaped, dull green, veined with bright light green. The flowers are comparatively small, about two inches in size, borne in bunches on the corky bark of the old lower stems, the pouch being yellowish green, veined with brown, the tube olive brown, and the ear-shaped lip purplish brown outside and thickly studded with little light brown warts inside, while the throat is cream-veined dull dark brown. The pods are said to be vanilla like. This climber was purchased from the Agri-Horticultural Society of India, Calcutta, in January, 1898, and thrives well here. It has commenced flowering only this year, the flowers appearing in July and August.

30. QUASSIA AMARA, ‡ *L.* (SIMARUBEÆ), *Suranam Quassia*. A tree of Tropical America (Guiana), said to be twenty feet high. The leaves are large, pinnate, with five articulated leaflets, dark glossy green, the midribs being red. The petiole is also red and winged. The flowers are in terminal panicles, each about one inch, of a coral red colour. The whole plant contains a bitter principle, and the wood furnishes the well-known "Quassia chips" used as an insecticide by gardeners, and for medicinal purposes. The plant was purchased from the Agri-Horticultural Society of India, Calcutta, in 1897. It has been propagated by laying. It begins to flower here in September, and remains in flower through the cold weather. It does not seem to bear exposure to sun at noon, and requires, therefore, to be planted in a situation where it can receive partial shade at noon. It does not grow into a tree here, as it does in its native habitat, but has remained a shrubby plant only about five feet high.

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* The name is derived from *Episkios*, shaded, as they grow in shady places.

† The name is derived from *Aristos*, best, and *locheia*, parturition, from its supposed medical properties, and from *leuconeura*, meaning white-veined.

‡ The name of the genus was applied by Linnæus to a tree of Surinam in honour of a negro, Quassi, who employed its bark as a remedy for fever, and the specific name, *amara*, means bitter from the properties of the plant.

31. SAINTPAULIA IONANTHA, * *Wend.* (GESNERACEÆ). It is commonly known as the Natal, Transvaal, or South African violet. It is an attractive perennial, stemless, hairy, herbaceous plant, native of Eastern Tropical Africa. Leaves are petioled, oval or roundish, about two inches in diameter, dark green, cordate, with crenate margin. The flowers are nodding, about an inch in diameter, two-lipped, violet blue. The plant was purchased from the Agri-Horticultural Society of India, Calcutta, in February, 1901. It has been propagated like the begonias by putting down the leaves as cuttings. It seems to thrive well here in partial shade and has been cultivated as a conservatory plant. It has begun flowering in December this year, and is said to be flowering continuously throughout the year.

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* Named in honour of Baron Walter Saintpaul, who discovered it in Africa and introduced it in Europe in 1893, and from *ionantha*, meaning violet-flowered.

THE BIRDS OF THE MADHUBANI SUBDIVISION OF THE DARBHANGA DISTRICT, TIRHUT, WITH NOTES ON SPECIES NOTICED ELSEWHERE IN THE DISTRICT.

By C. M. Inglis.

Part III.

(*Continued from page* 139.)

(99) Anthus trivialis.—The Tree Pipit

Oates, No. 840 ; *Hume*, No. 597.

I have a couple of skins, browner on the back than those usually got here of *maculatus*. I sent one to Mr. Baker, but he identifies it as *maculatus*, so probably the other one is also of that species ; if this proves to be the case then *trivialis* must be eliminated from our list. I forgot to mention that during the cold weather swarms of wagtails stay the night in the sugar-cane. The usual native name for all pipits is *Bagheyri*.

(100) A. maculatus.—The Indian Tree Pipit.

Oates, No. 841 ; *Hume*, No. 596.

Very common during the cold weather in all mango groves. They arrive later than the wagtails. Most of the birds sold as ortolans during that period belong to this species. Native fowlers called *Mir-shikars* snare them with bird lime smeared on a thin pliant fork of bamboo. This fork is placed on the end of a bamboo rod, several of these rods being jointed together like a fishing rod. The man carries a screen of leaves which he holds in front of him. When within striking distance he pushes forward his rod very gently till he gets close up to the bird and then with a sudden jerk he has caught it. He leaves it struggling to get away and pushes forward another rod and snares a second bird out of the number that always come round the one that was caught first. He then draws in the first rod, pulls out the primaries of one wing and places the captive in a basket. I have seen over half a dozen pipits caught in this way at one place before the fowler had to change his quarters. Native name according to Mir-shikars *Musrenchi bagheyri*.

(101) A. richardi.—Richard's Pipit.

Oates, No. 845 ; *Hume*, No. 599.

This species is also I think a cold weather visitant. Mr. Scroope also believes he has seen it.

(102) A. rufulus.—The Indian Pipit.

Oates, No. 847 ; *Hume*, No. 600.

Very common and breeds from February to June. A nest containing 3 young was taken on the 28th February ; this is the earliest date I have recorded. Three is the full complement of eggs, four being seldom found. Most eggs are to be got in April and June. I had a peculiarly coloured skin, it was cream colour. I sent it to Mr. Scroope and he says it must be a *lusus naturæ* and that he would call it a nearly albino Indian Pipit. I have mislaid the specimen.

(103) A. ROSACEUS.—Hodgson's Pipit.

Oates, No. 850 ; *Hume*, No. 605.

I had quite overlooked this species till this February when a *Mir-shikar* brought me in one. He said it was fairly common near marshes and I have got several more specimens. The fair skins I have are all of young birds Native name according to Mir-shikars *Paniella bagheyri*.

Family *Alaudidæ*.

(104) ALAUDA GULGULA.—The Indian Sky Lark.

Oates, No. 861 ; *Hume*, No. 767.

Common in the cultivation and grasses. I have not been successful in finding the eggs, though they undoubtedly breed here. I fired at a large lark near Narhar on the 20th November, 1899, but unfortunately missed it. I think it must have been *arvensis*. Native name *Bhurut*.

(105) CALANDRELLA BRACHYDACTYLA.—The Short-toed Lark.

Oates, No. 862 ; *Hume*, No. 761 (pt.)

The 17th October is the earliest date recorded by me for the arrival of short-toed larks. A small flock was seen on that date near Baghownie Fly. I do not think this species is so common as the following one, but I have not examined many specimens. In March and April large flocks of this and the next species are seen in the paddy fields and are then as fat as butter and excellent eating. During this time these take the place of pipits as ortolans. The native name for all these short-toed larks is *Pulluk*, Mir-shikar's name *Akonia*.

(106) C. DUKHUNENSIS.—The Rufous Short-toed Lark.

Oates, No. 863 ; *Hume*, No. 761 (pt.)

The above remarks also serve for this species. The cowherd boys near Baghownie snare them in nooses.

(107) C. TIBETANA.—Brook's Short-toed Lark.

Oates, No. 864.

Mr. Baker says of a skin sent to him that it probably belongs to this species as there is so pure a white on the outermost tail feathers.

(108) ALAUDULA RAYTAL.—The Ganges Sand-Lark.

Oates, No. 866 ; *Hume*, No. 762.

Common on the banks of the Kamla and probably of the other rivers in the District. Males shot at the end of February and middle of April had the testes enlarged and must have been breeding. I was, however, unsuccessful in finding the nests.

(109) MIRAFRA ASSAMICA.—The Bengal Bush-Lark.

Oates, No. 870 ; *Hume*, No. 754.

Very common. I have taken the eggs from March to July. Native name *Agghin*.

(110) GALERITA CRISTATA.—The Crested Lark.

Oates, No. 874 ; *Hume*, No. 769.

I have seen very few in the subdivision, but near the Baghownie and Hasowlie Factories they were rather common. They commence building in February and I have taken their eggs near Baghownie in March and April. All the nests were under clods in paddy land and the birds were very wary in approaching them. Native name *Chandool*.

(111) G. DEVA.—Syke's Crested Lark.

Oates, No. 875 ; *Hume*, No. 765.

Blanford in Vol. IV of Stray Feathers gives Behar as within the range of this species, but I have not come across it here.

(112) PYRRHULAUDA GRISEA.—The Ashy-crowned Finch-Lark.

Oates, No. 879 ; *Hume*, No. 760.

Very common. I have taken eggs from February to May in the same situations as *G. cristata*. Some birds breed earlier in January and I saw a pair building in the beginning of September. A hen bird was seen trying to feed a dead young one which was lying in the nest. Name according to Mir-shikar *Gotowli*.

Family *Nectariniidæ*.

Sub-family *Nectariniinæ*.

(113) ARACHNECHTHRA ASIATICA.—The Purple Sun-bird.

Oates, No. 895 ; *Hume*, No. 234.

Abundant. It breeds from February to May. I have taken nests from many situations. Some were found hanging under the eaves of houses and others hanging from bamboos, creepers, thorny hedges, twigs of small bushes, pomegranate, peach, kheir and mango trees. Most were from 2 to 5 ft. from the ground, one was about 20 and another about 40 ft. up in a mango tree. The earliest nest was taken on the 26th February, the latest with eggs on the 30th May. I have seen them picking small insects off the ground and often watched them flying up and catching insects on the wing. Only the female builds the nest and hatches the young, and an egg is laid daily till the number is complete. These sun-birds can be reared as I kept an *A. zeylonica* for about six months in a cage feeding it on sugar mixed in *sattoo*. It died from the cold as it had an iron perch which I omitted to cover during the cold weather. It lived from August to January.

Family *Dicæidæ*.

(114) DICÆUM ERYTHRORHYNCHUS.—Tickell's Flower-pecker.

Oates, No. 919 ; *Hume*, No. 238.

Common. They breed here in March and April. I have found very few nests and have not succeeded in getting the eggs ; though one nest had two eggs in it which were destroyed by *D. rufa*. I have found two young in a nest and probably two is the full complement of eggs laid. These birds commit a good deal of damage to the ripe mangoes and guavas.

(115) PIPRISOMA SQUALIDUM.—The Thick-billed Flower-pecker.

Oates, No. 921 ; *Hume*, No. 240.

If anything, commoner than the last species. They breed from March to June. All my nests, with one exception, were built on mango trees from 12 to 20 ft. from the ground, the other was being built on a tamarind tree at Narhar about the end of February but was deserted. All the nests were found hanging from the extremity of the thinnest twigs and generally from those on the outermost branches. The nests were like those described by Captain Beavan, but some were of a much greyer tinge ; the commonest colour however is orange brown. An egg is laid daily till three, which is the full number, are laid.

ORDER PICI.

Family *Picidæ*.

Subfamily *Picinæ*.

(116) LIOPICUS MAHRATTENSIS.—The Yellow-fronted Pied Woodpecker.

Blanford, No. 972 ; *Hume*, No. 160.

Rather uncommon. The few nests I have taken of this species were during April and May. I have seen others but they were always deserted. I have been most unfortunate with my woodpecker's nests, by far the greater proportion being deserted. I think this species here invariably make holes in the thinner branches of trees and never in the trunks themselves. All woodpeckers are called *Kat-kodi* by the natives.

(117) IYNGIPICUS HARDWICKII.—The Indian Pigmy Woodpecker.

Blanford, No. 976 ; *Hume*, No. 164.

Fairly common. I have only taken two nests with eggs of this species. In May 1899 I found over half a dozen pairs busy making nest holes in the thin branches of mango trees ; the birds were seen at all times of the day busy excavating and though never disturbed not a single pair laid eggs. They commence excavating in February. The nests with eggs were taken on the 24th March and the 12th July respectively. The first contained 3 slightly incubated eggs and the latter two fresh ones. Sometimes the holes are made in fairly thick branches but usually in thin ones.

(118) MICROPTERNUS PHÆOCEPS.—The Northern Rufous Woodpecker.

Blanford, No. 983 ; *Hume*, No. 178.

Scarce. It breeds here in April and May. I have the following note on its nidification. At Narhar, in the nearly horizontal trunk of a decayed tree standing out from a bund that overlooked a drain and surrounded by bamboos, was a hole in which some wasps had made a nest. This hole was about 7 ft. from the ground and had presumably been deserted by the wasps. In this nest a rufous woodpecker had bored a hole and laid four eggs which were slightly incubated. The eggs were absolutely glossless.

(119) BRACHYPTERNUS AURANTIUS.—The Golden-backed Woodpecker.

Blanford, No. 986 ; *Hume*, No. 180.

Very common. A female shot on the 1st December 1898 had the feathers on the upper back and rump black tipped with golden olive. This species breeds from March to July but commence excavating in February. They often bore into the trunks of trees but not invariably and prefer mango, but I have also found their holes in leechee and siris trees. I have seen them feeding on the ground.

Sub-family *Iyngin*æ.

(120) IYNX TORQUILLA.—The Common Wryneck.

Blanford, No. 1003 ; *Hume*, No. 188.

Rather rare ; but a few are generally to be seen every cold weather. I have secured four or five specimens. The scrub jungle which often grows on the banks of tanks seems to be rather a favourite place for this species. They arrive about the end of October, I having got one on the 24th of that month, and appear to remain till the middle of April.

Family *Capitonid*æ.

(121) THEREICERYX ZEYLONICUS.—The Common Indian Green Barbet.

Blanford, No. 1008 ; *Hume*, No. 193.

Very common. It breeds from April to June. Common though it is I have found very few nests and only taken one clutch of eggs. The latter were got from a hole in the trunk of a mango tree about 7 ft. from the ground and were quite fresh. Four is I think the full complement of eggs, but I have had a nest brought me containing 3 young.

(122) XANTHOLÆMA HÆMATOCEPHALA.—The Crimson-breasted Barbet.

Blanford, No. 1019 ; *Hume*, No. 197.

Exceedingly common, breeding from February to July. They lay from two to four eggs, three being the usual number. On the 3rd July I took 2 nearly fledged young from a hole in the branch of a *champa* tree. I cut off the branch below the hole, leaving about 10 inches on the tree ; on the 21st I found a new hole had been excavated in the remaining piece of the branch and from it I got 3 fresh eggs. The branch was again cut leaving only 3 or 4 inches on the tree and on the 29th a new hole had been made in it right into the trunk of the tree ; this hole, however, was deserted.

ORDER ANISODACTYLI.

Sub-order Coraciæ.

Family *Coraciad*æ.

(123) CORACIAS INDICA.—The Indian Roller.

Blanford, No. 1022 ; *Hume*, No. 123.

This species, commonly known to Europeans here as the Blue Jay, is extremely common. It breeds from March to June, and most eggs are to be got in April. I have never found any birds so wary about their nests as those mentioned by Mr. B. Aitken in Hume's Nests and Eggs. They have always

been very noisy and pugilistic, flying out at any bird, from a vulture downwards, that came near their nests. A pair took possession of a pigeon-house near my bungalow at Narhar, driving out the rightful owners. Mir-shikar's name *Sabzuk* ; ordinary native name *Nill Kunt.*

SUB-ORDER MEROPES.

Family *Meropidæ.*

(124) MEROPS VIRIDIS.—The Common Indian Bee-eater.

Blanford, No. 1026 ; *Hume*, No. 117.

Very common. It breeds from March to May. I have several times found seven eggs in the same nest, and on one occasion found a nest containing a single young one. Native name *Patringa.*

(125) M. PHILIPPINUS.—The Blue-tailed Bee-eater.

Blanford, No. 1027 ; *Hume*, No. 118.

I have found this species scarce in the subdivision though common near Baghownie from the middle of March throughout the rains. Mr. Scroope, however, says he has observed it in many places during the rains. I have noticed them up to October and they do not remain here after then. I found them breeding in numbers not far from Hatauri during April and May in the banks of the Keray River. Mir-shikar's name *Dorla.*

SUB-ORDER HALCYONES.

Family *Alcedinidæ.*

(126) CERYLE VARIA.—The Indian Pied Kingfisher.

Blanford, No. 1033 ; *Hume*, No. 136.

Very common. It breeds from February to April and again in October. They do not invariably lay in holes of banks overlooking running water as supposed by Hume for I have on several occasions taken their eggs from holes in banks of tanks. I have seen one swallow a fish on the wing ; they usually take it to the bank and eat it there. Mir-shikar's name *Korona.*

(127) ALCEDO ISPIDA.—The Common Kingfisher.

Blanford, No. 1035 ; *Hume*, No. 134.

Common during the cold weather and up to April. I *once*, however, saw one in July. I have not found their nest. Sometimes this species is seen hovering and diving like *C. varia.* Mir-shikar's name *Farissi.*

(128) PELARGOPSIS GURIAL.—The Brown-headed Stork-billed Kingfisher.

Blanford, No. 1043 ; *Hume*, No. 127.

I have not found this species very common, but Scroope says it is so in most places. Though a male shot on the 20th January had enlarged testes and was probably breeding, I have never found the nest. Mir-shikar's name *Tunnak.*

(129) HALCYON SMYRNENSIS.—The White-breasted Kingfisher.

Blanford, No. 1044 ; *Hume*, No. 129.

Fairly common in most places but rather scarce round about Jainagar. I have found it a very wary bird here quite unlike those I came across in

Cachar. Large numbers are snared by the native fowlers. One man told me that he usually snared 100 to 150 from October to January and that they fetched from Rs. 15 to Rs. 20 a hundred. This shows what a number of this useful Kingfisher are killed, as in some parts of the country there are small hamlets of these men who do nothing else, during that time of year, but snare these birds. The native name here is *Tunki*.

(130) H. PILEATA.—The Black-capped Kingfisher.

Blanford, No. 1045 ; *Hume*, No. 130.

I have already, in this Journal, recorded the occurrence of this species in the District and regret to say it has not been come across again.

SUB-ORDER BUCEROTES.

Family *Bucerotidæ*.

(131) LOPHOCEROS BIROSTRIS.—The Common Grey Hornbill.

Blanford, No. 1062 ; *Hume*, No. 144.

Very common. They are often seen picking fallen fruit off the ground. The note sounds like pee-ye. Three eggs and a hornbill were brought to Narhar by a native on the 16th April. I was away from home at the time, but the man told my servant that they were got in a mango tree and also mentioned the birds being closed up inside the hole with dung. The eggs are small for the size of the bird. On the 19th of April I found a nest hole high up in a large Simul tree, a few miles from Narhar. The hole had previously been made by a parrot and must have been enlarged by the hornbills. The male bird flew up at the hole, so I expect the female was safely shut up inside. I could get nobody who dared climb the tree, so was unable to investigate the matter. Native name *Duness*.

SUB-ORDER UPUPÆ.

Family *Upupidæ*.

(132) UPUPA EPOPS.—The European Hoopoe.

Blanford, No. 1066 ; *Hume*, No 254.

Not uncommon during the cold weather.

(133) UPUPA INDICA.—The Indian Hoopoe.

Blanford, No. 1067 ; *Hume*, No. 255.

Common. Many birds are hybrids between the two species. It breeds in February, March and April. The earliest eggs were got on the 12th February. It is only lately that I have been successful in getting eggs though I have found many nests but all had either young or were deserted. Here they build oftener in holes in the mud walls of houses than in trees. I tried to rear some young ones but they died in a very few days. During the day they were very quiet but in the evening chirruped a lot. On the 25th February, I got a nest with five eggs, two were broken in the nest, from a crack in some mortar on my bungalow roof, and though the hen-bird was handled rather roughly, all her rectrices being pulled out, she has selected a new site for a nest near my chimney. Native name *Hud-hud*.

ORDER MACROCHIRES.

Sub-order Cypseli.

Family *Cypselidæ*.

Sub-family *Cypselinæ*.

(134) CYPSELUS MELBA.—The Alpine Swift.

Blanford, No. 1068; *Hume*, No. 98.

Not an uncommon visitant during the rains. The earliest arrivals were noticed on the 18th April. I have seen them in May, but most are noticed from June to September. I have not succeeded in getting any specimens but am certain the identification is correct.

(135) C. AFFINIS.—The Common Indian Swift.

Blanford, No. 1073; *Hume*, No. 100.

I have found this species uncommon. A few years ago I saw them nesting on the rafters in the Maharajah's stables at Darbhanga, but am not aware whether they still do so or not. I have seen them from February to October, except during March and July. On the 3rd October a pair flew several times into my verandah at Baghownie, one settling on one of the bamboos in the roof.

(136) TACHORNIS BATASSIENSIS.—The Palm Swift.

Blanford, No. 1075; *Hume*, No. 102.

Very common. I have found them breeding from February to August. The earliest nest was taken on the 25th of February and the latest on the 2nd August. A nest from which 2 fresh eggs were taken on the 1st March contained a young bird on the 15th April. Two nests are never found on the one leaf though several pairs usually build on the same palm (*Borassus flabelliformis*). Most of my eggs were got in March.

SUB-ORDER CAPRIMULGI.

Family *Caprimulgidæ*.

(137) CAPRIMULGUS ASIATICUS.—The Common Indian Nightjar.

Blanford, No. 1091; *Hume*, No. 112.

I have a single skin of this species shot at Anarh Fty, on Xmas Day 1899.

(138) C. MACRURUS.—Horsfield's Nightjar.

Blanford, No. 1093; *Hume*, No. 110.

This is the common species found here. I have been unsuccessful in finding its eggs but am certain it breeds here. Native name *Chupka*.

ORDER COCCYGES.

Family *Cuculidæ*.

Subfamily *Cuculinæ*.

(139) CUCULUS MICROPTERUS.—The Indian Cuckoo.

Blanford, No 1107; *Hume*, No. 203.

I have noticed this species from the end of March to July during which months it is fairly common.

(140) HIEROCOCCYX VARIUS.—The Common Hawk Cuckoo.

Blanford, No. 1109 ; *Hume*, No. 205.

Abundant. Two females shot on the 21st June had each a fully shelled egg in the oviduct ; one was unfortunately smashed by the shot but the other was perfect and is now in my collection. The " brain fever " bird, as it is called, is very noisy during the breeding season, commencing to make itself heard in March ; at other times of the year it is very silent. Mir-shikar's name *Barow*.

(141) COCCYSTES JACOBINUS.—The Pied Crested Cuckoo.

Blanford, No. 1118 ; *Hume*, No. 212.

Very common from May to the beginning of October. An egg was obtained on the 27th July from a nest of *Crateropus canorus* containing six eggs belonging to the latter bird. The cuckoo was not seen on the nest but came out of the mango tree on which the babblers had the nest, and the parasitic egg is if anything rounder than the others. I have many times seen *C. canorus* feeding young of this species. Native name *Pupiya*.

Subfamily *Phœnicophainæ*.

(142) EUDYNAMIS HONORATA.—The Indian Koël.

Blanford, No. 1120 ; *Hume*, No. 214.

Abundant. It lays its eggs in the nests of *Corvus splendens* from May to July. I have never taken eggs from the nests of *C. macrorhynchus*. *Re* the number of eggs laid by this species I give the following extract :—

July 7th, 1897—One young Koël.
" 9th " —One young Koël and 3 young crows.
May 19th, 1898—3 fresh Koël's eggs and 1 incubated crow's egg.
" 21st " —1 fresh Koël's egg and 2 incubated crow's eggs.
June 17th " —5 fresh Koël's eggs.
July 2nd " —2 fresh Koël's eggs and 2 highly incubated crow's eggs.

A young bird which I had, used to sit on the whole of its tarsus and swallowed a plantain quite 3 inches long.

(143) TACCOCUA LESCHENAULTI.—The Sirkeer Cuckoo.

Blanford, No. 1129 ; *Hume*, No. 222.

This species is rather rare round Narhar and Jainagar, but Scroope says it is not uncommon elsewhere in the subdivision. Outside this subdivision I have found it common everywhere. I took many nests near Baghownie Factory from April to September. These birds can run very well. They have a habit of running a short distance and then raising their bodies and having a good look round, then off they scuttle again keeping their bodies almost horizontal with the ground. Native name *Soolbool*.

(144) CENTROPUS SINENSIS.—The Common Coucal.

Blanford, No. 1130 ; *Hume*, No. 217 quat.

Very common. Mr. G. Dalgliesh told me they were not common round Dulsing Sarai. It breeds from June to September. In Hume's Nests and

Eggs I see no mention of their building in bamboos, but here they very often do so. Some natives believe their flesh is a cure for consumption. The colours of the soft parts of a nestling were as follows :—Bill, upper mandible dark horn colour, lower mandible and gape yellow fleshing ; iris brown ; legs and feet brownish plumbeous. Native name *Mohoka*.

(145) C. BENGALENSIS.—The Lesser Coucal.

Blanford, No. 1133 ; *Hume*, No. 218.

I have only secured two specimens of this species in the District and seen two others ; it must be very rare. My two birds were shot at Narhar in December and January and are in winter plumage.

ORDER PSITTACI.

Family *Psittacidæ*.

(146) PALÆORNIS NEPALENSIS.—The Large Indian Paroquet.

Blanford, No. 1135 ; *Hume*, No. 147 ter.

I found this species not uncommon round Jainagar but noticed it nowhere else. Two males shot on the 19th January had the testes greatly enlarged and a pair were seen excavating in a large mango tree in the middle of February. They only worked at the hole for a few days and then deserted it. I have never found the eggs or young.

(147) P. TORQUATUS.—The Rose-ringed Paroquet.

Blanford, No. 1138 ; *Hume*, No. 148.

Very common. It breeds here from March to May, but I have found very few nests. Numbers of them, in company with *Columba intermedia*, breed in holes in an old pucca temple at Laheria Serai. Native name *Sooga* or *Tota*.

(148) P. CYANOCEPHALUS.—The Western Blossom-headed Paroquet.

Blanford, No. 1139 ; *Hume*, No. 149.

This species is also common, numbers being seen in the Indian corn and millet fields in August. They also do considerable damage to the paddy. I have never found the nest.

(*To be continued.*)

MISCELLANEOUS NOTES.

No. I.—SOME FURTHER NOTES ON THE NARCONDAM HORNBILL (*RHYTIDOCEROS NARCONDAMI*).

(*With a Plate.*)

At the request of Colonel R. C. Temple, Chief Commissioner of the Andamans, I visited Narcondam, on 22nd March 1901, for the purpose of making further notes on the Narcondam Hornbill and securing more skins. I had also hoped to have found the nest and eggs, but unfortunately the nesting season had not begun.

The birds were paired and the cocks were attentively feeding the hens as they sat together on the trees, but all were still moulting, and from what I noticed I should say that the nesting season would be quite a month later than the time of my visit.

The plumage of those we shot was in a very draggled state, the white tail feathers being dirty and ragged ; and the whole appearance of the birds was as if they had been confined in an ill-kept aviary.

In the description of the bird in the "Fauna of British India," Birds, Volume III, p. 149, and in the notes in the Society's Journal, Volume XII, p. 212, I notice some errors.

In no case have I seen it mentioned that the eye of the female is different in colour to that of the male. The iridis of the cock bird is brilliant orange red with a fine circle of pale yellow next to the pupil—not pale red as stated—and the iridis of the hen a dark olive brown with the same thin circle of pale yellow. The orbital skin is a rich smalt blue, the gular skin the same colour only very much lighter and in places almost white. The "dark brown" markings between the furrows of the casque are due to dirt only, the actual colour being a light brown, of a pinkish shade near the base. The feet are a rich black with a light yellow grasp, and not brown as described, although they turn brown a few days after death ; the claws are brown. The bills seem to vary considerably with the age of the bird, not only with regard to the furrows, but in total length ; those of the female being shorter in proportion to their depth than those of the male.

In the tail of the oldest hen-bird shot, there was one black and white parti-coloured feather.

C. P. CORY, (CHAPLAIN.)

PORT BLAIR, ANDAMANS, 25*th March* 1901.

No. II.—ON SOME DEEP-SEA FISHES COLLECTED BY MR. F. W. TOWNSEND IN THE SEA OF OMAN.

By G. A. BOULENGER, F.R.S.

(*With a Plate.*)

THE fishes listed in this paper were obtained by Mr. F. W. Townsend by means of a fish-trap whilst engaged in cablework in the Sea of Oman between the 21st and 29th October last, and presented by him to the British Museum.

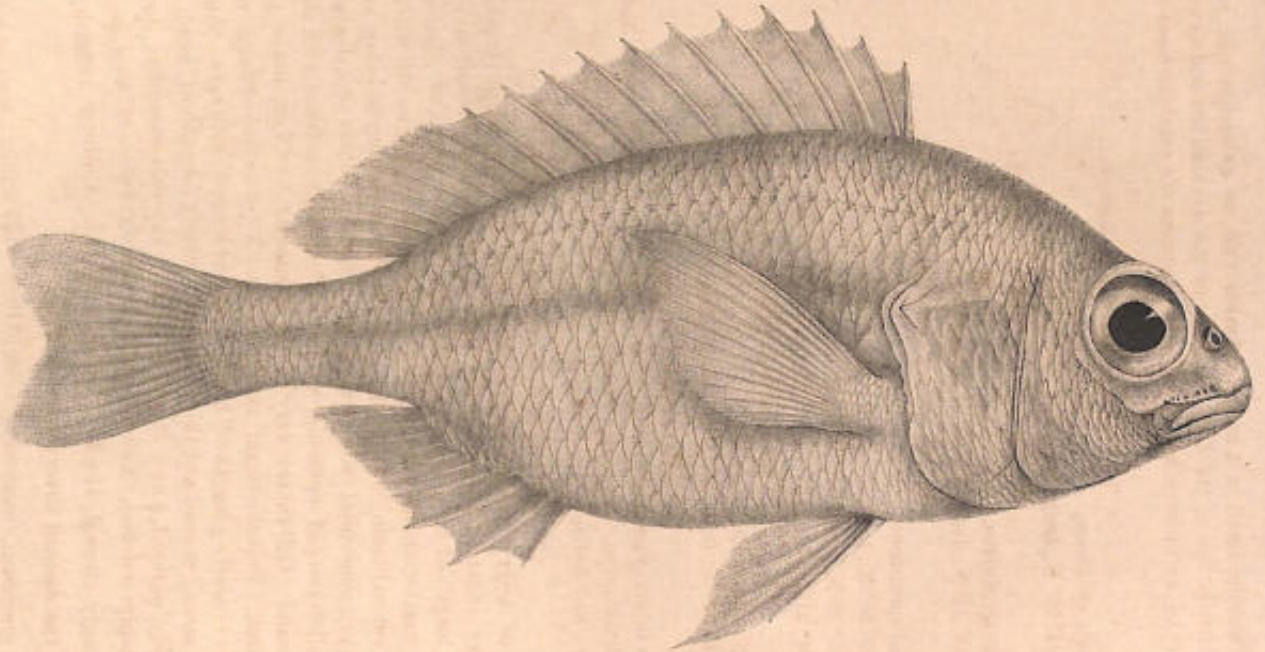


C.P.Cory del. March 1901.

Mintern Bros. Chromo. London.

THE NARCONDAM HORNBILL.

Rhytidoceros narcondami.



PARASCOLOPSIS TOWNSENDI.

J. Hanna del. et lith.

Mintern Bros. imp. London.

The collection, small as it is, is a valuable one, as extending our knowledge of the distribution of the deep-sea fishes of the Arabian Sea and as containing examples of an undescribed form which requires the establishment of a new genus.

1. *Scopelus pyrsobolus*, Alcock.

A single specimen.

Lat. 24° 49′ N., long. 56° 56′ E., 225 fathoms.

2. *Harpodon squamosus*, Alcock.

Several specimens.

Lat. 25° 24′ N., long. 57° 27′ E., 230-243 fathoms.

3. *Uroconger lepturus*, Richards.

Several specimens.

Lat. 23° 56′ N., long. 58° 5′ E., 142 fathoms.

Lat. 24° 5′ N., long. 57° 35′ E., 205 fathoms.

Lat. 24° 21′ N., long. 57° 5′ E., 170 fathoms.

4. *Epinephelus præopercularis*, Blgr.

A single specimen.

Lat. 24° 21′ N., long. 57° 5′ E., 176 fathoms.

PARASCOLOPSIS, gen. nov.

Agrees in every respect with *Scolopsis*, Cuv., but for the total absence of a suborbital spine. *Scolopsis inermis*, Schleg., in which the said spine is feeble, is a link between the two genera.

5. *Parascolopsis Townsendi*, sp. n. (Pl.)

Depth of body equal to length of head, $2\frac{2}{3}$ to $2\frac{3}{4}$ times in the total length. Snout very short, shorter than the eye, the diameter of which is 3 to $3\frac{1}{3}$ times in length of head; interorbital region flat, equal to the diameter of the eye; nasal openings large, separated by a dermal flap; mouth with bands of small conical teeth, outer largest; maxillary extending to below anterior third of eye; suborbital and præopercular borders finely denticulated; a single well-developed opercular spine; head entirely covered with strongly ctenoid scales. Gill-rakers very short, tubercular, 6 or 7 on lower part of anterior arch. Branchiostegal rays 5. Dorsal X 8-9; spines strong, middle longest, $\frac{2}{5}$ or nearly $\frac{1}{2}$ length of head, as long as longest soft rays. Anal III 7; spines strong, second and third equal and nearly $\frac{1}{3}$ length of head. Pectoral acutely pointed, $\frac{3}{4}$ or $\frac{4}{5}$ length of head. Ventrals extending to vent. Caudal deeply notched. Caudal peduncle nearly twice as long as deep. Scales strongly ctenoid, 45—48 $\frac{4-5}{14}$; lat. l. 37—42. Uniform reddish, with a more or less distinct silvery lateral stripe.

Several specimens, measuring from 110 to 160 millim., were obtained at three different points:—

Lat. 24° 5′ N., long. 57° 35′ E., 205 fathoms.

Lat. 25° 22′ N., long. 57° 47′ E., 225 fathoms.

Lat. 25° 31′ N., long. 57° 14′ E., 198 fathoms.

6. *Tetraroge Guentheri*, Blgr.

Two specimens.

Lat. 23° 56′ N., long. 58° 5′ E., 142 fathoms.

This species was described from a single specimen obtained at Muscat by Surgeon-Lieut.-Col. A. S. G. Jayakar. The present specimens differ from the type only in having 12 soft rays to the dorsal instead of 11.

7. *Physiculus argyropastus*, Alcock.

Several specimens.

Lat. 24° 5′ N., long. 57° 35′ E., 205 fathoms.
Lat. 24° 21′ N., long., 57° 5′ E., 179 fathoms.
Lat. 24° 42′ N., long. 56° 56′ E., 225 fathoms.
Lat. 25° 22′ N., long. 57° 29′ E., 107 fathoms.
Lat. 25° 31′ N., long. 57° 14′ E., 198 fathoms.

8. *Cynoglossus Carpenteri*, Alcock.

Several specimens.

Lat. 24° 21′ N., long. 57° 5′ E., 170 fathoms.
Lat. 24° 49′ N., long 56° 56′ E., 225 fathoms.
Lat. 25° 24′ N., long. 57° 27′ E., 230-243 fathoms.

(*The above appeared in the Annals and Magazine of Natural History, No. XXXIX, Mar. 1901.*

No. III.—NOTES ON SOME LAKHIMPUR BIRDS.

Within a very short time of the publication of Mr. Baker's notes on his new species of *Corythocichla* I have been lucky enough to obtain two female specimens of the same bird. Both were brought in by Nagas, the first on November 21st, the second on December 1st, 1901. On comparing them with a specimen of *C. striata* also found here a striking difference was noticeable. My birds agree perfectly with that obtained by Mr. Baker except that the white centre to the abdomen is not so large as in the plate.

Another marked feature is the greater slenderness of both bill and feet of *squamata* as compared with *striata*.

The tails of both my birds are 75″. I noted the colour of the iris in mine as red-brown though the other colours of the soft parts agree minutely with those of Mr. Baker's bird. Both specimens must have been obtained close to Margherita and at no great elevation. Another curious occurrence is that of *Phylloscopus neglectus* which little warbler was identified for me by Mr. Baker who also examined the *Corythocichla*.

Within the last year I have also obtained specimens of *Ptilolæmus Austeni* from the fledgling to the adult stage. The young are, as shown in "Birds of Cachar," far more rufescent than the adults in the upper plumage, and their bills are strongly tinged with green at the base.

An adult female in my collection has curious white striæ in the breast and upper abdomen.

MARGHERITA, UPPER BURMA, *6th December* 1901. H. N. COLTART.



THE RELATIVE PROPORTIONS
OF
A SNAKE AND ITS PREY

Mintern Bros. Printing, London.

No. IV.—THE OCCURRENCE OF THE WHITE-FACED STIFF TAIL DUCK AT MARDAN.

On 7th December after shooting some duck at one end of a long pond near here, (the one mentioned by Capt. Macnab, I. M. S., in his account of a previous occurrence of *Erismatura leucocephala* in the Society's Journal for April 1900), I saw a single bird swimming and diving in the open part of the pond. Waiting until it dived I ran up close to the edge. The bird came up within 20 yards of me only showing its head and neck, diving again immediately. I saw that it was a stiff-tailed duck at once. The manner of diving was most peculiar, very like the way a porpoise rolls over in the water, or a head and tail rise of a salmon. The bird tucked its head in and turned over showing the whole line of its back tail and legs in succession as it went down. The tail was bent downwards with the legs showing below and the tail, legs, and feet were the last part of the bird seen, showing very clearly as it disappeared. It came up several times only showing its head and neck, the body and *tail* remaining under water. I remained quite still and as it got a little further away it showed more of its body on coming to the surface, and also its tail which was carried at an angle of about 45 degrees to the surface of the water. After watching it for some time I shot the duck. The skin is forwarded for acceptance for the Bird Collection of the Society.

F. J. H. BARTON, MAJOR,
Q. O. Corps of Guides.

MARDAN, 10*th December* 1901.

P. S.—The bird on dissection proved to be a male. Its length from point of bill to tail was 15¾ inches, from point of bill to end of the legs 16½ inches, both measures between uprights. Colour of bill dull olive green, feet and claws lighter bluish green, webs black. Iridis brown.

No. V.—EXTRAORDINARY MAGNITUDE OF A SNAKE'S MEAL.

(*With a Plate.*)

On the morning of the 27th July, when out snake-hunting in the pine clad hills surrounding this charming little Japanese resort I encountered a snake (*Elaphis virgatus*) in the act of swallowing a leveret (*Lepus brachiurus*).

Wonderful as the magnitude of some snake's meals sometimes are, the disproportion between the size of the captor and its quarry in this case is so remarkable, that had I not witnessed the circumstance I would not have believed the feat within the wildest dreams of possibility. When I disturbed the snake in the jungle the head of the leveret was fast engaged in its jaws distending them and the neck enormously. Handicapped by its excessive burden the snake fell an easy victim to a blow from my bamboo, which caused it to relinquish and disgorge its prey. The leveret had a wound on the near hind limb near the trunk, which I took to be the point of initial seizure. The whole head and this only was covered with saliva secreted during the act

of partial deglutition. The ears lying back over the head were extensively and raggedly windowed in a longitudinal direction almost to the tips, evidently lacerated by the repeated perforations of the palatine or maxillary rows of teeth in their endeavour to secure a further purchase on the after-coming parts.

The snake which is one of the many kinds of rat snakes, is slender in figure and probably only about a quarter the girth of a python of similar length, or even less. It measured 60⅛" (sixty and one-eighth inches) and weighed 100 mé.* The leveret weighed 235 me' and was thus more than twice that of its would-be consumer.

The accompanying photograph conveys a better impression of the inordinate proportions of the two creatures than any words can do.

F. WALL, CAPT., I.M.S.

ARIMA, JAPAN, *July 31st*, 1901.

No. VI.—NATURAL HISTORY NOTES FROM FRYER'S TRAVELS.

The name of John Fryer needs no introduction to an Indian audience, but though we have all met with quotations from him times out of number, the opportunity of reading his celebrated book does not come within the reach of all. It may, therefore, prove interesting to the members of this Society to hear the accounts given by him of the wild animals he met with in India and Persia, which, though they may have no scientific value, are rendered picturesque by their quaint style, and are characterstic of a time when few Europeans had any knowledge of the manners and customs of the inhabitants of the jungles.

Dr. John Fryer embarked on the 9th December 1672 on board the East India Company's ship Unity, of 350 tons and 34 guns, the smallest of a fleet of ten which sailed that winter for the East Indies. By the following June they were in sight of Ceylon, in possession of the Dutch then at war with England, so they had to give it a wide berth for fear of being assailed by the Dutch Fleet. Fryer says: "This is the Island where (if true) the Elephants, are bred, who, transported, exact Homage from all Elephants of other places, and they withal, by prostrating (as it were) their Necks between their feet submissively acknowledge it." But he does not give his authority for this somewhat marvellous legend. The Fleet at the end of June anchored off Machlipatam, in the kingdom of Golconda, where the English, Dutch and Portuguese had factories. A list is given of the wild beasts in the country, leopards, bears, boars, tigers, antelopes, spotted deer and wild lions; though I doubt whether there is any authentic record of lions on the East Coast. A visit was paid to the King's Elephant Stables. "When e came they were feeding out of their Houses on Sugar Canes fresh gathered

* A me' is a Japanese weight and approximately one hundred and twenty me' equal one avoirdupois pound, but it is subject to variation in different parts of the country.

and administered by their Keepers. Alighting from our Palenkeens, they loosed one which was fourteen feet high, and the Black clawing his Poll with an Iron Engine, he stooped down for him to get up, and being upon his Back guided him as he listed. His Body is a Symmetrical Deformity (if I may so say); the Hanches and Quarters clapt together seem so many heaps; his Neck short, flapping ears like Scates, little Eyed, a broad face, From which drops his Proboscis or Trunk, thrusting it out, or shriveling it in, as he chuses; through its hollow he sucks his liquor, and with two Fingers, as it were, reaches the Fodder, shaking off the Dirt against his Thigh, or Vermin, such as Mice, which he abhors, he brings it under to his Mouth, from whence proceed two huge Tusks of Ivory for defence, not Mastication, for which he is supplied within with others; his Tail is curt; he shuffles on with a great Pace, moving all the Joints of his Legs, though the Motion of his Hinderlegs imitate Human Progression, having a Patella or Knee-pan afore, not articulated behind, as other four-footed Beasts are. When he stands, his Legs appear so many Columns, scolloped at bottom, being flat-hoofed. They are of a Mouse-colour. With their Trunks they strike a violent Blow, and are taught to fling Iron Links, to the destruction of their Enemies. That they draw their weighty Cannon is certain; but that they engage with smaller on their Backs I am no Eye-witness." Evidently he had been told that they did, but did not believe it. From Machlipatam Fryer sailed to Madras, and gives us a description of the country round about. "The Country is sandy, yet plentiful in Provisions; in all Places Tops of Trees, among one of which, on the top of a withered stump sat perching a chamelion, clasping with its Claws its rotten Station, filling himself with his Aerial Food; a Banquet which most other creatures else arise an hungred from. But to be confirmed in the Truth of what we have only by Tradition, I caused a Black, who had a bow there to fell him with an Earthen Pellet, which when he had, after a small time he revived, and making a Collar of Straw for his Neck, he carried him to my lodgings, where I dieted him a Month on the same proviand. That he changes his Colours at a constant time of the Day, is not to be contradicted, but whether he live by the Air alone, I will not stand to it, unless there were a Dearth of Flies in the country; though for my Part I did not see him eat any. In Shape he cometh nearest a Newt; with his lungs his Body does agitate its self up to its Neck; he craw'ls on all Four, and has a Tail longer than its Body, which all together was no more than half a foot; he has Teeth, and those sharp, which makes me think him an Anti-beelubian."

What this long word means is left to his readers to guess. His Black does not seem to have been afraid of the chameleon, but in some parts of India the natives consider it dangerous—in what way I do not know. Journeying to Triblitore, four miles north of Madras, Fryer says: "In the Way hither are store of Antelopes, not to be taken, but by a Decoy made of green Boughs, wherein a man hides himself and walking with this Bush upon his back, gains near on them, while grazing or brouzing rather on Shrubs or Bushes, as to hit

one with an Arrow, when it may be run down with Dogs, the rest of the Herd shunning it. They are of a delicator shape and make than a Deer, the Horns not jagged, but turned as an Unicorn's ; nor spread into branches, but straight, and long, and tapering, rooted on the Osfrontis, springing up on both sides." In September Fryer left Madras, sailing round Ceylon and up the Malabar Coast, where in obscure weather he tells us they were warned by water snakes of their too near approach to the land. Anchoring off Phalapatam, a town north of Mangalore, he sails up a creek in a boat manned by Lascars whom he compares favourably with the English sailors, "who can hardly ever work without horrid Oaths and hideous Crushing and Imprecations ; and these Moormen, on the contrary, never set their hands to do any Labour, but they sing a Psalm or Prayer and conclude at every joint application to it *allah allah*, invoking on the name of God." Those who have rowed up the Bombay creeks in a Bunder-boat can appreciate this description, though the songs here sound somewhat Secular. "The River was full of Alligators or Crocodiles which lay basking in the Sun in the Mud on the River's side, whom the Natives are fearless of ; conceiving the Brachminers have power to lay a spell upon them, that they do no harm. Which, whether true or false, 'tis certain they as seldom do Harm in the Water as the Tigres in the Woods, over whom they fancy their Priests have the same prevalency." A year after leaving England, Fryer landed in Bombay and was received by the Honorable Gerald Aungier, Governor, both for the King and the Company, and President of all the East Indies. An interesting description of Bombay follows, from which it may be gathered that Colaba was then called Old Woman's Island, low and barren, of no other profit but to keep the Company's antelopes, and other Beasts of Delight. A visit was paid to Bandora, then in possession of the Portuguese, whence Fryer and his party travelled all over the Island of Salsette or Canorein. Outside Bandora they used their fowling pieces all the way being presented with rich game, as peacocks, doves and pigeons, chitrels or spotted deer, and close to the ruined city of Canorein they passed through a wood peopled by apes, tigers, wild buffalos and jackals, also flocks of parocket. As the hot weather approached our author was led to moralise on the ingenuity of the Weaver Bird. "In the meanwhile Nature affords us a pleasant Spectacle for the Season, as well as Matter for Admiration ; whereby I know not why we should deny Reason wholly to Animals; unless it be Man having so much, they seem comparatively to have none. For here is a Bird (having its Name from the Tree it chuses for its Sanctuary, the Toddy Tree) that is not only exquisitely curious in the artificial Composure of its Nest with Hay, but furnished with Devices and Stratagems to Secure it Self and young Ones from its deadly Enemy, the squirrel ; as likewise from the injury of the Weather ; which, being unable to oppose, it eludes with this Artifice, contriving the Nest like a Steeple-hive with winding meanders ; before which hangs a Penthouse for the rain to pass, tying it by so slender a Thread to the Bough of the Tree, that the Squirrel dare not venture

his Body, though his Mouth water at the Eggs and Prey within ; yet it is strong enough to bear the hanging habitation of the ingenious Contriver, free from all the Assaults of its Antagonists, and all the Accidents of Gusts and Storms ; hundreds of these Pendulous Nests may be seen on these trees.' After the full moon in August "our Europe Ships, if they save their Passage about the Cape, venture to make in here, by the directions of the Yellow Bellies of the formerly mentioned Water-snakes, who are a warning to them of adventuring too near the Shore, till the open Weather appear." In the cold weather Fryer went to Surat. "To this place," he writes, "belong two sets of Vermin, the Flease and the Banyans ; the one, harbouring in the Sand, fasten upon you as you pass ; where'tis some Pastime to see what Shift the Banyan makes ; being bit by them, he dare not kill them, for fear of unhousing a soul, according to their Notion of Transmigration ; but giving them a severe Pinch will put them to shift for themselves, in a Nest of Cotton-wool. The other Vermins are the Banyans themselves, that hang like Horse-leeches till they have sucked both Sanguniem and Succom (I mean Money) from you ; ° ° ° Hunting of Tigers is sometimes a Pastime, at others a Tragy-comedy; for besetting a Wood where Tigers lurk, with Men and Horses and putting a Set of their loud Musick to strike up in the middle of it ; they rouze at the unaccustomed Noise and rushing forth seize the first in their way, if not shot or launced, to prevent them : Wild Bulls and Buffolas are as dangerous, nor is the Boar less fierce than any of them. Antilopes are set upon by Leopard, in this wise ; they carry the Leopards on Hackeries, both for less suspicion and to give them the advantage of their spring ; which if they lose, they follow not their Prey, being for a Surprize ; Therefore the Hackeries wheel about at a distance, till they come near enough to apprehend them, they feeding fearless of the Hackeries ; then with three or four Leaps, after a small chase, seize them, and easily become their Masters. The great Men have Persian Greyhounds, which they cloathe in the Cold Weather, and some few Hawks ; a Colum may be hunted with a Greyhound, as we do Bustards, being a great Fowl and long in rising. Buffollas animated by their Keepers, fight with great Fury ; their Horns, being reversed, are useless ; but they knock Foreheads with a force adequate to such great Engines, till they are all of a gore, and follow their blow with such vigour, the stronger will hardly permit the weaker to go back to return with his force, but pressing on him, endeavours to bear him down ; then foiling one another they are a long time before they will yield. Persian Rams set together in this manner, are not parted without a bloody Catastrophe, which are kept on purpose for the Sport of their great Men as likewise are Elephants who engage at the will of their Masters." In the English House Fryer saw "an Unicorn's Horn not that of the Rhinoceros of which cups are made and profered for Sale here, and are relied on to discover Poyson if poured into them." Also two skins of Labæan asses streaked with a dark grey upon a white ground, upon the back direct in other parts waving towards their length, and various kinds of piegons (with blubbered

noses, and of a brown colour), tumblers and pouters. By the river a woman had lately been devoured by a crocodile in spite of the Brachmin's pretending to charm them, so that they should do no mischief in their sacred river. "Fish, Oisters, Soles and Indian Mackerel the River yields very good, and the Pools and Lakes Store of Wild Fowl; peculiarly Brand-geese, Colum and Seeras, species of the former; in the cold Weather, they shuning the Northern rigid Blasts, come hither yearly from Mount Caucasus; what is worth taking notice of, is their Aspera Asteria wound up in a case on both Sides their Breastbone, in manner of a Trumpet, such as our Waits use; when it is single, it is a Serass, when double a Colum, making a greater Noise than a Bittern, being heard a great while before they can be seen, flying in Armies in the Air." During Fryer's stay at Surat "a Sea Tortoise was brought to the Fort, in Length Six Feet, the contents of his Hut near two Bushels, reckoning only that part with which his Back is shielded, being an huge Shell of a brown Colour; never to be made transparent as those come from the South Seas are, nor easily to be crackt by any weight; for Experiment, I and two others got upon it, and the Tortoise unconcerned carried us: its Head is loricated with Scales, the Neck reaching as far as the Hut, soft and undefensible: the fins are four, placed instead of Legs, by which it Crawls as well as Swims; the belly is covered with a Breast plate called the Callapee, soft and whitish in respect of the Backpiece or Callipet, its tail is short and wreathed like a Serpent; altogether it is as lovely as a Toad; it sighs like a woman and weeps like a child; being taken and turned on its Back, it is Shiftless. I caused it to be opened and examined its heart, which (countary to the opinion of the Vulgar) is but one, they affirming it to be three, grounded on this Mistake, the Auricles being larger than in other creatures, equalling almost the Ventricles and whole Body of the Heart, which is bigger in proportion than belongs to such an Animal, being as large as an Ox's, which might be the reason of its Pusillanimity; the Veins and Arteries were filled with currents of cold Black Blood; it participates more of Flesh than of Fish, of a viviparous than oviparous offspring, yet lays imperfect Eggs without a Crust (only covered with a Membrane, being most Yolk), buried by it in the Sands, to receive from the Sun's Heat the perfection of their hatching (as the eggs of Egypt from Furnaces, or others from Dunghills): It Spawns them as Fish do, in huge quantities, as much at one time as will more than fill a Saman's Bonnet (every one being as big as an Hen's Egg). By them aboard Ship they are ordered like buttered Eggs of a Fowl, though nearer akin to a Serpent's, hanging together as those do.

"For this end they come ashore, and when pursued, cast up with their Claws a Cloud of Sand to blind their Enemies; when overtaken some are so big four men can hardly turn them.

"It is supposed they feed on the Grass or caz on Land or at the bottom of the Ocean; and from the Fable of the Three Hearts, springs the Conceit of their Tripartite Community, of fish, and Flesh, and Fowl; the outward Cover-

ing being shelly, the inner Meat Carnous, its way of preserving its kind being by Eggs as the Feathered Fowl do: To me it seems (though the Flesh be highly extolled for the taste and colour of Veal) neither Fish, nor Flesh, nor good Red Herring."

In the winter of 1675 Fryer travelled down the coast visiting Goa, Karwar, and other places. At a village called Mirja he had an adventure with a Snake, evidently a King Cobra. "Being tired and lying to repose on the Bank of the River, under a shady Tree, I was made at by an unsizable Snake which hardly escaped, had it not hissed with an unheard-of Noise before me, which, rouzing me, made me shift its speedy Course, as it angrily gathered up its Body, and darted itself into the Flags on the River Side; these Creatures are dreadful to the inhabitants, and when I related my hazard, they wondered I came off so, there being of them big enough to master the largest Animals. After my Danger was over, I was told she had a Nest in that place, it being lately turned into a Burial-place; here, by the by, might be noted what Pliny writes, to wit, that Snakes are generated out of Human Brains putrifying." At Karwar meat apparently was scarce, no beef or mutton was obtainable and if they required flesh or fowl they had to get it themselves. Water-fowls, peacock, green pidgeons, spotted deer, sabre, wild hogs and sometimes wild cows formed the bag on their shooting excursions, and a strange adventure with a tiger is related. "One of our Soldiers, a youth, killed a Tigre-Royal; it was brought home by Thirty or Forty Combies, the Body tied to a long Bamboo, the Tail extended; so, they brought it to the House, where we saw 'twas wounded in Three places, one through the Head with Two Pullets, another through the Body slanting up to the shoulders, a third in the leg; it was a Tiger of the Biggest and Noblest Kind, Five Feet in Length beside the Tail, Three and-an-half in height, it was of a light yellow, streaked with black like a Tabby cat, the Ears short with a few Bristles about the Lips; the Visage Fierce and Majestic, the Teeth gnashing, Two of which she broke against the Stones for Anguish, the Shoulders and Forelegs thin and well-set, the Paw as large as the biggest Fist stretched out, the Clavs thick and strong

"The Boy shot it in the night from a Chouse or Estarzo, as it came to drink supposing it to have been a Deer: the first shot was that under the Shoulder, which made her spring three times an incredible height, at the last of which she fell into the Chouse, from whence she shaw the Flash, where with the English Boy were a Comby and a Comby Boy of eight Years old asleep a little on one side; she pawed the Stem with her Feet, while all but the Child asleep fled; but being wrung with her Pain, she soon left the place with an horrible Noise, that made the Woods tremble, all which awaked not the Lad, nor had it any Harm.

"In this interval, the English youth charged again with a couple of Slugs, and tracing the Blood, as she was making at him, discharged through the Brain-pan, at which she was quiet; but to make sure, he made another Shot at her which he believed was that in the Leg; all this time the Moon was obscured

and cloudy ; the Combay that had left him and his Son, at length came with many more, calling *Fringi*, the term they have for Europe men and Franks ; the Boy was walking about fearing to venture within reach, till at last laying aside his well-advised suspicion, he approaching, found the Terror of the Wood slain.

" Disrobed of its Royal Hide, two Bones of the bigness and Figure of a Levator presented themselves to our view, that had no connection with the other Bones, but wholly immersed in the Flesh, in the ends of each Pectoral, and the three circumducing Muscles, towards the joining of the Shoulder-blades, and the upper Bones of the Fore-feet, commonly called Shoulder-bones ; of these there goes a story handed by tradition, as that licking the Right Shoulder it appeases Hunger, the Left it whets it where these Bones lie ; but-probably enough it is, that Nature added these for its greater strength ; the Entrails were little variable, but the Heart was mighty, and the Liver (they say) had as many Lobes as that was years old, which were six and-an-half, like to a Foxes."

The chief commended the lad for his courage, and according to custom, plucked off his over-coat of venetian cloth of silk and silver and gave it to him. We are then provided with some curious information about the tiger. ' It is memorable what is attested, by these Woodmen, of the Tigre, that when he intends to prey on the Monkies, he uses this Artifice or Stratagem ; the Monkies at his first approach give warning by their confused chattering, and immediately betake themselves to the highest and smallest Twigs of the Trees when the Tigre seeing them out of his reach, and sensible of their Fright, lies constant under the Tree, and then falls a Roaring, at which they trembling let go their hold, and tumbling down, he at leisure picks them up to satisfy his Hunger ; they are his accustomed Repast, seldom making Man his Meal, and they are judged (as St. Paul's Barbarians did him) guilty of some Horrid Crime that such vengeance overtakes ; the Woods and Mountains yielding variety of other Food. The Tigre is dull-scented, and not long Nimble, Three Leaps tiring him, otherwise it's probable he would make more havock than he does. The She brings forth but once in Twelve Years, and then but a single Cub ; thus has Providence suppressed the growth of this Masterless Creature ; besides, if the proverb be true, the Bitch brings forth but once in her Life, or very rarely more, notwithstanding Œlian says otherwise in his 4 lib de Historiâ Animalium. Panthers were more common than tigers, and apes were plentiful, but the natives considered it " Piacular " to kill these, calling them Half Men, and saying that once they were Men, but for their laziness had Tails given them and hair to cover them. Which agrees with the theory of the latest Professor on the subject. The Indian tigers, we are told, was the fiercest in the world, but the Lion was feeble and cowardly.

The next year Fryer sailed up the Persian Gulf to Gombroon or Bunder Abbas, and travelled up to Ispahan, the capital. The Emperor kept a varied collection of wild animals, and here Fryer first saw the rhinoceros ; " a cruel

Beast, of a large size, there coming from his Nose an Horn a Cubit long (brown towards the Bottom, Whiter near the Point) and Six inches Diameter, whence the derivation of his Name from Rin, Nasus, a Nose and Kéras Cornu an Horn; between this Animal and the Elephant, is a mortal Strife, for which Nature seems to have Armed it on purpose; it being a four-footed Beast, with Three Partings of the Hoof, built on thick strong Thighs, but short, considering the great bulk of its Body which presses them; it is Tall enough to reach the Bowels of its antagonist with its Horn, with which it Gores him to Death; nor has she given him less firm Bones to the Trunk, if by chance it should be crushed by the Elephant, defending its very Hide with a Coat of Mail; wherefore before on the Neck and Shoulders, and behind in the Quarters, the Skin lies in folds, like Fish Scales over one another; the Face bears much of an Hog's Countenance, unless the upper Lip which resemble a Cow's, and the lower, the form of a Whale's, the Mouth discovers a mishaped tongue, set about with two rowes of Teeth; it is of the same Mouse colour, and Tailed as an Elephant is, and Feeds of the same Fodder and is kept facing too mighty, but lean Elephants.

"Whether the Rhinoceros be the Unicorn, I suspend my belief, since I have seen a Horn turned with Furrows and Ridges from the Basis to the Point, and Tapering like that of our King's Arms, but what Petrus Angelius relates concerning the Avager or Indian Ass can have no congenity with this." A quotation from this author is given, "The Wild Asses of India are as big or bigger than Horses, whose Heads are of a Purple die, their Eyes Blew, the rest of their Body White; on their Foreheads they have an Horn a Cubit in length, whose lower part for Two Hands breadth is White, and the top, which is sharp, inclining to a Bright Red, but the Middle Part is blood Red; of these they make cups out of which whosoever drinks, neither Cramp nor Falling Sickness seizes them nor has any manner of Poison any force, if that immediately before or after taking the same, either water, wine or other liquid thing be taken out of these cups." However Fryer thinks that the Rhinoceros, which come from Bengala, and are esteemed terrible and indomitable creatures, must be (or more) what Petrus calls Asses, there being no other beasts in those parts with but one horn. In some artificial lakes were flocks of water-fowl which the Persians were skilled, by their long case-hardened guns, to shoot flying. Hawks of Muscovia were purchased at great rates "nor undeservedly, for they will strike down these Colum that are big as Wild Turkies, and visit India in the Cold Season, eleven or a dozen one after another, as they fly in Train like Wild Geese, and come down with the last themselves; they have some Hawks of their own, but they are of a Cowardly Breed to these."

On the journey back to the coast "we met a Lion and a spotted Deer, carrying up as Presents to the Sophi from the Mogul; the Lion seemed rather a Catamountain than such a Majestick Creature as ours in Europe being nigher a Dun colour than a Dark Red, without Beard, nor haired all from the Head down to the Crest and Thighs; about the Lips it had Bristles

like a Cat, and when the keeper stroaked it, it would make a noise much the same as a Cat when she purls : These are kept to set upon Bulls before the Emperor, which they do sneakinly, coming behind to leap upon their quarters which one of our right bred English Mastiffs would scorn to do ; a true Bull Dog being too hard a Match for one of these Lions, which has often been proved at the court of Persia to the commendation of their courage." When Fryer left Ispahan the Company's Agent remained behind, waiting for a favourable opportunity to appear before the Emperor, which was a thing of great difficulty and expense to the Company, it seldom costing less than a thousand Thomands in fees and presents. "The Irish Buckhounds brought up for that end were admired and talked of by all, and represented to be as big as Camels ; and though they were young proved swift Creatures, I seeing the Bitch in our journey turn an Antelope, which none of their Hounds ever came near ; and had the dog been yare, no doubt but they had seized it." The dog, too, had a sense of humour as the following story related by Fryer goes to show. Being let loose one day, "he rambled about the Caravan for what he could get to satisfy his Hunger ; whilst an Hodge (one of their Pilgrims to Mahomet's Tomb) who was at his devotions on the most conspicuous place of the Ser Raw (they loving to be seen of men) had placed a Bowl of Buttermilk tempered for his Tooth, ready by him, to fall to after his prayers ; he bowing his Face to the ground, as their custom is to worship and there lying prostrate : the Dog scenting the Bowl, mounted the Quadrangle and clapping one Leg on the neck of the Hodge, kept him in that Posture, while he had made cleaner work than the Pilgrim, who for fear durst neither stir nor cry out, lest he should provoke so terrible a Monster to devour him ; but silently passed by both the affront and the Loss ; while in the meantime it was occasion of much laughter to the whole Caravan Ser Raw to behold the man of lofty Thoughts of his own Purity, thus handled by the Beast, and none offering to step in to his rescue, till we had called him off ; for which the Hodge thought himself obliged to return us Thanks, for delivering him from so great danger." The sheep of the country were prodigiously large, trailing tails after them, of the weight of thirty pounds full of fat, especially after the vintage and the cotton harvest, when they fed on the leave and tender branches of the vines and gathered up the scattered seeds of the cotton. "Their Horses though they have degenerated from their Primitive Race still are the best of all in the East, unless the Arabians be preferred for swifter Courses and light Horses ; however for charging Horses, and stout warlike Steeds, they are valued above all others."

On his return to Bombay one of the Mogul's generals, the Governor of Jeneah (now a town in the Poona District) having need of the service of a doctor, Fryer was commanded by the Hon. Gerald Aungier, to set forth for that place. Leaving Bombay at three in the afternoon on St. George's day, he anchored at nine that evening below Thana. The next morning, he proceeded up the creek, the banks of which were low and fruitful and

on both sides were placed stately Aldeas and Dwellings of the Portugal Hidalgos till within a mile of Kalyan when Sivaji's country was entered. Leaving thir boat at Kalyan, they proceeded across the Konkan to the ghaut leading up to Ambagaon and thence to Jeneah. The Governor's wife was the patient who required Fryer's attendance and luckily his treatment met with success though he only had a hand thrust through a curtain whereby to diagnose the case. The first hand given to him he declared to belong to a sound body, whereupon he was told that was an ingenious device to try whether he knew anything about his profession. When the rains were close at hand he set out on his return journey and one evening entered on a wood "which deluded us with false flashes, that you would have thought the Trees on a Flame, and presently, as if untouched by Fire, they retained their wonted verdure. The coolies beheld the Sight with Horror and Amazement and were consulting to set me down, and shift for themselves; whereof being informed, I cut two or three by breaking a vein, let Shitan (the Devil) out, who was crept into their Fancies and led them as they do a startling Jade, to smell to what their wall-eyes represented amiss; where we found an Host of This, the subject both of our Fear and Wonder, which the sultry heat and moisture had generated into Being the certain Proximus of the ensuing Rain, which followed us from the Hills.

This gave my thoughts the contemplation of that miraculous Bush crowned with Innocent Flames, that gave to Moses so pleasant and awful a Prospect; the Fire that consumes every thing, seeming rather to dress than offend it.

Thus we came to Bunta, a despicable Country Town, seven course more; it is in the possession of the Coonbies, who are not strong enough to aid their Herds against the devouring jaws of the wild Beasts, a Young Buffola being seized the night before, out of the Tabernacle they lodged me in; wherefore they cautioned me to keep Fires all Night, lest the Horse might lose one of its Quarters, or our oxen might serve them for a supper; I added to the Fires a strict watch, whose mutual answering each other in an high Tone, was deafened by the Roarings of Tigers, cries of Jackals and Yellings of Baloos, or overgrown wolves." In another passage Fryer again refers to "Palus, a sort of wolf." This is an interesting corroboration of Mr. W. G. Betham's note on the Kol-Balu which will be found at page 747 of Volume XI of the Journal. Messrs. Eardley Wilmot and Wallinger had met with Jackals which uttered the peculiar cry of the Kol-Balu, but Mr. Betham one morning put up these animals which uttered the same cry, but were certainly not Jackals; they were reddish, not so red as a wild dog and had reddish bushy tails.

From the passage quoted above, the natives evidently knew of an animal of the description which they called Baloo.

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like a Cat, and when the keeper stroaked it, it would make a noise much the same as a Cat when she purls : These are kept to set upon Bulls before the Emperor, which they do sneakinly, coming behind to leap upon their quarters which one of our right bred English Mastiffs would scorn to do ; a true Bull Dog being too hard a Match for one of these Lions, which has often been proved at the court of Persia to the commendation of their courage." When Fryer left Ispahan the Company's Agent remained behind, waiting for a favourable opportunity to appear before the Emperor, which was a thing of great difficulty and expense to the Company, it seldom costing less than a thousand Thomands in fees and presents. "The Irish Buckhounds brought up for that end were admired and talked of by all, and represented to be as big as Camels ; and though they were young proved swift Creatures, I seeing the Bitch in our journey turn an Antelope, which none of their Hounds ever came near ; and had the dog been yare, no doubt but they had seized it." The dog, too, had a sense of humour as the following story related by Fryer goes to show. Being let loose one day, "he rambled about the Caravan for what he could get to satisfy his Hunger ; whilst an Hodge (one of their Pilgrims to Mahomet's Tomb) who was at his devotions on the most conspicuous place of the Ser Raw (they loving to be seen of men) had placed a Bowl of Buttermilk tempered for his Tooth, ready by him, to fall to after his prayers ; he bowing his Face to the ground, as their custom is to worship and there lying prostrate : the Dog scenting the Bowl, mounted the Quadrangle and clapping one Leg on the neck of the Hodge, kept him in that Posture, while he had made cleaner work than the Pilgrim, who for fear durst neither stir nor cry out, lest he should provoke so terrible a Monster to devour him ; but silently passed by both the affront and the Loss ; while in the meantime it was occasion of much laughter to the whole Caravan Ser Raw to behold the man of lofty Thoughts of his own Purity, thus handled by the Beast, and none offering to step in to his rescue, till we had called him off ; for which the Hodge thought himself obliged to return us Thanks, for delivering him from so great danger." The sheep of the country were prodigiously large, trailing tails after them, of the weight of thirty pounds full of fat, especially after the vintage and the cotton harvest, when they fed on the leave and tender branches of the vines and gathered up the scattered seeds of the cotton. "Their Horses though they have degenerated from their Primitive Race still are the best of all in the East, unless the Arabians be preferred for swifter Courses and light Horses ; however for charging Horses, and stout warlike Steeds, they are valued above all others."

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fed us with fresh Provisions of Turkies, Geese, Ducks, Hens, Sucking Pigs, Sheep, Goat, and to Crown all, the Day we made England, killed us a fatted calf." I doubt whether we fare so well now-a-days.

N. C. MACLEOD.

BOMBAY, *Nov.* 1901.

No. VII.—OCCURRENCE OF THE AVOCET (*RECURVIROSTRA AVOCETTA*) NEAR POONA.

Barnes remarks that the Avocet does not occur in the Dekhan. As I saw one near here yesterday, the fact is worth recording. I endeavoured to shoot it, but was unsuccessful. In my own mind I have no doubt of its identity, as it is hardly possible to mistake its general white plumage and the upturned bill. I found it on the muddy bottom of a fast drying up tank in company with other waders, a few teal and snipe. It gave me one or two opportunities of bagging it, when I was hoping to get a teal, but, as soon as I secured my attention to it, it seemed to take in the altered conditions and after flying round, out of range, two or three times, it made a bee line for another tank.

R. M. BETHAM, MAJOR,
8th Bombay Infantry.

POONA, 20*th January* 1902.

No. VIII.—A NOVEL METHOD OF CATCHING A JACKAL.

The following novel method of catching a jackal may be of interest to members :—

This morning some of the sepoys of the regiment attracted by a clattering of tin and whines, followed up the noise and found a jackal with his head so firmly jammed into an old tin which had contained ghee that he could not get it off. The whole head was buried in the tin, and the animal was quite blinded and powerless, so he was rapidly secured and brought to the mess for inspection.

The tin had been left lying in one of the cooking places just outside the parapet of the camp.

D. THOMSON, MAJOR,
28th Bombay Pioneers.

CAMP KHWAJA KIDDER, KOHAT,
22nd January 1902.

No. IX.—TRAVANCORE SNAKES.

In 1895 a list of snakes taken in Travancore appeared in the Society's Journal containing fifty-eight species. To that number I have now to add nine more species taken since that date.

Gongylophis conicus.—This snake is only found in the extreme south, where it is fairly common about Nagercoil and Cape Comorin.

Platyplecturus madurensis.—A single specimen taken on the Cardamom Hills at about three thousand feet elevation.

Ablabes calamaria.—Also a single specimen taken on the Kanan Devan Hills at five thousand feet elevation.

Tropidonotus monticola.—Found at Vembayam in the low country ten miles from Trevandrum, also at Pirmerd at three thousand feet elevation.

Chersydrus granulatus.—Taken at sea by the fishermen at Trevandrum.

Dryophis pulverulentus.—A single specimen taken by Mr. O. H. Bensley at Pathanapuram in the low country.

Callophis bibronnii.—A single specimen taken two miles from Shencottah at the foot of the eastern side of the hills.

Hydrophis spiralis.—Taken by the fishermen at Trevandrum.

Distira jerdoni.—Taken by the fishermen at Trevandrum.

H. S. FERGUSON, F.L.S.

TREVANDRUM, *24th January*, 1902.

No. X.—SANDGROUSE IN NORTHERN GUJARAT.

Some time ago I wrote you a short note regarding the abundance of sandgrouse, both the common (*Pterocles exustus*) and painted (*Pterocles fasciatus*). Several sportsmen and others, who have known this locality for some time, fully agree with me as to the fact that the numbers of these birds, but specially of *P. exustus*, have increased largely during the past two or three years.

On thinking over the matter I have come to the following conclusion regarding their increase. Both the abovenamed species breed more or less all the year round, except, perhaps, for a month or so during the rains. That their numbers are kept down in ordinary years is no doubt due to their enemies, *viz.*, jackals, foxes, and birds of prey, which must account for vast numbers of eggs and young. During the famine of 1899-1900, the foxes and jackals almost disappeared from this portion of the country, a considerable number being doubtless killed or eaten by Wagaris and other aboriginal tribes. The usual seasonal visitants among the birds were almost entirely absent, many of the permanent residents partly disappeared, and consequently the birds of prey went elsewhere.

The removal of their natural enemies has thus, I think, directly led to the increase of sandgrouse. I notice that the kangaroo rats (*Gerbillus hurrianæ*), and to some extent hares, which have the same natural enemies, have increased considerably. As regards the sandgrouse, as I am about to leave Deesa, I shall not be able to observe whether their numbers are reduced during the next few years, but I notice that in the last six months foxes and jackals have increased considerably, although birds of prey are not as numerous as usual, owing to the partial famine from which the country is at present suffering, and I shall not be at all surprised to hear that a few more years have reduced the sandgrouse to the normal number.

While on this subject, I should like to record that a specimen of the pintailed sandgrouse (*Pterocluru alchata*) was recently shot near here by Capt. L. Oldfield, R. F. A. He informs me that it was one of a flock of 20 or 25 which came down to drink somewhat earlier than *P. exustus*. I have heard that others have also been shot, but Capt. Oldfield's is the only one I have actually seen. I believe that this species has never been previously recorded from anywhere so far to the south-east.

P. arenarius (the large sandgrouse) have visited us this year in small numbers, and thus we get four species, viz., *P. exustus* and *P. fasciatus* permanent residents, and *P. arenarius* and *P. alchata* occasional cold weather visitants. I have never heard of the spotted sandgrouse (*P. senegalus*) being obtained here, but they are common cold weather visitants to the Runn of Cutch and other localities not far distant, and it is quite possible that a few may sometimes reach Deesa.

C. G. NURSE, MAJOR,
13th Bombay Infantry.

DEESA, *2nd February*, 1902.

No. XI.—TIGER NETTING IN MYSORE.

Referring to the shooting trip of some visitors to the Mysore jungles, a local paper recently had the following remark:—"It is reported that the tigers have been netted for their sporting delectation, but we must refuse to believe that the distinguished shikaris will tolerate sport of this kind," and it is probable that, in spite of what Sanderson and others have written, there is still a good deal of misconception about tiger netting, as pursued in Mysore, which is a genuine native sport, well worth witnessing by any one interested in wild beasts and their ways. As Sanderson says: "This is the only method by which they can be brought to bay where the cover is too continuous to be easily driven. It may seem unsportsmanlike to shoot a tiger through a net, but as far as danger goes there is, perhaps, as much as in shooting him from a tree." Obviously the fact that the tiger cannot escape takes away the sportsman's pride in his shot, and the man with the rifle feels that he is playing only a subordinate part in the game, but even so the shooting is not easy, and killing a netted tiger is not a case of potting a beast pegged out on the ground like the lion in the familiar picture in Æsop's Fables, though this might be supposed from the comments sometimes heard.

The method of enclosing the beast is as follows:—When a tiger is to be caught, the villagers are warned to be ready with their nets, and a buffalo is tied up in a likely jungle. On a kill occurring, the nets are sent ahead a quarter of a mile or so from where the tiger is supposed to be lying up, and erected in a crescent-shape across the line which the beast must take when driven. The nets, of which every village in these parts keeps its own stock, are made of stout rope with a large mesh, and run up to 40 feet in length with a depth of 12 feet, and the line will often extend to a quarter of mile or more, reaching right into the open country on either flank. Care is taken to place

the nets immediately behind a considerable patch of the very densest thickets, and the consequence is that when the tiger is driven forward by the beat and reaches the net, it almost invariably lies up in the thicket instead of trying to break out with a charge. Men who have been posted on trees signal the moment when the animal has reached the right spot, and immediately the two wings close in from behind and complete the circle of nets, using spare lengths if necessary. Next comes the work of making the enclosure secure. Spearmen are placed at close intervals all round to repel the tiger should he meditate a charge, and the nets, strongly fastened to the ground with pegs and heavy logs of wood, are connected by the main ropes with the trees and, inclining slightly inwards, are supported at a height of 9 or 10 feet by forked sticks stiffened with an interlacing of branches and thorns. A barrier is thus formed, too strong and too elastic to be torn up or broken through by the charge of any tiger. If the animal is to be caught alive, nothing more has to be done but to introduce a trapdoor cage baited with a goat, and wait till hunger compels the tiger to enter ; but if it is to be shot, the circumference of the nets is contracted till rather less than an acre of jungle is enclosed Then begin the preparations for the shoot. As I have said, the jungle inside the nets is necessarily of the thickest, and diagonal tracks, 10 to 20 feet in breadth have to be cut in order to render the tiger visible when moved. For this work a party of some twenty picked spearmen enter the enclosure and form a ring round, a like number of men armed with long handled choppers, a few others with horns and tom-toms accompanying. The task, at close quarters with the beast, looks highly dangerous, and the sportsman, who is not content to wait outside the net, may enjoy a certain amount of sensation by joining the cutting party. It might be imagined that the tiger or tigers (in one case there were four), maddened by rage, hunger and thirst, would seize the chance for a charge, and every now and then, in some particularly thick patch there is a thrill of excitement, when the spearmen stand alert with lowered points and the tom-toming is redoubled, but a charge has never been known, for, no unwounded tiger, and, in my opinion, no wounded one either, would face such a compact and noisy body while there was any way of retreat. When the cutting is finished the men with rifles take their stand outside the nets on *machans*, which command the clearings, and the beaters try to drive the tiger from one block of jungle to another by shouting and rockets. Needless to say, the beast when he moves at all does so at a gallop, and, judging from the amount of missing, which generally occurs, it takes a quick shot to stop the animal when crossing a narrow opening in a large enclosure. The beast may have to make its dash several times before it is killed, and the chief interest to the sportsman is the magnificent spectacle of the angry tiger at large, which ordinary methods of shooting give few and short opportunities for seeing. If the patches of jungle left after cutting are very thick, it is sometimes impossible to make the tiger move and on one occasion we had to give it up at night without getting a shot,and went away with the intention of

cutting more of the bushes next day. During the night a tiger always moves round the enclosure and makes many a desperate charge at the net, which is repelled by the spearmen who are on guard by their watch fires at close intervals. On the night after this unsuccessful attempt at moving him, the tiger, an exceptionally large one, evidently gauged the situation and knew that a supreme effort alone would save him. Accordingly, about 5 A.M., when the shikaris, tired with the work of the previous day had dropped off asleep and the fires had burnt low, the tiger crept up to the net and jumped clean over it, pitching right on the top of two of the watchers. When we arrived early in the morning, the truth of the story was proved by the hairs on the top of the forked stick where the beast's stomach grazed the net, by the marks where he pitched, and by the two villagers, both of whom were considerably mauled. The net at the spot was nine feet high and sloping inwards, while the take-off was slightly up-hill and out of thick lantana bushes, so that the leap was a fine one, but the fact that it should have been attempted at all, is still more remarkable, for all the natives bear out Sanderson in his statement that tigers never attempt to jump over the nets, and this is the only instance of such an escape known of in Mysore.

On the last occasion that I was out, the hunt was got up to catch a man-eater which had inspired such terror in the neighbouring villages, that quarrying there for the new Palace Buildings in Mysore was stopped, the toddy drawers petitioned that they were afraid to work, carts would not pass through, and the annual festival at the local temple was abandoned. As the doings of veritable man-eaters are always a subject of interest I will detail the two cases where men were killed, about which I obtained the official reports. Other subsequent cases were mentioned, but not verified by me.

(1). On 16th November last two villagers, Ranga and Subba Setty, went into the jungle in the morning to collect roots. Ranga stood preparing snuff, and Subba Setty was cutting creepers close by, when Ranga saw the tiger coming towards him and fled. The tiger pounced upon Ranga and dragged him into the bushes, where the Police, to whom the matter was reported, found a few bones and the clothes of the deceased two days later.

(2). On 22nd November last, one Kare Gowda took his bullocks to water at a pond in the jungle. His father-in-law soon after saw the bullocks dashing back to the village in alarm and went to look for Kare Gowda, but not finding him at the pond, returned to the village and took out a party to search. Bits of his clothes, blood, the signs of a struggle and the foot-prints of a tiger were found, and three days later the Police came on a few bones further on in the jungle. Tales were told me of the tiger having attacked parties bearing corpses to the burning ground and carrying off the corpse, and the acquisition of such a curious taste, may perhaps be explained by the following passage in a letter from the Amildar :—

"It is a custom among the villagers here not to burn or bury the dead bodies of pregnant females, but to expose them in the neighbouring jungles to

be eaten by vultures and wild beasts. The body is tied to a tree in a sitting posture and a pot of water is placed close by. Not long ago some cow-herd boys came across the dead body of a woman tied to a tree as described and noticed the foot-prints of a tiger round it, but the body was untouched. The boys cut the rope binding the body, which fell to the ground, and the next day the corpse was found eaten away by the tiger." This I give for what it is worth, but the custom described deserves mentioning.

To return to our nets. When we got out to the enclosure we were told that there were two or more tigers inside and, to cut the story short, two were killed that day, and two, on clearing more jungle, the next. There was one male tiger, 8 feet 7 inches in length, and the other three were young tigresses, running from 8 feet to 8 feet 5 inches; in fact, as it seemed, a party of brother and sisters. Whether any of these was the veritable man-eater it is impossible to say, but they were certainly caught in the jungle close to which the men were killed, and it is not very likely that there was a fifth.

One of the tigers, I may mention, was wounded and had to be walked up inside the enclosure. On this occasion it was too maimed to charge, but there is always the possibility of excitement over a wounded beast which cannot be otherwise finished off. Sanderson describes how the villagers sometimes kill the tiger for themselves with spears, which must be a fine sport to witness, but I fancy this is seldom done now-a-days, when the netting is chiefly carried on by the direction of H. H. the Maharajah on special occasions only, to catch tigers alive for his own magnificent collection at Mysore and to present to the London and other Zoological Gardens, or to provide shooting for his visitors. Any one who has been present, whether the young sportsman who wishes to become familiar with the sight of an angry tiger, or the old shikari who has slain the beast by the usual methods, will equally agree that Tiger netting in Mysore is an interesting experience, and well-worth witnessing.

S. M. FRASER, I.C.S.

MYSORE, 18*th February*, 1902.

No. XII.—BIRDS COLLECTED IN HYLAKANDY, CACHAR.

ZOOTHERA MARGINATA.—The Lesser Brown Thrush.

Hume, Cat. 350 bis.; *Oates*, No. 705.

I have a single female skin in my collection collected at Roopachena. This is the only one I have ever come across.

MICROHIERAX MELANOLEUCUS.—The White-legged Falconet.

Hume, Cat. 20 bis.; Blanford, 1268.

I entered this species as *fringillarius* in my list but it must be altered to the present species. I sent my skin to Mr. Stuart Baker and he kindly corrected my identification.

CHAS. M. INGLIS.

BAGHOWNIE FACTORY,
DARBHANGA, 18*th February*, 1902.

No. XIII.—THE MASKED FIN-FOOT (*HELIOPAIS PERSONATA*).

I have just received from Mr. Primrose a male specimen of this rare bird. It was shot by Mr. Ross at Monierkhall in Cachar and the skin was given by him to Mr. Primrose, who has very kindly passed it on to me. Mr. Baker in his "Birds of Cachar" says he has not come across it, so I think this occurrence deserves notice.

BAGHOWNIE FACTORY, CHAS. M. INGLIS.
DARBHANGA, 19*th February*, 1902.

No. XIV.—NESTING OF THE COOT (*FULICA ATRA*).

(1.)

Major R. M. Betham in a note in this Journal says:—"and should like to know whether any other ornithologists have found this bird breeding in India excluding Cashmere." I got a nest with six highly incubated eggs in some water at Belahi Factory in the Mozufferpore District on the 30th July 1896. I was only able to save two of the eggs and they are very disreputable specimens. Mr. Harrington Bulkley, however, has very kindly given me 3 eggs, which he collected last August.

BAGHOWNIE FACTORY, CHAS. M. INGLIS,
5*th March*, 1902.

(2.)

As I do not think either Messrs. Baker or Inglis mention the occurrence of the common Coot (*Fulica atra*) in their respective articles the "Birds of North Cachar," and "Birds collected in the Hylakandy District" I think it perhaps worth noting that I came across it on two or three occasions in the Chutla bheel; and have had a specimen, shot here, brought me by my collector a few days back—this was a female, with eggs well defined. This will I think, show that it occurs, perhaps sparingly, both in Cachar and Sylhet.

A. M. PRIMROSE.

CHANDPUR BAGAN, P. O.,
SOUTH SYLHET, 29*th March*, 1902.

(3.)

Major Betham in his notes on the nesting of the Coot near Poona asks for information as to its breeding in other parts of India. I am under the impression that it breeds freely in most parts of the Madras Presidency. I have found nests in several places in the Cuddapah District. In 1892 I found a nest in a small tank near the town of Cuddapah on the 30th of September. It contained three eggs, hard set. On the 30th of October of the same year I found several nests in a small, reedy tank at Occhaveli, containing fresh eggs. There are evidently two broods, for I have seen a clutch of young birds following their parents on a tank early in April. I was particularly interested in the sight, for a couple of Brahminy kites that were sailing overhead made repeated, but ineffectual, attempts to carry off the chicks. Again and again they swooped down to the water, but the little

things were ever on the alert and were safe under water before their enemy reached them. The old birds showed great indignation and rushed to and fro with ruffled feathers, hissing and flapping their wings.

W. HOWARD CAMPBELL.

GOOTY, MADRAS, 24*th March*, 1892.

No. XV.—OCCURRENCE OF THE SHELDRAKE (*T. CORNUTA*) AND THE GOOSANDER (*M. CASTOR*) IN THE DARBHANGA DISTRICT, TIRHUT.

I have received males of both species got by Mr. Edgell on the Suwasingpur chaur near Shahpur oondie, in this District. He says they were got about 'Xmas time; and that once before he saw three Sheldrake on another large chaur called the Baraila.

CHAS. M. INGLIS,

BAGHOWNIE FACTORY,
6*th March*, 1902.

No. XVI.—NOTE ON THE HABITS OF *RALLINA SUPERCILIARIS*, SHARPE, AND *GORSACHIUS MELANOLOPHUS*, BLYTH.

Seeing a note on the Banded Crake by Major Betham in the last number of the Journal (Vol. XIV, No 1, p. 180) has reminded me of the fact that we have made a discovery here in Kanara which is sure to be of interest to ornithological readers. H. L. Hervey and I discovered the nest and eggs of *Rallina superciliaris* in the month of August 1898; to be precise, on the 8th of August 1898.

A "kunbi," or aborigine of the place, brought H. the news that there was a nest with large white eggs in a bush at a place called Binghy, within a few miles of our head-quarter station. We both went out and were much exercised in our minds at the sight of the nest: a more or less round, untidy structure of dead leaves and a thin twig or two, with a slight concavity in the centre, placed in a low bush in scrub jungle on flat ground, surrounded by high hills on three sides, within a mile of the sands of the seashore. The nest was well hidden by the foliage of the bush and was placed on the thin interlaced branches about two and-a-half feet from the ground; there were six white eggs in it of a slightly creamy shade, with a slight gloss and fine texture. We had provided ourselves with a gun and cartridges each and sat down, one on each side of the bush in hiding, to wait for the bird, which had left the nest immediately it caught sight of us coming. We had not waited long before we were rewarded with the sight of a Banded Crake that came sneaking out with much circumspection from some thick jungle close by. The bird spotted H. the first time and disappeared in a second. We changed our places slightly and shot it the second time it appeared. It was a female in full male plumage.

H. L. H. was Judge for four years in the same station where I am, and during that time we collected eggs assiduously with very satisfactory results and gathered a great deal of information of interest about birds, which we intend to publish some day in the near future. We found that the Banded Crake was a fairly common bird in the jungles along the coast during the monsoon ; and we obtained altogether some dozen nests with eggs varying in number from four to seven in the clutch, besides finding many empty ones. All the nests with eggs were found in the months of June to September, *i.e.*, during the heavy rains. Many nests were found robbed of their contents by mongooses, &c., the empty egg-shells lying on the ground below, some few there were in which the eggs were rotten. The nests are placed in bamboo clumps, on creeper-masses, on the top of a tree stump, &c., and were at the most six feet from the ground. The size of the egg is about 1·30″ × 1″ on an average ; one of the largest out of a series of 50 measures 1·40″ × 1·20″. The birds breed in the densest jungles as well as in the scrub jungles, from sea level up to the tops of the highest hills which are here about 1800 feet.

Mr. Davidson noticed this bird first in Kanara as mentioned in his *Birds of North Kanara*, in Vol. XII, p. 60 of this Journal. What he says there about its habit of calling in the mornings and evenings is correct ; but it calls at other times during heavy, misty weather. The cry is rather like that of the common hen after laying an egg ; but there is a difference. Suddenly disturbed, it utters the cry of the common paddy bird (*Ardeola grayi*) when alarmed ; if suspicious of danger, it makes a noise like "krrrrr" pronounced in a subdued voice. It is extremely shy of open ground and will invariably fly across even a few feet of open path in the jungle ; when flushed, it takes to the nearest tree or any thickly foliaged place available, and is quite at home perched on a branch. We have put up many during our walks, generally with dogs. I have never seen one during the dry months, though I am constantly in their breeding haunts during that time. Whether they migrate or not from the district we do not know for certain, but it seems probable. It would be interesting to know where they go.

I have kept this Crake in a cage on several occasions in my bungalow, and the birds have, after a few hours, become quite unconcerned as to the unaccustomed surroundings. When thus caged they are very pugnacious and will instantly go for a finger or hand inserted through the bars. In the jungles they go about with their wings slightly hanging. They feed on insects.

Gorsachius melanolophus or the Malay Bittern was first discovered by J. Davidson in Kanara. He published his observations about this bird in Vol. XII, p. 70 of this Journal (*The Birds of North Kanara*). What he says there as to its habits is absolutely correct. It is not a rare bird in Kanara when one knows where to look for it. I have found many nests perhaps some two dozen in all ; but it is hard work at the best of times

seeking for them as the birds build during the heaviest rains, always in very retired places in thick jungle, generally choosing some steep nalla. The nest is always placed in a conspicuous position, at least it is conspicuous when once discovered, but is easily overlooked and generally in a terminal fork of a branch of a thinnish tree, anywhere from 15′ to 30′ from the ground. I have always found the tops of the hills the surest place for a find and, generally, at the commencement of a nalla; the birds seem to prefer to have a bit of flat, open ground under the nest, but never build them exposed to the sky; the nest being invariably overshadowed by the foliage of a high tree. I have never heard the bird utter any sort of cry. It is certainly not exclusively nocturnal in its habits as stated by Oates in his "Birds" (*Fauna of British India*), if indeed it is nocturnal at all; for I have often found it feeding in the day time by the shady pools in the hill nallas as well as on the tops of hills ranges in the damp evergreen jungles. I have put up some dozen birds at different times in such places, sometimes singly, sometimes in pairs, during my rambles in the jungles from May to November. When flushed, the birds generally take to trees and can then be shot; but they are very wary and require careful stalking. The number of eggs laid is generally three, often four, rarely five. The egg is white with a slight greenish shade, of chalky texture, nearly without gloss and measures about 1·90″ × 1·60″, one egg of a clutch of four we have, measures 2·20″ × 1·50.″ All the eggs are oval with a decided tendency to a point at one end. The birds are very regular in their time of laying, which is always the end of July or the very commencement of August. Like the *Banded Crake*, this Bittern does not seem to stay in the district during the months of December to April. I have certainly never seen one in those months.

T. R. BELL.

KARWAR, *9th March* 1902.

No. XVII.—CANNIBALISM IN SNAKES.

It is of course a well-known fact that the King Cobra or Hamadryad (*Naia bungarus*) feeds on other snakes, and the last specimen we had alive in our Museum, ate 13 live snakes almost all of which were Dhamans (*Zamenis mucosus*), each measuring from 4 feet to 9 feet in length. The Common Kraits(*Bungarus cæruleus*) also whenever we have kept them alive have refused all food except other snakes and apparently had no preference for one species more than another.

About two years ago, however, one of the live Pythons (*Python molurus*) in our collection quarrelled with his companion in one of the cages, the bone of contention being a partridge which had been put in the cage as food, and after swallowing the other Python, measuring about 9 feet in length, he ate the partridge.

The most recent instance of cannibalism was amongst the Cobras (*Naia tripudians*) a few days ago. There were 3 cobras in the cage, a black one and

two yellow ones. Some frogs had been put in as food, and the black cobra and one of the yellow ones attacking the same frog, the black cobra swallowed both the frog and the other cobra. Both cobras measured about 4½ feet in length.

With the Daboias or Russell's Vipers (*Vipera russelli*) which we have alive—it frequently happens that if hungry, two vipers will try to obtain one rat even if one of them has not bitten it, but when their heads approach each other in trying to swallow the rat, one of them always manages to let go—and the viper who has secured the head of the rat first, is almost always the winner.

In the case of cobras, however, they are more tenacious of their hold and their fangs being fixed slanting backwards, it is probably more difficult for them to detach themselves from their prey, and the victim only finds out his mistake when it is too late to extract himself from the other cobra's throat.

W. S. MILLARD,
Honorary Secretary.

BOMBAY NATURAL HISTORY MUSEUM,
19*th March* 1902.

No. XVIII.—MISCELLANEOUS NOTES ON BIRDS' NESTING ROUND POONA AND ELSEWHERE.

THE RED-HEADED MERLIN (*Falco chicquera*).—Although fairly common, I have not been over successful in obtaining its eggs. So long ago as February 1888, I found a nest at Rajkote containing 4 fresh eggs, which was situated in a mango tope high up and overhanging a well. It was after a shoot, and I told one of the beaters to climb up and investigate. As he refused, I said I would not pay them any wages until I had got the eggs and drove away. I must confess the nest was in a most "hairy" place. I had hardly gone a couple of hundred yards when I heard the beaters shouting out. I at once came to the conclusion that one of them, in endeavouring to reach the nest, had been precipitated into the well by the breaking of a bough. I returned as rapidly as possible, and was relieved to find that nothing had gone wrong, and that the man had got the eggs. On this the beaters received their wages. From that date till the present year, I have never come across the nest again. On the 7th January, not far from Poona, I was attracted by the call of one of these birds and, at the same time, saw it swoop down and up again over a bare Banyan tree alongside the rail. I immediately proceeded to examine it, and was not long in discovering two crow-like nests. On throwing up stones at that which appeared the freshest, I observed a bird moving within it. I had only about 10 minutes in which to catch the train, and fortunately the station was very handy and the tree easy to climb, so I sent my *shikari* up double quick and obtained 3 perfectly fresh eggs. While these were being taken the parent birds sat on

the top of the tree and remonstrated to some time. On the 12th January I obtained 3 more fresh eggs from a nest, situated very high up among the leaves of a mango tree, one of a tope. The nest was taken with some difficulty, as for about 20 feet from the ground the tree was branchless; consequently, a rope had to be requisitioned. This nest was discovered simply through the fussiness and noise of the birds when building, though they were quite silent while it was being taken.

BONELLIS OR THE CRESTLESS HAWK EAGLE (*Nisaetus fasciatus*).—On the 14th January, I was fortunate enough to come on another nest of this species in the Sholapur District. It was an enormous structure of sticks, placed at the very top of a lofty tree and visible from a considerable distance. It has probably been used as a nursery for many years. I got a boy to climb the tree after some difficulty, during which operation the female vacated it and took up her position on an adjacent one. I was not sure of the species, so intended shooting her if the nest contained eggs, but she defeated me by betaking herself off before this had been settled. The nest contained two hard-set eggs, one of which I managed to clean by the "water system." While the boy was descending the tree, I heard a rushing of wings and, looking round, saw the male coming out of space at a tremendous pace, like a bolt from the blue, straight for the nest. It seemed very cruel, but I had to shoot him to identify the species. I hit him hard which stopped him, he turned, reeling as he flew, went a few hundred yards, wheeled, and then fell dead—a truly glorious bird. I hope to visit the spot again next year and am curious as to whether the nest will be re-occupied.

THE BLACK-WINGED KITE (*Elanus cæruleus*).—Though I have been at Poona three years, until the present year I have hardly seen any of these birds. Of late, they seem to be far more common. They apparently have a penchant for open grass lands, studded with babul trees. It is a pretty sight to watch them hovering in the air and then dropping, like a stone, on to their prey or, when disappointed, moving off to repeat the process elsewhere. Towards the end of December, I found a nest, built in the slender branches of a thorny tree, about 20 feet from the ground. It was difficult to get at owing to the thinness of the branches and unfortunately contained young. The birds were very fussy, wheeling, and flying round, uttering a low whistle or squeal. They apparently haunt the nest with their young, after these have once flown, as on visiting the spot later, I found them still loitering around.

THE ROCK-HORNED OWL (*Bubo bengalensis*).—Though a fairly common bird and found in most localities, I have only just obtained its eggs. I was out in October near a large tank, where these birds had taken up their abode and were to be seen at all hours. I hardly expected to find eggs so early, but on searching the banks, I came on a nest containing 5 eggs, partially incubated, and all in different stages. Date 18th October. There was no nest, but the earth had been hollowed out and sifted, as it was very fine. The hen was

sitting. I stood watching her for a few moments, her ears and great yellow eyes, like two full moons, being visible. On her quitting the nest, I took the eggs. She flew across some intervening water to commanding ground opposite, where her lord and master joined her, and they both commenced hooting me. The nest faced north. I came on another nest, which looked quite ready, though eggs had not been laid. I got a second clutch towards the end of November, taken by my man.

THE INDIAN GREY SHRIKE (*Lanius lahtora*).—Three years ago, at the commencement of June, I came on a family of grey shrikes, which I thought had not long left the nest. On looking round I found it and came to the conclusion that eggs must have been laid early in April; consequently, about the middle of March last year, I again visited the spot, and within a few yards of the old nest I found the new one, which, to my disgust, contained unfledged young. This year, however, I took steps sufficiently early, and found the nest very close to the old spots, and got 2 eggs. Later on, I got another containing 4 fresh eggs, and a third, containing 3. This latter nest was placed in the same tree, and within 6 inches of a nest that had been occupied last year. I am sure that most birds breed every year in almost the same locality, unless disturbed or otherwise frightened. I have had many experiences of it. The grey shrike builds a very compact nest, usually in a densely thorny bush or tree, which takes trouble to obtain. They are very fond of incorporating rags in their nests and building on an old nest of the white-throated Munia (*Uroloncha malabarica*).

TICKELL'S BLUE FLYCATCHER (*Cyornis tickelli*).—Last year I found several more nests of this pretty little bird. The first was situated down a well where a brick had been displaced, and contained 4 fresh eggs. I was looking into the well when the bird flew up: thinking this peculiar, I instituted a search, and was rewarded. Date 17th June. On the 26th June, I found 3 nests, each containing 4 eggs; two lots fresh and one incubated. One was situated in a bank under a prickly-pear root, another in a crevice of a banyan tree and the third in a rubbish heap of dry leaves, all well concealed. In addition to the above I found two more, one in the hole of a tree and the other in the face of a wall, where a brick had been displaced, quite exposed. When the hen is sitting the male keeps up an incessant little song. I found the best method to pursue was to follow him. In due time the hen, apparently warned by him, leaves the nest; once you catch a sight of her, do not let her escape you, as very shortly she will return to the nest, and that is all you want. Oates says 3 is the normal number of eggs, but from the above 4 would seem more usual in these parts. The nest is very solid, built of roots in which a certain amount of earth is incorporated and embellished with dried and skeleton leaves.

THE SPOTTED MUNIA (*Uroloncha punctulata*).—After much waiting, I found the nest of this little Munia last year, and obtained several clutches of eggs. The first nest I came on was placed in a thorny tree, standing in water,

and about 6 feet from the ground. It contained 8 incubated eggs. Date 10th August 1901. On the 27th August and 7th and 8th September, I found more nests all containing fresh eggs, some 4, some 6. These were all situated in low thorny bushes well within reach of hand. The nests are enormous about the size of a man's head, very rough and untidy, but of the strict Munia type, *viz*, a ball of grass, with the entrance at one side.

As a rule they select a site close to water and liable to inundation, which give the nests the appearance of drift and rubbish caught up in the branches. There is no lining. These Munias use fresh green grass to construct their nests with, which they obtain by tearing strips off the larger sorts of grass. On seeing one of them flying along with a long green strip behind it, I thought I had come on a new description of parrot !

The White-backed Munia (*Uroloncha striata*) appears to be the common Munia below ghats. I found a nest being built in a cashew tree on the 13th November near Sawantwadi. It resembled that of the White-throated Munia (*Uroloncha malabarica*) but I think was neater, the entrance being more neatly finished off with flowering grasses and more elongated. On the 30th November, at Khed, Ratnagiri District, I found 2 nests, one with young and the other with 4 fresh eggs. These were situated on thorny trees and were from 6 to 10 feet from the ground.

The Crested Bunting (*Melophus melanicterus*). Barnes states that this handsome little bird is an adept at concealing its nest. Last year I found a few nests at Satara, which do not bear out this statement. The first contained 4 young birds very nearly ready to fly. I discovered the nest by watching the parent birds, who, in due course, conveyed food to the nestlings. They were jolly little chaps and I am sorry they took to flight on my investigating their quarters though I had no sinister designs on them. The mother was very much alarmed and tried to distract my attention from them, by fluttering along the ground with outspread wings as though in her last death agonies. This particular nest was situated under a projection on the steep slope of the Satara Fort hill and protected from the prevailing wind by a tussock of grass. It was just such a nest a lark, robin or wagtail might build. The second nest was being constructed and was in a similar position. The third was placed alongside the road leading up to the Fort and no attempt at concealment was made. On jumping on to the road, the hen darted out and I had no difficulty in finding the nest which contained 3 hard set eggs. I found these nests in June and July. The cockbird, who is very smart in appearance with his crest and shining black and cinnamon kit, has a very melodious little lay which he keeps up at frequent intervals.

The Chestnut Bittern (*Ardetta cinnamomea*). I believe the nesting of the Chestnut Bittern in the Dekhan is not common. I was fortunate enough to find two nests last year containing 3 and 5 fresh eggs respectively in July and August, while searching some thick tangle, growing in water, in the hopes

of coming on some Rails' nests. Both nests were placed on beaten down reeds and consisted of mere platforms of grass and had no great pretensions as works of arts. In the case of the finding of the second nest, the bird flapped up within a few yards of me, in fact so close that I could almost have knocked her over with a stick.

THE BLUE-BREASTED BANDED RAIL (*Hypotænidia striata*). As mentioned above I found a nest of this bird containing 9 beautiful fresh eggs on the 8th September. The bird lay very close and only rose as we were practically stepping on her. In spite of this we had to search very diligently before we succeeded in discovering the nest. It was well down in some tufts of grass and completely concealed, consisting of dry grass, welded into a compact mass. I always search for a nest of this description with a line of beaters else it would be hopeless. Captain Payn, K.S. L. I., found a nest in the same locality about a month earlier, but was unfortunate enough to step on the nest and break some of the eggs.

R. M. BETHAM, MAJOR,
8th Bombay Infantry.

POONA, 20*th March*, 1902.

No. XIX.—*PTEROMYS INORNATUS.*

I am glad to be able to confirm, to some extent, Mr. Clutterbuck's theory, that all the Large Red Flying Squirrels do not hibernate as stated in Vol. XIII, No. 3, page 531 of this Journal. Whilst out on a shooting trip, this February (1902), my coolies caught and brought me one, that had found its way, into a gujar's hut, that morning, which the coolies were at the time occupying. The same morning and just as it was getting light, I saw one fly across, from one tree to another, quite near the camp and of course this might have been the same one that was soon after caught by my coolies. This was on the 25th February at an elevation of 10,500 ft. I have seen and caught them, as late as 16th December, at over 10,000 ft. and after brown bears had hibernated that year, and have heard of some being shot in Dharmsala, in the Kangra District, Punjab, during January.

C. H. DONALD.

BHADARWA, JUMMU STATE, 15*th March*, 1902.

No. XX.—OCCURRENCE OF THE RED-BREASTED MERGANSER (*MERGANSER SERRATOR*) NEAR QUETTA.

When shooting yesterday on the tank at Khush-dil-Khan, about 7 miles from Peshin, Captain Macnamara of my regiment shot a specimen of the Red-breasted Merganser (*Merganser serrator*). I was one of the party, but was unable to name the bird at the time, never having seen one before. On returning home, by referring to my books, I was able to identify it. I did not sex it, but from the plumage it was evidently a young male. I regret that

had no time to preserve the specimen, which is very rare within Indian limits, only one or two others having been previously recorded. It is, however, stated in Vol. IV of "Birds of the Fame of Indian series to be probably fairly common on the coast of Baluchistan," and "both a salt and fresh-water bird," so there is nothing surprising in its occurrence in this neighbourhood. The tank at Khush-dil-Khan is a fairly large artificial one, formed by bunding up a valley; and is well known to most sportsmen who have served in the Quetta District.

C. G. NURSE,
(Major, 13th Bombay Infantry).

QUETTA, *4th April*, 1902.

No. XXI.—NESTING OF THE GREY PELICAN (*PELECANUS PHILIPPENSIS*) IN THE CUDDAPAH DISTRICT, MADRAS PRESIDENCY.

On looking over Blanford's "Birds" the other day I noticed the statement that of late years no authentic account of Pelicans breeding in India has appeared. In 1890 when in camp in a secluded valley in the extreme East of the Cuddapah District, in the end of March, I found a large number of Grey Pelicans breeding in company with a community of Painted Storks (*Pseudotantalus leucocephalus*). The nests, of which there were several hundreds, were on neem and tamarind trees in a small village called Buchupalle. The people of the village were very much averse to any interference with the nests. The birds trusted them and they would not have them injured, they said; so I did not examine many nests. I got three eggs of the Painted Storks, hard set, from one nest, but in every other nest, so far as I could see, there were young birds. The parent birds of both species kept coming and going, bringing quantities of a fine trailing of water-weed, from a tank about two miles off, to feed their young.

W. HOWARD CAMPBELL.

GOOTY, MADRAS, *2nd April*, 1902.

PROCEEDINGS

OF THE MEETING HELD ON 17TH DECEMBER, 1901.

A meeting of the members of the above was held on Tuesday, 17th December 1901, Major D. Prain, I.M.S., presiding.

NEW MEMBERS.

The election of the following new members was then announced :—

Mr. L. C. H. Young (Bombay) ; Lieutenant L. C. Brodie (Trimulgherry) ; Mr. W. A. Conduit, C.E. (Seoni District, C. P.) ; Captain C. H. Lincoln, I.M.S. (Bombay) ; Major R. E. S. Davis, I.M.S. (Rangoon) ; and Mr. J. A. B. Ball (Umballa).

Mr. H. M. Phipson, the Honorary Secretary, acknowledged receipt of the following contributions to the Society's Museum since the last meeting :—

Contribution.	Description.	Contributor.
1 Palm Civet (alive)	*Paradoxurus niger*	Mr. E. W. Thompson.
1 do. do.	*Do.*	Mr. Fazalbhoy Laljee.
2 do. do.	*Do.*	Mr. Paul Girhardt.
A Collection of Moths.....	.....	Do.
Lizard's Eggs	.....	Mr. M. Loam.
1 Snake	*Lycodon aulicus*	Mr. H. Stauber.
1 Woodcock	*Scolopax rusticola*	Major G. A. Leslie, R.E.
1 Krait	*Bungarus cæruleus.*	Mr. J. Stiven.

CONTRIBUTIONS TO THE LIBRARY.

The Flora of the Presidency of Bombay, Part I, by Theodore Cooke, C.I.E. (from the author) ; the Distribution of Vertebrate Animals in India, Ceylon, and Burma, by W. T. Blanford, F. R. S. (from the author) ; Catalogue of the Indian Decapod Crustacea in the collection of the Indian Museum (Part I, Brachyura), from the Trustees ; the Coleoptera of South Africa (Peringuey) ; Annals of the Royal Botanic Gardens, Calcutta, Vol. IX, Part I ; and Living Animals of the World, Parts I to VIII (from Mr. William Phipson).

THE VICTORIA GARDENS.

The Honorary Secretary drew the attention of the members to the new and extensive aquatic aviary which had been completed at the Victoria Gardens, and expressed a hope that members who were in a position to obtain specimens of wild ducks, geese, swans, pelicans, flamingoes, storks, cranes, &c., would communicate with the Superintendent of the Gardens.

DEATH OF MR. L. DE NICÉVILLE.

The Honorary Secretary stated that the Society had suffered a heavy loss through the death of Mr. L. de Nicéville, the well-known lepidopterist, which took place in Calcutta on the 4th instant. Mr. de Nicéville had been an important contributor to the Bombay Natural History Society's Journal since 1887, as reference to the General Index of Vols. I to XIII (published in No. 5 of Vol. XIII) would show. Looking back through the back numbers of the Society's Journal, members would find 34 coloured plates of Oriental butter-

flies, illustrating no less than 346 species, all of which were produced under the supervision of Mr. de Nicéville, whose untimely death would be deplored by all members of the Society.

PAPERS READ.

The following papers were then read and discussed.—(1) Natural History Notes from Fryer's Travels, by N. C. Macleod. (2) Notes on some of the Plants introduced into the Victoria Gardens, Bombay, during the past eight years (Part II), by Cowasjee D. Mahaluxmivala.

PROCEEDINGS
OF THE MEETING HELD ON 21ST JANUARY, 1902.

A meeting of the members took place on Tuesday, the 21st January, 1902, at the Society's Rooms, Dr. D. Macdonald presiding.

NEW MEMBERS.

The election of the following new members was announced :—

Lieutenant William F. Harvey, M.A., I.M.S. (Saugor); Staff-Surgeon W. Stericker, R. N., H. M. S. Fox, (Persian Gulf); Mr. A. C. Logan, I.C.S. (Broach); Lieutenant B. E. A. Manson (Belgaum); Mr. J. G. Burn, I.C.S. (Madanapalli); Mr. H. B. Peirce (Bombay); Mr. Arthur Langham (Bombay); Major J. R. Stuart, R.A.M.C. (Bombay); Mr. Eric McDougall (Burma); Mr. F. B. P. Lory, B.A. (Bombay).

CONTRIBUTIONS TO THE MUSEUM.

Mr. H. M. Phipson, the Honorary Secretary, acknowledged receipt of the following contributions since the last meeting :—

Contributions.	Description.	Contributor.
1 White-faced Stiff-tail Duck.	*Erismatura leucocephala* ...	Major F. J. H. Barton.
2 Bearded Vultures, or Lamergeyers.	*Gypaetus barbatus*	Mr. C. H. Donald.
1 Imperial Eagle	*Aquila heliaca*	Do.
1 Monal Pheasant.....	*Lophophorus refulgens*	Do.
2 Desert Larks	*Alæmon desertorum*.....	Mr. Percy Hide.
1 Cotton Teal.....	*Nettopus coromandelianus*...	Do.
1 Griffon Vulture	*Gyps himalayensis*	Major G. S. Rodon.
3 Pant er Cubs	*Felis pardus*	Col. L. L Fenton.
1 Bonellis Eagle	*Nisætus fasciatus*	Maj. R. M. Betham.
The Jaw-bones of a Whale.	*Balænoptera indica*.....	Mr C. E. Palmer, I.C.S., and Mr. C. V. Vernon, I.C.S.
1 Snake (alive)	*Cerberus rhynchops*	Mr. E. H. Aitken.

PAPER READ.

Captain George Lamb, M.B., I.M.S., read a most interesting paper on the Physiological Action of Snake Venoms and their Antidote, explaining with great clearness, the difference which exists between the action of Cobra poison and that of Daboia poison and maintaining that whereas we possess in Dr. Calmette's Antivenin an infalliable antidote against the former, the remedy is quite useless in the case of the latter.

Captain Lamb stated that, so far he had not made any experiments with the poison of the Phoorsa (*Echis carinata*) or the various species of Kraits (*Bungarus*) having been unable to obtain a supply. He hoped that members of the Society would assist him in his efforts to obtain live specimens of these snakes.

The method of extracting the poison from a live Cobra was demonstrated before the meeting and also the mode of administrating food into the snake by means of a funnel.

A hearty vote of thanks was passed to Captain Lamb for his valuable paper, which will duly appear in the Society's Journal.

Mr. Comber called attention to letters received from Mr. W. D. Cumming, of Ormara, on the Mekran coast, reporting the occurrence there of the Red-breasted Merganser (*Merganser serrator*), of which there was previously only one authentic record within "Indian" limits, and of a species of Diver (*Colymbus*) which genus has never been known or suspected to occur in any part of the Indian region. Some curious instances of albinism were also referred to, in which some caged Buntings had replaced "plucked" wing and tail feathers by white ones.

PROCEEDINGS

OF THE MEETING HELD ON 18TH FEBRUARY, 1902.

A meeting of the members was held at the Society's Rooms on Tuesday, the 18th February 1902, Mr. F. O. Gadsden, R.I.M., presiding.

NEW MEMBERS.

The election of the following new members was announced :—Mr. R. C. H. Barnard, C.E. (Lanauli) ; Mr. William Hall (Bombay) ; Mr. A. A. Gover, D. S. P. (Vizagapatam) ; Mr H. A. B. Vernon, I.C.S. (Vizagapatam) ; Mr. J. Humphrey (Bombay) ; the Honorary Secretary of the Sind Club (Karachi) Professor G. A. Gammie (Poona) ; Mr. H. P Todd-Naylor, I.C.S., C.I.E. (Minbu, Burma) ; Mr. Kirkman Finlay (Rangoon) ; Mr. H. Haussler (Rangoon) ; Mr. Neville Eliot, R. A. (Rawalpindi) ; and H. H. the Maharajah of Mysore (Mysore), (*Life Member*).

CONTRIBUTIONS.

Mr. H. M. Phipson, the Honorary Secretary, acknowledged receipt of the following contributions since the last meeting :—

CONTRIBUTIONS TO THE MUSEUM.

Contributions.	Description.	Contributors.
1 Snake	*Gongylophis conicus*	Mr. R. H. Harter.
1 do. (alive)	*Eryx johnii*	Mr. E. Good.
A Collection of Hymenoptera	.....	Major C. G. Nurse.
1 Snake (alive)	*Eryx johnii*	Mr. E. J Lilly.
1 Do.	*Gongylophis conicus*	Capt. G. Lamb, I.M.S.
1 Cobra (alive)	*Naia tripudians*	Do.
1 Dhaman (alive)	*Zamenis mucosus*	Do.
A number of Indian Gerbilles.	*Gerbillus indicus*	Mr. A. H. A. Simcox, I.C.S.
1 Puff Adder's Skin	*Vipera arietans*	Major S. Prall, I.M.S.
2 Jackals	*Canis aureus*	Mr. C. Merroney.

ACCOUNTS FOR 1901.

Mr. N. C. Macleod, the Honorary Treasurer, placed before the meeting a statement of accounts for the year ending 31st December, 1901, showing a credit balance of Rs. 982-7-3 in cash, and Rs. 4,800 invested in Government Paper. It was resolved that the accounts be passed subject to the usual audit.

ELECTION OF COMMITTEE.

The President, Vice-Presidents, and members of the Managing Committee for the present year were duly elected as follows :—

President—H.E. the Right Hon'ble Lord Northcote.

Vice-Presidents—Mr. J. D. Inverarity and Dr. D. MacDonald.

Managing Committee—Veterinary-Captain G. H. Evans, Mr. E. C. Stuart Baker, Dr. D. MacDonald, Mr. E. H. Aitken, Rev. F. Dreckmann, S. J., Mr. E. Ernest Green, Lieutenant-Colonel K. R. Kirtikar (I. M. S.), Mr. J. D. Inverarity, Mr. W. S. Millard, Colonel H. D. Olivier, R.E., Mr. A. Abercrombie, Mr. E. L. Barton, Mr. R. Gilbert, Mr. E. Comber, Mr. R. C. Wroughton, Mr. T. R. D. Bell, Major A. Newnham, Mr. F. O. Gadsden, Major C. G. Nurse, and Mr. G. O. Ludgeon.

Mr. N. C. Macleod, Honorary Treasurer, *ex-officio*.

Mr. H. M. Phipson, Honorary Secretary, *ex-officio*.

PAPERS READ.

The following papers were read and discussed.

1. "Notes on the Hog Deer in Burma (with Photographs)," by Veterinary-Captain George H. Evans, A.V.D.
2. "Aids to the Differentiation of Snakes," by Captain F. Wall, I.M.S.
3. "Sand Grouse in Northern Gujarat," by Major C. G. Nurse.
4. "Travancore Snakes," by H. S. Ferguson, F.L.S.
5. "A novel method of catching a Jackal," by Major D. Thomson.
6. "Occurrence of the Avocet near Poona," by Major R. M. Betham.
7. "Notes on some Lakhimpur Birds," by H. N. Coltart.
8. "Occurrence of the White-faced or Stiff-tail Duck at Mardan," by Major F. J. H. Barton.
9. "A man-eating Panther," (with a Photograph), by W. A. Conduit.
10. "Extraordinary magnitude of a Snake's meal," by Captain F. Wall, I.M.S.
11. "Our Collection of Eagles and Owls," by E. H. Aitken.

PROCEEDINGS

OF THE MEETING HELD ON 18TH MARCH, 1902.

A meeting of the members was held at the Society's rooms on Tuesday, the 18th March, 1902, Mr. F. O. Gadsden presiding.

NEW MEMBERS.

The election of the following new members was announced :—

Mr. Donald N. Graham (Bombay); Captain A. L. Valentine (Bombay); Mr. J. D. Mills (Hampshire, England); Mr. A. L. Whittell (Bombay);

Mr. John S. Anderson (Coorg); Captain P. F. Chapman, I.M.S. (Raipur, C.P.); Mr. C. G. C. French, I.C.S. (Raipur, C.P.); Mr. W. De Morgan, C.E., (Waltair); Mr. G. Monteath, I.C.S. (Dharwar); and Mr. Douglas Dewar, I.C.S. (Almora, N.-W. P.).

CONTRIBUTIONS.

The Honorary Secretary acknowledged receipt of the following contributions since the last meeting:—

CONTRIBUTIONS TO THE MUSEUM.

Contributions.	Description.	Contributors.
3 Palæolithic implements found in Somali Land.	.....	Mr. H. W. Seton-Karr.
A collection of photographs of Animals shot in East Africa.	.....	Mr. T. J. Spooner, C.E.
1 White-bellied Sea Eagle	*Haliaetus leucogaster*	Mr. C. E. C. Fischer.
1 Shama.....	*Cittocincla macrura*	Mrs. Bythell.
4 Snakes (alive)	*Dipsas forstenii*	Capt. C. Lamb, I.M.S.
1 Shikra.....	*Astur badius*	Mr. J. D. Inverarity.
7 Rats (alive)	*Gerbillus indicus, Nesocia bengalensis, etc.*	Mr. A. H. A. Simcox, I.C.S.

MINOR CONTRIBUTIONS

From Mr. H. B. Peirce.

PAPERS READ.

"Bombay Ducks from a Sportsman's Point of View," by Colonel H. D. Olivier, R.E.

A very interesting lecture was given by Colonel Olivier on the above subject in which he pointed out from the specimens of ducks in the Society's collection, the distinguishing characteristics of each species, and gave some account of his experiences in duck-shooting in the Bombay Presidency.

Mr. E. H. Aitken read a paper written by Mr. S. M. Fraser, I.C.S., on "Tiger-netting in Mysore," in which he observes that it is probable that in spite of what Sanderson and others have written, there is still a good deal of misconception about tiger-netting as pursued in Mysore, which is a genuine native sport well worth witnessing by any one interested in wild beasts and their ways.

The paper will appear in full in the Society's Journal.

PROCEEDINGS

OF THE MEETING HELD ON 22ND APRIL, 1902.

A MEETING of the members was held at the Society's rooms on Tuesday, the 22nd April, 1902, Dr. D. MacDonald presiding.

NEW MEMBERS.

The election of the following new members was announced:—

Major T. D. Collis Barry, I.M.S. (Bombay); Captain P. F. Pocock (Khar); Mr. B. H. Barlow-Poole, I.F.S. (Anantapur); Major W. E. Jennings, I.M.S. (Poona); Captain M. B. Roberts (Lansdowne); Lieutenant Richard Clifford

(Myitkyina); Captain H. Des Vœux (Bassein, Burma); Mr. W. Sparke (Bassein, Burma); Mr. J. H. Burkill (Calcutta); Mr. F. D. Little (Katha, Upper Burma); Dr. W. S. J. Shaw (Sholapur); and Mr. H. V. Purkis (Bhadarwa, Jammu State).

CONTRIBUTIONS.

The Honorary Secretary acknowledged receipt of the following contributions since last meeting :—

CONTRIBUTIONS TO THE MUSEUM.

Contributions.	Descriptions.	Contributors.
1 Snake (alive)	*Echis carinata*	Dr. A. H. Deane.
1 Snake	*Lytorhynchus paradoxus*	Lieut. G. A. Hawks.
3 Bear Skulls	*Melursus ursinus*	Capt. R. G. Burton.
7 Panther Skulls	*Felis pardus*	
1 Hyæna Skull	*Hyæna striatus*	
1 Wolf Skull	*Canis pallipes*	
1 Wild Dog's Skull	*Cyon dukhunensis*	
1 Indian Gazelle's Skull	*Gazella bennetti*	
2 Oorials (alive)	*Ovis vignei*	Capt. P. Z. Cox, F.Z.S.
1 Snake	*Dipsas forsteni*	Rev. B. Wright, H.M.S. Highflyer.
1 Hamadryad (alive)	*Naia bungarus*	Mr. E. H. Aitken.
1 White-legged Falconet	*Microhierax melanoleucus*	Mr. Vernon Woods.
1 Large Indian Pratincole	*Glariola orientalis*	
1 Samll Indian Pratincole	*Do. lactea*	
3 Eggs of Indian Green Barbet.	*Thereiceryx zeylonicus*	Mr. J. Spilling.
A quantity of Fossil shells	.....	.....
2 Spotted Hawk-Eagles (alive).	*Spizaetus nepalensis*	Mr. C. H. Donald.
Some fishes, shells and marine specimens from the Persian Gulf.	.....	Mr. F. W. Townsend.
1 Snake	*Typhlops acutus*	Mr. F. Dundas Whiffin.
1 Chesnut-headed Shortwing	*Oligura castaneicoronata*	Mr. S. L. Whymper.
1 Black-chinned Yuhina	*Yuhina nigrimentum*	
1 Bronzed Drongo	*Chaptia ænea*	
Some photographs of the growth of *Ficus coræifolia*.	.....	Col. St. G. Gore, R.E.
1 Dhaman with Eggs	*Zamenis mucosus*	Major C. T. Hudson, I.M.S.
1 Snake	*Oligodon subgriseus*	Mr. E. H. Aitken.
Some Scorpions	.....	
1 Nest of Malabar Woodshrike.	*Tephrodornis sylvicola*	
1 Lizard	*Varanus bengalensis*	Genl. W. Osborn.
1 Himalayan Palm Civet	*Paradoxurus grayi*	
1 Leopard Cat	*Felis bengalensis*	
8 Photographs of Sea Fish	.....	Mr. C. J. I. Jones, R.I.M.
1 Sword fish	*Histiophorus sp*	
1 Snake (alive)	*Tropidonotus plumbicolor*	Mr. P. Gerhardt.

MINOR CONTRIBUTIONS FROM

Mr. A. R. Wilson (Almora, N.-W.-P.), Mr. D. A. Macmillan (Orissa), Mr. J. Spilling, Mr. G. P. Millett (Kanara), and Mr. G. R. Lowndes.

EXHIBITS.

A large Sword Fish (*Histiophorus sp.*), presented by Mr. C. J. I. Jones, R.I.M., was exhibited. It was captured off the Laccadive Islands and measured 9ft. 11in. in length and 100lbs. in weight. Some excellent photographs showing the rapidity of growth of *Ficus cordifolia* on a mango tree were exhibited by Colonel St. G. Gore, R.E., of Dehra Dun.

PAPERS READ.

The following papers were then read: "Note on the habits of the Banded Crake (*Rallina superciliaris*) and the Malay Bittern (*Gorsachius melanolophus*)," by T. R. Bell, I.F.S.; "Notes on some *Nepenthes* and other new stove plants introduced into Bombay," by W. S. Millard; "Miscellaneous notes on Birds' nesting round Poona and elsewhere," by Major R. M. Betham.

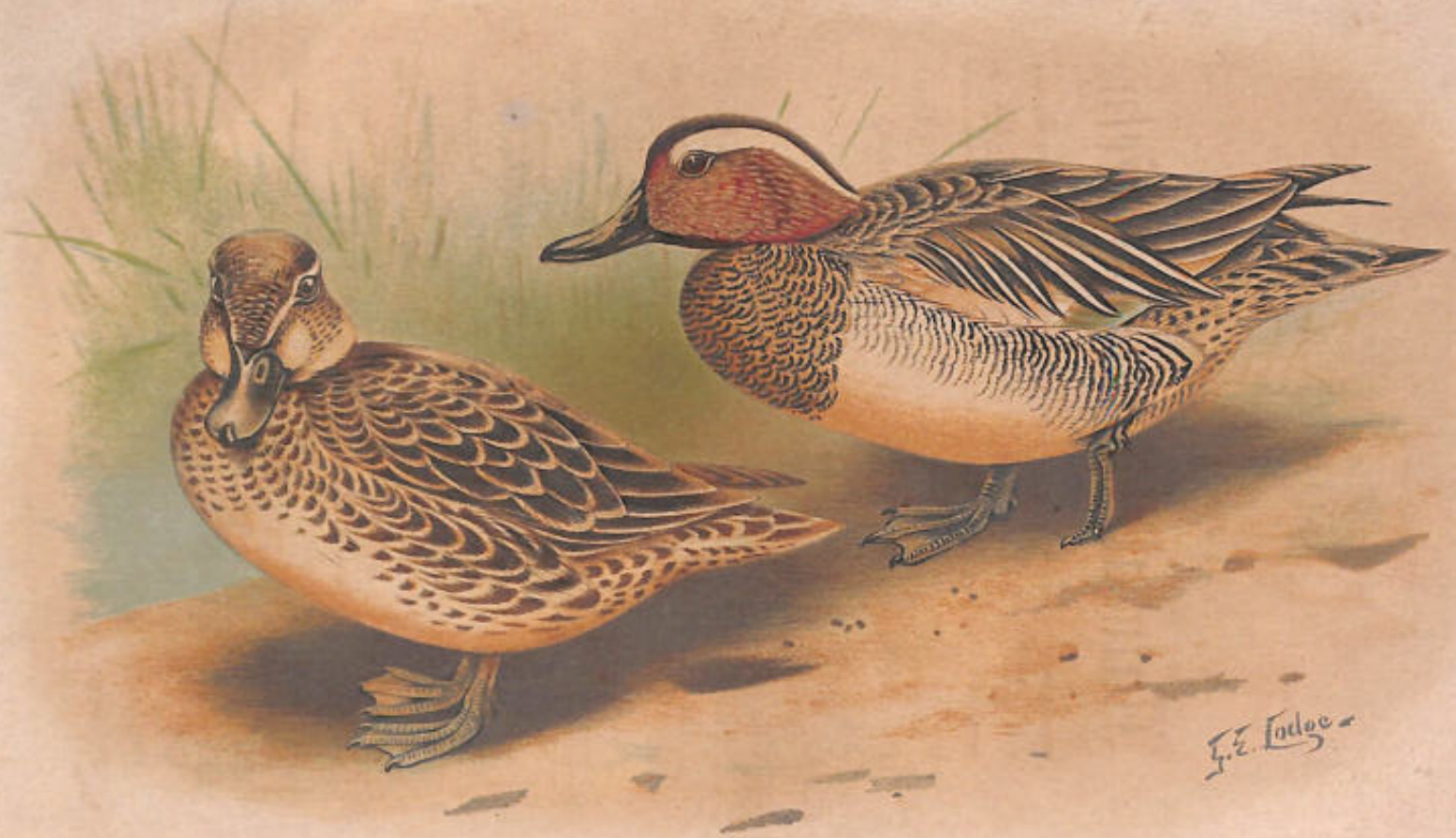
DR. MACDONALD'S RETIREMENT.

Mr. Aitken then asked permission to say a few words about the chairman, who was very shortly to leave, and would probably never be present again at a meeting of the Society. He said that probably few of those present knew the real origin of the Bombay Natural History Society, or had any idea that Dr. MacDonald was the *fons et origo* of the whole thing. But such was the fact. It was early in 1883 that Dr. MacDonald suggested that it would be an excellent thing to form a Society for the study of Natural History. Dr. Maconachie told the speaker, who welcomed the suggestion, and with the view of translating suggestion into fact, asked Dr. Maconachie to name a day and place for the first meeting. The result was that six gentlemen met in the Victoria and Albert Museum and constituted themselves the Bombay Natural History Society. The six were, Dr. Maconachie, Dr. MacDonald, Dr. Atmaram, Mr. J. C. Anderson, Mr. J. Johnston, and the speaker. The membership now was over seven hundred, and of the six original members only Dr. MacDonald and the speaker were in Bombay this day. Dr. MacDonald had been one of their Vice-presidents all through the Society's wonderful career. He had often filled the chair at their meetings. He had continuously filled a place in their slender list of office-bearers, and that was a difficult place to fill, as the Secretary knew. He was leaving them at last, and the speaker thought they ought to remember gratefully his long connection with the fortunes of the Society and wish him a happy time in his own land.

The proposition was seconded by Mr. Millard and carried by acclamation.

Dr. MacDonald replied briefly, disowning the credit which Mr. Aitken had given him and thanking the members for their kind thoughts of him.

A vote of thanks was passed to the donors of the papers, and the meeting then terminated.



G E Lodge del.

THE GARGANEY OR BLUE-WINGED TEAL.

Querquedula circia.

Mintern Bros. Chromo-lith. London.

JOURNAL
OF THE
BOMBAY
Natural History Society.

Vol. XIV. BOMBAY. No. 3.

THE KING-COBRA, OR HAMADRYAD—*NAIA BUNGARUS* (BOULENGER), *OPHIOPHAGUS ELAPS* (GÜNTHER).

BY VETY. CAPT. G. H. EVANS.

(*With a Plate.*)

BURMESE.—Gnan-Gnan-bôk.

KAREN.—Gni-thaw—Gni-thaw-plaw.

SHAN.—Gnu-son-an.

The Hamadryad is at least by its notoriously evil reputation known to a large number of our readers, and having seen something of this reptile, it occurred to me that a paper on the subject might prove of some interest. This snake may be met with in suitable localities throughout this province and adjoining States. Many of us have heard of exciting encounters with, and hair-breadth escapes from, this much-dreaded reptile. On looking over some books on Burma I came across the following remarks in Mason's work:—"Burma, its People and Productions," revised by Theobald, Volume I, pages 309 and 310:—"The Hamadryad is the most formidable reptile in the country. It may be described in general terms as a magnificent variety of the cobra, but has no markings on it. It bears the character of being a very fierce snake and of always pursuing when attacked. I met one on the Toungoo Hills, two or three years ago, when accompanied by a dozen Karens. We all stopped, and the brute being some ten or twelve feet long, no one was disposed to attack him. He glided close by us in a very deliberate manner, seeming to say, 'Let me alone, and I will let you alone,' and we accepted the terms. One of these serpents, about

seven feet long and one foot in circumference, was caught in Shwagyen, and after being secured to a bamboo, was brought to Major Berdmore. He sent for a famous Burmese serpent-charmer who met the brute on the verandah in the confident expectation of subduing it by a 'few brays,' a bold front and a shake of the finger. At first the serpent appeared to cower beneath his glance, but when he approached and put forth his hand, it sprang on his wrist and bit him. The man felt the poison up to his shoulder in an instant, and ran off immediately to his house, which was near, for an antidote; but he fell exhausted on the threshold, and expired in less than half an hour after he was bitten. The Karens say they are sometimes three fathoms long, but from ten to twelve feet is the most common length of adults. A Karen at my side says that on three several instances he has seen a Hamadryad devouring other snakes, so one of its specific names, 'Ophiophagus' (snake-eater), is most appropriate. An intelligent Burman told me that a friend of his one day stumbled upon a nest of these serpents, and immediately retreated; but the old female gave chase. The man fled with all speed over hill and dale, till, reaching a small river, he plunged in, hoping he had then escaped his fiery enemy; but, lo! on reaching the opposite bank, up reared the furious Hamadryad, its eyes glistening with rage, ready to bury its fangs in his trembling body. In utter despair he bethought himself of his turban, and in a moment dashed it upon the serpent which darted upon it like lightning, and for some moments wreaked its vengeance in furious bites, after which it returned to its former haunts." Mr. Theobald in the work referred to writes:—"I was one evening attracted by a noise of men and dogs near my tent, and found a large crowd round a bush, in which some creature was at bay. On coming up I found it to be a magnificent 'Gnan' (Hamadryad) twelve feet long, which was making furious charges at the dogs, but was protected by the bushes among which it kept from the men who, moreover, were very much disinclined to come very close. Taking a stick from a boy, I directed all present to go the other side of the bush and keep quiet, whilst I stationed myself a few yards in the open. As I anticipated, in a minute or so the 'Gnan' thinking the coast clear came straight out on my side, with the idea of escaping; and, when well clear of the bushes, I made one step forward, and delivered a smart blow on the neck, and before he could recover himself, I was upon him and had him firmly by the nape." Yule in his "Embassy to Ava,"

page 180, remarks :—" At about a mile from the coal we came on a large Hamadryad snake. One of the men had a double-barrelled gun, but when he attempted to fire at it, all the rest cried to him to stop. I said, 'Shoot him,' but the snake looked at us and glided away unhurt. I asked him why he did not shoot it. The reply was curious as bearing out a statement in Mason's 'Tennasserim' which I confess, I did not credit before. They said it would, if hurt, turn after and chase them; so it got off. It was about 9 feet long." Boulenger, "Reptilia and Batrachia" (Fauna of British India), page 393, states :—"From its larger size and fiercer habits this snake is still more dangerous than the cobra; it is fortunately less common." Mr. Hauxwell, I.F.S., informed me that at Shwegyin in 1883, while sitting in his verandah one day, he heard screams and shouts of snakes from the house on the opposite side of the road. He ran across and found a Burmese girl under the portico at the foot of the steps striking with a bamboo about 8' long, at an infuriated Hamadryad, afterwards found to be over 8' in length. Owing to the length of the bamboo she was doing more harm to the posts and balustrade of the steps than to the snake; at the same time it was evident that the snake was more intent on escaping than on attacking her, although quite prepared to defend himself. On his telling the girl to leave off trying to hit the snake and to run away—a request she complied with without demur—the snake at once settled down and endeavoured to escape, when it was an easy matter to break his back and bring him to book. In 1892 while the same gentleman was "collecting" along the sand banks of the Thoungyin river, he observed a large snake coiled up in a willow bush. Being anxious to take him alive, Mr. Hauxwell sent some Burmans to cut forked sticks, while he with a small collecting gun in his hand remained to watch the snake which never moved till the men returned and commenced poking about with the sticks, when he quietly tried to glide away. On being touched with a stick, however, he immediately reared up and dilated his neck. There was then no question as to what the snake was, but as he was not further molested, he sank down and made for the river, when he was shot. Length—10'-7" Girth—over 5". Mr. Hauxwell in a note to me, added :—"I do not believe in the aggressiveness with which this snake is credited. He will, like anything else, make every effort to defend himself when cornered, but will, in nine cases out of ten, prefer to make off and

save his own skin." My experience is quite in accord with that of the above named gentleman, *viz.*, that it is unusual for them to be aggressive. I consider their evil propensities have been greatly exaggerated. Their large size, activity, fierce appearance when irritated, readiness to attack on slight and at times seemingly without provocation, have undoubtedly tended to earn for them a bad character. There is however, no denying, that empty-handed, an infuriated Hamadryad is about as nasty a creature as one could possibly be brought in contact with. I have met several individuals who have had the unpleasant experience of being chased, and though there was an unanimity of opinion as to the shocking sensations produced, apparently all had the full use of their limbs, or hamadryads are not fleet, or do not pursue for any distance, as not one would even admit to having nearly been caught. As a rule, people have such a dislike for the most ordinary snakes that when one is met with he is pretty certain to have his back broken, and, later his head battered and mangled to an extent certain to preclude the possibility of his ever doing damage. The amount of fear likely to be inspired by a snake with a reputation for being ordinarily aggressive can readily be imagined, and perhaps there is nothing in this world so calculated to even make a lame man put his best leg forward as the knowledge that a Hamadryad is at his heels. For my own part I have no pretentions to being fleet of foot, but if ever I have been near breaking the record for 100 yards (I regret I cannot give the time), it was on an occasion when a Hamadryad turned his attentions to me. The snake was moving along rather fast through grass, and having caught a glimpse of his size, I concluded it was a python; so taking a stick from the hand of a friend, I ran after him, only to soon have the tables turned, for as I approached he suddenly stopped, turned, and raised his head and neck. I at once perceived my mistake, took advantage of the start, and what is more, to my surprise, intense relief and astonishment of my friend, maintained my distance throughout the race. My friend who had never before heard of a Hamadryad, and enjoyed what he described as the fun, stated with evident disappointment that the snake had only followed some twenty or thirty yards; as I never troubled to look behind till I came up to him, I accepted the statement.

I have endeavoured to obtain authentic information regarding instances of bites and results, but have only four worthy of mention, not a formidable number for a snake so greatly dreaded.

(1) Some few years ago at Yenangyat or Yenangyoung, I now forget which, a Shan snake-charmer was exhibiting four Hamadryads There is a custom among many Burmans, Shans, etc., to have themselves specially tatooed, and even to have charms inserted beneath the skin in order to render themselves invulnerable to certain things, *e.g.*, bullets, snakebite, &c. It happened that on this occasion among the spectators was a Burman who had recently undergone some such treatment as described against snake-bite, and, no doubt, thinking it an excellent opportunity for displaying his invulnerability before an admiring audience, he proceeded to boldly play with the snakes, one of which (a recent capture) soon became enraged, struck at and seized him by the hand, with the result that the unfortunate man soon died. Some few days after this occurrence I saw the snakes and took the opportunity of inspecting the mouth of the one which had bitten the man, and discovered that the fangs had been rudely broken and that the portions remaining were sufficiently long if the snake managed to get a grip to penetrate flesh. The snake was a very fine specimen.

(2) A Burman captured a Hamadryad, brought it home, and kept it in a covered basket. Some friends anxious to see the snake called at his house, when he at once offered to exhibit it; but apparently he was too careless in removing it from the basket or in handling it, for it seized him at the base of the index finger, and he shortly after died from the effects of the bite.

(3) One evening, just after dusk, a man was driving home along a jungle track, when his bullocks suddenly shied and dashed into the jungle. On pulling them up he got down from the cart and taking his *dah* went off to see if he could ascertain the cause of their alarm, and to his surprise found a Hamadryad lying disabled across the track, a wheel having passed over his body. The cartman cut a bamboo, killed the snake, and returned to his cart, when he soon observed one of the bullocks trembling, &c. He unyoked the animal, but it gradually became worse and died. On several occasions I have seen a cobra lying in the grass between the ruts on a cart-track, when disturbed, strike at the bullocks in a passing cart.

(4) A few men accompanied by a dog were walking along a jungle path, when suddenly the dog, which was following at a little distance behind, gave a sharp bark. On looking round he was seen

running towards them, and shortly after coming up with them, they noticed something wrong, so leaving the dog they went back a little way, when they saw a Hamadryad emerge from the hollow in the base of a large tree. The party forthwith dispersed, and in time returned to where they had left the dog and found him dying. I suppose the dog could not resist having a peep in at the hole as he passed, thus disturbing the snake which at once bit him. One frequently hears of dogs being pursued, which is undoubtedly due to their prying and inquisitive habits; but I have not heard of any being run down. Perhaps, as is the case with men, a Hamadryad in rear forces the pace.

It is probable that every year several oxen are bitten by these snakes, as in some districts immense herds are grazed in unreserved forest tracts. They, I think, show a decided preference for damp places, and are certainly fond of water; in fact, I cannot remember ever having met one very far from it. They swim gracefully, are given to lying in pools in the hot weather, and evince no hesitation in entering creeks, &c. Mr. Hauxwell told me that a Hamadryad that he afterwards killed, was always to be found lying in the same pool for several successive days, and a Burman, well known to me who spends his life in the jungles cutting canes, bamboos, &c., on my questioning him, said he rarely met one while going about his work, but that during the heat of the day in the hot season, in a certain stream he mentioned, he had frequently seen one, rarely two, lying in one or other of the pools. He had seen several Hamadryads, and had never been molested. On three separate occasions I have seen a Hamadryad swimming. The first was when I observed one crossing a creek some thirty yards wide, the second when one came swimming down a stream we were fording, and we left hurriedly; and the third was also while crossing a stream, when we saw a Hamadryad swimming in a pool below us. I have heard of several other instances where a Hamadryad has been met with crossing streams. Except when in a party, Burmans and Karens are generally speaking much afraid, as they say a snake will generally try and escape when they see a number of men, not so when there is only one or two. They also state that these snakes will invariably pursue (*a*) when suddenly disturbed, (*b*) when guarding their nests, (*c*) when provoked. No doubt as regards (*a*) the statement is correct; with regard to (*b*) I can only say that I have twice come on a kind of nest (a heap of dry leaves)

and I certainly did not approach nearer than twenty yards or so. In neither instance did the snake attempt to attack me, though from the fact of raising the body, &c., it was evident I had been observed. I killed both, near the nests, destroying 29 eggs in one, and 21 in the other nest. The eggs were lying under leaves, &c., at the bottom of the nests, one lot contained embryos, the other no trace. To the best of my recollection I found them towards the end of April or early in May. The Burmans with me on each occasion ran away in spite of my having a gun. The explanation afforded was quaint, *viz.*, that Hamadryads live in pairs, and as the male always lives near the nest to take turn to guard the eggs, the shot would be sure to alarm him, and on discovering his mate ruthlessly slaughtered, would chase us in the hopes of avenging her death. If what a Shan told me be true, Hamadryads either do not always attack an intruder, or do not always remain in the immediate vicinity of their nests to protect the eggs. Some two years ago in the month of July I came across a Shan at the foot of the hills east of Yamethin, he was carrying some snakes eggs, and the information he gave me was roughly as follows. He was returning from a village in the hills, and feeling thirsty left the track to obtain a drink, when he suddenly found himself alongside a Gnan's nest, he nipped up the nearest tree thinking the snake would be after him. After waiting some little time and not seeing the Gnan about he came down, collected the eggs and bolted back to the path; he was in a great fright till he got on to open ground. He assured me there were more than thirty eggs, he had broken some, and still had some two dozen, which he was taking as a present to a snake-charmer friend at Nyounglôn." (*c*) This is generally speaking, correct; but it often requires much irritation to provoke attack. Many harmless snakes, when cornered, will menace and often strike with great malice; and I well remember when driving to camp in a bullock cart rather late one evening we came on a cobra. I told the cartman to get out and kill it. He took his cane and went after the cobra, aimed a blow at it and missed. The snake was round instantly, and with hood extended came straight at him, when the man struck it a blow which killed it.

With regard to their food, snakes innocent and poisonous, apparently enter into the bill of fare; but I imagine their diet is not restricted to snakes. Other varieties of snakes often make a meal on another, the python, cobra, *Bungarus fasciatus*, *Simotes cyclurus*, &c. Twice I have

seen a Hamadryad with a snake. On the first occasion when out with Mr. G. who killed the snake in the act of swallowing a monocellate cobra (*Naia tripudians*); 18" had been swallowed. On the other occasion I was with Mr. Todd-Naylor, Commissioner of the Minbu Division. About 10-30 A.M. on the 28th August 1901, we were crossing the Sun Choung (stream), in the Magwe District and were half-way across, when a Burman with us called out "Sabagyi" (python), another "No-Gnan," on hearing which we promptly loaded our rifles, and then saw in the pool below us a very fine snake which I recognized to be a Hamadryad. The fore-part of the body was raised, and he was carrying something in his jaws in the manner a dog does a stick. One Burman said it was a "put" (*Varanus*), another a snake. The Burmans ran off and cut long bamboos from a clump hard by. We then proceeded towards the pool, where the snake was still swimming about; but on our approach he at once swam to a rock in the water, depositing on it what we then saw to be a large snake, and forthwith swam for, and took refuge under, an undermined portion of the opposite bank, where he promptly began to drag his body up through a hole in the bank, and was rapidly disappearing from our gaze, when he stupidly showed his head at another hole in the face of the bank. The Burmans taking advantage of his position stepped into the water and thrust bamboos at the hole, which manœuvre caused him to lower his body again into the water. He next made a bid for a landing on the opposite bank, but the splashing of the water with the bamboos used in vain efforts to kill him, evidently scared him, as he immediately retreated under cover of the bank. It was only after much provocation that he was again induced to leave cover, when he once more tried to effect a landing. The bamboos were plied with much vigour, and, I think he was probably touched. At any rate, he whipped round and with body raised quite 18", neck dilated, a most malicious look in his eyes which made us wish ourselves elsewhere, came straight at us. The Burmans waited till he came well within reach, and then aimed blows at him. Whether he was injured or not I cannot say, but he was knocked clean under water, only to re-appear with expanded hood quite close to us. We were about to fire, when a Burman fortunately struck him behind the head and killed him. We dragged him on to a sand bank, and ran the tape over him. Length—11'-4"—Girth—7¼". We next proceeded to fish out the snake which had slipped off the rock into the water, and to our astonishment

it proved to be a Hamadryad. We placed him alongside of the other. Length—8'-6"—Girth—5½". It really required a stretch of imagination to think that the larger snake meant to make a meal off the smaller one, as we assumed must have been his intention. For what other purpose could he have been carrying about a dead snake? By the appearance of the skin of the larger snake it was clear he had quite recently sloughed, so we determined to take it, and accordingly asked the Burmans to skin it. Their faces dropped, and it was clear no one was keen on doing it, so we enquired why, and were gravely told that the risks attending the operation were very serious. Should the operator by any chance get pricked by a bone, it meant certain death, the bones being extremely poisonous. We never heard this theory before, so Mr. Todd-Naylor announced his intention of skinning the snake. The thought of a Mingyi (Commissioner), exhibiting such reckless behaviour proved too much for them, as two Burmans stepped forward prepared to accept the risk. We observed that the care exercised by the operators was such as to render a prick from a bone highly improbable. Another Burman, judging by the manner in which he handled the skin, must have thought it poisonous. As we were leaving the stream I observed the carcase of the snake on the bank, which surprised me; so I asked if they were not going to bring it to camp for dinner, which question appeared to somewhat astonish them. On my remarking that Karens ate the flesh and pronounced it good, one man ventured to say that "some people will eat anything." This was really funny coming from a Burman, many of whom do not hesitate to eat adjutants, snakes, hawks, &c. Up to date I have not been fortunate enough to kill a Hamadryad after a meal.

Burmans and Karens recognize two varieties of this snake, *viz.*, the dusky without markings Gnan-bôk; and the belted-Gnan. The former are reputed to be infinitely more fierce and aggressive than the latter. I have only met with two specimens, and both of these, when carefully inspected showed faint markings. The young are dark olive-brown in colour, with well marked and rather bright yellow rings or chevron-shaped marks. With regard to the size of these snakes, the longest I have measured was in the hands of a snake-charmer. We straightened him out as well as we could, and he taped 13'-4". Had the snake been dead, he would probably have measured another 4". I have records of two others 13'. I think, as a general rule, adults run anything between

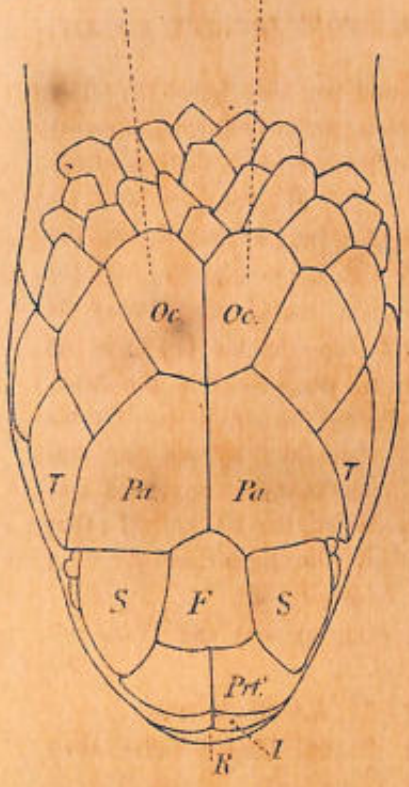
10′ and 12′. I believe a friend measured one that taped 15′. The circumstances connected with the specimen, coupled with the unusual size, tended to impress the fact on my memory. To the best of my recollection the facts are as follows:—Mr. H., shortly after his arrival in Burma, was riding through some jungle near K., in the Toungoo District. Suddenly he observed a large snake coming straight at him or his pony. As he approached it reared up dilating its hood. Mr. H. fortunately had a longish cane in his hand, so he leaned sideways, struck at and luckily hit the snake on the head. He at once dismounted, and administered some further blows. On his return to camp during breakfast he mentioned the episode, and was promptly chaffed. He, however, stated that the snake was dead and could be produced. It occurred to my friend, the late Mr. T., that the snake was possibly a Hamadryad, so after breakfast the party went off, found and measured this enormous specimen.

Differences between *Naia bungarus* (Hamadryad) and *Naia tripudians* (Cobra).

Naia bungarus.	*Naia tripudians.*
(*a*) Rostral much broader than deep.	(*a*) Rostral little broader than deep.
(*b*) Internasal separated from præocular.	(*b*) Internasal in contact with præocular.
(*c*) A pair of large shields behind parietals.	(*c*) *Absent.*

I am indebted to Mr. T. H. Hauxwell, I.F.S., for the drawings illustrating the above mentioned points.

1. PAIR LARGE SHIELDS BEHIND PARIETALS OCCIPITAL



2. POST PARIETALS WANTING



R. Rostral
I. Internasal
Prf. Præfrontal
F. Frontal
S. Supraocular
Pa. Parietal
T. Temporal

Oc. Occipital
Pr. Præocular
Po. Postocular
1, 2, 3, etc., Upper labials

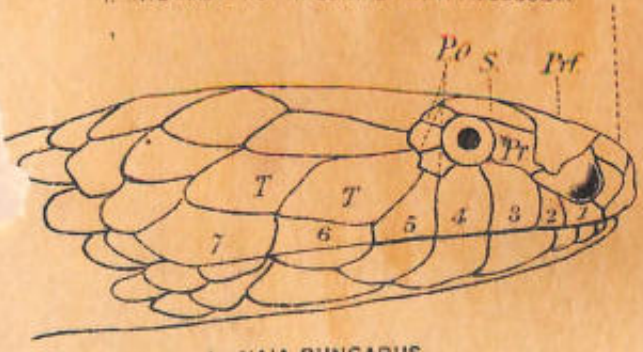


1. ROSTRAL MUCH BROADER THAN DEEP.



2. ROSTRAL LITTLE BROADER THAN DEEP

1. INTERNASAL NOT IN CONTACT WITH PRÆOCULAR



1. NAIA BUNGARUS.

2. INTERNASAL IN CONTACT



2. NAIA TRIPUDIANS

DESCRIPTIONS OF NEW GENERA AND SPECIES OF *HYMENOPTERA* COLLECTED BY MAJOR C. G. NURSE AT DEESA, SIMLA AND FEROZEPORE.

By P. Cameron.

Part II.

(*Continued from page* 293 *of this Volume.*)

ANTHOPHILA.*

Lamproapis, *gen. nov.*

Wings with two cubital cellules in the forewings; the second cellule receives both the recurrent nervures; the first at a slightly greater distance than the second from the transverse cubital nervure. Radial cellule long, narrow, lanceolate, extending to the apex of the wing; the transverse median nervure is received on the outer side of the externo-median, not behind it. Antennæ stout, bare, the second joint is two-thirds of the length of the third; the last joint is about one-third longer than the preceding. Ocelli not quite forming a triangle (.·.). Clypeus transverse, the labrum large, gradually narrowed towards the apex. Mandibles long, rather narrow, hollowed on the outer side. Legs thickly covered with short pubescence; the claws are bifid; the anterior calcaria are cleft at the apex and have, on the upperside, a broad, diaphanous, rounded dilatation; the middle tibiæ have only one spur; the hinder two; they are sharp and bare; the basal joint of the hinder tarsi is stout and is longer than the following three joints united. Scutellum large, convex, depressed in the middle above. The base of the median segment forms a large triangular area. Abdomen smooth and shining, sparsely haired towards the apex; the basal segment is largely depressed at the base; the pygidium depressed; the sides raised, keeled; the apex incised in the middle. The abdomen is longer than the head and thorax united; it is narrowed at the base and apex and is distinctly curved above; there are seven dorsal segments.

This genus has no near relationship with any of the known Indian genera with two cubital cells. It comes nearest to the European genus *Dufourea* with which it agrees in having the body bare and shining; it differs from it in the transverse median nervure, being received in

* To the list of Indian Bees should be added *Epeolus fervidus*, Smith, Description of New Sp. of Hym., p. 102, from the Bombay District. Col. Bingham has overlooked the description of this species. The genus is not included in his work. The species are parasitic and are found in most parts of the world.

front of, not behind, the externo-median; the head is much more distinctly narrowed behind the eyes and the occiput is not transverse, but incised; the scutellum is convex, distinctly raised, and rugose and depressed in the middle; the radial cellule is more elongated, it reaching nearer to the apex of the wing; and there is a marked difference in the relative lengths of the discoidal cellules; in *Dufourea* the first and second are of about equal lengths; in the present genus the first is much longer and narrower compared to the second; the third also is longer and narrower, being longer than broad, not broader than long. It cannot readily be confounded with *Panurgus*. It has more the appearance of *Halictus*. I unfortunately can say nothing about the form of the trophi, not having a spare specimen to risk dissecting.

LAMPROAPIS MACULIPENNIS, *sp. nov.* (Pl. fig. 2.)

Nigra, nitida; capite thoraceque albo pilosis; alis hyalinis, apice fusco-violacis, nervis stigmateque nigris. ♀.

Long: 8 m.m.

HABITAT: Simla.

Scape of antennæ closely punctured, and thickly covered with black pubescence; the flagellum with a pale pile. Head closely and distinctly punctured and sparsely covered with long fuscous hair; the orbits margined. Face and clypeus thickly covered with depressed silvery pubescence and strongly and closely punctured; the depressed labrum is thickly and similarly covered. The collar is smooth and depressed behind. Mesonotum closely, uniformly and rather strongly punctured; in the centre is a narrow, deep furrow; scutellum roundly convex, rugosely punctured, widely depressed in the middle and thickly covered with long black hair. The triangular area on the median segment is large, strongly aciculated, more strongly at the base than at the apex; the base is irregularly striated. Pleuræ closely punctured, the lower part and the sternum thickly covered with white pubescence. Legs black; the apex of the fore femora and the fore tibiæ in front are rufo-testaceous; the tarsi and apex of the tibiæ are thickly covered with fulvous pubescence; the rest of the legs have a sparse white pile. Abdomen smooth and shining, bare, the apex sparsely pilose.

MELANAPIS, *gen. nov.*

Last abdominal segment with a longitudinal bare rima, bordered by distinct keels; its sides thickly covered with long stiff hairs. Trophi

short; the labial 4-, the maxillary palpi 6- jointed; the basal joint of the labial is not quite twice the length of the second—about the length of the second and third united; the apical two joints are sub-equal. Ocelli in a curve (.·.). Face and clypeus not elongated; the apex of the clypeus with a distinct border triangularly projecting at the apex and slightly, but distinctly, curved. Head and thorax thickly covered with longish hair; the median segment with an area on the base. Scutellum flat. Legs thickly haired; the hair on the hinder tibiæ and tarsi long and thick; their claws have a sub-apical tooth; the front calcaria have a membraneous dilatation at the base; there is only one on the middle tibiæ; the hinder are long, thin, curved and bare. Wings with three cubital cellules; the second and third are equal in length on the top; but below the third is about one-half longer, being nearly as long as the lower side of the first; both the recurrent nervures are received shortly beyond the middle of the cellules; stigma distinct, the radial cellule is narrow, longish, but not reaching to the apex of the wing. Abdomen, except on the apical segments, bare and shining; the apical segments thickly covered with long black hair; the ventral surface is almost bare.

The antennæ are bare and shining, short, about the length of the thorax; the third joint twice the length of the fourth; the mandibles are longish, stout, and end at the apex in a broad, bluntly rounded tooth which is clearly separated; the labrum is not produced, the tarsi are short and the apical joints are narrow, compared to the basal one, which is as long as the others united and enlarged; the middle joints are fringed with stiff hairs at the apex; the last joint is as long as the preceding two united. The anterior ocellus is not in a pit. The front is keeled in the middle. Eyes parallel, reaching close to the base of the mandibles.

The deep black body, large size and violaceous wings give this genus the appearance of a small Xylocopa, but it has no near relationship to that genus. In Bingham's table on p. 414 this genus comes into, "*A*. Forewings with three cubital cells, *a* Maxillary palpi 6-jointed, a^1 Posterior tibiæ densely pubescent, a^2 Ocelli in a curve on the vertex"; but it cannot be confounded with *Halictus*, *Nomia* or *Tetralonia*, the three genera included in the section. It has the anal rima of *Halictus*, but otherwise has no near relationship to that genus.

MELANAPIS VIOLACEIPENNIS, *sp. nov.* (Pl. fig. 1.)

Nigra, nitida, capite thoraceque nigra pilosis; alis fusco-violaceis, nervis stigmateque nigris. ♂ et ♀.

Long: 13-14 m.m.

HABITAT: Ferozepore.

Antennæ almost bare; from the third joint rufous beneath. Head covered with long black hair; thickest on the occiput and beneath. Clypeus closely and distinctly punctured and sparsely haired; the face is less distinctly punctured and more thickly haired; the apex of the clypeus is roundly, but not deeply, incised and has a distinct margin. Mandibles smooth and covered with long black hair on the underside. Thorax thickly covered with long black hair. Mesonotum strongly and closely punctured; the centre less closely than the sides and apex. Scutellum similarly punctured, most closely towards the apex. Median segment rugosely punctured; in the centre, at the base, is a large, somewhat triangular area, formed of irregular longitudinal keels, intersected with short, irregular transverse ones. Mesopleuræ closely rugosely punctured. Wings uniformly fuscous-violaceous; the stigma and nervures black. Legs black; the four hinder thickly covered with long black hair; which is very long and thick on the hinder tibiæ and to a less extent on the metatarsus. Abdomen smooth and shining, bare except on the fifth segment, which is thickly covered with long black hair; the sixth segment is bare in the middle; the bare part being distinctly bordered or keeled; outside the border it is fringed densely with stiff black pubescence. The apical two ventral segments are fringed thickly with long black, stiff pubescence; the others are almost bare.

The ♂ is similar to the ♀ and is, if anything, more thickly haired; the legs and abdomen offer no noteworthy peculiarity.

ANDRENA SIMLÆNSIS, *sp. nov.*

Nigra, nitida, sparse albo pilosa; clypeo albo; basi metanoti punctata; alis hyalinis, stigmate fusco. ♂.

Long: 9 m.m.

HABITAT: Simla.

Scape of antennæ shining, sparsely covered with long white hair; the flagellum with a pale pile. Clypeus smooth and shining, yellowish-white; there is an oblique white mark on either side of its lower edge between it and the eyes; the vertex behind the ocelli is bare, smooth nd shining; the rest of the vertex and the front covered, but not

thickly, with long blackish hair. Mandibles long, curved; when closed their apices reach near to the inner side of the eyes; they are black; their apex bright red; at the base of the red part, and distinct from the apex, is a rounded, clearly separated tooth. Thorax smooth and shining, sparsely covered with longish white hair; the mesonotum is minutely and closely punctured; on it are two longitudinal furrows; the punctuation is closer and stronger at the apex. Median segment opaque, closely granular, the area clearly separated and not differing in sculpture from the rest of the segment. Legs black; the hair on the femora is white, sparse and long; it is thicker on the tibiæ; on the metatarsus it is still denser, long and of a fulvous tinge; the spurs are pale. Abdomen smooth and shining; the apices of the segments are brownish; the basal four dorsal segments are almost bare; the apical segments are fringed with long brownish hair, the ventral segments are sparsely covered with long pale hair. The second cubital cellule at the top is as long as the third; the first and second transverse cubital nervures are distinctly bullated at the top and bottom.

This species comes into Bingham's section "*A*. Enclosed space at base of median segment punctured" and "*B*. Median segment without a medial vertical furrow"; but is not related to either of the species included in it.

CHRYSIDIDÆ.

EUCHROEUS CUPREIVENTRIS, *sp. nov.*

Viridis, coeruleo maculato; geniculis, tibiis tarsique testaceis; alis fusco-violaceis. ♀

Long : 10 m.m.

HABITAT : Deesa.

Scape of antennæ green, closely punctured and covered with white pubescence; the flagellum black, covered with a white down. Vertex bright-green, with golden and blue tinges; strongly and deeply punctured and sparsely covered with short white pubescence; the depressed front is sparsely and shallowly punctured; above thickly covered, on either side of the middle projection, with depressed white pubescence; the sides are also covered with depressed pubescence, as well as the sides of the clypeus. The apex of the clypeus has a row of large, deep, irregular foveæ. Mandibles rufo-testaceous, darker towards apex; the base has a green patch. The front ocellus is surrounded at the back and sides by a smooth furrow, which is prolonged below them at the apex.

Pronotum closely and rather strongly punctured; at the sides in front it projects into sharp, short teeth; the apex laterally, broadly triangularly projects; the base in the middle is slightly and broadly incised. The base of the mesonotum is depressed broadly on the sides; the depression is widest on the innerside and is finely and closely punctured; the rest of the mesonotum bears scattered, moderately large and deep punctures which are largest in the middle, close to the scutellum, it being there blue coloured. Scutellum deeply punctured; the punctures are large and deep; their boundary walls are mostly blue. The post-scutellum projects over the median segment; it is large, broad at the base, becoming gradually narrowed towards the apex which is rounded; it is coarsely and deeply punctured like the scutellum and is, for the greater part, blue. The median segment, immediately beneath it, is stoutly punctured; the sides with three stout oblique keels. In the centre of the segment is a large area divided down the centre by a stout keel; the top is broadly rounded on either side; inside, above the middle on either side, are two stout, slightly oblique keels; below is a short, irregular, stout curved keel. The sides of the segment triangularly project and are closely, rugosely punctured. Propleuræ irregularly striated and with some deep punctures; below the middle is a curved projection; the part below this is closely and minutely punctured. The tegulæ large and rather strongly punctured. Wings uniformly fuscous-violaceous; the nervures black; the radius is thick. Abdomen: the apex of the first, the base and apex of the second and the base of the third segments closely and minutely punctured; the rest of them bear larger, more widely separated punctures; the apical depressions are thickly and broadly covered on the basal region with depressed white pubescence; the apex beyond the depressions is closely and strongly punctured; the extreme edge is beset all over with stout, mostly bluntly pointed, short spines intermixed with smaller, sharper ones. The ventral surface is entirely coppery-brown in colour and is smooth and shining. The apex of the first segment in the centre and the base and apex of the second and third more broadly blue; the green has slight golden tints; the sides of the first and second segments at the apex are covered with white pubescence. The coxæ, trochanters and femora are bluish-green; the fore femora at the apex, the four front tibiæ anteriorly and the hinder knees, tibiæ and tarsi are rufo-testaceous.

The apical teeth appear to be more numerous than usual; the large apical foveæ are few in number and are mixed up with the numerous smaller punctures which beset the whole of the broad apical margin; the mesopleuræ are clearly separated from the pro- and metapleuræ; on the apex is a wide furrow, which ends below in a rounded projection.

The genus *Euchrœus* is of small extent and has not hitherto been recorded from India. It is easily known by the apex of the abdomen being beset all over with numerous large and small teeth and not with a few large ones as in *Chrysis*. This form of the apex is shown by *Du Buysson* in Journ. Bomb., Nat. Hist. Soc., X., Pl. I., f. 13. The apex of the present species differs from that of the European species there figured in having a gradually rounded slope, the centre not being so much raised and separated from the base and apex.

ICHNEUMONIDÆ.

Pimplides.

GLYPTA NURSEI, *sp. nov.*

Nigra, pedibus anterioribus flavis, posticis fuscis, coxis rufis; alis hyalinis, nervis stigmateque nigris. ♂.

Long: 8-9 m.m.

HABITAT: Simla.

Antennæ entirely black, thickly covered with a black microscopic pile. Face closely and strongly punctured and covered with silvery pubescence; the clypeus and mandibles yellow and smooth; the mandibular teeth blackish; the palpi rufo-testaceous; the front and vertex, if anything, more strongly, but not quite so closely, punctured as the face. Thorax shining; above covered with silvery pubescence; the mesonotum is closely and uniformly punctured; the scutellum is closely punctured; its lateral slope is irregularly striated; the lateral depression is closely, obliquely, irregularly striated. Postscutellum closely punctured. Median segment areolated all over; in the centre is an elongated area reaching to the apical slope, which is narrowed on the basal and longer part—the part behind the transverse keel;—the apical slope is bounded above by a stout keel; there is a longitudinal keel on the outer side, so that there is thus a larger central and two smaller lateral areæ; there are two large lateral areæ on the basal slope; the basal one being somewhat the larger and there is a large spiracular area. The four front legs are

lemon-yellow; the hinder pair fuscous, with the coxæ and trochanters rufous. Wings clear hyaline, nervures and stigma black. Abdomen black; the ventral surface pale; the dorsal segments are closely punctured and covered with a white pubescence; the oblique depressions are deep; there are two longitudinal keels on the base of the petiole and one short central one on the apex. The tegulæ and the part of the pronotum next to them are yellow.

LISSONOTA APICIPENNIS, *sp. nov.*

Nigra, capite thoraceque flavo maculatis; abdomine rufo, nigro-lineato; pedibus rufis, nigro lineato; coxis flavis; alis hyalinis, apice fusco-maculato. ♀.

Long: 10 m.m., terebra 9-10 m.m.

HABITAT: Simla.

Antennæ black; the scape yellow, the flagellum brownish beneath. Head black; the face, clypeus, the orbits all round, mandibles and palpi, lemon-yellow; the face is closely punctured and covered with a stout, white pubescence; the clypeus smooth; the front and vertex closely and distinctly punctured. Mandibular teeth black. Thorax black; a large triangular mark on the side of the prothorax—the narrow end on the base,—the base of the propleuræ, the tegulæ, the scutellum, except a triangular black mark on the base, the post-scutellum and the tubercles, lemon-yellow. The thorax is closely and uniformly punctured all over; there are no keels on the median segment. Legs testaceous; the coxæ and trochanters lemon-yellow, the middle coxæ behind, the posterior before and behind, the basal joint of the fore trochanters above, the base of the four anterior entirely and a line on the upper side of the four front femora, black. Wings hyaline; the apex between the radial and cubital nervures smoky; the stigma fuscous, the nervures darker in tint; the areolet has a long pedicle, it being not much shorter than the lower divisions; the outer branch is largely bullated; the recurrent nervure is received shortly behind it. Abdomen rufous, the base and apex of the petiole and the apex of the second and third segments lemon-yellow.

LISSONOTA ZANTHORIA, *sp. nov.*

Flava, supra nigro-maculata; pedibus pallide fulvis, coxis trochanteribusque flavis; alis hyalinis, nervis stigmateque nigris. ♂.

Long: 10 m.m.

HABITAT: Deesa.

Scape of antennæ black, yellowish below; the flagellum brownish, black above. Head lemon-yellow; the ocellar region and the central part of the occiput, black. Face closely punctured and covered with white hair; the clypeus smooth, except for a few punctures on the top. Mandibular teeth black. There is an irregular mark on the base of the mesonotum, an elongated mark—roundly narrowed towards the base, the apex roundly incised—the sides and apex and two curved marks, on the base of the median segment, extending from the middle of the base to the spiracles, black. The mesonotum and the scutellum are uniformly punctured allover; the median segment is more closely and strongly punctured; there is a transverse keel above the apical slope. The pleuræ are punctured like the upper surface. Legs obscure fulvous, the posterior darker in tint; the basal joint of the hinder trochanters black; the hinder tarsi are infuscated. On the abdomen the middle of the petiole is broadly,—the band incised in the middle behind—the middle of the second, third and fourth segments broadly and the base of the others broadly, black.

The size and shapes of the black marks on the thorax vary.

LISSONOTA CLARIPENNIS, *sp. nov.*

Flava, capite thoraceque nigro maculatis; abdomine flavo lineato, apice rufo; pedibus flavis, femoribus posticis fulvis; alis hyalinis, stigmate fusco. ♂.

Long: 9 m.m.

HABITAT: Simla.

Scape of antennæ black, yellow below; the flagellum brownish, darker above. Head black; the face, oral region, the inner orbits—broadly below—and the outer still more broadly, lemon-yellow. The face is closely, but not strongly, punctured. Mesonotum black, except for a yellow line bordering the central region; the line is triangularly dilated at the base.

Scutellum yellow, the sides and base irregularly bordered with black. The median segment has two large marks, extending from the base to shortly beyond the middle, and irregularly narrowed at the apex and with an irregular yellow mark in the centre near the base; the apex is narrowly black. The whole thorax is closely and distinctly punctured. Legs yellow; the four anterior trochanters and femora

lined with black above; the hinder legs obscure fulvous; the innerside of the coxæ and the basal joint of the trochanters black; the apex of the tarsi infuscated. Wings clear hyaline, the areolet appendiculated; the pedicle longer than the lower branches. Abdomen black above, the base of the petiole, its apex more narrowly, and the apices of the second, third and fourth segments, yellow; the apex of the fourth and the following segments entirely rufous, with their apices narrowly lined with yellow.

Tryphonides.

LAPAPHRAS, *gen. nov.*

Areolet 4-angled, longish, oblique, narrow; the first transverse cubital nervure is short, straight and oblique; the second is more than twice the length of the first and is roundly curved; the two are united at the base and at the apex; the second forms a rounded curve with the cubitus; the recurrent nervure is at the apex of the areolet almost touching the apical abscissa of the cubitus; the areolet is nearly three times longer than broad. Radial cellule wide; the basal abscissa of the radius is straight and oblique; the apical is longer and roundly curved. Antennæ stout, not tapering towards the apex; the third and fourth joints are equal in length; the scape is short, scarcely twice the length of the second. Head not quite so wide as the thorax; the face projects in the centre, the sides being oblique; the clypeus is roundly convex, separated from the face, but not by a distinct furrow; its apex is rounded. Mandibles brought gradually to a point to the apex, which is rounded and without a subapical tooth. Eyes large, parallel, separated by a short space from the base of the mandibles. Occiput roundly, but not deeply, incised. Scutellum convex, but not raised above the mesonotum. Median segment with a gradually rounded slope to the apex; the middle with a longitudinal keel which bifurcates at the apex; the spiracles are small, circular. Legs of normal size; the four hinder tibiæ armed with two spurs; the claws are simple. Abdomen roundly convex above, not compressed laterally; the petiole becomes gradually wider towards the apex; the spiracles are placed shortly behind the middle; the apical segment is bluntly rounded.

Belongs to the *Tryphonides*. The distinctive characters are the unidentate mandibles; the oblique narrow longish areolet, the longitudinal keel on the median segment, bifurcating at the apex, and the rather short, wide, radial cellule with its straight, oblique abscissa of the

radius. The transverse basal nervure is interstitial, above it is not united to the stigma; the cubitus has a broad, rounded curve; the ocelli are large; the head is well developed behind the eyes, but does not project there; the tarsi are spinose.

LAPAPHRAS NIGRICEPS, *sp. nov.*

Lutea, capite, antennis palpisque nigris; tarsis nigro maculatis; alis fuscis, nervis stigmateque nigris. ♀ et ♂.

Long : 6-7 m.m.

HABITAT : Simla.

Antennæ black, thickly covered with a microscopic pile; the scape smooth and shining. Head shining, the face aciculated; the clypeus is more shining than the face; its apex bears a row of distinct punctures; the palpi dark-fuscous. Thorax smooth and shining; the pleuræ lighter in tint than the mesonotum which, as is also the metanotum, is thickly covered with fulvous pubescence. Legs coloured like the thorax; the apex of the four hinder tibiæ and of the joints of the four hinder tarsi, black. Abdomen smooth and shining, thickly covered with fulvous pubescence; the extreme base of the petiole is triangularly depressed at the base.

NOTHAIMA, *gen. nov.*

Areolet open. Face swollen as in *Exochus*. Clypeus obliquely depressed, rounded above, clearly separated from the face and forming an angle with the mandibles. Apex of the mandibles curved inwardly and having two unequal teeth, the upper being the larger. Parapsidal furrows distinct. Scutellum roundly convex, not much raised above the level of the mesonotum. Median segment with two stout keels down the centre, and a more slender one on either side of the spiracles; there are no transverse keels; the spiracles oval. Legs stout, the femora thickened; there are two spurs on all the legs; the claws are long, curved and simple. Petiole flat, becoming gradually wider to the apex, which is about four times wider than the base; the spiracles are placed near the apex of the basal third; there are no longitudinal keels on it, or on the second segment.

The basal joints of the flagellum are equal in length; the antennæ are stout and are placed well up on the head; the occiput is roundly incised, in the middle it is excavated above; the ocelli are placed near the edge and are large.

Allied, by the form of the head, to *Exochus* ; is easily known from it by the depressed clypeus, by the curved apex of the mandibles and by the two longitudinal keels on the median segment.

NOTHAIMA BICARINATA, *sp. nov.* (Pl. fig. 10.)

Nigra, pedibus anterioribus rufo-testaceis, coxis nigris ; alis hyalinis, nervis stigmateque nigris. ♂.

Long : 10 m.m.

HABITAT : Simla.

Antennæ black, stout, the flagellum dark-brownish beneath. The face is closely and strongly punctured ; the obliquely depressed clypeus is smooth and shining. Mandibles black ; the middle with an oblique testaceous mark ; the palpi yellowish-testaceous. Thorax entirely black ; the mesonotum is thickly covered with short fuscous pubescence ; the parapsidal furrows are deep, the middle lobe being thus clearly separated. The basal half of the scutellum bears scattered punctures. Median segment irregularly rugosely punctured ; there is one central area which reaches to the apex of the segment, and is bounded by two straight keels ; its basal half is smooth ; the apical bears some stout, irregular transverse keels ; there is a narrow keel on either side of the spiracles. Mesopleuræ punctured, but not very closely or strongly ; the apex of the meta- closely, finely, obliquely striated. The four hinder legs are dark, rufo-testaceous, the coxæ black ; the hinder legs are black, the femora and tibiæ with a slight fuscous or brownish tinge ; the femora are slightly, broadly hollowed on the inner side. Wings clear hyaline ; the nervures and stigma black ; the areolet is completely open. Abdomen black ; the basal three ventral segments obscure testaceous ; the petiole is irregularly, coarsely, closely shagreened and striated, except at the apex, where it is smooth and shining ; the base in the middle is smooth, depressed and furrowed in the centre from near the base.

EXOCHUS APPENDICULATUS, *sp. nov.*

Niger, pedibus flavis, femoribus late fulvis, coxis posticis late nigris ; alis hyalinis, nervis stigmateque nigris. ♀.

Long : fere 7 m.m.

HABITAT : Deesa.

The flagellum is brownish, the scape yellowish beneath. Face regularly and closely punctured and thickly covered with longish white hair ; the front is smooth, the vertex is sparsely punctured. Mandibles

sparsely punctured; the apex brownish. Thorax smooth and shining; the mesonotum thickly covered with fuscous pubescence; the scutellum is sparsely punctured; the post-scutellum has a round fovea on either side at the base. Median segment regularly areolated; the central area is large and extends to the base; the basal half of the keels roundly curved; the narrowed basal part is as long as the apical. Legs yellow, the femora and coxæ are fulvous for the greater part; the basal half of the hinder coxæ is black; the hinder tarsi fuscous. Wings clear hyaline; the costa and stigma are darker fuscous; the areolet is appendiculated, the cellule is small, oblique; the outer nervure is faint. Abdomen smooth and shining; the petiole is closely punctured to near the apex; the keels reach to near the middle.

EXOCHUS XANTHOPUS, *sp. nov.*

Niger, facie, linea pronoti late, tegulis, scutello, post-scutello maculaque. ♀.

Long : 5 m.m.

HABITAT : Simla.

Antennæ black; the scape yellowish beneath. Head black; the face, oral region, the inner orbits to near the top and a somewhat triangular mark on the hinder, inner edge of the eyes, lemon-yellow. Face strongly and distinctly punctured and covered with white pubescence; the front and vertex smooth and shining. Mandibles and palpi yellow; mandibular teeth black. Thorax black, smooth and shining; the edge of the pronotum broadly—more broadly at the apex than at the base,—the tegulæ, scutellum, the apical half of the post-scutellum, and a large mark on the mesopleuræ in the middle at the base, lemon-yellow. The supramedian area is continued to the base of the segment; its basal part is obliquely narrowed; the other areæ are clearly defined. Legs clear lemon-yellow, the hinder coxæ black. Abdomen smooth and shining; the basal part of the petiole bears two stout keels.

EXOCHUS CURVICARINATUS, *sp. nov.*

Niger, scutello flavo-lineato; pedibus flavis, coxis trochanteribusque nigris; alis hyalinis, nervis stigmateque nigris. ♀.

Long : 6 m.m.

HABITAT : Simla.

Antennæ black; the scape yellow beneath. Head black; the face and oral region, the inner orbits to near the lower ocelli and a small oblique conical mark near the top of the eyes on the innerside, lemon-yellow.

Face closely and distinctly punctured and thickly covered with short white pubescence. Front and vertex smooth and shining. Mandibles and palpi lemon-yellow; the mandibular teeth black. On the thorax the edge of the pronotum, the tegulæ, a line round the sides and apex of the scutellum and the apex of the post-scutellum are lemon-yellow. Thorax smooth and shining; the keels on the median segment are not very stout; the central area is large, wide; the basal keels are roundly curved. Legs lemon-yellow; the hinder coxæ and trochanters black. Wings clear hyaline; the stigma and nervures black; the transverse cubital nervure is short; the part of the cubitus between it and the recurrent nervure is double its own length. Abdomen smooth and shining; the keels on the base of the petiole are short.

This is a smaller species than *E. zanthopus*, and may be known from it by the scutellum being only lined along the edges with yellow, and by the keels bounding the central area of the median segment being roundly curved at the base, not straight and oblique.

EXOCHUS ERYTHROPUS, *sp. nov.*

Niger, pedibus rufis; alis hyalinis, nervis stigmateque nigris.

Long : 7 m.m. ♀.

HABITAT : Simla.

Antennæ black; the scape rufous beneath. Face closely and distinctly punctured, covered with a depressed pale pile; the clypeus smooth, sparsely punctured above; the front and vertex are more sparsely punctured than the face; the front bears a narrow longitudinal furrow. Immediately below the antennæ is a transverse rufous band; the mandibles are rufous, except at the apex; the palpi testaceous. Thorax smooth and shining; the mesonotum is thickly covered with pale-fuscous pubescence. The areæ on the median segment are clearly defined by stout keels; the supramedian is three times as long as broad; it is narrowed and rounded at the base, transverse at the apex. Legs entirely rufous; the anterior of a slightly paler, more yellowish tinge. Wings clear hyaline; the stigma and nervures black; the areolet obsolete; the apical nervures in the hind wings are faint, almost obsolete.

BRACONIDÆ.

BRACON PUNJABENSIS, *sp. nov.*

Ferrugineo; antennis tibiis tarsisque posterioribus nigris; alis fumatis, stigmate nigro, basi rufo. ♀.

Long : 9-10, terebra 7 m.m.

HABITAT : Ferozepore.

Antennæ black ; the scape covered with black hairs ; the flagellum with a pale down. Head smooth and shining ; the face and oral region closely and distinctly, but not strongly, punctured, and sparsely covered with pale, longish hairs ; there is a narrow longitudinal furrow in the front. Thorax smooth and shining, above sparsely covered with short pale hairs ; the oblique furrow on the base of the mesopleuræ is smooth and extends near to the middle ; the furrow on the meta-pleura is wide and deep at the base and becomes gradually narrowed. Wings uniformly dark-fuscous, except for a large oblique cloud in the first cubital cellule, this cloud being prolonged obliquely into the discoidal cellule where it extends into the middle, the basal half being much wider ; the second transverse cubital nervure is surrounded by hyaline bands ; the stigma is rufous to slightly beyond the middle. The apical central lobe of the petiole is stoutly, irregularly, longitudinally striolated ; the outer furrow bifurcates at the apex, the outer fork being wider and deeper. The second segment is coarsely, irregularly, rugosely punctured ; the basal part in the middle is irregularly, longitudinally striolated ; the lateral depressions on it are striated at the bottom ; the secucuriform articulation is deep, wide, is widened at the sides and is stoutly, longitudinally striated ; the apex of the segment is irregularly striated in the middle ; the other segments are closely punctured ; the fourth and fifth have oblique depressions on the sides and striated transverse furrows at the apices. Legs coloured like the body ; the front tibiæ behind and the four hinder tibiæ and tarsi fuscous-black.

BRACON DEESÆ, *sp. nov.* (Pl. fig. 11. wing.)

Luteus, antennis nigris, abdomine nigromaculato ; alis flavis, apice maculisque duobus fuscis. ♂ et ♀.

Long : 12, terebra 15 m.m.

HABITAT : Deesa.

Antennæ black, narrowed towards the apex ; the scape covered with blackish hair. Head smooth and shining ; the face covered with long fuscous hair ; the clypeal depression deep, smooth and shining. Mandibles with the apical half deep-black. The ocelli are bounded behind by two deep, curved furrows ; in front of them is a triangular depression. Thorax smooth and shining ; there is an oblique furrow on the base of the mesopleuræ at the base above. Wings yellowish-hyaline ;

there is a fuscous cloud between the base of the stigma and the transverse basal nervure and extending to the opposite side of the wing; a cloud at the apex of the stigma extending to shortly beyond the middle of the cubital cellule; the apex of the wing to near the second transverse cubital nervure and on the lower side extended backwards to beyond the middle of the second cubital cellule. The apex of the hinder wing and its lower side to the middle where it projects obliquely upwards along the cubital nervure, smoky. Legs luteous; the apices of the tarsi blackish. Abdomen luteous, more or less suffused with black; the basal three segments irregularly longitudinally striated, the striæ in places forming reticulations; the three transverse furrows are deep and closely, stoutly, longitudinally striated; there is no keel on the second segment; the smooth basal plate is small, indistinct and triangular.

The ♂ is similar; the clouds in the wings are more suffused; the apex of the abdomen is black; the antennæ are longer than the body.

DITHERUS, *gen. nov.*

Eyes hairy. Wings with three cubital cellules; the apical abscissa of the radius faint and curved upwards at the base; the base of the cubitus and the upper part of the recurrent nervure are interrupted, so that the first cubital, the first discoidal and first posterior cellules are not separated completely; the recurrent nervure is received in the first cubital cellule and at a distance from the first transverse cubital nervure; the transverse median discoidal is received shortly behind the middle of the first discoidal cellule; the second discoidal cellule is open at the apex. Face with a sharp keel down the middle, the clypeus is separated from the face, its apex rounded. The mandibles end in a long sharp tooth. Occiput not distinctly margined; broadly, roundly incised. Parapsidal furrows distinct, deep. Scutellum rounded, not raised above the mesonotum. Median segment areolated. Legs stout, the hinder coxæ large; the metatarsus large; thickened.

The head is well-developed behind the eyes, the part between them and the ocelli is depressed; the parapsidal furrows are deep; the petiole is broad at the base, becoming gradually wider towards the apex; there is a distinct suturiform articulation; the cubitus originates from shortly above the middle of the transverse basal nervure, the first discoidal cellule being thus smaller than usual and not so much

narrowed at the apex compared to the base ; the transverse median nervure is received near the apex of the basal third of the cellule ; the anal cellule is open. In the hind wings only the subcostal, the præbrachial and the transverse præbrachial nervures are thick, black and distinct, the others being very faint or obsolete. In the fore-wings the axillary cellule is not divided. The metacarpus is thickened beyond the stigma ; the radial cellule is long and narrow, extending to the apex of the wing ; the middle ocellus is bordered by furrows.

Belongs to Wesmail's division, *Polymorphi*, but does not fit very well into any of the tribes into which that group is divided. Characteristic are the hairy eyes, the long, narrow radial cellule, the radius curved upwards and the keels on the metanotum.

DITHERUS RUFICOLLIS, *sp. nov.* (Pl. fig. 14.)

Niger, pronoto mesonotoque rufis ; alis hyalinis, apice fumato ; nervis stigmateque nigris ; capite thoraceque dense albo pilosis. ♀ .

Long : 6-7 m.m.

HABITAT : Simla.

Antennæ black ; the scape closely punctured and thickly covered with short black hair. Head smooth, shining and thickly covered with long white hair ; the clypeus is less thickly pilose. Mandibles dark-rufous before the apex ; the palpi black. The upper part of the mesopleuræ, the pronotum and mesonotum, rufous. Mesonotum thickly covered with short white hair ; smooth, the parapsidal furrows crenulated. The base and sides of the scutellum are dark-rufous ; the lateral furrows are deep and crenulated. Median segment closely punctured ; in the centre is a large area, which is sharply pointed at the top and bottom ; the sides on the upper and lower half straight, oblique ; on the side of this at the base is another area, somewhat triangular in shape, the broad end being at the base. Pro- and meso-pleuræ smooth and shining ; the base of the metapleuræ to the furrow smooth ; the rest rugosely punctured. Legs thickly covered with white hair ; the apex of the fore femora, the extreme base of the hinder and the fore tibiæ and tarsi rufo-testaceous. Wings hyaline, the apex from shortly behind the second transverse cubital nervure smoky, with a slight violaceous tinge ; the second transverse cubital nervure is largely bullated, as is also the cubitus immediately above it ; the apical nervures are pale, as are also the nervures in the hind wings. Abdomen smooth and shining ; the apex densely pilose ; the furrows along

the sides of the petiole are wide and deep ; the suturiform articulation is smooth and deep ; on either side behind it is a shallow, wide, oblique furrow.

PYCNOBRACON, *gen. nov.*

Eyes hairy. Head and wings as in *Bracon*. Abdomen ovate, the petiole broad, clearly separated from, and much narrower than, the second segment, which is enormously large, much larger than all the rest of the abdomen together ; it is rounded and narrowed at the base, transverse at the apex ; the suturiform articulation is distinct and is placed shortly beyond the middle; the sides of the third and fourth segments project broadly ; the fifth and sixth segments are smooth and shining ; the ovipositor is nearly as long as the abdomen.

The antennæ have about 40 joints and are placed well up on the head, which is obliquely narrowed behind the eyes ; the stigma is large ; the radial cellule is distinctly bordered in front ; the posterior nervure originates from near the middle of the nervure ; the median cellule in the hind wings is large and clearly limited ; the transverse discoidal nervure is interstitial. The mandibles become gradually narrowed to the apex ; the palpi are longish ; the metathoracic spiracles are placed beyond the middle, are distinct and oval.

The form of the mouth refers this genus to the *Cyclostomi*. The form of the abdomen gives it the appearance of one of the *Cryptogastres* to which, however, it has no relationship otherwise. The abdominal form is not unlike what we find in some species of *Spinaria*. Characteristic are the hairy eyes, a feature not known to occur with any genus of the *Cyclostomi*, but which is found in *Chelonus*.

PYCNOBRÆON NIGER, *sp. nov.* (Pl. fig. 13.)

Niger, abdomine rugoso, alis fusco-hyalinis, nervis stigmateque nigris. ♀.

Long : 5, terebra fere 2 m.m.

HABITAT : Simla.

Antennæ 40-jointed, moderately stout, not tapering much towards the apex, slightly longer than the body ; the scape smooth, shining and covered with short pubescence. Front and vertex smooth and shining and covered with short pale pubescence ; the face coarsely aciculated, opaque, tuberculated in the middle below and covered with short pubescence, and some long hairs. Clypeus smooth, shining and bare. Mandibles black, shining, dull piceous before the apex. Palpi

pale, black at the base. Thorax smooth and shining; the median segment thickly covered with long fuscous hairs; the depression at the base of the scutellum is deep and is stoutly crenulated. Wings hyaline, with a slight, but distinct, fuscous tinge; the nervures and stigma black. Legs black, thickly covered with a white pubescence, the coxæ with white hair. Abdomen ovate, the petiole depressed at the base; the apex raised, its base smooth and with an oblique slope; the apex coarsely reticulated; the second and third segments are closely, coarsely, longitudinally punctured; the base of the second segment is reticulated in the middle, where there is a longitudinal keel, which is widened at the base, the widened part becoming gradually narrowed and is hollowed; the suturiform articulation is wide and deep, striated, bifurcated at the sides, the hinder fork being the shorter.

Obs.—I have above compared this genus to *Spinaria*, and undoubtedly it is closely related to that genus as I have understood it when I described two Indian species, that is to say, it is to be referred to the *Cyclostomi*, but, according to some authors, *Spinaria* is related to the *Cryptogastres—Chelonus*, &c., Brullé (Hymén., iv., 512), who described the genus for the first time, placed it in the *Cryptogastres*, in which he is followed by Marshall (Species I., Hym., iv., p. 307), who says that there are "parmi les *Cryptogastres* exotiques des genres comme *Fornicia* et *Spinaria* que offrent une certaine ressemblance avec les *Cyclostomes*." So far as the Indian species known to me are concerned they must be referred to the *Cyclostomes*, inasmuch as they have the mouth widely and roundly incised as in *Bracon* and not transverse and entire as in *Chelonus*, &c. The form of the head, thorax and wings in our Indian species is exactly as it is with the *Cyclostomi*; the form of the abdomen has a certain resemblance to what we find with some of the *Cryptogastres*, but that, however, is hardly sufficient to warrant the genus being placed among them, considering how close is the agreement with *Bracon* in other respects. It is somewhat remarkable that neither Brullé (*l.c.*), Westwood, in his monograph of the genus (Tijdschr. voor Entomologie, 1882) nor any other author make any mention of the form of the mouth. We must, therefore, either assume that they have overlooked the fact that the species described by them have the oral structure of *Bracon*, or, if they really have the clypeus of *Chelonus*, then the species I have described from India must be referred to a new genus.

CHALCIDIDÆ.

SPILOCHALCIS SIMLÆNSIS, *sp. nov.*

Nigra, thorace octo-flavo-maculato, medio mesonoti reticulato ; alis fere hyalinis. ♀.

Long : 6 m.m.

HABITAT : Simla.

Antennæ stout, covered closely with a short white pubescence ; the under side of the flagellum brownish-red ; the last three joints become gradually narrowed towards the apex. Head black ; the inner orbits broadly—broadest in the middle ; the outer orbits narrowly above, the lower part of the antennæ keel and the upper side and the apex of the mandibles, yellow. Front and vertex closely and strongly punctured ; the part on either side of the ocelli bearing some large, clearly separated punctures ; the frontal depression finely and closely transversely striated. The face is bluntly keeled in the centre, the keel being closely transversely striated ; the rest is punctured, the punctures being large, moderately deep and broader than long. On the thorax there are two marks, broader than long, on the pronotum, two oblique lines on the sides of the middle lobe of the mesonotum, a shorter line, narrowed towards the apex, opposite the tegulæ, and the sides of the scutellum broadly yellow. Pronotum closely and uniformly punctured ; the mesonotum is not quite so closely and regularly punctured, the punctures being not so closely together, especially on the middle lobe. Scutellum rugosely punctured, and somewhat depressed in the middle ; the apex bears stout, clearly separated, longitudinal keels. Metanotum stoutly, irregularly reticulated. Propleuræ rugosely punctured above, below closely aciculated, and bearing a few irregular striæ. The base of the mesopleuræ is smooth and shining ; the rest irregularly rugose above, the middle with a few stout striæ. Metapleuræ coarsely rugosely punctured. Mesosternum rugosely punctured. Wings hyaline ; their middle and apex slightly, but distinctly, smoky ; the costa and nervures are black. The four front knees, tibiæ and tarsi are yellowish-testaceous ; the hinder trochanters ; the basal fifth of the hinder coxæ on the sides and above, the apex above and a mark on the sides near the apex on the lower side—this mark being dilated on the lower side—yellow. The hinder coxæ are as long as the femora and are thickly covered with white hair ; the under side of the femora is minutely and regularly toothed ; the hinder tibiæ yellow, broadly marked at the base and

middle with black; the tarsi yellow. Abdomen smooth and shining; the petiole is smooth and is half the length of the second segment.

HALTICELLA ORNATIPENNIS, *sp. nov.*

Nigra, basi flagello antennarum pedibusque anterioribus rufis; alis hyalinis, fusco-bifasciatis. ♀.

Long: 5-6 m.m.

HABITAT: Deesa.

The scape of the antennæ reaches to the top of the head, has a slight curve and is somewhat dilated on the top; it is more or less rufo-testaceous, as is also the base of the flagellum. The head is closely covered with silvery pubescence, closely rugosely punctured, except on the frontal depression, which is smooth in the centre, or at least only aciculated; the eyes on the inner side are bordered by a distinct keel; the antennal tubercles are smooth and shining. Thorax entirely black, closely and regularly punctured; the scutellum ends in two bluntly pointed teeth. Median segment opaque, irregularly longitudinally keeled; the two central keels are distinct and are united at top and bottom, forming thus an enclosed area, which is widest below. Pleuræ closely and distinctly punctured; the basal third of the mesopleuræ is strongly and regularly obliquely striated. Legs black; the four anterior legs, the hinder trochanters and the base of the hinder femora, rufous; the hinder femora bear no teeth, but have two curves in the middle; the part separating them being rounded and the basal curve is the larger; the apex of the hinder tibiæ is roundly depressed or incised on the outside. Wings hyaline; there is a dark cloud at the stigmal region and a larger, lighter coloured one beyond it, the space separating the two being milky-white. The sides of the abdomen, on the lower part, are more or less rufous.

Is referable apparently to Kirby's "genus" *Antrocephalus*, which was founded on two Bombay species described by Walker (*H. fuscicornis* and *H. diversicornis*).

TENTHREDINIDÆ.

FETHALIA, *gen. nov.*

Wings with 2 radial and 4 cubital cellules; lanceolate cellule divided by a short perpendicular nervure. Antennæ short, thickened towards the apex; the third joint distinctly longer than the fourth. Head largely developed behind and bulging out roundly beyond them; the occiput sharply margined on the top. Clypeus widely and roundly

incised at the apex. Labrum large, if anything, longer than the clypeus; its apex rounded. Mandibles roundly and widely incised at the base on the inner side; there is a large apical, a smaller sub-apical, and behind that a small rounded tubercle-like tooth. Front and vertex without furrows; the front raised broadly in the middle; the raised part is bounded laterally by a smooth furrow. Scutellum pyramidal, ending above in a distinct smooth point, which has a perpendicular slope behind. Sternum separated from the pleuræ by a wide, deep triangular furrow. Legs stout; the claws bifid. Abdomen not much longer than the thorax.

The occiput is roundly incised; the transverse median nervure is received half way between the middle and the base of the cellule; the humeral nervure is curved upwards near the base; in the hind wings the humeral nervure is received shortly behind the transverse one or is interstitial; the eyes slightly converge below and hardly reach to the top of the clypeus and are clearly separated from the base of the mandibles; the parapsidal furrows are distinct, but neither wide nor deep; the middle lobe is not raised and is furrowed in the middle; the tarsal patellæ are distinct; there is no "blotch" on the abdomen.

Belongs to the *Tenthredina*.

FETHALIA NIGRA, *sp. nov.*

Nigra, clypeo, labro, basique mandibularum flavis; alis fusco-violaceis, nervis stigmateque nigris. ♀.

Long: 12 m.m.

HABITAT: Simla.

Antennæ not much longer than the head and thorax united, stout; if anything, becoming thicker towards the apex; the apical joints fuscous beneath; the last distinctly shorter than the preceding. Head closely and distinctly punctured; the vertex more coarsely than the rest. Clypeus and labrum smooth; the latter fringed with long pale hair. Mandibles black; the base on the upper half above and the upper side of the lower side broadly pale-yellow; behind the teeth is a rufous band. Palpi black. Thorax entirely black; opaque, closely punctured, all over; the pyramidal scutellum is more strongly and less closely punctured; its top smooth and shining. Legs: the four front tibiæ and tarsi pale-yellow below, the patellæ are large. The anterior wings are fuscous-violaceous; the costa, stigma and nervures are black; the second

and third cubital cellules are about equal in length; the second receives the recurrent nervure shortly, but distinctly, behind the middle; the second recurrent nervure is received near the apex of the basal fourth. Abdomen smooth and shining.

LITHRACIA, *gen. nov.*

Wings with two radial and four cubital cellules. Lanceolate cellule contracted; the basal cellule as long as the apical, the two being separated by slightly less than their own length. Hind wings with two cubital cellules. Antennæ slender; the third joint is slightly longer than the fourth. Clypeus roundly, but not very deeply, incised. Labrum large, somewhat longer than the clypeus. Eyes large, parallel, separated by a small space from the base of the mandibles. Scutellum rather flat; the lateral keels are broad and reach to the base of its apical third. Post-scutellum sharply keeled down the middle; the keel is largest at the base. The hinder coxæ are large and reach to the apex of the third segment; the claws are bifid.

This genus has the large hind coxæ of *Macrophya* and *Pachyprotasis*, but it differs from both in the form of the lanceolate cellule, in the form of the scutellum, and in the keeled post-scutellum.

LITHRACIA FLAVIPES, *sp. nov.*

Nigra, pleuris subtus sternoque pallide flavis; pedibus flavis, dimidio apicali femorum posticarum, tibiis tarsisque posticis fulvis; alis hyalinis, stigmate fusco. ♀.

Long: 7-8 m.m.

HABITAT: Simla.

Antennæ slender, black, the scape yellow beneath. Head black, the face, the lower inner orbits, the outer, on the lower half, the clypeus, labrum and mandibles pallid yellow; the mandibular teeth piceous and black. Thorax black; the tegulæ, a small spot before them, the apex of the middle lobe of the mesonotum, the middle and apex of the scutellum, a line between the cenchri, a larger one in the centre behind them, the lower third of the meso and meta-pleuræ and the mesosternum, pallid-yellow. Front and vertex closely rugose; the frontal depression is raised in the middle. Mesonotum opaque, closely and minutely punctured. The four front legs are pallid-yellow, as are also the hinder coxæ, trochanters and basal half of the femora; the apical half of the femora, the tibiæ and tarsi rufo-fulvous; the apex of the tibiæ black, as is also the apex of the last tarsal joint. The wing

have a slight fulvous tinge; the costa is white; the greater part of the stigma dark-fuscous; the nervures blackish; the second transverse cubital nervure is largely bullated in the middle; the third is pale throughout. Abdomen deep-black; the second to sixth segments narrowly lined with white on the apex in the middle.

PACHYPROTASIS DORSIVITTATA, *sp. nov.*

Nigra, abdomine subtus flavo; pedibus flavis, femoribus tibiisque supra tarsisque nigris; alis hyalinis, stigmate testaceo. ♀.

Long : 10-11 m.m.

HABITAT : Simla.

Antennæ black. Head black; the antennal region, the clypeus, labrum and the outer orbits from shortly above the middle of the eyes, whitish-yellow. Front and vertex coarsely shagreened, running into striations on the sides; the frontal area raised; its middle depressed, the depression keeled in the centre, except at the base; there is a black transverse line over the clypeus, which has the apex widely, deeply and roundly incised. Mandibles pallid yellow, the teeth black and piceous. Thorax black; the edge of the pronotum, tegulæ and the base of the mesopleuræ, except at the top, whitish-yellow. Mesonotum minutely and closely punctured, the scutellum sparsely punctured. Pleuræ closely and minutely punctured. The back of the abdomen is black except for an irregular fulvous mark in the middle; its apex and the ventral surface yellow. Legs pale-yellow; all the femora, the four front tibiæ and tarsi are lined with black above; the hinder tibiæ black above and at the apex all round; the posterior tarsi black; the spurs are dark-testaceous. Wings hyaline, the anterior with a slight fulvous tinge; the costa and stigma pale-testaceous, the nervures blackish.

The ♂ has the breast and the lower half of the pleuræ pale-yellow; the black on the upper part of the mesopleuræ is triangularly dilated downwards, and in the centre above is a small oval yellow mark; the apex of the propleuræ is yellow except narrowly above.

The size of the yellow mark on the back of the abdomen varies.

PŒCILOSOMA NIGRICEPS, *sp. nov.*

Luteum, capite, mesosterno, antennis tibiis tarsisque nigris; alis fusco-hyalinis, nervis stigmateque nigris. ♀.

Long : 8 m.m.

HABITAT : Simla.

Antennæ longer than the abdomen, black, thickly covered with a microscopic down. Head black, the front and vertex shining; smooth; the front alutaceous, minutely punctured; the frontal area depressed, its sides broadly raised; the antennal keel distinct; its sides oblique. Clypeus and labrum opaque, alutaceous, thickly covered with black pubescence; the apex of the clypeus is almost transverse; the mandibles piceous before the apex. Thorax and abdomen luteous, except the depressions at the sides of the scutellum, the post-scutellum and the space between the cenchri; the sheaths of the ovipositor black. Legs luteous; the four hinder tibiæ and tarsi entirely, the base of the fore femora, the apex of the tibiæ and the tarsi, black. All the transverse cubital nervures are distinct; the second cubital cellule is slightly, but distinctly, shorter than the third; the first recurrent nervure is received near the apex of the basal third, the second in the middle of the cellule. The claws are bifid; the outer division longer than the inner.

TAXONUS NIGRITARSIS, *sp. nov.*

Niger, abdominis medio supra testaceo; pedibus pallide testaceis, tarsis nigris; alis hyalinis, nervis stigmateque nigris. ♂.

Long : 5 m.m.

HABITAT : Simla.

Head shining, black; the clypeus white; there are two short deep furrows behind the ocelli; the ocellar region is raised; the frontal area is not defined. Clypeus widely, but not deeply, incised; the labrum is white; the palpi of a darker white. Thorax smooth and shining, black except for a narrow white line on the pronotum. Legs white, with a slight testaceous tinge; the tarsi and the extreme base and apex of the hinder tibiæ, black. Wings hyaline, highly iridescent; the nervures and stigma black; the second and third cubital cellules are about equal in length; the first recurrent nervure is received at the base, quite close to the transverse cubital nervure; the second shortly beyond the middle. Abdomen black; the middle segments down the centre and the third and fourth at the apex and the basal half on the underside, testaceous.

TAXONUS MELANOPODUS, *sp. nov.*

Niger, tibiis tarsisque anterioribus albis; alis hyalinis, nervis stigmateque nigris. ♀ et ♂.

Long : 5 m.m.

HABITAT: Simla.

Antennæ black, stout, thickly covered with a short pile. Head smooth and shining; there is a furrow in front of the ocellus; there is a central fovea and one on either side of it over the antennæ; the apex of the clypeus is transverse; the labrum is roundly convex, is rounded at the apex and is, as is also the clypeus, thickly covered with short, black pubescence. Apex of mandibles rufous. Thorax black, smooth and shining. Legs black; the apex of the four anterior femora, their tibiæ and tarsi white; they are thickly covered with pale pubescence: the calcaria pale. The first recurrent nervure is received close to the apex of the basal third of the cellule; the second shortly behind the middle.

TAXONUS LABIATUS, *sp. nov.*

Niger, prothorace mesonotoque cum scutello rufis; pedibus nigris, coxis, trochanteribus femoribusque posticis pallide flavis; alis fere hyalinis, nervis stigmateque nigris. ♀.

Long: 8-9 m.m.

HABITAT: Simla.

Head smooth and shining, thickly covered with short pubescence; the clypeus deeply and roundly incised; closely, but not very strongly, punctured; the labrum is white. Thorax black, shining; the prothorax, the mesonotum, the scutellum and the upper half of the mesopleuræ rufous. The back of the abdomen has bluish-violet tinge. Legs black; the apices of the four front coxæ, the hinder coxæ entirely, the hinder trochanters and the hinder femora, pallid-yellow. Wings hyaline; the anterior with a fuscous tinge on the apical half; the stigma and nervures are black.

TAXONUS FOVEIFRONS, *sp. nov.*

Nigro-cœruleo, trochanteribus albis; alis fusco-hyalinis, nervis stigmateque nigris. ♂.

Long: 7 m.m.

HABITAT: Simla.

Antennæ stout, of the length of the abdomen; thickly covered with a black microscopic pile. Head smooth and shining, thickly covered with short pubescence; frontal area obsolete; above the antennæ is a deep fovea of oval shape. Clypeus deeply and roundly incised in the middle; the labrum is pale. Thorax smooth and shining; the parapsidal furrows are deep; the middle lobe is distant from the scutellum; its apex is sharply pointed; the scutellum at the base is surrounded by a wide

furrow. Legs black; the apex of the coxæ, the trochanters, and the extreme base of the femora, white; the apex of the anterior femora in front and of the tibia more broadly, white; the anterior tibiæ and tarsi are fuscous in front. The second and third cubital cellules are almost equal in length; the transverse basal nervure is received near the middle of the cellule.

A larger species than *T. melanopodus*; it has a more decided blue tint; the transverse basal nervure is received near the middle, not near the apex, of the basal third; the trochanters are white and the frontal fovea is larger, deeper and longer than broad.

BUSARBIA ALBIPES, *sp. nov.*

Nigra, nitida, pedibus, linea pronoti, tegulis scapoque antennarum albis; alis hyalinis, nervis stigmateque nigris. ♀.

Long: 6 m.m.

HABITAT: Simla.

Antennæ black, the scape white, lined with black above. Head smooth and shining; the furrows bounding the vertex are wide and deep; the frontal area is depressed at the apex and bears a few longitudinal striæ; the frontal area is largely depressed in the middle—wide above, becoming narrowed below,—the apex of the clypeus and the labrum fuscous. Thorax smooth and shining; the edge of the pronotum and the tegulæ white. Legs clear white; the apices of the tarsi infuscated. Wings hyaline, a very little infuscated in the middle; the first transverse cubital nervure is largely bullated; the first recurrent nervure is received at less distance than its own length from it. The back of the abdomen has a slight violaceous tinge.

This species comes near to *B. viridipes*, which differs from it in the clypeus, labrum and base of the mandibles being broadly white; the pleuræ are also marked with white, and the second cubital cellule receives the recurrent nervure near the apex, not at the base as with the present species.

SELANDRIA TRIFOVEATA, *sp. nov.*

Nigra, pedibus albis; apice tibiarum posticarum tarsisque posticis nigris; alis hyalinis, stigmate nervisque nigris. ♀.

Long: 5 m.m.

HABITAT: Simla.

Antennæ not quite so long as the abdomen, distinctly tapering towards the apex, and densely covered with short, stiff pubescence; the

third joint is about one-half longer than the fourth. Head smooth and shining ; frontal area is slightly raised, flat ; the apex obliquely narrowed at the sides ; there is an irregular fovea on the top of the antennal tubercle and a larger deeper one on either side of it. Clypeus and labrum thickly covered with blackish pubescence ; both are transverse at the apex. Mandibles broadly piceous before the apex ; the front and vertex are thickly covered with short pale pubescence. Thorax smooth and shining ; the mesonotum thickly covered with black pubescence. Legs white ; the apex of the hinder tibiæ and the tarsi black. Wings hyaline ; the stigma and nervures black ; the first transverse cubital nervure is indicated by a hyaline line ; the second recurrent nervure is received near the apex of the basal fourth of the cellule ; the basal nervure is received near the base of the apical fourth of the cellule.

MONOPHADNUS SIMLÆNSIS, *sp. nov.*

Niger, prothorace, mesonoto cum scutello maculaque magna subalis ferrugineis ; alis violaceo-fuscis, nervis stigmateque nigris. ♀.

Long : 10 m.m.

HABITAT : Simla.

Antennæ short, stout, almost bare. Head smooth and shining ; the ocelli bordered by furrows ; behind them are two deep curved furrows, which extend backwards to shortly behind the middle of the vertex ; the frontal fovea is large, deep, dilated broadly behind ; the dilated part with a narrow furrow in the middle. Clypeus sparsely punctured, convex and bordered above by a curved furrow. The prothorax, mesonotum, scutellum, tegulæ and a large triangular mark on the base of the mesopleuræ extending above to the apex, rufous. Wings smoky-fuscous, with a violaceous tinge ; the nervures and stigma black ; the third cubital cellule is more than double the length of the second ; the recurrent nervure is received close to its base. Abdomen smooth and shining, the edges of the segments narrowly at the apex, and the fifth and following broadly in the middle, whitish-yellow ; the ventral segments have their apices narrowly whitish-yellow. Legs stout, covered with a stout, stiff pile ; the claws rufous.

ATHALIA NIGRO-MACULATA, *sp. nov.*

Lutea, antennis, capite metanotoque nigris ; abdominis dorso nigro maculato ; pedibus flavis ; femoribus posterioribus tibiis tarsisque nigro maculatis ; alis fusco hyalinis, basi fumatis ; nervis stigmateque nigris. ♀ et ♂.

Long: 7-8 m.m.

HABITAT: Simla.

Antennæ 10-jointed, the third twice the length of the fourth, the terminal joint twice the length of the preceding. Head black, below the antennæ pale-luteous; the front and vertex are without distinct furrows or depressions. Mandibles black at the apex. Thorax bright luteous; the mesonotum thickly covered with depressed fulvous pubescence; the depressions at the sides of the scutellum, the metanotum, the base of the abdomen and six broad black marks on either side of the abdomen—two on each segment, except on the posterior two—black, the pleuræ under the hinder wings being also broadly black. Wings smoky hyaline, paler towards the apex; extreme base yellowish. The apices of the four posterior femora, the apices of all the tarsi and the apices of the tarsal joints, broadly black.

The transverse cubital nervures are more widely separated than in *A. antennata*; the second cubital cellule is not so much narrowed towards the apex and the wings are not so broadly yellow at the base.

In the ♂ the black marks on the abdomen are much reduced in size.

ATHALIA ANTENNATA, *sp. nov.*

Lutea, flagello antennarum, capite metanotoque nigris, tibiis tarsisque nigro maculatis; alis fusco-hyalinis, nervis stigmateque nigris. ♀.

Long: 7-8 m.m.

HABITAT: Simla.

Antennæ 13-jointed, the apical two joints more closely amalgamated than the others; the third joint narrower than, and twice the length of, the fourth. Head shining black, luteous below the antennæ; a curved shallow furrow runs from the outerside of the hinder ocelli, and a shorter, oblique one from either side of the front ocellus, there being also a shallow fovea in front of it. Mandibles luteous, black at the apex; the palpi yellow. The depressions at the sides of the scutellum the median segment and the base of the abdomen are black; the mesonotum is thickly covered with pale fulvous pubescence; there is an impressed line on the middle lobe in the centre. The back of the abdomen is infuscated. The wings have a yellowish tinge at the base; the basal nervures are luteous, the others with the costa and stigma are black; the second cubital cellule is largely narrowed at the apex. Legs

coloured like the body ; the apex of the four front tibiæ and the apices of their tarsal joints black ; the apical third of the hinder tibiæ and the tarsi, except the basal two joints at the base, black.

CLADIUS ORIENTALIS, *sp. nov.*

Niger, tibiis tarsisque anterioribus late albis ; alis fere hyalinis, nervis stigmateque nigris. ♀.

Long : 7 m.m.

HABITAT : Simla.

Antennæ as long as the abdomen, distinctly tapering towards the apex ; the third, fourth and fifth joints with their apices sharply produced on the upper side ; the basal two joints covered with stiff black hair. Head smooth and shining, thickly covered with short black pubescence ; the frontal area flat ; transverse behind and in the middle in front ; the sides at the apex obliquely narrowed ; before the ocelli is a curved shallow furrow ; the antennal area is continuous with it ; is raised, flat above, its apex triangular. The apex of the clypeus is roundly incised ; the labrum is slightly depressed in the middle. Thorax and abdomen smooth and shining, covered with a short black pile ; the cerci are moderately large, shortly pilose and widely separated ; the blotch is indistinct. Wings hyaline, with a slight fuscous tinge ; the stigma and nervures are deep black ; the recurrent nervures are received shortly behind the middle of the cellules.

Belongs probably, like the other species here described, to *Priophorus*. It may be known from *Nigricans* by being larger, by the tibiæ being pure white, by the curved furrow in front of the eyes, by the antennal tubercle not being so deeply hollowed, by the clypeus being more deeply incised, and by the clearer, more hyaline wings.

CLADIUS NIGRICANS, *sp. nov.*

Niger, tibiis antecis geniculisque fuscis ; alis fusco-hyalinis, nervis stigmateque nigris. ♀ et ♂.

Long : 5-6 m.m.

HABITAT : Simla.

Antennæ as long as the abdomen, tapering towards the apex and thickly covered with stiff black pubescence ; the basal joints of the flagellum not produced at the apices. Head smooth and shining ; the frontal area not clearly defined ; there is a short fovea—longer than broad—in front of the ocelli ; the antennal fovea is distinctly, but not very deeply, depressed at the apex ; the antennal tubercle is large, tri-

angular on the top and reaching to the top of the clypeus, which is transverse at the apex. The labrum is depressed in the middle. Mandibles black, broadly rufous before the apex. Legs black; the base of the tibiæ and the anterior tibiæ in front fuscous. Wings hyaline, with a slight fuscous tinge; the stigma and nervures black; the first recurrent nervure is received in a broad angle behind the middle of the cellule, the cubitus in front of it being largely bullated; the second is received at the apex of the basal fourth. The depression between the cenchri is wide at the base, becoming gradually narrowed towards the apex.

The antennæ in the ♂ are longer, thicker and more densely pilose than they are in the ♀; the third joint is distinctly shorter than the fourth.

EXPLANATIONS OF PLATE.

1. Melanapis violaceipennis. ♀.
2. Lamproapis maculipennis. ♂.
3. Pompilus heraclides. ♀.
4. Nursea carinata. ♀.
5. Meira quadrimaculata. ♀.
6. Pœcilotiphia albomaculata.
7, 7a. Notogonia pulcherrima. ♀.
8. Mutilla regia. ♀.
9, 9a. „ ♂.
10. Nothaima bicarinata. ♂.
11. Bracon deesæ, wing.
12. Lithracia flavipes. ♂.
13. Pyncobracon niger. ♀.
14. Ditherus ruficollis. ♂.
15. Fethalia nigra. ♀.

ON NEW AND LITTLE-KNOWN BUTTERFLIES, MOSTLY FROM THE ORIENTAL REGION.

By Lionel de Nicéville, F.E.S., C.M.Z.S., &c.

Part II.

(*Continued from page 251 of this Volume.*)

Genus Symbrenthia, Hübner.

Symbrenthia Hübner, Verz. bek. Schmett., p. 43 (1816); id., deNicéville, Butt. of India, Burmah and Ceylon, vol. ii, p. 238 (1886); id., Distant, Rhop. Malay., p. 431 (1886) ; id., Schätz, Ex. Schmett., vol. ii, p. 123, n. 23, pl. xv, *neuration of S. hyppoclus* [*sic*], Cramer, *palpus* and *foreleg of male* (1887) ; id., Moore, Lep. Ind., vol. iv, p. 110 (1899) ; id., Fruhstorfer, Berl. Ent. Zeitsch., vol. xlv, pp. 19-21 (1900) *Laogona*, Boisduval, Sp. Gén., vol. i, pl. x, fig. 3 (1836); id., Doubleday, Gen. Diurn. Lep. vol. i, p. 190 (1848) ; id., Felder, Neues Lep., p. 11, n. 20 (1861) ; id., Wallace, Trans. Ent. Soc. Lond., 1869, pp. 344, 345.

Dr. F. Moore in Lep. Ind. has recently revised the Indian species of the genus *Symbrenthia*, and has mentioned many of the described, extra-Indian species. Last year Mr. Fruhstorfer gave a list of the species in the genus, but has omitted eleven, the names of these arranged chronologically being *lilæa*, Hewitson ; *hippalus*, Felder ; *brabira*, Moore ; *hysudra*, Moore; *daruka*, Moore ; *javanus*, Staudinger ; *platena*, Staudinger ; *sivokana*, Moore ; *niasica*, Moore ; *semperi*, Moore ; and *sinica*, Moore. Throughout his paper Mr. Fruhstorfer uses *hyppoclus*, though Cramer originally spelt it *hippoclus*, and this spelling was adopted by Mr. Fruhstorfer in his earlier papers ; and he credits *silana* to Dr. Moore instead of to myself.

I propose to give a resumé of the species contained in the genus, with as far as I am able from my collection my conclusions as regards synonymy, which largely differs from that of Dr. Moore and Mr. Fruhstorfer. I will give only the principal references in the synonymy ; to quote all the citations would occupy too much space. I am fully aware that my conclusions will not be considered to be final, even if my opinions as far as they go are accepted, as my collection of extra-Indian species is by no means complete. Such as it is I trust my study of the genus will be of some assistance to future workers.

1. Symbrenthia lucina, Cramer.

Papilio lucina, Cramer, Pap. Ex. vol. iv, p. 82, pl. cccxxx, figs. E, F, *female* (1780) ; *Symbrenthia lucina*, Moore, Lep. Ind., vol. iv, p. 111, pl. cccxxi, figs. i, *larva* and *pupæ* ; 1*a male* ; 1*b*, 1*c*, *female, wet season forms* ; 1*d*, 1*e*, *male* ; 1*f*, 1*g*, *female, dry season form* (1899) ; *S. khasiana*, Moore, Proc. Zool. Soc., Lond.,

1874, p. 569; *S. daruka*, Moore, Proc. Zool. Soc. Lond., 1874, p. 570, pl. lxvi., fig. 10 *male*; *S. hyppoclus* [*sic*], Moore, (*nec* Cramer), Proc. Zool. Soc. Lond., 1882, p. 243, pl. xi, figs. 4, *larva*; 4*a*, *pupa*; id., Distant, Rhop. Malay., p. 431, n. 1, pl. xlii, figs. 4, *male*; 5 *female* (1886); *S. hippocla* [*sic*], Kirby in new edition Hübner's Ex. Schmett., text p. 19, vol. iii, pl. ccccxlvi (8), figs. 1—4 (1900) *; *S. hippocle* [*sic*], Hubner, Verz. bek. Schmett., p. 43, n. 384 (1816); *S. asthala*, Leech [*nec* Moore], Butt. China, Japan, and Corea, vol. i, p. 285, pl. xxv, fig. 2, *male* (1893).

HABITAT: *lucina*, China (*Cramer*); *khasiana*, Khasia hills (*Moore*); *daruka*, N. India (*Moore*); the Himalayas from Kashmir to Assam, thence southwards to Burma and the Malayan Peninsula, Western Central and Southern China to Hongkong; Indo-China; and the Eastern Ghats of peninsular India.

This is by far the commonest species of the genus, where it occurs it is usually very abundant, the larva feeding on nettles. It is highly seasonally dimorphic, as are all the Indian species. The female is monomorphic. Mr. Fruhstorfer in Berl. Ent. Zeitsch., vol. xlv, p. 20 (1900) keeps it as a distinct sub-species from China only under the name of *S. hyppoclus* [*sic*] *lucina*, Cramer (*nec* Semper).

2. SYMBRENTHIA VIOLETTA, Hagen.

S. hippoclus, var. *violetta*, Hagen, Iris, vol. ix, p. 165, n. 133 (1896).

HABITAT: Sumatra (*Hagen*); Sumatra; Borneo (*Moore*).

On page 164 (l. c.), n. 132, Dr. B. Hagen records true *S. hippoclus*, Cramer, which appears to be confined to Amboina, from the low country (coast) of Sumatra; and on p. 165, n. 133, *S. hippoclus*, var. *violetta*, from the Karo Plateau (*i. e.* the mountains)* of Sumatra. All my specimens are from the mountains, and are therefore true *S. violetta*, which in the male has the ground-colour of both wings on the underside much darker than in the continental *S. lucina*, Cramer; the females of *S. violetta* and *S. lucina* are indistinguishable. Dr. F. Moore records *S. violetta* from Borneo, from whence I have no specimens of the genus. The female is monomorphic.

3. SYMBRENTHIA NIASICA, Moore.

S. niasica, Moore, Lep. Ind., vol. iv, p. 122 (1899); *S. hyppoclus* [*sic*] *niasicus*, Fruhstorfer, Berl. Ent. Zeitsch, vol. xlv, p. 20 (1900).

HABITAT: Nias Island off the south-western coast of Sumatra (*Moore* and *Fruhstorfer*).

* I have not seen this plate at the date of writing. The specimens figured may not be the true *S. lucina*, Cramer, as amongst other localities Mr. Kirby quotes Amboina and Java where *S. lucina* is not found.

I have males only of this species, which is very near to *S. violetta*, Hagen. The female appears to be monomorphic.

4. SYMBRENTHIA JAVANUS, Staudinger.

S. hippoclus, var. *javanus*, Staudinger, Iris, vol. ix, p. 233 (1896); id., Fruhstorfer, Berl. Ent. Zeitsch., vol. xli, p. 314 (1896); *S. hippoclus*, deNicéville, (*nec* Cramer), Journ., Bomb. Nat. His. Soc., vol. vi, p. 354, n. 8, pl. F, fig. 10, *female* (1891); *S. hyppoclus:hyppocla*, Fruhstorfer, Berl. Ent. Zeitsch., vol. xlv, p. 20 (1900).

HABITAT: Java, Bali, Borneo.

The males in my collection from the three above-named localities cannot be distinguished from Indian and Chinese *S. lucina*, Cramer, nor can Form I of the female from Java, which is yellow like the male. Form II of the female, which has the ground-colour white, has no corresponding dimorphic form on the Asian continent. I would therefore retain the name *S. javanus* for this species for the reason that it has two forms of female. I have no females from either Bali or Borneo, so cannot say if the species in those islands is dimorphic in the female or not. If not, I would place them under *S. lucina*. Mr. Fruhstorfer refers to this species as *S. hyppoclus hyppocla*, Hübner, from East and West Java. He says that the white females in Java are found in the hills in the eastern part of the island, that the yellow females exist near the coast, especially at Malang in Eastern Java, and Sukabumi and Palabuan in Western Java. To avoid too many names he uses *hyppoclus* [dropping *hyppocla*, Hübner] for the *Symbrenthia* of this group from Bali and Sikkim, from the Malay Peninsula and Borneo, and notes that Borneo has two forms of female. Both, however, are yellow, the alpine form from Kina Balu is richly coloured and has broad yellow bands, the coast form is lighter coloured with narrow yellow bands. While placing together the Sikkim, Malay Peninsula, Java, Bali and Borneo forms under one name, Mr. Fruhstorfer keeps the Khasia Hill form (*S. khasiana*, Moore) distinct. I may note that D. F. Moore gives *Hypanartia hippocla*, Hübner, Samml. Ex. Schmett., vol. iii, figs. 1, 2, 3, 4 ♂, and dimorphic ♀ (1827) under *S. javanus*, Staudinger, which is the plate I have not seen and is referred to in the foot note under *S. lucina* on page 451.

5. SYMBRENTHIA ANNA, Semper.

S. anna, Semper, Schmett. Philipp., p. 114, n. 135, pl. xxi, figs. 5 *male*; 6 *female* (1888), p. 342 (1892).

HABITAT : Camotes, Bohol, Cebú, Leyte, Panaon, Surigao, Camiguin de Mindanao, Mindanao—all in the Philippines (*Semper*); Bazilan in the Philippines (*Fruhstorfer*).

Of this species I possess three males only. The female as figured by Mr. George Semper is white-banded, but the white colour is mixed with pale ferruginous. Apparently the female is monomorphic.

6. SYMBRENTHIA SEMPERI, Moore.

S. semperi, Moore, Lep. Ind., vol. iv, p. 122 (1899); *S. lucina*, Semper (*nec* Cramer), Schmett. Philipp., p. 114, n. 134, pl. xxi, figs. 7, *male*; 8, *female* (1888), p. 342 (1892); *S. hyppoclus philippensis*, Fruhstorfer, Berl. Ent. Zeitsch., vol. xlv, p. 20 (1900).

HABITAT : Luzon, Bohol, Samar, Mindanao, Babuyanes, Mindoro—all in the Philippines (*Semper*).

Mr. Semper records both *S. anna*, Semper, and *S. lucina*, Cramer (the latter species Dr. Moore re-names *S. semperi*) from the islands Bohol and Mindanao. I greatly doubt if two really distinct species of the same group of the genus occur together on the same island, unless the mountain and the plains forms are different. I have two males of this species only from the Philippines. The female as figured by Mr. Semper differs considerably in shape from the female of *S. anna*, it has the bands of the upperside of both wings very much broader, they are yellow apparently tinged with white, but much less so than in *S. anna*. Mr. Fruhstorfer records one species only from the Philippines, remarking that "*S. hyppoclus anna* has ♀♀ nearly like the alpine white Javan *hippocla* Hübner, ♀♀, while the rare aberration *lucina*, Semper, which I call *philippensis*, is like the normal yellow female." Mr. Fruhstorfer gives no detailed description of this new form *philippensis*, which apparently sinks to *S. semperi*, Moore.

7. SYMBRENTHIA DISSOLUTA, Staudinger.

S. hypatia, Wallace (?), var. *dissoluta*, Staudinger, Iris, vol. ii, p. 49 (1889).

HABITAT : Palawan, one of the Philippine Isles (*Staudinger*).

I have seen no specimen of this species. The female is white. I do not know if it is dimorphic, that a yellow female is found with the white one or not.

8. SYMBRENTHIA LOMBOKENSIS, Fruhstorfer.

S. hyppoclus (*sic*) *lombokensis*, Fruhstorfer, Berl. Ent. Zeitsch., vol. xlv, p. 19 (1900).

HABITAT : Lombok (*Fruhstorfer*).

I have a single female only of this species, which is white. I am not aware if a yellow female also occurs in the island.

9. SYMBRENTHIA SUMBAWENSIS, Fruhstorfer.

S. hyppoclus (*sic*) *sumbawensis*, Fruhstorfer, Berl. Ent. Zeitsch., vol. xlv. p. 19 (1900).

HABITAT: Sambawa (*Fruhstorfer*).

I have not seen this species. The female is described as being white, and Mr. Fruhstorfer says that no yellow female is found in the island.

10. SYMBRENTHIA PLATENA, Staudinger.

S. platena, Staudinger, Iris, vol. ix, p. 234 (1896).

HABITAT: Minahassa in East Celebes (*Staudinger*). This species is entirely unknown to me.

11. SYMBRENTHIA CONFLUENS, Fruhstorfer.

S. hippoclus confluens, Fruhstorfer, Berl. Ent. Zeitsch., vol. xli, p. 313 (1896).

HABITAT: North and South Celebes, 3,000 feet (*Fruhstorfer*).

I have not seen this species, and know nothing about its female as to whether it is dimorphic or not. Is it distinct from *S. platena*, Staudinger?

12. SYMBRENTHIA HIPPOCLUS, Cramer.

Papilio hippoclus, Cramer, Pap. Ex., vol. iii, p. 46, pl. ccxx, figs., C., D., *male* (1779); *S. hyppoclus*, Staudinger, Ex. Schmett, vol. i, p. 96, pl. xxxvi, *male* (1885).

HABITAT: Amboyna (*Cramer*).

I have not seen this species, and know nothing about its female.

13. SYMBRENTHIA BATJANA, Fruhstorfer.

S. hyppoclus (*sic*) *batjana*, Fruhstorfer, Berl. Ent., Zeitsch, vol. xlv, p. 19 (1900).

HABITAT: Batjan; Halmaheira (*Fruhstorfer*); Buru.

I have one male each from Batjan and Halmaheira, two males and a female from Buru. The female is yellow. The name *batjana* is a MS. one only, as no description accompanies it. It should be compared with specimens from Amboina (Cramer's figures are useless for close comparison), as I think that *S. batjana* will probably prove to be a synonym of *S. hippoclus*.

14. SYMBRENTHIA HYLÆUS, Wallace.

S. hylæus, Wallace, Trans. Ent. Soc. Lond., 1869, p. 345; *S. hippocrates* Staudinger, Iris, vol. ix, p. 234 (1896).

HABITAT: Dorey, New Guinea (*Wallace*); German New Guinea (*Staudinger*); Hattan and Kapaur in New Guinea (*Fruhstorfer*).

I have not seen this species. The late Dr. O. Staudinger describes the female as yellow, and apparently there is no dimorphic white Form II.

15. SYMBRENTHIA COTANDA, Moore.

HABITAT : Si[illegible]ore, Proc. Zool. Soc. Lond., 1874, p. 569, pl. lxvi, fig. 9, *male*; [illegible] (W[illegible]Ind., vol. iv, p. 114, pl. cccxxii, figs. 1, 1*a*, 1*b*, *male*; 1*c*, 1*d*, *female*, [illegible] *Vison form*; 1*e*, *male*, 1*f*, 1*g*, 1*h*, *female*, *dry-season form* (1899); *Lasgona hypselis*, Doubleday and Hewitson (*nec* Godart), Gen. Diurn. Lep., vol. 1, p. 191, n. 2, pl. xxv, fig. 1, *male* (1847); *Lasgona lilæa*, Hewitson, Trans. Ent. Soc. Lond., third series, vol. ii, p. 246, n. 4, pl. xv, figs. 5, 6, *male* (1864), *Symbrenthia sinis*, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. vi, p. 257, n. 10, pl. F, fig. 9, *male* (1891); *S. hypselis assama*, Fruhstorfer, Berl. Ent. Zeitsch, vol. xlv, p. 21 (1900).

HABITAT : Throughout the Himalayas from Eastern Kumaon to Assam, thence southwards through Burma to the Malay Peninsula; Sumatra.

Next to *S. lucina*, Cramer, this species is the commonest of the genus occurring in India. It is seasonally dimorphic. Its transformations have not been discovered. Dr. Moore records it from "Kashmir" in Lep. Ind., but I believe the late Mr. W. Doherty was correct in saying that it "does not occur further to the westward than the Kali valley, which divides Nepal from Kumaon." The *Lasgona lilæa* of Hewitson, from "East India" is undoubtedly an aberration of the male of this species. I have even more remarkable aberrations in my collection from Sikkim. Mr. Fruhstorfer retains *S. sinis*, de Nicéville, as a distinct sub-species from the Malay Peninsula and the Battah Mountains of N.-E. Sumatra, which is in my opinion incorrect, the Malayan Peninsula form joining on to and being indistinguishable from the Lower Burmese form, the two regions being conterminous. Mr. Fruhstorfer also describes a *S. hypselis assama*, new sub-species from the Khasi Hills and Assam, which cannot be separated from *S. cotanda*.

16. SYMBRENTHIA SINICA, Moore.

S. sinica, Moore, Lep. Ind., vol. iv, p. 123 (1899).

HABITAT : Western China (*Moore*).

I have not seen this species.

17. SYMBRENTHIA OTTILIA, Fruhstorfer.

S. hypselis ottilia, Fruhstorfer, Berl. Ent. Zeitsch, vol. xlii, p. 327 (1897).

HABITAT : Nias Island.

I have not seen this species.

18. SYMBRENTHIA HYPSELIS, Godart.

Vanessa hypselis, Godart, Enc. Mèth., vol. ix, Suppl., p. 818, n. 5-16 (1823); *Lasgona hypselis*, Boisduval, Sp. Gén., vol. i, pl. x, fig. 3, *male* (1836); id.,

Doubleday and Hewitson, Gen. Diurn. Lep., vol. i, p. 191, n. fer. *male* (1847); *Symbrenthia hypselis*, de Nicéville, Journ. Bomb. tsch. Z. p. vol. vi., p. 356, n. 9, pl. F, fig. 8, *male* (1891).

HABITAT: Java; Bali.

Mr. Fruhstorfer records this species from East and West Java, 2,000 to 4,000 feet. I have both series from Java and Bali.

19. SYMBRENTHIA BALUNDA, Staudinger.

S. hypselis, Godart, var. *balunda*, Staudinger, Iris, vol. ix, p. 233 (1896).

HABITAT: Kina Balu Mountain, North Borneo (*Staudinger*).

I have not seen this species.

20. SYMBRENTHIA BRABIRA, Moore.

S. brabira, Moore, Proc. Zool. Soc. Lond., 1872, p. 558; idem, id., Lep. Ind., vol. iv, p. 116, pl. cccxxiii, figs. 1, 1*a*, *male*; 1*b*, 1*c*, *female, wet-season form*; 1*d*, 1*e*, *male, dry-season form* (1899); *S. hysudra*, Moore, Proc. Zool. Soc. Lond., 1874, p. 268, n. 28, pl. xliii, fig. 8, *male, dry-season form*; idem, id., Lep. Ind., vol. iv, p. 118, pl. cccxxiv. figs. 1, 1*a*, *male*; 1*b*, 1*c*, *female, wet-season form*; 1*d*, 1*e*, *male*; 1*f*, 1*g*, *female, dry-season form* (1899); *S. asthala*, Moore, Proc. Zool. Soc. Lond., 1874, p. 269, n. 29, pl. xliii, fig. 9, *male*; id., De Nicéville But. Ind., Burmah and Ceylon, vol. ii, p. 244, n. 539, pl. xxiii, fig. 106, *male* (1886); *S. sivokana* Moore, Lep. Ind., vol. iv, p. 117, pl. cccxxiii, fig. 2, 2*a*, *male*; 2*b*, *female, wet-season form* (1899).

HABITAT: Himalayas from Kashmir to Sikkim. Dr. F. Moore in Lep. Ind., places *S. asthala*, Moore, as a synonym of *S. brabira*, Moore, from the Western Himalayas, Kashmir to Kumaon, but apparently he has had access to Kashmir specimens only. He keeps *S. hysudra*, Moore, as a distinct species, from the N.-W. Himalayas, having examined specimens from Kashmir, Kulu, and Kaleni, 3,900 feet (this latter locality is unknown to me). He also describes *S. sivokana* as a new species from Sivoke in British Sikkim; it also occurs in Native Sikkim. After a careful examination I have come to the conclusion that all four names represent one species. Three of them, it will be noticed, were described from the Western Himalayas, and one from the Eastern Himalayas. Even these from the west and the east cannot be separated, leave alone those from one region. The species is usually rare, especially the female sex, and is as usual with continental species strongly seasonally dimorphic.

21. SYMBRENTHIA NIPHANDA, Moore.

S. niphanda, Moore, Proc. Zool. Soc. Lond., 1872, p. 559; idem, id., Lep. Ind., vol. iv, p. 119, pl. cccxxv, figs. 1, 1*a*, *male*; 1*b*, 1*c*, *female, wet-season form*; 1*d*, 1*e*, *male, dry-season form* (1899).

HABITAT : Sikkim ; Bhutan ; Naga Hills (*Elwes*) ; Upper Chindwin, Burma (*Watson*) ; Palawan, one of the Philippine Isles (*Staudinger*). I have specimens of this species only from Sikkim but have no doubt that Messrs. Elwes and Watson have recorded it correctly from Upper Assam and Upper Burma. It is, I think, rather doubtful, however, that it occurs in Palawan as Dr. Staudinger says it does. It is seasonally dimorphic as usual.

22. SYMBRENTHIA SILANA, de Nicéville.

S. silana, de Nicéville, Journ. A. S. B., vol. liv, pt. 2, p. 117, pl. II, fig. 9, *male* (1885) ; id., Moore, Lep. Ind., vol. iv, p. 121, pl. cccxxv, figs. 2, 2*a*, *male, wet-season form* ; 2*b*, *male, dry-season form* (1899).

HABITAT : Sikkim ; Bhutan. A rare species with a very limited range, and slightly seasonally dimorphic.

23. SYMBRENTHIA HYPATIA, Wallace.

Lasgona hypatia, Wallace, Trans. Ent. Soc. Lond., 1869, pp. 344, 345, n. 3 ; *Symbrenthia hypatia*, Distant, Rhop. Malay., p. 432, n. 2, pl. xlii, fig. 6, *male* (1886) ; id., Fruhstorfer, Berl. Ent. Zeitsch., vol. xxxviii, p. 366 (1893) ; idem, id., Stat. Ent. Zeit., vol. lv, p. 125, pl. iii, fig. 4, *male* (1894) ; id., de Nicéville and Martin, Journ. A. S. B., vol. lxiv, pt. 2, p. 488, p. 239 (1895) ; id., Moore, Lep. Ind., vol. iv, p. 122 (1899) ; *S. hypatia*, var. *chersonesia* Fruhstorfer, Berl. Ent. Zeitsch., vol. xxxviii, p. 366 (1893) ; *S. hypatia*, var. *hippocrene* Staudinger, Iris, vol. ix, p. 252, pl. v, fig. 3, *male* (1897).

HABITAT : Malay Peninsula ; Sumatra ; Java ; Borneo.

I concur with Dr. Moore in placing the var. [*chersonesia* of Fruhstorfer from the Malay Peninsula, and the var.] *hippocrene* of Staudinger, from Kina Balu Mountain and Brunei in North-Western Borneo as synonyms of *S. hypatia*, Wallace, from Java. *S. hypatia* is a rare species, and appears to be confined to mountainous districts, Dr. Moore, has described its female from Sumatra.

24. SYMBRENTHIA INTRICATA, Fruhstorfer.

S. intricata, Fruhstorfer, Ent. Nach., vol. xxiii, p. 61 (1897) ; idem, id., Berl. Ent. Zeitsch., vol. xli, p. 312 (1897).

HABITAT : Toli-Toli, North Celebes. I have not seen this species.

25. SYMBRENTHIA HIPPALUS, Felder.

Laogena hippalus, Felder, Reise Novara, Lep., vol. iii, p. 396, n. 587, pl. li, figs. 9, 10, *male* (1867).

HABITAT : Halmaheira (Felder) ; Mount Tondano, N.-E. Celebes (*coll. de Niceville*).

I possess a single male of this species ; the female has not been described. It is a very remarkable species, there is nothing else like it in the genus.

THE FERNS OF NORTH-WESTERN INDIA.

Including AFGHANISTAN, the TRANS-INDUS PROTECTED STATES, and KASHMIR: arranged and named on the basis of Hooker and Baker's *Synopsis Filicum*, and other works, with New Species added.

By C. W. HOPE.

(*Continued from page* 266 *of this Volume.*)

PART III.—THE GENERAL LIST—(*continued.*)

Genus 22. ASPIDIUM, *Sw.* (in part), *R. Br.*

Subgenus POLYSTICHUM, *Roth.*

1. **A. Lonchitis**, Swartz; Syn. Fil. 250; C. R. 505. *Polystichum Lonchitis*, Sw., Bedd. H. B. 203. Hook. Brit. F. t. 9.

TRANS-IND. STATES: Baraul 10,500-11,000′, Harriss 1895.

KASHMIR: Jacquem, and S. & W. (in Herb. Brit. Mus.); Gulmarg and Sonamarg 9-11,000′, Dr. J. L. Stewart, Levinge, Trotter; elsewhere—Gilgit, and W. & S. Kashmir 8-12,000′, Duthie, McDonell, MacLeod.

DISTRIB.—*N. Amer.* Greenland—Disko Bay; Brit. Columbia—Cascade Mts. 5-6000′; United States—southern shore of Lake Superior and northwards (Britten). *Europe*—North to Centr., more sparingly in S. Europe; Brit. Isles—N. and Centr. Scotland; Durham, Westmoreland, and Yorkshire; Carnarvonshire; W. and N.-W. Ireland, very local. *Asia*: Asia Minor, Siberia, Turkestán.

Mr. Clarke says:—"The single Himalayan specimen at Kew (Jacquemont's) has been marked *A. Lonchitis* by Moore; but others have marked it *A. auriculatum*. H. C. Levinge's example is typical *A. Lonchitis*." The additional localities in Kashmir, summarised above—ten or twelve in number—show that the plant is not uncommon in the western and southern parts of that State. The dimensions given in the Synopsis, namely, fr. 12—18 in. l., 1—2 in. br., are exceeded in Kashmir: I have a frond from MacLeod, with narrow pinnæ, which measures 15 in. by 3 in., and another 18 in. by 2 in.; but there is a frond in his collection 28 in. in length, the breadth of which I omitted to note. The pinnæ are lobed: each vein after leaving the costa branches; and in well-developed fronds each group of veinlets occupies a shallow lobe, the apex of which is a mucronate tooth on the longest veinlet; and there are smaller teeth at the points of the other veinlets.

2. **A. lachenense**, Hook.; Syn. Fil. 250; C. R. 506. *Polystichum lachenense*, Hook., Bedd. H. B. 203, F. B. I., t. 32.

KASHMIR: Palgram 13,000′, C. B. Clarke, No. 31051, 4-9-'76; *Gilgit Dist.*—Gor 15,000′, Tanner 1880; *Liddar Vy.*—above Kainmal 12,000′, Duthie No. 13131, Masjid Vy. 12-13,000′, Duthie No. 13198, and Sonsál Nála 13-14,000′, Duthie No. 14128—all in 1893.

PUNJAB: *Chamba.*—Rávi Valley, Cheni Pass 12,000′, McDonell 1892.

N.-W. P.: *T. Garh.*—Damdár Vy. 12-13,000, No. 106′, and Dudu Glacier Moraine, 4-15,000′, Duthie 1883; near Jaulea, under Srikanta, 15-16,000′, No. 397, and above

Chinpul 14-15,000′, No. 406, Duthie 1883; "Kumaun 9678 ! in Herb. Schlagentweit," (note by Mr. Baker on a Sikkim sheet in Kew): Rálam Valley 12-15,000′, Duthie No. 3610, 28-8-'84, by Nipchang Glacier in Darma 16-17,000′ and Kutti Valley 12-13,000′, Duthie No. 3708 (in part), 18-9-84.

NEPAL W.—Opposite Buddhi Village 10-11,000′ and Nampa Gadh 12-14,000′, Duthie 1886.

DISTRIB.—*Asia*: N. Ind. (Him.)—Sikkim 13-16,000′, *Drs. Hooker, Thomson* and *Anderson*.

3. **A. Duthiei**, n. sp. Plate VI. (See Part II., p. 532.)

4. **A. marginatum**, Wall. Cat. 366. *A. auriculatum*, Sw., β, *A. marginatum* Wall., Syn. Fil. 251; C. R. 207. *Polystichum auriculatum* (Linn. under *Polypodium*), var. β *marginatum*, Wall., Bedd. H. B. 204. Plate XXVII.

PUNJAB: *Chamba*—McDonell, loc.?; *Simla Reg.*—"Above Simla," Colonel Bates, in Herb. Kew; Bisáhir—Kunáwar, *fide* Clarke in Rev; *Kangra V. Dist.*—Harrbágh, Edgew. in Herb. Kew; Dharmsála 10,000′, C. B. Clarke No. 24,51, 1874.

N.-W. P.: *T. Garh.*—Lev. 1872; Kidár Kánta Mt. 8-9000′, Herschel 1879, 10-11,000′, Duthie 1879, and between Manma and Barahát; *Brit. Garh.* 7-11,000′ (two stations) P. W. Mackinnon 1881; *Kumaun*—above Dwali 9,000′, S. and W. 1849; Mundul 7,000′, Davidson 1875; Gori Valley—below Askot 3-4,000′, Duthie No. 3629, 1884; Pindar Gorge—above Dwáli 8,500′, Trotter 1891; Mangalia Gor 7,500′, MacLeod 1893.

DISTRIB.—*Asia*: N. Ind. (Him.) Nepal, *Wallich*; Sikkim and Bhotán.

I have not the slightest hesitation about separating this plant from *A. auriculatum* Sw., for not only the shape of the pinnæ, and the cutting of them, but the venation is different in the two. Also I think the stipes of *A. auriculatum*, are the shorter, and the scales on them are pale drab instead of rich brown, with darker centres; they are not so broad and ovate as those on *A. marginatum*, and they do not extend so far up the stipe and rhachis. In *A. marginatum*, there are fibrillose or hair-like scales mixed with the broad ones. The rhizomes of both species are erect or suberect, and stipes densely tufted. *A. auriculatum* is thinly herbaceous in texture, and dries a dull dark green colour: *A. marginatum* is very coriaceous and shiny, with a metallic sheen on the upper surface. The under surface of *A. auriculatum* is nearly glabrous, having only a few small linear scales on the costa: that of *A. marginatum* is always more or less covered with a myriad of very minute pellate or broadly ovate, short, brown, adpressed scales, situated on the veins and veinlets, which, without a lens, look like mere dots: but on some large fronds I see fibrillose or chaffy scales, like those on *A. lentum*, Don (see below). The "Synopsis" says the lower veinlets of *A. auriculatum* are in groups of three, but nothing as to those of *A. marginatum*. I find that the system of venation is quite different in the two plants. In *A. auriculatum* the veins are obscure on the upperside; but they can be made out on the underside in young fronds, and

it is then seen that they are very few in a group, and that the sori are generally placed on the short *inferior* veinlets of the groups which take off nearer the costa than the margin, and that these veinlets seldom, if ever, go beyond the sori—see Beddome's drawing, F. S. I., t. 120. Occasionally the sori are medial on a vein which reaches the margin. In *A. marginatum* the veinlets are so numerous in the narrow groups that their number is not easily counted with a lens ; it appears, however, to be from five to seven, and all reach the margin. All round the margin is a pale-coloured fringe, mucronately toothed in correspondence with the veinlets, from which feature I conjecture Wallich named the plant. In *A. auriculatum* I see no such margin. In both species the auricle at base of pinnæ has a distinct costa or pinnated vein ; but in *A. marginatum*, this auricle is broader and has more veinlets than in the other species. Finally, though in *A. auriculatum* large fronds are distinctly but shallowly lobed or serrated in correspondence with the groups of veinlets, even the smallest in *A. marginatum* are generally so ; and in large fronds this is carried so far that the frond becomes quite bipinnatifid nearly to the secondary rhachis,—the distance between the groups of veins becoming greater in order to admit of this. I first observed this in some of Mr. P. W. Mackinnon's specimens from British Garhwal, which, when collecting them, I believe he identified with the simple narrow form and named *A. auriculatum*, var. β *marginatum*, Wall., or *A. aculeatum*, var. In one frond I have, 9 in. l. by 2½ in. br., the pinnæ are merely lobed, but in the lowest pair the auricles are free to the midrib ; in another (apex wanting), probably 12 in. by 3¾ in. the seven lowest pairs of pinnæ are cut down nearly to the rhachis into rhomboidal-ovate segments, and the upper pairs are diminishingly cut. In two other fronds, 15 and 16 in. l. by 5 in. br., the auricles are quite free, and the pinnæ are less cut towards their acuminate apices, and towards the apex of the frond. Each lobe, or segment, has a costa, and up to eight veinlets on either side, which do not fork ; all run out to the margin. The segments more or less overlap each other. There seems to be a small spinulose tooth for every veinlet, and a larger stiff one for the principal vein of each group. But none of these four fronds is fertile. I should when I received them, have put the three last mentioned fronds under *A. aculeatum*, Swartz, had not Mr. Mackinnon gathered them for *A. marginatum*, and but for the characters given above, which agree with those for that species. A specimen I have from Sikkim, collected by Mr. Levinge, has stipe 8½ in. long, and frond 10½ in. long by 2¾ in. wide near the base, with up to eight pairs of distinct, toothed lobes in the pinnæ, the lowest superior on the lowest pinnæ quite free. This has the characteristic metallic sheen and other peculiarities above described.



J.N.Fitch del.

Clarke Beljs & Co Leith

ASPIDIUM MARGINATUM Wallich.

1. From a Kumaun plant. Pinnae, upper and under surfaces; with portion of margin and scale from under surface enlarged.
2. From a Nuugea V^a^ plant. Pinnae, from two fronds of same plant; with enlargements of margin and scale from under surface.
3. From a Sikhim plant. Pinnae with enlargements of margin, and scale from under surface.
4. From a Brit. Garhwal plant. Pinnae with enlargements of margin and scale from under surface.

Going through the collection of Ferns in the Kew Herbarium, I have found no difficulty in distinguishing between these four species—

1. *A. auriculatum*, Swartz.
2. *A. marginatum*, Wall.
3. *A. lentum*, Don.
4. *A. obliquum*, Don.
   = *A. cæspitosum*, Wall.

I have gathered only the two last of these, and taking them only, whether in the field or in the Herbarium, I think it would not occur to a casual observer that they were so nearly connected as to be merely varieties of another fern; they are as different from each other as any two species of the same genus can be. But large fronds of No. 4, as seen in a Herbarium, have a superficial resemblance in cutting to fronds of No. 1; and there is at least one character in common between No. 4 and No. 2. Also there is one character common to all four species, which is that they all have auricled pinnæ; but that is the almost invariable characteristic of the subgenus (or genus) *Polystichum*. I take it that it was the result of No. 1 having been given the specific name—*auriculatum*, by Swartz that species subsequently described and differently named by other collectors and authors, but which also were auricled, were afterwards, by authors who had not gathered the plants, united with, or given as mere varieties of the first described plant, *A. auriculatum*. Had Swartz named his species after any other feature of the plant than its auricle, or after, say, "The man in the street," this confusion between the four species might never have arisen, and certainly could not have between Nos. 3 and 4 at least. The chief differences between Nos. 1 and 2 have been mentioned above, and the distinguishing characters of Nos. 3 and 4 will be mentioned in their proper places. Returning to No. 2, *A. marginatum*, I have to add that I have the simple form with fronds varying in size from 4 in. l. by ¾ in. br. to 14 by 4½ inches; and one incomplete frond from Sikkim must have been at least 20 inches in length; in these the auricle is not free, and the rest of the pinna is not very deeply lobed. The more compound form has fronds not longer than the other, but often much broader,—9 inches broad in one specimen in Kew, from the Rattong Valley in Sikkim (J. D. H., Jany. 7th), and quite bipinnate, though the secondary rhachis is winged in the upper part of the pinnæ. The pinnules are rhomboidal-ovate, sharply and stiffly spined on the apex, and once or twice spined on the sides.

My Chamba specimens, from Mr. McDonell, are whole plants, with three to seven fronds each, and they show the plant to be dimorphous, with the fertile fronds considerably smaller than the sterile, but with the stipes not much shorter.

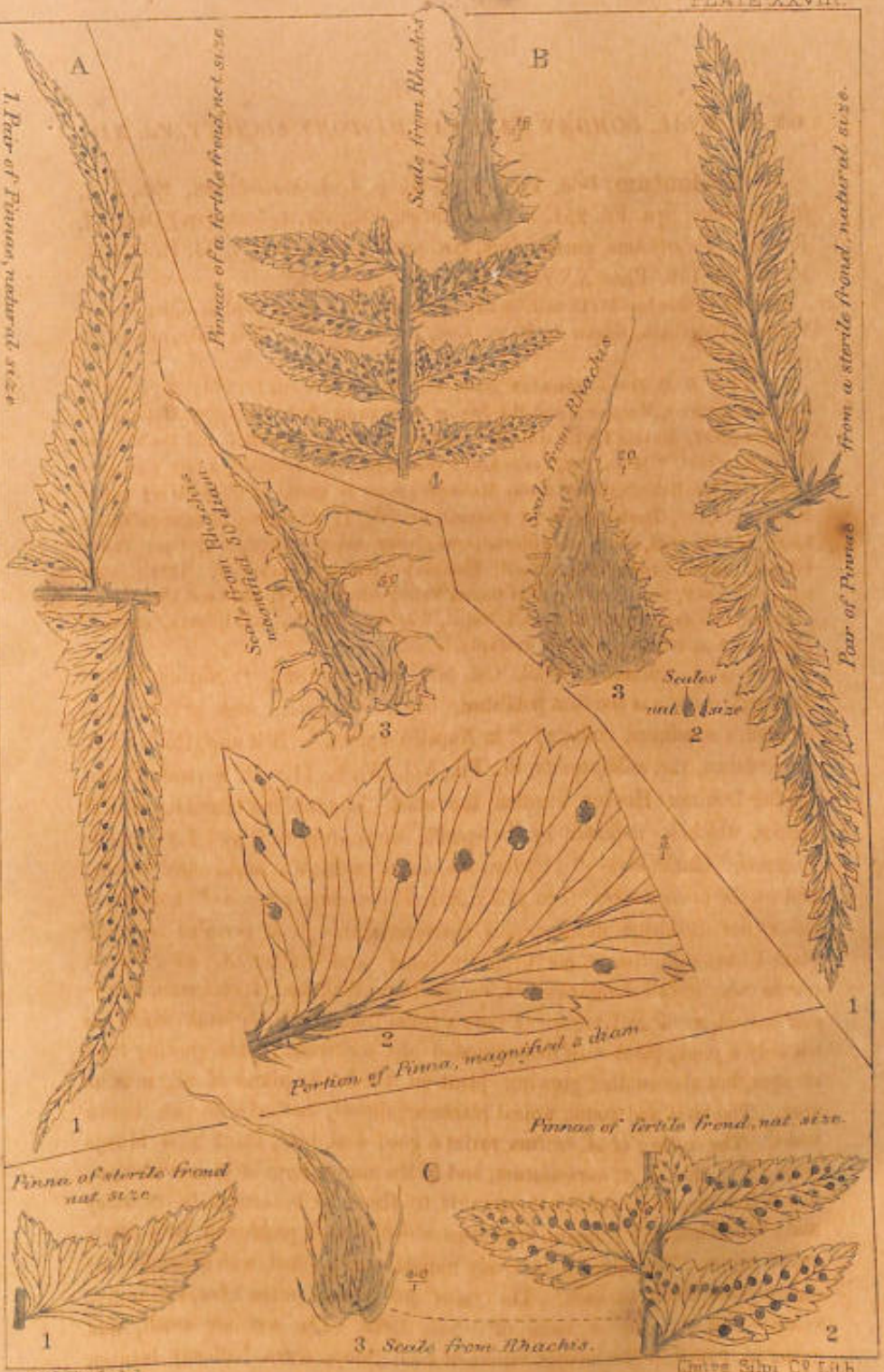
5. **A. lentum**, Don, Prod. Fl. Nep., p. 4. *A. auriculatum*, Sw., γ *A. lentum*, Don; Syn. Fil. 251. *A. auriculatum*, Sw., var. 4, *lenta* (sp.) Don, Cl. Rev. 507. *Polystichum, auriculatum*, Sw. var. δ *lentum*, Don, Bedd. H. B. 204. F. B. I., t. 136. Plate XXVIII, B.

PUNJAB: *Chamba*—McDonell, in List of Chamba Ferns identified at Kew; Kangra V. Dist.—Harrabágh, Edgew. in Herb. Kew, ex. Herb. Hort. Bot. Calc., named *P. radicans*.

N.-W. P.: *D. D. Dist.*—Sowarna Nála 4-5,000′, Mackinnons 1878-79; *T. Garh.*—Bhatauli, between Mussooree and the Jumna on road to Chakráta 4,500′, Hope 1886; Phedi 4-5,000′, Duthie 1881; collected also in 1878 by Herschel and Duthie and ticketed by both "Mussooree," as is also a specimen from H. Chase, 8,000′ elevation, recd. 1878 (Mr. Baker's ticket): *near* Mussooree must be meant in these cases; below Mussooree 5,000′, Gamble 1895 (at Bhatauli probably); *Kumaun*—Rámganga Valley 2,600′, S. & W. 1848, No. 2, *Aspid. radicans*; near Askot 4-5,000′, and Gori Valley 4-5,000′, Duthie 1884; Chipla, coll. Ramsukh (Duthie's collector) 1888; near Lohughát 5,000′, Trotter 1891; Gori Ganga Valley—Buin 7,500′, MacLeod 1893.

DISTRIB.—*Asia*: N.-Ind. (Him.) Nepál, *Wallich*; Sikkim and Bhotan, common Assam—Khasi Hills from 1,500′ upwards.

This is *A. ocellatum*, Wall. Cat. 360, in Herb. 1823, "Napalia 1820." D. Don's name was the first published, but his description was written from Wallich's specimens collected "in Napaliæ alpibus." It is also Hooker's *A. auriculatum*, var. *subbipinnata*, Sp. Fil., Vol. IV., p. 11. It is strange that neither Don nor Hooker mention the chief distinguishing character of this species, which is indicated by the specific name given to it by (?) namely, *radicans*. Clarke says—"This fern frequently produces a subterminal rooting bud on the main *rhachis*; then it is called *Polystichum radicans*," but neither Baker nor Beddome mentions this character; though it pertains to every plant I have seen, though not to every frond, and neither *A. auriculatum*, nor its other so-called varieties—*A. marginatum*, Wall. and *A. obliquum*, Don—ever have it, so far as I know. I have a frond from Tehri Garhwál, which has not only a young plant with four pinnated and soriferous fronds growing from its apex, but also another growing plant on the lowest pinnæ of all, near its apex. The buds and young apical plants are densely clothed with pale brown scales. The cutting of *A. lentum* varies a good deal, but I think it is always deeper than that of *A. auriculatum*, and of the simple form of *A. marginatum*, and is from one to two-thirds downwards to the midrib, except in Strachey and Winterbottom's Kumaun specimens which, though proliferous, have nearly entire pinnæ. The lobes are obliquely rounded and pointed, with generally only one aristate tooth to each. The veins are pinnate in the lobes, two to five veinlets in a lobe, one or more of which forks. The *sori* are small, and uniserial, placed on the inferior veinlet of each group, about half-way between costa and margin, and the sometimes quite free falcate auricled segment next



J. N. Finch del.

Chitw. Silpi Co Lith.

A. ASPIDIUM AURICULATUM, Swartz.

B. ASPIDIUM LENTUM, Don.

C. ASPIDIUM OBLIQUUM, Don.

the main rhachis has a pinnated costa with a row of sori on each side of it : involucres rather fugacious. The auricles are sometimes themselves auriculate. The scales on stipe are large, broad, dark-brown with lighter margins, or sometimes pale concolorous, mixed with which are pale fibrillose scales ; and both kinds of scales extend up the main rhachis, diminishing in size upwards. The costa and veins of the pinnæ are, on the underside, to some extent clothed with small fibrillose or chaffy scales, which, being inconspicuous, are liable to be overlooked. These are quite different in shape and appearance from the much smaller round or ovate scales, which generally thickly cover the under surface of *A. marginatum*.

6. **A. obliquum**, Don. Prod. Fl. Nep. 3. *A. auriculatum*, Sw. β, *A. obliquum*, Don., Syn. Fil. 2nd ed. 493. *A. auriculatum*, Don., var. 3 *cæspitosa*, Wall. Cat. 367, Cl. Rev. 507. *Polystichum auriculatum* L., var. γ *cæspitosum*, Wall., Bedd. H. B. 204. F. B. I., t. 33. Plate XXVIII, C.

PUNJAB: *Chamba*—Rávi Valley 7,000′, McDonell ; *Kulla*—7,000′, Trotter, Coventry. *Simla Reg.*—above Simla, Colonel Bates ; Edgew. 1834 ; near Simla 4,000′ (?) Herschel; "very rare within my limits and area. I have found it but once, at 4,800′." Blanf. in List.

N.-W. P. : *D. D. Dist.*—Jaunsar 7-8,000′, Gamble ; Mussoorie 5-6,500′, plentiful in several places on wet rocks in forest ; *T. Garh.*—Kidár Kánta Mt. 8-9,000′, Herschel ; *Kumaun*—near Naini Tál 6,000′, Hope 1861, Levinge 1875.

DISTRIB.—*Asia* : N. Ind. (Him.) ; Nepál *Wallich* ; Sikkim and Bhotan. Assam —Khasia 3-4,000′, very common ; N. Manipur 3,500′, *Clarke*.

The stipes in this species are densely tufted, slender, and, except for a few greyish brown scales near the base, extending a short distance up the main rhachis, are, with the rhachises and the surfaces of the frond, glabrous. The plants vary much in size, according to situation and the degree of moisture they are favoured with.

Mr. Baker says—"Seldom above ½ ft. high": the other books give no dimensions. I have fertile fronds with stipe and frond together less than 2 in. high, by ½ in. broad, and all sizes between that and a total height of 22 inches, of which the stipes are 8—9 inches, and the fronds 12—13 in. long by 2—2½ in. broad. The shape and cutting of the pinnæ vary very much, from rhomboido-ovate, nearly as broad as long, *in small plants*, to 1¼ in. long by ½ in. broad, sharply, pointly and distinctly auricled at the base and greatly cut away on the inferior side, *in large plants*. The pinnæ are sometimes merely crenate, sometimes narrow and falcate, and the barren fronds are sometimes sharply toothed at the end of every veinlet. The pinnæ are hardly ever distinctly lobed, and occasionally they are in shape almost like the simple form of *A. marginatum*.

The system of venation in *A. obliquum* is the simplest in the whole group, and in the absence of distinct lobes to the pinnæ may best be described as—pinnate on the costa, with veinlets forking once or twice. The venation is

rather obscure: the superior veinlets, which alone are usually soriferous, often appear not to extend beyond the sori, but sometimes reappear near the margin and run out to a small tooth near the sinus where there is a trace of a lobe. In large pinnæ the auricle has a pinnate costa and double row of sori. A distinguishing character of the plant, though shared with *A. marginatum*, is its sub-dimorphism. The fertile fronds are generally much shorter than the sterile ones, which is contrary to the general habit of dimorphous ferns. Sometimes this may be only apparent, and be due to the smaller fronds of the previous year being persistent after new sterile fronds have sprung up; but I have short young sterile fronds also. Occasionally, in large plants at least, young fertile fronds are seen as long as the sterile ones, which are generally in the majority. Whether the dimorphism be real or only apparent and not invariable, it is a character of the plant.

7. **A. ilicifolium**, Don., Prod. Fl. Nep., p. 3; "Fronde pinnatâ-lanceolatâ; pinnis alternis ovato-oblongis coriaceis rigidis mucronatis nitidis brevissime stipitatis bi-v-tricuspidatis spinulosis subtus lepidotis at latus superius lobo lata auriculatis, stipite rhachique semi-teretibus squamosis. Hab. in Nepalia, Wallich.

"Frons sesquipedalis, Pinnæ pollicem v. sesquipollicem longæs, semi-nuciam latæ. Sori magni, superiores biseriati, inferiores imordinate associati."

A. ilicifolium, Don, Syn. Fil. 251; Cl. Rev. 508. *Polystichum ilicifolium*, Don, Bedd. H. B. 206. F. B. I. t. 31.

PUNJAB: *Chamba*—Rávi Valley: Sao Nala 8,000′, McDonell; *Kangra Vy. Dist.*—Dharmsála 10,000′, C. B. Clarke; *Kulu*—Outer Soráj 7,000′, Trotter; Simla Reg.—ridge E. of Simla; Theog to Baghi 5-10,000′, common: Edgew., Bates, Falconer ("N.-W. I."), Gamble, Collett, Blanford, Hope, Trotter, Bliss, Lace.

N.-W. P.: *D. D. Dist.*—Jaunsar; Soshol 8,500′, C. G. Rogers; *Garhwal*—Pábar Vy, Jacquem., Nos. 722 and 2253; *T. Garh.*—Nág Tiba Mt., Mackinnons 1878, W. Gollan 1881; Kidár Kánta Mt., 10-11,000′, and Bok Mt., Duthie 1878; Jamnotri 9-10,000′, Duthie 1883; Rikishin 9,000′, C. G. Rogers 1891; Gangar 7,500′, Gamble 1893; *Brit. Garhwal*—Ramri 8-9,000′, Duthie 1885; *Kumaun*—R. Blink. (Aspidium pungens, Wall. in Herb. 1823); Madhari Pass 9,000′, S. & W.; Pinsara, Davidson 1875; Kali Vy. 8-9,000′, and above Sosa 8-10,000′, Duthie 1884-86; Gori Ganga Vy. 9,000′, MacLeod 1893.

DISTRIB.—*Asia*: N. Ind. (Him.), Sikkim 7-10,000′; Nepal, *Wallich*.

I have quoted Don's description as showing that the plant he described as A. ilicifolium,—which is Wallich's *A. pungens*, Cat. 368,—had short pinnæ merely lobed and auricled. I cannot admit that the pinnæ are ever again pinnate as Beddome says they are, though the auricle is sometimes quite free; indeed, I think Beddome would now put his more compound plants under his

var. acanthophyllum (sp. Franchet) of *A. aculeatum*, which—opposing Baker, who in his Summary of New Ferns accepts it as a species—he sets up in the Supplement to his Handbook.

In the "*Synopsis Filicum*" this fern is characterised as "quite doubtfully distinct from some of the forms of *auriculatum* and *aculeatum*." I know no form of *A. auriculatum* which *A. ilicifolium* in the least resembles; and it certainly is very different from the three species I have above separated from it; and Mr. Clarke suggests no resemblance to any of these, though he says there are intermediates between *A. ilicifolium* and *A. aculeatum*, which no one up to the time when he wrote had ventured to name. There is no doubt a great resemblance to *A. rufo-barbatum* Wall. in the cutting (of segments, not of frond) and texture of *A. ilicifolium*, and since Mr. Clarke wrote M. Franchet has "rushed in" and named a Chinese plant *A. acanthophyllum*. On seeing the scrap of this in Kew I adopted this name for a somewhat common N.-W. Himalayan plant, to which I had been giving the variety names of *contortum*, and, afterwards, *pseud-ilicifolium*. Holding to my present scheme of admitting no varieties in ferns except cultural ones, and not being able to see that any one of these three ferns is a mere form of another of them, I keep them separate as species; and I would describe *A. ilicifolium* as follows:—

> "*St.* tufted, often densely so, 2—9 ins. long, slender, clothed sometimes sparsely with large broad scales, mixed sometimes with fibrils; *fr.* 6—10 ins. long $\frac{3}{4}$ in. to $\frac{1}{4}$ in. broad; *pinnæ* subdeltoid or broadly lanceolate, $\frac{3}{16}$—$\frac{5}{8}$ in. long, apex mucronate, with a large mucronate auricle below generally nearly, and sometimes quite, free in large specimens, and several mucronate lobes above, pinnæ becoming very distant and rather smaller towards the base of frond; *texture* very coriaceous; both surfaces naked, except for a few scales on the underside of the costa; *rhachis* slender, clothed with narrow hair-pointed scales; *veins* immersed—best visible on upper side, forked once or twice in the lobes; *sori* one in each lobe, and in two rows in the auricle, large in proportion to the size of the segments."

Blanford was sceptical as to the claim of this fern to specific rank, and considered it an alpine form of *A. aculeatum*, graduating into *A. rufo-barbatum*; but he evidently included *A. acanthophyllum*.

8. **A. acanthophyllum** Franchet, in Bull. Bot. Soc. France 1885, 28; Baker in Summary of New Ferns, Ann. Bot., Vol. V., No. xviii. *Polystichum aculeatum, var. acanthophyllum* (Franchet), Bedd. Suppt. H. B. 43. Plate XXIX.

PUNJAB: *Hazara Dist.*—Black Mt., Trotter in List; near Chittabat, Gatacre 1888; *Chamba*—Dalhousie 7500′, Ravi Vy. 8000′, McDonell; "Chamba" J. Marten 1898;

Kangra Vy. Dist.—Dharmsála 5500', Trotter; *Kullu* 6-8000', Coventry; *Simla Reg.*—Simla, Hope 1871; Hat Mt. 9000', Cheog Forest 8000', Mahásu 8000', Gamble 1876-78; Forest above Bulsun, Collett 1877; Simla 8000', common, Blanf. in List (under *A. ilicifolium*, "bipinnate form"); near Mashobra 7000', and Theog. 8000', Hope 1886; Bághi 9000', Trotter 1887; Simla—Jako Mt. 7700', The Glen and Mashobra, Bliss; Bághi Forest, Bliss 1891; Raiengar Forest 8000', Gamble 1898.

N.-W. P.: *D. D. Dist.*—Jaunsar—Kathián 7000', and Mandáli Forest 8000', Gamble 1891-93; *T. Garh*—9000', Lev. 1872, Datuni 7000', Gamble 1893; *Kumaun*—Kháti 7200', S. & W. 1848; Káli Vy. 7-8000', and near Sosa 8-9000', Duthie 1884-86; Dankuri to Kháti 75-8000', Trotter 1891; Gori and Rámganga Vys. 7-8500', MacLeod 1893.

DISTRIB.—*Asia*: N. Ind. (Him.) Sikkim 12,000', *Lovinge's* collr. 1882. China—Yünnan, *Delavay*.

I noted this fern, as having a distinct individuality, when at Simla in 1886; and when at Kew in 1888 I found a poor specimen or two, from Yunnan, named as above, which seemed to be the same. The stipes are always short—often much shorter than Beddomes length, 3—4 ins. The pinnæ are never so short and simple as those of *A. ilicifolium*. The fronds seem seldom to grow straight up, but curve sideways: Trotter describes them as—"sickle-shaped, radiating, spreading-out on the surface of rocks; and connecting *rufo-barbatum* with *ilicifolium*." Sometimes the fronds are bent like the upper part of a note of interrogation (?) I think it necessary to give this frond specific rank in order to prevent *A. ilicifolium* being said to pass into *A. rufo-barbatum*, to which it is totally unlike in everything except shape and spinosity of the ultimate segments.

9. **A. Thomsoni** Hook.; Syn. Fil. 251; C. R. 508. *Polystichum Thomsoni* Hook., Bedd. H. B. 206, F. B. I. t. 126.

KASHMIR: Pushána 6500', Winterbottom 1847, No. 81; Chittapáni Vy. 75-8000', Trotter; *Kishtwar*, W. S. Atkinson 1872.

PUNJAB: *Chamba*—Upper Chénab Vy., Chiri 10,000', Baden-Powell 1879; Rávi Vy., Chatri Forest 6000', McDonell 1882; Sach Pass 7500', Rávi Vy.—Barmaur 7000', and 9000', McDonell 1885; *Kullu*—Babbu Pass 10,000', Trotter 1887; *Simla Reg.*—ridge E. of Simla, Matiána to Hatu Mt., and Kunáwar, 8-10,000', T. T., Bates Gamble, Blanf., Hope, Trotter, Bliss, Lace; Simla—The Glen, 6-6500 Bliss 1890.

N.-W. P.: *D. D. Dist.*—Jaunsar, Deoban 9000', Herschel 1879, Mrs. J. Sladen 1880; Lokandi 8-8500', Mandáli Forest 9500', and Karáma 9500', Gamble 1891, '93 and '94; Mussooree, Dr. Bacon, Duthie 1877. (These two last are probably from Tehri Garh; I have never seen this species from in or near Mussooree.) *T. Garh.* 7-10,000', Levinge, Mackinnons, Duthie, Gollan; *Brit. Garh.* above Ramri 8-9000', and near Kuári Pass 11-12,000', Duthie 1885; *Kumaun*—Ralam 12,000', Tola, Rilkot, and near Dwáli S. & W.; Byáns—Kali Vy. 9-12,000' (5 stations) Duthie 1884-86; Pindar Gorge—near Dwáli 8000', Trotter 1891; Rámganga and Gori Vys. 5-10,000', Macleod 1893.

DISTRIB.—*Asia*: Thibet—Indus Vy., Shayok, 7-8000', *T. T.* N. Ind. (Him.) Sikkim 9-13,000'.



N. E. Brown delt. K. P. Dass lith.

ASPIDIUM (§ POLYSTICHUM) ACANTHOPHYLLUM Franchet.

1. Part of a plant, natural size.
2. Pinna, enlarged 3 diam.
3. Indusium, enlarged 10 diam.
4. Scale from the base of the stipes, enlarged 3 diam.
5. Scale from rachis, enlarged 3 diam.

I cannot see much, if any, resemblance of this fern to *A. Prescottianum* Hook; though Mr. Clarke says the two species are no doubt very close, and Colonel Beddome that *A. Thomsoni* is very near the smaller forms of *A. Prescottianum*, and that it is very probable that they are only varieties of the same plant (name not stated). *A. Prescottianum* is a comparatively large fern, and grows to dense bushy thickets; it is very scaly all over, shaggy almost. *A. Thomsoni* is a small plant, growing on rocks, or on rocky ground in forest, but each plant separately, so far as I have seen. The largest plants of *A. Thomsoni* I have seen are Mr. Gollan's from Nag Tiba Mt. in Tehri Garhwal, one frond of which is $17\frac{1}{2} \times 1\frac{1}{2}$ ins., and it is just as much *A. Thomsoni* as is the smallest of all those cited above. But there is difference between some of these: McDonell's from the Sach Pass in Chamba and Duthie's No. 101 from the Ganges Vy. have stipes and rhachis almost glabrous, and quite a different cutting of frond from that of most others—like some one's *var. alpina* of *A. Prescottianum* from Sikkim; and some at least of the sori of Duthie's plant are nephrodioid. These cannot, however, be Clarke's *var. gracilis* (*Lastrea gracilis* Moore), for that is said to have fronds smaller than those of typical *A. Thomsoni*, whereas Duthie's is a large plant with fronds 10 ins. long by $1\frac{1}{2}$ ins. broad. Another form has broadly falcate and auricled pinnæ with sharp teeth, much cut away at the base on the lower side; while another has straight, almost dimidiate pinnæ, and segments spreading on both sides; but these are intermediate forms, and the habit of all is alike.

[*A. aculeatum* Sw. is attributed in all the books to the Indian Region. The *Synopsis* says—"Hab.—Throughout the world"; but gives as a synonym *A. squarrosum* Don (*rufo-barbatum* Wall.), which "has the rachis densely clothed with reddish-brown fibrillose scales," and we are left in doubt under which of the three varieties it recognises, namely α *A. lobatum*, Sw., β. *A. aculeatum*, Sw. and γ *A. angulare* Willd., *A. squarrosum* ought to be placed. From the fact that var. β is given in the *Synopsis* as a variety of *A. aculeatum* Sw., *i.e.*, as a variety of itself, I gather that the species 18, *A. aculeatum* Sw., of the *Synopsis* is a theoretical conception of the authors'; but it ought to have been given a distinctive specific name, instead of being fathered on Swartz, and I would suggest *metaphysica*, *hypothetica*, or *theoretica*, or some equivalent name, to indicate that the plant has no existence in nature. Swartz did not include *A. lobatum* under *A. aculeatum*, but gave it as a separate species, with only "Anglia" as the habitat.

Mr. Clarke says *A. aculeatum* Sw. (var β of the *Synopsis*) is very common in the Himalaya and Khasia, alt. 2,000′—15,000′; and he

gives *A. rufo-barbatum* (sp.) Wall. Cat. 369, as var. 2 (out of 6 varieties), and says it is common from Kashmir to Bhotán, and also in the Nilgiris (but not from Khasia). Beddome, in his Hand-book, says *Polystichum aculeatum* Sw. is found "throughout the Indian Region on the mountains," (also throughout the whole world); and he gives (among 7 varieties) var. γ *rufo-barbatum* (Wall. Cat. 369), F. S. I., t. 121, with habitats—"Nilgiris and Western mountains of South India; Himalayas, from Kashmir to Bhotan."

As to the other varieties mentioned in the *Synopsis*, Clarke gives as his var. 1, "*lobata* (sp.) Engl. Bot., t.1563. Fronds narrowly lanceolate; pinnæ hardly pinnate, the lower secondary pinnæ sessile or decurrent. Throughout the Himalaya, but much more rare than *A. aculeatum* type." Beddome quotes verbatim from Clarke, but omits the final remark as to rarity. These authors appear to limit the distribution of *A. lobatum* to the Himalaya.

Var. γ *angulare*, Willd., of the *Synopsis* is not even mentioned by Mr. Clarke, and this seems to have led Colonel Beddome to give merely "Nilgiris and Western mountains of South India" as the habitats of his *var.* ε *angulare* (Presl., Newm. 173), which he thus describes:—"Lax and of thinner texture" (than of what?), "pinnules smaller, more numerous, orbicular, rhomboid, mostly auriculate, the serratures setiferous rather than spinulose." t.122. This seems to apply to much of the Himalayan material which Clarke seems to have considered as typical *aculeatum*, but which is all quite different from what is considered as *A. aculeatum* by European botanists.

Clarke's *var.* 3 *semifertilis* (base of the frond fertile, upper ⅓ barren; Sikkim: not very common), which is adopted by Beddome as var. ζ *semifertile*, is probably merely a local form of one of the soft Himalayan plants.

With var. 4 *mucronifolium* (sp.) Bl.,—Beddome's var. λ *mucronifolia* Bl.,—I need not concern myself, as it is not said to grow in North-Western India: nor, for the same reason, with Clarke's var. 5—Beddome's var. ν —*biaristatum* (sp.) Bl. Clarke's var. 6, *setosa*, Wall. Cat. 371—Beddome's var. ο *setosum*—I give below as a distinct species; and Beddome's vars. ι, *anomalum* and κ, *Travancericum*, do not concern me as they have not been recorded from N. India. Other two plants given in the *Synopsis* as synonyms of *A. aculeatum*, namely, *A. luctuosum* Kze., and *A. Tsus-Simense* Hook., I shall give as good species under the first of these names.

Turning again to the three individual plants mentioned in the *Synopsis* as being varieties of the imaginary comprehensive species No. 18, *A. aculeatum*, I find some difficulty in ascertaining their distinguishing characters. Swartz's description is :—

"frondibus bipinnatis, pinnis pinnatis, pinnulis ovatis acutis subfalcatis ciliato-spinosis, subtus pilosis, rachi paleacea, stipite strigoso, Smith britt.

Polypodium aculeatum, *L.*

Polypedium setiferum. Forsk fl. acg. ar.

Pluk. ph. t. 180. f. 1. 3, Moris. p. 14. t-3. f. 15. (Schkuhr l. c. t. 39.—W. M.) Europa. Arabia, Cap. bon. spei."

This shows clearly that the fern Swartz described had ciliate spines on the pinnules, and therefore was soft and not prickly ; but the rest of the description is too vague, and the only substantial difference in his description of his *A. lobatum* is—"*pinnis approximatis.*" Swartz seems to have done little more than transfer Linnæus's plant from *Polypodium* to *Aspidium* ; but Willdenow, only two years later, interpolated in Linnæus's list *A. angulare*, and from his descriptions of that and *A. aculeatum* it is clear that under the new name he recognised a fern with a more compound cutting and a laxer texture than he saw *A. aculeatum* had. He, however, gave only Hungaria as the habitat for *A. angulare*, whereas now it seems to be a very widely distributed species.

E. J. Lowe, in "British Ferns, 1891," the latest authority I can find says :—"*A. aculeatum* Sw.—Pinnules stalklets, with acute angled or wedge- shaped bases ; whilst in *A. angulare* the pinnules are stalked and their bases obtuse-angled. In *A. aculeatum* the fronds are darker and more shining, stouter and more leathery in texture, and the habit of the plant is more erect." Mr. T. Moore, who considered them distinct species, said the chief differences between the two were—the obtuse angle of the stalked pinnule of *P. angulare*, and the acute-angled, or wedge-shaped base of the sessile pinnule of the more divided states of *P. aculeatum*. Mr. James Britten, in "European Ferns," says :—"So far as our experience goes they are not often found together, but they contrast very effectively with each other when planted in a rockery, the stiff upright fronds of *P. aculeatum* towering above the softer and more drooping ones of *P. angulare*." To a sheet in the Kew Herbarium (general collection) marked in Sir W. J. Hooker's handwriting—

"Ireland, D. Moore," and also, in pencil—"*A. Brawnii*, intermediate between *aculeatum* and *angulare*," is pinned a note written by D. Moore, as follows:—

"After considerable attention to *Aspidium lobatum* and *A. aculeatum*, I cannot think them distinct species, though I find they are still retained as such by persons who have no doubt had equally good opportunities of judging. Consequently I shall only state my own ideas on the subject at present, when it appears to me they altogether depend on their places of growth for the slight characters which distinguish them. Whenever I find the species growing in warm shady situations, it assumes the habit of *aculeatum* by having the pinnule slightly petiolate and generally larger. A little further up the mountain glens it becomes lobatum *good*; and when it is found very high the pinnules are scarcely divided at all. *A. angulare* is equally common here" (in Ireland?) "and a very distinct species. I should say there were only two species, *A. lobatum* or *aculeatum*, whichever you like to call it, and *A. angulare*, both rather variable, but their varieties are easily traced to the original."

I understand Mr. Baker now to agree, substantially, that *A. lobatum* is merely *A. aculeatum* in a less developed state; though in the "*Synopsis*" he said that the last mentioned plant is less coriaceous than is the other; and I therefore think I may safely allow the existence of *A. lobatum*, as an Indian fern, to depend upon the existence there of *A. aculeatum*.

Dr. H. Christ, in a monograph—"*Les différentes formes de Polystichum aculeatum* (*L. sub. Polypodio*), *Leur Groupement, et Leur Dispersion, y compris Les variétiés Exotiques*, published in Bull. Bot. Soc. Suisses, Livre III, 1893, has taken quite as wide a view of this group of Polystichum as any of the botanists who have written of Indian ferns; but his treatment of the subject is too deductive for me; it seems only to deepen the haze in which the subject has been enveloped by the profitless effort to bring together under the specific name *aculeatum*, given by Linné, several plants which are abundantly distinct.

In proceeding to deal with the North-West Indian material of this group I shall, in the first place, divide it according to texture, into "coriaceous", hard and tough plants, and "herbaceous", thin and soft plants; and having thus cleared the way, I shall see whether any subdivision of these two categories is necessary. I can find nothing I feel justified in calling *A. aculeatum*, but much that I cannot say is not *A. angulare*.]

A. Texture very coriaceous. Sp. II.

11. **A. squarrosum** Don (*rufo-barbatum* Wall. Cat. 369); Syn. Fil 252, under *A. aculeatum* Sw. *A. aculeatum* Sw., var. 2, *rufo-barbatum* (sp.) Wall., C. R. 509. *Polystichum aculeatum* Sw., var. γ *rufo-barbatum* Wall., Bedd. H. B. 207, F. S. I., t. 121.

I hazard the following as a new and complete description of this species :—

Plants isolated, or united in tufts. *St.* densely tufted, forming a thick rootstock, thickly covered at base with long linear bright chesnut scales from 1 and 2 in. l., gradually succeeded upwards by large broadly-ovate acuminate scales, with more or less broad dark-brown centres, the scales further up resuming the pale self-colour of those at base, and becoming mixed with the pale-coloured long and narrow scales or fibrillæ which in diminishing size clothe the main and partial rhachises and costa. *Fr.* lanceolate-acuminate, sometimes broadest near base, often 2 ft. l., rarely 2½ ft., by 3—9 ins. br.—average breadth perhaps 6 ins., always bipinnate : *pinn.* always broadest at base because auricled, very gradually narrowed to the quickly acuminate apex, always though shortly stalked, distant at base but becoming crowded and imbricated towards apex : *pinnl.* 12—18 pairs, all distinctly stalked except near apex of the frond, close and often overlapping each other at base ; *in simplest form* —rhomboidal with a curved apex or ovate-acuminate, entire and cut away towards the base on inferior side and always broadly auricled on superior side, sharply and stiffly toothed at apex of pinnule and auricle and hardly toothed elsewhere except obscurely on the superior side above the auricle, *in less simple forms* the pinnules prolonged and more or less lobed or pinnatifid with sharp stiff teeth on each lobe or segment on both sides, the lowest of all pinnatifid and sharply toothed ; up to 1¼ in. long, and cut down nearly to the rhachis with several (up to five) pairs of narrow segments ; all lobes or segments furnished with hard sharp mucronate teeth, never merely aristate ; *Texture* very coriaceous, frond heavy ; upper surface glabrous and shiny ; lower—covered on veins with small pale-coloured fibrillæ and occasional shorter and broader minute scales : *colour* greyish green ; *ven.* obscure, best seen on underside : 4—6 groups on each side of the costa, pinnate or forked in the lobes, reaching almost to the margin : *sori* large, crowded, and ultimately extending across several veinlets, absent from centre of pinnæ and apex of pinnule, but occasionally found on auricle ; *receptacle* consisting of numerous persistent fibres in a bunch ; *involucres* large, cucullate, persistent, stalked, with dark centres (the sporangia when ripe spreading widely beyond the edge), veins of involucres radiating and connected by scalariform veinlets.

Don's description, though perhaps fuller and better than those he wrote of some other species, seems either to have been thought insufficient or to have been disregarded by subsequent authors, which must be my excuse for writing a n w one. I will, however, give extracts to show that it does not apply to

A. aculeatum Sw. He says—"6. *A. squarrosum*, fronde lanceolatâ bipinnatâ; foliolis pinnisque alternis subsessilibus oblongo-ovatis mucronatis rigidis glabris nitidisque." . . . "Polypodium spinulosum, Hamilton M. S., nec aliorum. . . "Frons ampla, rigida, tactu aspera." Dón's fern was, therefore, bipinnate, mucronate, rigid, smooth and shining, but rough to the touch.

Punjab: *Chamba*—6000' McDonell; *Kangra Vy. Dist.*—Dharmsála 6000', Trotter; *Kullu* 6—8000', Coventry; Mandi State 7000', Trotter; *Simla Reg.* 5500'—8000', common, Hope, Gamble Blanf., Duthie, Bliss, Lace.

N.-W. P.: *D. D. Dist.*—Jaunsar 5500' and upwards, Sundar Lál, C. G. Rogers, Gammie; Mussooree 5-6500', very common; *T. Garh.* above Dhakára, Duthie's colln. 1879, Ganges Vy. 7-8000', and Phedi, Duthie; *Kumaun*—common 5-8500', S. & W., Hope, Davidson, Trotter, Macleod.

DISTRIB.—*Asia*: N. Ind. (Him.)—Nepál, Sikkim and Bhotán. Assam—Jakpho. Mt.; Kohima 6000', *Clarke*.

Occasionally the whole of the scales and fibrils or stipes and rhachis are brown and not rufous, faded perhaps. The cutting of the ultimate segments the coriaceous shiny nature of the frond, and the stiff mucronate spines sufficiently distinguish this species from the other Himalayan plants which have been called *A. aculeatum* and *A. angulare*. The plant produces numerous fronds annually, grows to large bushes, and is evergreen in spite of frost and snow in winter. Sori are generally wanting on the lower third or quarter of the frond, but often also on the upper part. The involucres sometimes overlap each other.

I cannot follow Clarke and Beddome, when they say—"frond usually reddish." The rhachises and costæ are covered below with the red beard from which Wallich named the plant; but the small fibrils on the veins are not enough to colour the surface of the pinnules, and the upper surface is either quite glabrous, or has only a few fibrils on the costa.

I think what Clarke calls *A. aculeatum*, var. 1, *lobata* (sp.) Engl. Bot., must be the very narrow form of *A. squarrosum* of which I have specimens from the Simla Region, Jaunsar, and Tehri Garhwál. The pinnules are small, simple, ogival at apex, very close together, and imbricated, and are less distinctly stalked than in the normal form—reduced to lobes in the upper part. The scales and fibrillæ are brown rather than rufous; and the texture is rather thicker than in the type, and the fronds dry a brown colour. In all other respects the plant is identical with the present species, and is antithetical to the so-called *A. lobatum* of European botanists.

B. Texture herbaceous.

12. **A. angulare**, Willd. Sp. Pl. 1810 V. 257; "*Frondibus* bipinnatis, pinnulis oblongis subfalcatis mucronato-serratis sursum auriculatis, infima elongata subpinnatifida, stipite rachibusque paleaceis. *W. Habitat in* Hungaria.

"*Stipes* tri—vel quadripollicaris paleaceus. Rachis universalis atque partialis paleacea sed pales tenniores. *Frondes* sesqui-vel bipedales bipinnatæ. *Pinnæ* tripollicares et longiores. *Pinnulæ* oblongo-subfalcatæ acutæ basi cuneatæ sursum acute auriculatæ, serratæ, serraturis mucronatis. *Pinna* infima superior reliquis longior pinnatifido-serrata. *Sori* subrotundi. Affine A. aculeato sed præter formam pinnularum præcipue *pinnula* infima pinnatifida et habitu laxiore diversum. W."

KASHMIR: *Chittapani Vy.* 8000', Trotter; Dardpura 5-7000', and Aud'rbug 7000', MacLeod; Pir Panjáb and Gulmarg 7000', Gammie 1891.

PUNJAB: *Hazara Dist.*—Black Mt., Kalim Gali 8000', Duthie 1888; near Kalapáni 6-7000', Trotter 1890.—*Chamba*—McDonell, comm. 1885; above Chamba town 7000', Blanf. 1886; *Kullu* 6-8000', Coventry 1894; *Simla Reg.*—Simla, eastward to Hatu Mt. 48-8300', Hope, Blanf., Bliss; Bashahr Forest 8000', Lace.

N.-W. P.: *D. D. Dist.*—Jaunsar 43-8000', Brandis, Duthie, C. G. Rogers, Gamble; Mussooree 6500' and downwards, very common; in the Dún (Valley)—Nalota Khála 2500' or more, Hope 1880 and 1891, some very large; T. Garh.—Nila Vy. 11—12,000'! Duthie 1883; Sahlra Forest 7000', Deota 5000' and Bamsu 6000', Gamble 1893-95; *Kumaun*—near Karim 6200', and Naini Tal, S. and W. 1848, and Hope 1861; Rálam Valley 11-12,000', Duthie; Lohughát 5000', Trotter; Ramganga Vy. and elsewhere 5000', MacLeod.

DISTRIB.—*N. & Centr. Amer.* *Eur.*: common. *Asia*: near the Black Sea; N. Ind.—Sikkim; Assam—Khasia.

After having renewed acquaintance with the living European plant, and having gone through the specimens of it and from all habitats, in the Kew Herbarium, including the British collection of the late Mr. Thomas Moore which shows what a wonderfully variable species it is (without taking into account mere sports and abnormal developments), I find I cannot definitely separate from *A. angulare* any of the Himalayan material which has been placed under that species. But I will indicate where differences occur. In my own collection I have, from North-Western India, 32 sheets, on which are 36 specimens, some of which consist of 2, 3, and even more fronds, besides unmounted duplicates.

1. *As to scales.* Some of the Himalayan specimens have no broad ovate scales on the stipes—such as the European specimens all have: many instead are clothed near the base with long linear-acuminate scales, which pass into mere hairs higher up, and along the rhachis. These scales and hairs are generally dark-brown or nearly black, but occasionally they are of lighter, dull-brown colour. I have, however, seen hairs on a few British specimens. Some specimens have large, broad, ovate-acuminate, hair-pointed scales, mixed with narrow linear-acuminate scales, which become almost hairs on the rhachis: the broader scales are bi-coloured, but the very dark-brown colour of the centre seems to belong to the upper surface, and the under surface and narrow margins are

pale ; the narrower scales are also, sometimes at least, bi-coloured. The scales of the European plant, whether broad or narrow, are generally pale, self-coloured, or if bi-coloured merely with a darker shade towards the centre.

2. *Habit of plants.* The European plant has fronds with comparatively short stout stipes, thickly clothed with scales all the way up, forming a stout compact crown, from which very numerous fronds spread out at a greater or less angle from the perpendicular. The Himalayan plants appear to have comparatively few fronds, generally with long stipes which quickly taper off and are not densely clothed far above their bases ; but sometimes stipes are only 6 in. long to a frond 22—25 in. long by 9—10 in. broad. Growing on steep ground in forest, as they generally do, the fronds of the large plants (or of the large broad form), being of lax habit, bend downwards, and are sometimes found overhanging and dipping their tips into the rills which run down the rocky hill sides. The fronds vary much in size and shape, even in the same station. 5 ins. to 6 ins. is a common length for the middle pinnæ of a frond, and the lowest pinnæ are often not much reduced ; a lanceolate frond is rare, and then the lowest pinnæ are not mere auricles. I have the upper three-fourths or so of a frond I gathered in the Dehra Dún in 1880 (why now incomplete I cannot recollect) which has pinnæ fully 9 ins. long, and this portion of the frond is 23 ins. long. Fronds from Mussooree, 5-6000′ alt., reach to 34 ins. in length by nearly 1 ft. in breadth, unstretched, beside stipes 13—15 ins. or 4 ft. in total height. But I have, also from Mussooree, other fronds of mature plants, fertile, with simpler cutting, which are less than 1 ft. high, including the stipes, by only 3 ins. broad. All sizes between these extremes are met with. The British plant rarely, I think, has fronds over 6 ins. broad. The latest specimen, from Jaunsar, the hill tract of the Dehra Dún district, is Gamble's No. 26616, April 1898 : a frond and incomplete stipe, the frond 38 in. by 26 in., and part of stipe 21 in., total over 5 ft. high. The pinnules have up to ten lobes. The plant is very soft. Dr. Christ says this is *var. batjanense* of *A. aculeatum*, Filicine Warburg, Monsunia, Bd. I, p. 77.

3. *Cutting of fronds and pinnæ.* The pinnæ are always distant, or distinctly separated ; and the pinnules so also, and distinctly stalked. In the large, broad, form the pinnæ are very acuminate, and even caudate ; but in the smaller they taper regularly from base to tip, as in the European plant. The pinnules vary in shape from—"short ovate-acuminate with a broad auricle $\frac{1}{16}$ in. long to $\frac{1}{8}$ in. broad, lobed on the front and toothed on the back," to—"falcate, $\frac{5}{8}$ in. long by $\frac{3}{8}$ in. broad, lobed though unequally on both sides," and to "narrow, falcate, acuminate, $\frac{3}{4}$ in. long, by only $\frac{1}{16}$ in. broad at base across the auricle." I have never seen the auricle free ; and the longest pinnules are seldom cut down nearly to the costa ; whereas the European plant is

sometimes tripinnate at base of pinnules. There seems to be an aristate tooth, or awn, to each veinlet; but the awns are never so long as in the European plant, and they therefore seem stiffer; they are, however, really soft.

13. **A. luctuosum**, G. Kunze in Linnea, Vol. 10. (1835-36) p. 548; "† 103. *A. luctuosum*, Kze.: *costis* rhachibus stipiteque fronde breviori nigriscenti-paleaceis; *fronde* lanceolato-acuminatâ, bipinnatâ, coriaceâ, *pinnis* alternis, petiolatis, longe attenuatis, sursum auriculatis; *pinnulis* trapezio-ovatis, subfalcatis, mucronatis, basi sursum auriculatis, deorsum truncata cuneata decurrentibus, arristato-serratis; *indusiis* reniformibus glabris."

A. aculeatum, Sw., Syn. Fil. 252; *A. Tsus-Simense*, Hook., Sp. Fil. IV. 16, t. CCXX.

KASHMIR: Jhelam Valley 3500'; Chitapani Valley 75—8000', Trotter 1888-89; Jhelam Valley, 5 miles from Rámpur 4500', MacLeod 1891; Upper Chenab Valley, 6500', McDonell 1893.

PUNJAB: *Hazara Dist.*—Trotter in MS. List of Punjab Ferns. *Chamba.*—Ravi Valley, Chanju 7000', and near Tisa 7000', McDonell 1882.

DISTRIB.—*N. Amer.*—California. *Asia*: N. Ind. Assam—Mausmai, *Griffith*, 1835; Khasia—Cherra, Hk. & Th.—Japan—Island of Tsus Sima, in Straits of Corea, *Wilford*; Yokohama, *Dickins.*

On seeing Mr. McDonell's Chamba specimens I thought them quite different from *A. aculeatum*; but it was not until many years later that I found them to be identical with a specimen from Natal, collected by Buchanan, which is ticketed *P. luctuosum*, Kze. Then I had the privilege of a perusal of Dr. Christ's monograph on *Polystichum aculeatum*; and I also saw McDonell's later collected specimens from Kashmir which were ticketed *A. Tsus-Simense*, and I wrote to him on the subject. He replied that he had got the name from Colonel Beddome, who, on seeing those and other specimens of Mr. McDonell's Kashmir collections, wrote as follows:—"Aspidium—Upper Chenab Vy., = *A. Tsus-Simense*, Hook.; figured and described by Hooker in Sp. Fil., included by Baker in Syn. Fil. under *aculeatum*. I call it *Polystichum aculeatum*, var. Tsus-Simense; it exactly corresponds with the Japanese specimens. New to British India." (Now, I rather think Mr. McDonell referred to Colonel Beddome after I had called his attention to the plant.)

On revisiting Kew I have seen that on the cover which contains many China and Japan specimens of A. Tsus-Simense Sir W. J. Hooker wrote in pencil—"20. Tsus-Simense est luctuosum, Kze., not Pappé." In the Synopsis both these names are given as synonyms of *A. aculeatum*, Sw., though in the Sp. Fil. Vol. IV., p. 16, *A. Tsus-Simense* is given as A. No. 20, and figured as such on Plate CCXX. On the Herbarium working Copy of the Sp. Fil. Sir William Hooker has written—"If the same as *luctuosum*, Kze, I fear it is too near *aculeatum*." On p. 19., under *A. aculeatum*, Sir William wrote, in ink,

"*an P. luctuosum*, Kze." ; and, again, "luctuosum, Kze. is the same as my No. 20 A. Tsus-Simense, v. n. 20."

Christ places *A. luctuosum* as a var. of 6. *P. lobatum*, and says of it :—

"Distinct, from its deltoid form, not elongated, and with a frond the lowest pinnæ of which are the longest. The frond is borne on a bare stipe, of one-third to one-half the length of the frond. Throughout (*en outre*) the scaly covering of the rhachis consists of black, long, and very narrow scales. The basal scales are narrow, blackish. The plant is of less height (plus basse), the pinnæ (pinnules ?) are slightly auricled, subsessile, decurrent (except the superior basal pinnule which is broadly stalked), stoutly toothed, but not aristate.

"Kunze's name, relating as it does to the black covering of the plant, very well indicates its peculiarity.

"*Habitat*.—Southern Africa ; Boschberg,-(McOwan), Drakenberg (Rehman, 7204)."

Hooker's description of *A.* (*Polyst.*) *Tsus-Simense* is long and minute. As to *Habitat* he gives only the Island of Tsus Sima ; and he adds—"I find no described species to accord with this. The scales of the caudex are singular in shape and peculiarly black; the upper portion of the fond is pinnated, the rest regularly bipinnate, the lowest pair of pinnæ deflexed." In the Kew Herbarium, on the same sheet with Dickins' specimen from Yokohama, is a larger frond with ticket—"*Polystichum luctuosum*, Perie Bush, British Kaffraria, May 7th, 1861, W. D'Urban." Opposite this Sir William Hooker has written in pencil—"black hairs on the rachis—hence true *luctuosum* of Kze., in Linn. 10 p." Another sheet from South Africa (a plant with caudex and four fronds in a tuft) has two tickets, one written by Baker (?)—*Aspidium luctuosum*, Kze., No. 11, Natal, Buchanan ; and the other, Buchanan's own ticket, is (recd. 8/69) "11. A very fair specimen—natural colour well preserved" (it is pale olive green) : "Grows in same bush and similar places with *Aspid. aculeatum*, of which 11*a* is our ordinary type, only not at all so plentifully. If only a variety, it is a very marked one. But is it indeed so ?"

14. **A. setosum**, Wall. Cat. 371. *A. aculeatum*, Sw. var. 6, *setosum*, Wall. Cat. 371, C. R. 510. *Polystichum aculeatum*, Sw. *var.* 9 *setosum*, Wall., Bedd. H. B. 209.

N.-W. P.: *Brit. and T. Garhwal*—8000', P. W. Mackinnon, April 1881 ; *Kumaun*—R. Blink. *fide* Wallich, in Herb. Hort. Kew ; near Khâti 7700', S. & W. 1848 ; Pindar Gorge—Khâti 7000', Trotter 1891.

DISTRIB.—*Asia* : N. Ind. (Him.)—Nepal, *Wallich* 1820 ; Sikkim.

This plant is not mentioned by Baker, either in the "*Synopsis*," or in his "Summary of New Ferns." Clarke, while giving it as a mere variety of *A. aculeatum*, says :—

"This seems to me more worthy of specific rank than many other species of *Polystichum* retained by Mr. Baker. The series is not merely defined by being fibrillose on the surface of the frond beneath ; the whole set is remarkably uniform in cutting ; the frond is large, long-lanceolate ; the primary pinnæ numerous,

close together, nearly parallel to each other; the secondary pinnæ numerous, close, very distinct, all remarkably like each other. Nor are there any connecting forms between the var. and any other form of *A. aculeatum*."

Beddome's description is:—

"Lower surface of frond with very fine fibrillæ, rhachis with very long scales as well as fibrillæ, pinnules small, quite entire, except the spinulose apex, or with very inconspicuous crenatures to represent the usual lobes; sori apical, on the lower veinlet of the forked or pinnate vein of the segment (or what would correspond to the segment where the pinnule is entire)."

Christ puts this fern as—4. *P. lobatum*, var. *setosum*, Wall., and says of it:—

"This plant is very remarkable for its scaly clothing; not only is the rhachis clothed with enormous principal scales, yellowish and pellucid, oval or round, which even attain in the upper part of the frond the length and breadth of 8 millimètres or more, but all the parts, with the pinnules, are upon the two faces covered with numerous thread-like scales (hairs), which are flexible" (wavy!), "one *centimètre* long, and golden in colour, which gives to this magnificent plant a very rich appearance. The frond is of the largest size (70 centimètres), the pinnules numerous (up to 80 in one pinna), lanceolate, toothed (?) like a comb decurrent, scarcely stalked, almost toothless, only the lowest of the upper row, which is much larger than the rest, being deeply cut. The texture is flaccid, membranous."

"*Habitat*.—Excessively damp forests of Sikkim, Himalaya on Senchul 8000′ (Gamble 8041) and 9000′ (Gammie)."

Both Clarke and Beddome say that only the lower surface of the frond is clothed with long fibrillæ. Christ is right in saying that both surfaces are so clothed. I have not seen this fern growing; but, judging from herbarium specimens, it seems quite distinct from any other species of the group. A specimen collected in Sikkim, alt. 5000′, by Sir J. D. Hooker, has, besides the long straw-coloured hairs, large ovate-acuminate dark-brown scales all along the main rhachis. Some other specimens have similar scales, but pale-brown in colour. A specimen from Wallich, *in Herb. Bentham* at Kew, has very large broad scales up the stipe, brown with darker centres.

15. **A. Prescottianum**, Hook. Sp. 4. p. 22., t. 223; Syn. Fil. 253; C. R. 510. *Polystichum Prescottianum*, Wall., Bedd. H. B. 210.

AFGHAN.: Kuram Vy.—9-10,000′, Aitch. 1879.

KASHMIR: *Gilgit*—Sai, Col. Tanner; Gulmarg 10,000′, Lev.; Pir Panjál 11,500′, Trotter, Gammie; Sangam Valley, 13-14,000′, Duthie 1893, No. 13539.

PUNJAB: *Hazára*—Khágán Valley 9000′, Dr. Stewart: *Chamba*—Sach and Drati Passes 10-12,000′, Baden-Powell 1879; Ravi Valley.—Satrundi and above it 11-12,000′, and Cheni Pass 12,000′, McDonell; *Kulu*—Rohtang Pass 13,000′, and Jalori Pass, N. 10,000′, Trotter; *Lahoul*—Chandra Valley, 11,000′, Trotter; *Simla Reg.*—Jubal State, Chor. Mt., Collett; Sirmur State 9-10,000′. T. T.; Hatu Mt. 9,5-10,500′, Edgew, Bates, Collett, Gamble, Blanf., Hope, Trotter, Bliss; Bashahr—near Hárang Pass 12,500′, Lace.

N.-W. P.: *D. D. Dist.*—Jaunsar; Chachpur Peak 10,000′, Gamble 1892, Kerâna 9500′, Gamble 1893 (on sheet with *A. Thomsoni*); *T. Garh.*—10-16,000′, (ten stations) Duthie 1879—83; *Brit. Garh.*—Dombitia Gadh 9-10,000′, Duthie 1885; *Kumaun*—Wallich; above Tola 12,500′ and near Milam, S. & W.; Palam Vy. 11-13,000′, S. & W., Trotter; Pinsara 10,000′, Davidson; Dhauli Valley 14-15,000′, Duthie 1884; near Pindari Glacier 10-11,000′, Trotter 1891.

NEPAL, W.—Nampa Gâdh, 12-13,000′, Duthie 1886.

DISTRIB.—*Asia*: N. Ind. (Him.)—Nepal; Sikkim and Bhotân.

Clarke's and Beddome's descriptions of *A. Prescottianum* are better than that in the *Synopsis* in that they mention the fibrillæ or narrow scales which are mixed with the large broadly ovate-acuminate scales on the stipes and rhachis. On the rhachis the scales get narrow and smaller, and the fibrillæ more hair-like. The fibrillæ are found on the surfaces, perhaps more sparingly on the upper than on the lower. The cutting of the frond varies of course with the size; but, with the exception mentioned below, I cannot find any specimens on which the pinnæ are "even pinnate," as Beddome says they are; and yet I have fronds, gathered by myself on Hatu (or Hatugarh) Mt., which are up to 27 ins. long by 4 ins. broad, though 18 by 3 ins. are the maximum dimensions given in the *Synopsis*. The habit of the plant is well described by Blanford—"abundant on Hatu, growing in dense masses, on the hill side between 9,500 and 10,500 ft."—in the open, chiefly, I should add. The rhachis may be weak, as the *Synopsis* says; but the masses on Hatu Mt. Blanford speaks of (as I have seen) are composed of stout upstanding plants; the fronds support each other, perhaps. Normal fronds of old plants have from 35 to 40 pairs of pinnæ—generally about 40—cut down to a winged rhachis into 8—10 pairs of elongated rhomboidal segments which have 4 or 5 pairs of aristately toothed lobes. Beddome's figure is from a young plant, and does not correspond with his description.

I have a beautiful little frond from Kashmir, Duthie's No. 13539 above-mentioned, stipe (incomplete) about 3 inches, frond 10 in. long by 2 in. broad, unextended, bipinnate, pinnules stalked, distant, rather bluntly and shallowly lobed or toothed, scales and fibrillæ as of *P. Prescottianum*, with numerous pinnæ of which most are again pinnate. Small as it is, it is mature and crowded with sori; and had I more material like this I should be inclined to make of it a separate species, from the distinct bipinnateness, the great breadth of frond in proportion to length, and other characters.

Another form, notably different from the type, is that of Duthie's specimens Nos. 2215, 5159, and 6240, from Tehri Garhwâl, British Garhwâl, and West Nepâl, which has stipes up to 10 or 11 inches in length, very regularly shaped ovate-lanceolate bipinnate fronds 15—18 ins. long by 4—5 ins. broad; pinnæ distant, about 30 pairs below the pinnatifid apex of the frond, pinnules

broad, falcate, sometimes auricled, aristately toothed, decurrent below and not stalked, lowest upper the largest, about 15 pairs besides an acuminate pinnatifid apex. The scales and fibrillæ are those of *P. Prescottianum*. This is a remarkably elegant and graceful fern.

16. **A. Bakerianum**, Atkinson MS.; Baker in Hook. Ic., t. 1656; Clarke and Baker in Journ. Linn. Soc. XXIV., 414. *A. Prescottianum*, Wall., *var Bakeriana* (sp.) W. S. Atkinson MS., C. R. 510. Pl. 66. *Polystichum Prescottianum*, var. β Bakeriana (Clarke) Bedd. H. B. 210.

KASHMIR: Marbul Pass 11,000', and Sind Valley 12,000', Clarke 1876; Pir Panjal 11,500', Trotter 1888; Sarpat 10,000', McDonell, MacLeod 1891.

PUNJAB: *Chamba*—Ravi Valley, below Cheni Pass, 10,000', McDonell 1882, 1885; *Kangra Vy.*, near Dharmsala 11,000', C. B. Clarke 1874; *Kullu*—Seoraj, Trotter 1887; *Simla Reg.*—Chor Mt., Herschel 1877 (*Nephrodium Brunonianum* on ticket) Jalauri Pass, Edgew.; Kunáwar 11,000', T. T. 1847.

N.-W. P.: *T. Garh.*—Kidár Kánta Mt. 9000', Herschel 1879; Damdar Valley 9-10,000', Duthie 1883; *Kumaun*—Kaphini 10,000', "grown at Almora", S. and W.; Pinda, Gorge, and Dwali to Phurka 9000', Trotter 1891; Gori Ganga Valley, 10,500', MacLeod 1893.

DISTRIB.—*Asia*: N. Ind. (Him.)—Sikkim.

Clarke (whom following Beddome) says—"frond truncate at the base;" but I find that all the fronds Gamble and I have are tapering, and even dwindling downwards to auricles. This species seems glabrous on the upper surface: *A. Prescottianum* is slightly fibrillose. The sori sometimes look nephrodioid.

SUBGENUS CYRTOMIUM, PRESL

17. **A. falcatum**, Sw., Syn. Fil. 257; C. R. 512. *Cyrtomium falcatum*, Sw., *var.* β. *Caryotideum*, Wall., Bedd. H. B. 211, F. S. I., t. 119.

KASHMIR: Jhelam Valley 3500', Trotter 1888; Jhelam Vy.—Chakoti, Kishenganga Valley, and Titwal, MacLeod 1891.

PUNJAB.—*Hazara—fide* Trotter: "cut from a plant in pot, at Abbotabad, in possession of Major Dempster, 4th Sikhs, who said it had been transplanted from near Natiagali 7000', where it grew in quantity; *Chamba*—McDonell (*fide* Trotter in List); *Kullu* 55-8000', Trotter, and Coventry; *Simla Reg.*—Bates; below Simla to north 4500', Gamble; "very rare. The one or two localities are rocky ravines between 5 and 6500'," Blanf. in List.

N.-W. P.: *D. D. Dist.*—Jaunsar; Deoban, Vicary 1838, in Herb. Sahar; 7000', Brandis 1881; Missan 7000', Gamble; Mussooree, T. T. 1845, Dr. G. King 1871?; Duthie 1877; 5000', Mackinnons 1878; 5500', Hope 1881 and 1887; 5000' J. W. Furrell 1895. *T. Garh.*—Ganges Vy., between Betwari and Dangulla, and Kidár Kánta Mt., Duthie 1881; *Kumaun*—T. T. 1845; Dwali 8260 and near Khati 7800, S. & W.; Hope 1861, Davidson 1875; Pindar Gorge, Trotter 1891; Gori Valley.—Ruin 3000', MacLeod 1893.

DISTRIB.—*Asia*: Ind. Or.—(Him.) Sikkim and Bhotán, 3—8000'; Assam—Khasia 3-4000', not common. S. Ind.—Nilgiris, at the higher elevations. Japan. China. Sandwich Islands. *S. Afr.*—Caffraria, Natal, Madagascar.

The *Synopsis* gives s *A. caryotideum*, Wall., but adds—"It is impossible to separate our two varieties satisfactorily." Clarke gives *A. caryotideum* as a synonym. Beddome does not give *A. falcatum* as an Indian plant, and says it differs only slightly from *B. caryotideum*. The N.-W. Indian plant seems to be the latter, which is very commonly cultivated in Great Britain. It loves water and shade—in the Himalaya. Mr. Clarke's No. 17656, from Assam, Khasi Hills, has very long, narrow, falcate and toothed pinnæ, 7 ins. × ¾ in.: one frond has pinnæ 5 in. long, by only 1 in. broad.

THE BUTTERFLIES OF THE LUCKNOW DISTRICT.

By Geo. W. V. de Rhé-Philipe.

The plain districts of the United Provinces of Agra and Oudh, as they are now called, have not hitherto had much attention paid them by collectors and those generally interested in butterflies; and the reason is not far to seek. Insect life in the hot dry plains of these Provinces is admittedly poor; collecting is in the hot months practically impossible, and even during the rains most trying; and it is difficult, even for the most enthusiastic collector, to summon up sufficient energy to do a day's outdoor work when the prospects of securing anything good are so remote. It is hardly to be wondered at, therefore, that while the Himalayan and submontane districts of the Provinces have been more or less thoroughly worked, and the butterfly life there made the subject of numerous papers and notes, the plains have, to a very great extent, been neglected. During the course of the three years and a half of my stay here I have met with only one other collector and have not seen or heard of a single representative collection.

And yet, in spite of their poverty, there is plenty of interesting work in these districts for those entomologically inclined, and it may take three or four years of steady collecting to get together even an approximately complete collection of the ninety or hundred species found within their limits. A year ago I considered I had fairly well exhausted the capabilities of Lucknow for new species, but I have since added some half dozen fresh varieties to my lists; and even now, though I have very nearly every butterfly that I know of as being found in Lucknow, I am by no means certain that my collection is complete. No local list exists; and as my own experience has repeatedly shown how useful such lists are to collectors, I have tried in the following pages to give as complete a list as possible of the *Rhopalocera* found in Lucknow and its vicinity. It may, I hope, be interesting to butterfly collectors in general, as forming a guide to what may be found in the hot dry plains of Northern India, and useful to any who may in the future take up the study of the butterflies of these Provinces.

A word as to seasons and places. Butterflies may be found in Lucknow all the year round with perhaps the exception of the very hot period between the middle of April and middle of June. The best time is, of course, from the middle of July to the end of October—in other words, during and just after the monsoon. As soon as the first heavy falls of rain bring out the new vegetation, the butterflies begin to appear and continue to be seen in numbers till the cold weather sets in. During the very cold months of December and January not many are seen, though, if the winter be a mild one, the autumn or post-monsoon species often remain out later, mingling with the early arrivals of the spring varieties. From February till the end of March or middle of April an entirely different set of apparently single brooded species are on the wing; and these finally disappear as soon as the hot West winds begin to blow.

As regards places I shall, when noting on each species, mention more particularly the spots where it is likely to be found. As a general rule, however, in the hot dry months before the rains, butterflies—and then only the commoner kinds—will be seen only in heavily wooded, shady gardens and groves, among thick shrubby undergrowth and near water channels leading from wells. On bright days during the rains and after the rains, they come out more into the open and may be taken on grass lands and round flowers. The Duranta (*D. plumeri* and *ellisii*) and the Lantana (*L. aculeata*) form a special attraction to most species and swarms of all varieties may be seen hovering round the plants when in full bloom. Lime gardens, again, are favourite resorts of many species and well re-pay a visit. The few species of the *Satyrinæ* found in the district will only be taken in shady spots and among heavy undergrowth where there are plenty of dead leaves. It is, however, unnecessary to enlarge further beyond these few general hints; a collector will very soon find out for himself the most likely spots to go to.

In conclusion, I would add that, though I have assiduously looked for the caterpillars and pupæ of the various species, I have been able to find them in very few cases only. The reason for this non-success is not very evident, but is possibly due to the caterpillars retiring to out-of-the-way shady corners during the day. The fact that I have been far more successful in this direction in the cold weather, and that in the hot weather even leaves and branches freshly eaten (during the night) and under which fresh droppings are found, very seldom carry caterpillars during the day, would seem to confirm this theory. I have more than once observed the larvæ of moths moving away from the outer branches of their food plants as soon as the sun began to get powerful.

For the sake of completeness, I have included in the following list all species which I can find as having been recorded from the dry regions of Oudh. Those which I have not taken or seen myself and therefore cannot personally vouch for are marked with an asterisk.

FAMILY—NYMPHALIDÆ.

Sub-Family—Danainæ.

The Danainæ are very poorly represented, being confined to five species.

1. Danais Limniace, Cramer.

Though not often seen in the open, this butterfly is not uncommon in shady gardens just before and during the rains. They may often be seen in great numbers on the Lantana flowers in the Secunderabagh Gardens, Lucknow. The species disappears almost wholly from the end of October till the beginning or middle of the following June.

2. Danais chrysippus, Linnæus.

Common throughout the year except, perhaps, during the very cold months. It swarms from July to October when scores may be seen everywhere. Very dwarfed specimens are sometimes taken in the winter, and I have two whose expanse is not more than 2·1 inches. The *D. alcippus* variety I have not seen

though it has been recorded from Lucknow by Col. Lang; but I have taken what may be an intermediate form, in which the median nervure and its branches in the hindwing are more or less suffused and bordered with pure white.

3. DANAIS GENUTIA, Cramer.

Less common than the last and, in Lucknow, not seen so often in the open. It appears to associate largely with *D. limniace* and is found at the same time and in the same places.

° 4. EUPLŒA MIDAMUS, Linnæus.

Mr. de Nicéville records the capture, by Col. Lang, of this *Euplœa* at Sitapur, a station about 50 miles north-west of Lucknow. I have never seen it within our limits, and it is possible that the one taken was a straggler from the lower Himalayas north of Sitapur where it is not uncommon.

5. EUPLŒA CORE, Cramer.

Very common in Lucknow and all over the district from July to September. May always be taken in the same spots as *D. limniace* and *D. genutia* and on Duranta flowers. The larva, as pointed out by various writers, may often be found on the Oleander (*Nerium*).

SUB-FAMILY—SATYRINÆ.

This is also very poorly represented in these districts, the species found being only seven in number.

6. MYCALESIS MEDUS, Fabricius.

Is not common but may occasionally be taken among the undergrowth in shady spots, and in the open in the early mornings during the height of the rains. What is held to be the dry season form—*M. runeka*, Moore—does not, as far as I know, occur.

7. MYCALESIS PERSEUS, Fabricius.

The typical *M. perseus* is fairly common in our limits, being often taken in the early mornings after the monsoon is well over, and during the cold weather.

8. MYCALESIS BLASIUS, Fabricius.

Is generally considered the monsoon form of *M. perseus* which it replaces during the rains. It is common in August and early September but is extremely local in its habits, some spots holding dozens while not a single one will be seen in any part of the adjoining country. I have only taken the species in the Secunderabagh Gardens, Lucknow, and in a thick jungle at Barabanki about 16 miles north of Lucknow.

9. YPTHIMA HUEBNERI, Kirby.

This, the only *Ypthima* within our limits, is by no means common, but is sometimes to be seen early in the rains. I can only record two captures, both males.

10. MELANTIS LEDA, Linnæus.

11. MELANITIS ISMENE, Cramer.

These, which are, I believe, generally considered to be the rains and dry season forms of one species, may be dealt with together. My own experience

has been that both forms are more or less concurrent and may be taken together, sparingly just before and very commonly during and after the rains. The species is very crepuscular in its habits, seldom or never coming out before dusk. I have often noticed, late in the evening, swarms of them flying round the roots and trunks of peepul (*Ficus religiosa*) trees.

12. MELANITIS ASWA, Moore.

By no means so common as the last but not rare. I have only taken it during the rains, never in the drier months. Among scores of Melanitis netted in October and November there has not been a single *M. aswa*—all have been *M. leda* or *ismene*.

SUB-FAMILY—ACRÆINÆ.

13. TELCHINIA VIOLÆ, Fabricius.

This butterfly simply swarms here in some years whereas in others it is comparatively rare. It does not, as a rule, make its appearance till the rains are over, and then continues flying well on into the cold weather. Common as it is, I have not yet found the larva which, however, has already been described in the "Butterflies of India, &c."

SUB-FAMILY—NYMPHALINÆ.

The butterflies of this sub-family form a marked feature of the district *Rhopalocera*, as, though the species number only 19, individuals are numerous. It is essentially a monsoon and cold weather sub-family ; I do not remember ever having seen a single representative of it during the hot months of the year.

14. ERGOLIS MERIONE, Cramer.

This species is not common in the district, and in the course of three years collecting, I have seen only two—both in October when the rains were well over. Both were of the variety "*tapestrina*" described by Mr. de Nicéville as an occasional aberration or sport. My own notes on the species, taken in places where it is common, go to show that both forms *merione* and *tapestrina* are equally abundant, the former predominating during the rains and the latter in the drier months. I have not discovered the larva in the Lucknow district, but have often reared it where the species is common. The following is the description noted by me of Rajahmundry (East Coast) specimens. *Larva.*—About 1" long, cylindrical, green with a double pencilled line of lighter green along back, sides shaded darker green. Head tesselated black and white, provided with two branched spines. Each segment of body with six similar spines, the anal having two only. Feeds on the castor-oil plant (*Ricinus communis*). *Pupa.*—Attached to leaf, angular, black or greyish black with yellowish markings, abdominal portion ringed black and yellow.

15. ATELLA PHALANTA, Drury.

Very abundant in Lucknow from August to October, less so during the cold weather months till February when it finally disappears. May be seen in swarms round the flowers of the Duranta which the species seems specially to affect.

°16. CETHOSIA CYANE, Drury.

A single specimen is recorded by Mr. de Nicèville as having been taken by Col. Lang, R.E., on the Gogra in Oudh. I have never seen the species even in the damper submontane tracts of the United Provinces; and its occurrence here, so far out of its usual limits, can only be very exceptional.

17. PRECIS IPHITA, Cramer.

I have only taken one specimen of this butterfly within our limits—a beautiful fresh female captured in Lucknow during the height of the rains. If it occurs at all regularly, it is very rare.

18. JUNONIA ASTERIE, Linnæus.

Is very common during the rains and may be taken almost anywhere but is especially partial to sunny gardens. I have, on one occasion, found the larva on a *Torenia*; but as it pupated immediately, I cannot be certain that this is a food-plant.

19. JUNONIA ALMANA, Linnæus.

This, presumed to be the dry season form of the preceding, replaces it as soon as the monsoon is well over, and is almost equally common. Its habits are very much the same but it has a faster flight.

20. JUNONIA ATLITES, Linnæus.

I have not observed this *Junonia* in Lucknow itself, but it is common at Bahramghat, on the south bank of the Gogra, some 50 miles to the north-east, and I have seen it at Barabanki, closer still. It is not improbable, therefore, that it appears occasionally in Lucknow and therefore has been included in this list.

21. JUNONIA LEMONIAS, Linnæus.

A very common species in the district where it may be taken in sunny gardens and open country at any time of the year except the very hot months.

22. JUNONIA HIERTA, Fabricius.

Abundant all over the district in September and October.

23. JUNONIA ORITHYIA, Linnæus.

The commonest species of the genus and may be seen everywhere from August to November.

24. CIRRHOCHROA MITHILA, Moore.

Decidedly rare in the United Provinces. I have taken only two specimens in Lucknow, both males, within a few days of each other, in August. On both occasions the butterflies were flitting in and out of and around a hedge of *Inga dulcis*, darting out at times to the flowers of a *Duranta plumeri* near. I have seen only one other specimen from these Provinces—taken at Fyzabad. It is apparently difficult to get in good condition, the wings being badly broken in all cases I have known.

25. HYPOLIMNAS BOLINA, Linnæus.

This splendid butterfly is common in Lucknow, appearing soon after the rains break and continuing on the wing till well into the cold weather.

The early individuals of the species are comparatively small and the patches on the wings of the male are almost pure white just faintly tinted with light blue. These occurring towards the end of and after the rains are, on the other hand, as a rule, large insects and the markings on the male are of a very much deeper and more brilliant blue, often invisible except in certain lights. The female is a rough mimic of *Euploea core* but may easily be distinguished by its different flight. It is very fond of skulking in the grass and among shady undergrowth, where, it is presumed, it lays its eggs. These I have never found ; but I have on two occasions discovered the caterpillars in a bed of *Pilea muscosa* and violets. As on both occasions the larvæ pupated immediately, I am unable to say for certain whether either of these are food-plants.* The caterpillar is a stout cylindrical insect of a dark maroon colour, rather more than an inch long, with rows of branched spines. The pupa is a dull brown, the head and wing cases angular, the abdomen tubercular, the period of pupation being eight days.

26. HYPOLIMNAS MISIPPUS, Linnæus.

Is as common as the last but appears somewhat later. Some males have a curious habit of, as it were, taking possession of a bit of ground or a small shrub, in the vicinity of which they will stay nearly all day if not disturbed. I have often noticed one of these insects take up its quarters on some favourite spot and stay there for hours, occasionally dashing out at any other butterfly intruding on its preserves. There are two forms of female, the first, which is a close mimic of *Danais chrysippus*, being very common, and the second, a mimic of *Danais dorippus*, rare. I have one specimen intermediate between the two types in which the black apical patch is present though somewhat suffused with tawny scales, while the white band of Form 1 is replaced by an exactly similar tawny band. The female has a habit of skulking along and settling on low grass and the ground, which at once distinguishes it from its models.

27. ARGYNNIS NIPHE, Linnæus.

This is essentially a cold weather insect, never appearing in the Lucknow district before the end of September and remaining on the wing till February or March. It is fairly common, the female, a rough mimic of *Danais genutia*, much more so than the male. The caterpillar is cylindrical, about 1½" long, of a blackish purple colour, the spiracles being outlined with reddish. The head is provided with four stout branched spines ; each other segment has seven or eight longer but similar spines, all more or less red. I have discovered it both among violets and on Lobelias on which it feeds. The pupa is also a blackish purple marked with greenish grey and metallic spots; head and wing cases angular, abdominal segments spined. The period of pupation is from eight to ten days.

* *Note.*—This season I again discovered a larva in a pot of violets ; it is very probable therefore, that this *is* a food-plant.

28. SYMPHÆDRA NAIS, Forster.

Very rare. I have only taken one specimen—a male—in the course of three years, and have not heard of any other instance of its occurrence in our limits. My capture was made in March so it is apparently a cold weather species.

29. EUTHALIA GARUDA, Moore.

Not common though it may occasionally be taken in August and September in Mango groves and round the Jack fruit tree (*Artocarpus integrifolia*). I have not seen the larva in Lucknow, but have reared it in other districts on the mango.

*30. EUTHALIA LUBENTINA, Cramer.

Mr. de Nicéville records this butterfly from Fyzabad. I have not yet seen it in the district and if it does occur it must be very rare.

31. PYRAMEIS CARDUI, Linnæus.

The cosmopolitan "Painted Lady" is common in Lucknow and all over the plains of the United Provinces during the cold weather. In December and January scores may be seen flitting about gardens and in any open ground.

32. CHARAXES FABIUS, Fabricius.

Is not uncommon from July to November and again in February and March. Owing, however, to their predilection for the tops of trees, it is most difficult to get specimens. The species is generally seen round tamarind trees, on which the larva breeds; but I have noticed that the butterflies have also a partiality for the Shisham (*Sissoo dalbergia*).

FAMILY—LYCÆNIDÆ.

The Lycænidæ of the district number some twenty-eight species, nearly all of the *Lycæna* and *Polyommatus* groups. The *Thecla* group is represented in two genera and the *Deudorix* in three; the remaining groups not occurring at all.

33. CHILADES LAIUS, Cramer.

This "blue" may be taken in Lucknow and its vicinity almost throughout the year but is most common from August to November. The dry season form with the dusky patch on the underside of the hindwing does not, as a rule, appear till late in October. The species is especially partial to lime gardens, and the larvæ may often be found on lime trees by watching the attendant ants.

34. CHILADES TROCHILUS, Freyer.

This tiny butterfly swarms in grass lands all through the autumn and early winter months. A single sweep of the net will often bring in a dozen insects.

35. ZIZERA MAHA, Kollar.

Very common from August to March and may always be taken among low grass and weeds.

36. ZIZERA CHANDALA, Moore.

This species, also recorded from Oudh, has been sunk by many later writers as a synonym of *Z. maha*.

°37. ZIZERA LYSIMON, Hubner.

Mr. de Nicéville mentions Continental India as one of the localities in which this *Zizera* occurs. I have not, however, been able to identify any of the genus I have taken in the district as this species.

38. ZIZERA KARSANDRA, Moore.

I have netted what I take to be this species occasionally in October and November.

39. ZIZERA GAIKA, Trimen.

Common in low grass after the rains and during the cold weather.

40. ZIZERA OTIS, Fabricius.

This, the *Z. sangra* of Moore, and the *Z. indica* of Murray, is, next to *Z. maha*, the commonest Lucknow species. It occurs at the same time.

41. AZANUS UBALDUS, Cramer.

Fairly common from November to February. Does not appear during the rains or early autumn.

°42. AZANUS URANUS, Butler.

This species has been recorded from Fyzabad. I have not taken it myself.

°43. NACADUBA ARDATES, Moore.

Judging from Mr. de Nicéville's remarks on this species in his "Butterflies of India, &c.", it should occur in our limits. I have, however, not seen it yet.

°44. JAMIDES BOCHUS, Cramer.

Also recorded as being found "throughout Continental and Peninsular India", but I have not so far come across it on the dry plains of the United Provinces though it is not uncommon in the damper submontane tracts.

°45. LAMPIDES ÆLIANUS, Fabricius.

The same remarks apply to this as to the preceding. I have not yet taken it on the dry plains.

46. CATOCHRYSOPS STRABO, Fabricius.

Appears in great numbers between August and November, but is not often taken during the other months. Is most common about open fields.

47. CATOCHRYSOPS PANDAVA, Horsfield.

Rather rare in the district. The females are, on the plains, taken oftener than the males, the reverse being the case in the hills and submontane tracts. Is a monsoon and early autumn butterfly.

48. CATOCHRYSOPS CNEJUS, Fabricius.

Somewhat less frequently taken than *C. strabo*, and the female more often than the male. Occurs during the rains.

49. TARUCUS THEOPHRASTUS, Fabricius.

Abundant all over the district in September and October, flying round shrubs of *Plumbago capensis*. Further to the north-west in Rohilkhand it often swarms among the low grass and flowering weeds on the Railway embankments, being especially fond of a small yellow flower that grows in

profusion in the country bordering on the hills. Late in the evenings they may be picked off these flowers in scores, having settled on them for the night.

50. TARUCUS PLINIUS, Fabricius.

Is even more common than the preceding. It generally appears somewhat later, seldom coming out before October though an occasional specimen may sometimes be seen as early as August. What is apparently a second brood appears in the spring. Like *T. theophrastus*, the species affects the flowers of the Plumbago.

°51. CASTALIUS ROSIMON, Fabricius.

Recorded as being found all over India, but I have never observed the species in or near Lucknow.

52. POLYOMMATUS BŒTICUS, Linnæus.

One of the most common Lycænidæ of the district, where it appears in great numbers during the cold weather. In March and April 1901 the swarms were almost remarkable, large flights passing every day north-westwards. This emigration takes place every spring; I have watched the species in many parts of this and the adjoining districts always and everywhere hurrying away towards the hills.

53. APHNÆUS VULCANUS, Fabricius.

Not by any means common in our limits, but may be taken sparingly in the early spring. The most likely spots to look for them are among the flowers of the Calendula and similar *Compositæ*.

°54. APHNÆUS ICTIS, Hewitson.

Has been recorded from Fyzabad. Not yet taken by me.

55. APHNÆUS ELIMA, Moore.

This species is very much more frequently met with than either of the preceding, though never exactly common. Generally flies about gardens of annuals.

56. TAJURIA LONGINUS, Fabricius.

The female of this beautiful species is not uncommon in the autumn and cold weather, but I have not once during the last three years and more taken a male. Frequents gardens and parks where there are large trees.

57. TAJURIA JEHANA, Moore.

Very much less common than the preceding. I can only record one—a male—taken in November.

°58. DEUDORIX EPIJARBAS, Moore.

The general distribution of this species leads to the inference that it would be found on the plains of Upper India. I have, however, not seen it nor do I know of any definite record of its capture in the district. If it does occur here it is extremely rare.

°59. RAPALA SCHISTACEA, Moore.

Has been taken at Bareilly and possibly occurs sparingly in the winter and early spring in the submontane and adjoining districts.

60. RAPALA ORSEIS, Hewitson.

Decidedly rare. Only one female taken in Lucknow, in November.

61. RAPALA MELAMPUS, Cramer.

Is not common but a few may generally be taken every winter. Is fond of Chrysanthemum flowers on which I have taken nearly all my Lucknow specimens.

62. VIRACHOLA ISOCRATES, Fabricius.

I have one specimen which I doubtfully identify as this species, taken in Lucknow in the early spring. It is unfortunately a broken and faded insect, but agrees in outline and general colouration with the description given by Mr. de Nicèville. The species should occur in Lucknow but is probably rare.*

FAMILY—PAPILIONIDÆ.

SUB-FAMILY—PIERINÆ.

This sub-family is represented by sixteen species, most of which are very numerous in individuals.

63. DELIAS EUCHARIS, Drury.

Occurs more or less throughout the year, occasional specimens being seen in the early mornings of even the hottest months of the year. It is most common during the autumn and winter when scores may usually be seen on the flowers of the Duranta or among the branches of high trees.

64. CATOPSILIA CROCALE, Cramer.

May almost be considered the most common Pierid of the district as it occurs in great numbers right through the rains and well on into the cold weather. The females vary greatly but are, as a rule easily distinguishable as one or the other of two types. In the first or ordinary form the ground colour is a distinct yellow, deepening towards the base, and the black marginal and other markings are clearly defined and comparatively narrow, the underside being like that of the male. The second and somewhat rarer type has a ground colour of creamy white with very broad black apical and marginal markings, the exterior margins of both wings having a series of circular spots somewhat more yellowish in tint than the ground colour, while the bases of the wings are suffused with dusky. The underside has a distinct pearly sheen with hardly any traces of yellow. Both forms occur concurrently in Lucknow.

65. CATOPSILIA CATILLA, Cramer.

This, generally considered a dimorphic form of the last, is equally abundant. The variety with the dark purplish blotches on the underside is comparatively rare, but may sometimes be taken when the rains are well over.

66. CATOPSILIA PYRANTHE, Linnæus.

Another very common species, occurring everywhere almost throughout the year, but most frequently seen during the rains and cold weather. The female is much more seldom met with than the male. The dry season form, *C. gnoma*, Fabricius, replaces the monsoon type, the true *C. pyranthe* about October.

* *Note.*—Since the above was written, I have (July) taken a female *V. isocrates* in excellent condition in Lucknow.

67. TERIAS HECABE, Linnæus.

By far the most common species of the genus, swarming in gardens and grass lands from July to March. Almost every variation described by Capt. Watson in his "Notes on the Synonymy of Indian Pierinæ" (*Bombay Natural History Society Journal*, Vol. VIII., p. 509) as occurring in sub-group B of the *T. hecabe* group may be taken in Lucknow, but I have so far made no attempt to differentiate the series in my possession according to their sub-specific names.

68. TERIAS LIBYTHEA, Fabricius.

The only other *Terias* I have found within our limits. Is scarce and I have taken only one specimen at Bahramghat on the south bank of the Gogra River.

69. COLIAS FIELDII, Menetries.

This butterfly may occasionally be taken in the winter. Is far more frequently met with in the districts to the north-west; while one February I found it exceedingly common among low jungle and around hedges near Goshainganj, a station some 130 miles south-east of Lucknow.

70. PIERIS CANIDIA, Sparrman.

This butterfly belongs rather to the hills and submontane districts and does not, as a rule, extend to the plains. I have, however, taken one—a somewhat faded female—in Lucknow in April, and therefore include it in this list.

71. PIERIS BRASSICÆ, Linnæus.

Very common all over the Lucknow and adjacent districts from February to the middle of April. The larva feeds on cabbages and does great damage; and the butterfly may always be seen in numbers round cabbage fields and in vegetable gardens. It does not, however, confine itself to them but may be taken anywhere where there are flowers.

72. BELENOIS MESENTINA, Cramer.

Appears, somewhat sparingly at first, towards the end of the rains, but is very abundant throughout the autumn and winter months. May be taken anywhere and everywhere. The female is less common than the male.

73. HUPHINA PHRYNE, Fabricius.

Occurs at very much the same time and is as common as the preceding, for which, while on the wing, it is apt to be taken. The depth of the markings, both on the upper and underside, vary greatly, passing from the heavily marked upper and rich yellow underside of the monsoon specimens, to the pale upper and very faintly tinted underside of the dry and cold weather insects.

74. APPIAS (*Catophaga*) PAULINA, Cramer.

I have only one specimen, taken in Lucknow in August and named for me by Mr. de Nicéville. It differs from the usual descriptions of the species in having the apex, costa and exterior margin of the forewing broadly marked with black, the black at the apex being broken by a transverse line of three white spots. The butterfly is decidedly rare in the district and during three years' collecting I have seen only this one specimen.

75. NEPHERONIA HIPPIA, Fabricius.

Occurs in the Lucknow district only during the early part of the cold weather and is never very common. The female is comparatively rare.

76. IXIAS MARIANNE, Cramer.

Common in gardens and grass lands from September to November.

77. IXIAS PYRENE, Linnæus.

The male of this species is common from September onward till the end of the cold weather. I have not yet taken a female in the district.

78. TERACOLUS ETRIDA, Boisduval.

Is decidedly rare in Lucknow itself, where I have come across only one or two specimens. When shooting in the Hardoi district—some seventy miles out of Lucknow—I, however, saw swarms of this delicate little insect flying about the wasteland and low jungle round jheels. It occurs in the autumn and early part of the cold weather.

SUB-FAMILY—PAPILIONINÆ.

The number of species of this sub-family obtainable in the plains of the United Provinces is small, but individuals are, as a rule, very numerous.

79. PAPILIO ARISTOLOCHIÆ, Fabricius.

Common throughout the rains but not often seen at other seasons. The caterpillar, which is more or less cylindrical, about 1¼" to 1½" long, of a purplish brown colour with red processes, is found on the *Aristolochia indica* and probably other *Aristolochiæ*.

80. PAPILIO ERITHONIUS, Cramer. (vel. *P. demoleus*, Linnæus).

Exceedingly abundant and may be taken at any time of the year. It especially frequents lime gardens, flying in and out of the lime trees, on which its well-known larva feeds.

81. PAPILIO POLYTES, Linnæus.

Common all over the district, especially around lime trees on which the caterpillar (which is very like that of *P. erithonius*) feeds. The species is on the wing throughout the rains and cold weather, the males as a rule, appearing somewhat later than the females. Of the three forms of the latter, Type I, which is like the male, does not apparently occur in the district ; at any rate I have never seen it. Type II, which mimics *P. aristolochiæ* is common and the only one generally taken ; while Type III, mimicing *P. hector*, is very rare, but as I have seen it on two occasions, apparently does occur. Its appearance at all is rather surprising as its model is never, as far as I know, found in Upper India.

82. PAPILIO DISSIMILIS, Linnæus.

I have only seen two of this species in the plains of the United Provinces, both in Lucknow in August. It is probably rare. The dimorphic form *P. panope*, Linn. does not occur.

83. PAPILIO NOMIUS, Esper.

This butterfly is, as far as the United Provinces are concerned, practically confined to the low foot hills and sal forests of the submontane districts

where it is common. As, however, I have taken one specimen—probably a wanderer from the hills—in Lucknow, I include it in the list.

FAMILY—HESPERIDÆ.

84. BADAMIA EXCLAMATIONIS, Fabricius.

Is not very common but I have taken a few specimens in August and September. Is generally found in the neighbourhood of *Inga dulcis* hedges. Their rapid flight and habit of settling on dark leaves makes it an extremely difficult butterfly to net.

85. PARATA CHROMUS, Cramer.

This butterfly was very common in Lucknow during the latter part of the rains of 1900, but though never rare I have not seen it in such numbers since. May generally be taken on the flowers of the Duranta, for which it appears to have a special liking. The next species ° *P. alexis, Fabricius*, should also apparently occur in the United Provinces ; but except in size it differs very little from *P. chromus* and I have not been able to identify it.

86. CHAPRA MATHIAS, Fabricius.

More or less common from July to February or March. Usually flits about and settles on low shrubs in open gardens.

87. CHAPRA AGNA, Moore.

Watson considers this species doubtfully distinct from the preceding. Specimens answering to the description in his " Hesperidæ Indicæ " may occasionally be taken.

88. SUASTUS GREMIUS, Fabricius.

By far the commonest " skipper " of the district where it is most abundant from August to October. Like *P. chromus*, it is extremely fond of Duranta flowers and may always be taken on them.

89. TELICOTA BAMBUSÆ, Moore.

Another very common species. Occurs during the rains.

90. PADRAONA DARA, Kollar.

Not taken as frequently as the preceding but is not rare. Appears, as a rule, in July and August.

°91. TARACTROCERA MOEVIUS, Fabricius.

Has been recorded from North West India by Butler and from its general distribution should occur within our limits. I have, however, not yet taken a specimen.

92. UDASPES FOLUS, Cramer.

This species is, as a rule, confined to the hills and the regions of heavy rainfall. Its appearance in the Lucknow district is therefore unusual. I have seen only one specimen, taken in April.

93. HESPERIA GALBA, Fabricius.

A very common species all over the district. Occurs from June to February and affects grass lands and low growing scrub and jungle.

THE MOTHS OF INDIA.

SUPPLEMENTARY PAPER TO THE VOLUMES IN "THE FAUNA OF BRITISH INDIA."

SERIES II. PART VII.

By Sir G. F. Hampson, Bart., F.Z.S., F.E.S.

(*Continued from page 219 of this Volume.*)

Moths of India—5a.

EPIPLEMIDÆ.

3040*b*. EPIPLEMA FLAVISTRIGA. Warr. Nov. Zool. VIII., p. 21.

Pale brownish ochreous; frons and palpi black; wings irrorated with dark scales. Forewing with curved brown postmedial line ending in three black marks above inner margin; two conjoined rufous lunulate patches on outer margin at the excisions below apex, the lower large; a cloudy fuscous patch towards outer angle. Hindwing with tails at veins 6 and 4; a yellow fascia in a fold from base through the cell to the postmedial line, met by an oblique black striga from a spot at upper angle of cell; the postmedial line formed by two fine brown lines very strongly angled at vein 4, with a black mark on its inner side at costa and others between the veins below the angle, some leaden suffusion between the angle and a rufous marginal patch at lower tail; a black marginal line between upper tail and the rufous patch which has two black specks on it, the lower with whitish lunule round it.

Habitat.—Khásis. *Exp.* 30 mill.

3041*c*. EPIPLEMA DELICATULA. Warr. Nov. Zool. IV., p. 202, pl. 5., f. 7.

♀. Head, thorax and abdomen white, irrorated with dark brown; vertex of head pure white; wings white, thickly irrorated and striated with dark brown; the veins finely streaked with brown. Forewing with an erect antemedial line from subcostal to inner margin; a discocellular line; an oblique line from costa beyond middle to outer angle; a spot on margin between veins 6, 7; the margin deeply crenulate from vein 4 to outer angle. Hindwing with fine ante- and postmedial dark brown lines, oblique from costa to near vein 2 where they are acutely angled; a fine marginal line; the margin produced to prominent points at veins 2, 3, 4, 7.

Habitat.—Khásis. *Exp.* 26 mill.

3045*a*. EPIPLEMA ATRIFASCIATA. Warr. Nov. Zool. VI., p. 9.

Forewing with the termen very slightly excised above middle.

♂. Head, thorax and abdomen grey-brown; frons black-brown. Forewing grey-brown, with darker striæ; an indistinct antemedial line angled on median nervure and oblique towards costa and inner margin; the postmedial line oblique and with a strong black shade on its inner side from costa to vein 4, where it is obtusely angled and with some black suffusion on its inner side on inner area; traces of a sinuous subterminal line and some dark suffusion towards inner margin. Hindwing grey-brown with black striæ; a V-shaped mark at lower angle of cell with its lower arm whitish; a broad

band of black suffusion before the whitish postmedial line which is angled outwards at middle; some brown suffusion on terminal area; a sinuous subterminal line between the tails, intersected by a white streak at lower tail; a fine whitish line at base of cilia.

Habitat.—Khásis. *Exp.* 24 mill.

3045*b*. EPIPLEMA RECTIMARGINATA, n. sp. (pl. C., f. 27).

♂. Purple-brown; antennæ ochreous. Forewing with the termen strongly excised from apex to vein 3, where it is strongly angled; the wing with a few dark striæ; an indistinct olive-brown antemedial line angled inwards to costa; an almost straight subterminal olive-brown line with darker outer edge slightly angled inwards to costa; an olive brown terminal line; cilia black at base, grey at tips, except at apex and the angle. Hindwing with the termen almost straight from apex to vein 3, then twice excised before tornus; a few dark striæ; an indistinct curved brown postmedial line with white points on its inner edge on veins 2, 3, 4; an olive-brown terminal line; cilia black at base, grey at tips.

Habitat.—Kanara, Satara (Davidson). *Exp.* 26 mill. *Type*—In B. M.

3045*c*. EPIPLEMA FALCATA, n. sp. (pl. C., f. 1).

♂. Forewing with the apex strongly produced and falcate; hindwing with the termen evenly rounded.

Head, thorax and abdomen dull chocolate brown; the anal tuft whitish. Forewing with the basal third dull chocolate brown; the rest of wing pale yellowish brown with fuscous striæ; an obscure dark discoidal spot, the costal edge yellow brown; a curved yellow-brown subterminal line, with the area beyond it chocolate irrorated with white scales. Hindwing chocolate-brown, greyish towards costa, irrorated with dark scales; a yellowish patch on middle of inner margin; a yellowish postmedial line on inner half; cilia red-brown, the tips white.

Habitat.—Ceylon (Mackwood). *Exp.* 26 mill. *Type*—In B. M.

3051*b*. EPIPLEMA SIMPLEX, Warr. Nov. Zool. VI., p. 322.

♀. Grey-brown; head dark-brown with the vertex and antennæ white; wings with dark striæ. Forewing with strongly curved medial brown line; the postmedial line slightly angled at veins 6 and 4 and oblique towards costa and inner margin; a subterminal lunulate brown mark above middle. Hindwing with very oblique antemedial brown line from costa to vein 2, where it is angled; the postmedial line brown defined by white on outer side, very oblique from costa to vein 3, then retracted to inner margin; a black point on termen at the lower tail; a fine white line at base of cilia.

Habitat.—Nilgiris. *Exp.* 30 mill.

3060*a*. EPIPLEMA HOLOSTICTA, n. sp. (pl. C., f. 19).

♀. Head, thorax and abdomen yellowish white, thickly irrorated with brown and blackish; first segment of abdomen with blackish band. Forewing white, thickly irrorated and blotched with reddish brown and blackish; the costa yellowish brown to the postmedial line; the lines blackish on a yellow-

ish-brown ground, the antemedial sinuous, oblique, and much interrupted, the postmedial excurved from costa to vein 3, then strongly incurved; a blackish point at lower angle of cell; the sub-terminal line black, dentate arising from apex, then oblique to vein 5, then excurved to vein 2. Hindwing white, thickly striated and blotched with brown; a brown line on a yellowish ground, oblique from middle of costa to vein 4, where it is acutely angled, then strongly incurved; a black line on discocellulars with a brown bar beyond it and a black and brown spot below end of cell; a V-shaped black subapical mark defined with white above; a dentate black and white subterminal line from vein 4 to near tornus with blackish before it beyond the angle of postmedial line and brown beyond it.

Habitat.—Ceylon, Matale (Pole). *Exp.* 16 mill. *Type*—In B. M.

3061*b*. EPIPLEMA NIVEA n. sp. (pl. c., f. 10).

♀. Pure white; palpi above, antennæ towards tips and forelegs blackish. Forewing with fine oblique fuscous ante- and postmedial lines; broader oblique medial and subterminal fuscous lines on underside showing slightly on upperside, the latter ending at tornus; a fine line just inside termen from vein 7 to 3. Hindwing, with a fine line from below costa before middle slightly incurved to vein 2 above tornus, then bent back to inner margin, a more diffused line from vein 7 beyond middle to vein 3 near termen, where it is angled, then running to tornus; a fine terminal black line from the point at vein 7 to the point at vein 4; a bright yellow patch just inside the termen above vein 3 and a black spot on termen.

Habitat.—Tibet, Yatong 10,500′ (Hobson). *Exp.* 30 mill. *Type*—In B. M.

3067. EPIPLEMA *leucocera* insert *Erosia* mutans, Bull. A. M. N. H. (5) XIX, p. 434 (1887) which has precedence—Solomon Is.

3067*a*. DIRADES KOHISTARIA, Swinh., A. M. N. H. (7) 6, p. 307.

♀. Differs from *mutans* in the postmedial line of forewing, being excurved at vein 4 instead of dentate and with a black spot on its inner side. Hindwing with the black marking replaced by brown; the inner area striated with brown; the postmedial line excurved instead of angled at vein 4; the subterminal line crenulate.

Habitat.—Andamans, Port Blair; Borneo, Sarawak. *Exp.* 24 mill.

GEOMETRIDÆ.

Boarmianæ.

3102. MYRTETA SIMPLICIATA, insert var *mediofusca*. Warr. Nov. Zool., IV, p. 238; the area between the ante- and postmedial lines of both wings almost entirely filled in by pale fuscous; the submarginal line of forewing obsolescent.

3108. BAPTA MYTYLATA, insert (syn). *B. longipennis*, Warr. Nov. Zool., IV., p. 237.

3109*a*. PLATYCEROTA OLIVATIA, n. sp.

♂. Olive grey-brown. Forewing with slight dark striæ; especially on costa; an indistinct slightly waved antemedial olive-brown line and slightly

oblique straight postmedial line, the area between them sometimes suffused with black ; a black discal point, a triangular fuscous shade on termen below apex. Hindwing with dark striæ, especially on basal half ; a black discoidal point ; an indistinct olive-brown medial line.

Habitat.—Pal· is 7000′ (Campbell). *Exp.* 38 mill. *Type*—In B. M.

3118*a*. Caberodes nana Warr. Nov. Zool. IV., p. 239.

♂. Head orange fulvous ; shaft of antennæ and a band between their bases white ; thorax fuscous ; abdomen fulvous, dorsally suffused with fuscous; wings orange fulvous, irrorated and suffused with fuscous. Forewing with the costa white and with short white striæ arising from it ; indistinct sinuous ante and postmedial lines and a discoidal point. Hindwing with discoidal point and indistinct sinuous, medial line ; cilia of both wings yellow. Underside orange.

Habitat.—Khasis. *Exp.* 24 mill.

3119*b*. Caberodes binotata. Warr. Nov. Zool. IV., p. 239.

Head and thorax dull rufous ; abdomen grey dorsally suffused with rufous. Forewing grey irrorated with fuscous and suffused with rufous, deepest towards medial part of costa and leaving the outer area clear ; triangular yellowish-white medial and postmedial marks on costa ; a dark marginal line. Hindwing pale grey, the inner margin pale rufous with some fuscous specks ; a discoidal point and traces of a postmedial line on inner area.

Habitat.—Khásis. *Exp.* ♂ 24, ♀ 30 mill.

3175*a*. Anonychia trifasciata, n. sp.

Head, thorax and abdomen grey irrorated with brown ; palpi reddish-brown at sides. Forewing grey irrorated with dark-brown ; an oblique almost straight antemedial reddish brown band ; a small black discoidal spot ; a diffused medial brown line, slightly excurved below costa, then oblique and with the area beyond it suffused with red-brown to the postmedial line arising towards apex, defined with grey on outer side, slightly angled outwards above vein 6 and at vein 5, then strongly incurved ; an indistinct diffused greyish subterminal line with dark brown beyond it on apical half ; a dark terminal line. Hindwing pale brownish grey ; the inner area with some dark irroration ; a postmedial line almost obsolete except towards inner margin and incurved to costa ; a dark terminal line ; underside strongly irrorated with dark brown, a small black discoidal spot, a series of dark striæ on the veins at postmedial line.

Habitat.—Tibet, Yatong (Hobson). *Exp.* ♂ 38, ♀ 44 mill. *Type*—In B. M.

3177*a*. Heterolocha obliquaria, n. sp.

♀. Creamy white irrorated with small purplish red spots. Both wings with oblique postmedial line, slightly excurved from costa to vein 4, then incurved and with a pale reddish band on its outer edge. Underside yellow ; forewing with indistinct slightly curved antemedial purplish red line ; both wings with discoidal spot, oblique postmedial band and slight terminal line.

Habitat.—Kashmir, Scinde Valley (Leech). *Exp.* 28 mill. *Type*—In B. M.

3178*a*. HETEROLOCHA RUBRIFUSA, n. sp.

Head, thorax and abdomen yellow slightly tinged or entirely suffused with rufous. Forewing olive-yellow, the basal and terminal areas or the whole wing irrorated and suffused with rufous; the basal area bounded by an indistinct curved line; a small discoidal spot sometimes with white centre; an obliquely sinuous line from apex to inner margin beyond middle excurved at median nervules. Hindwing yellow, more or less prominently irrorated and suffused with rufous; an indistinct oblique line from near apex to inner margin beyond middle.

Habitat.—Tibet, Chumbi Valley, Yatung (Hobson). *Exp.* 38 mill. *Type*—In B. M.

3180*a*. HETEROLOCHA DECOLORARIA, n. sp.

♂. Grey, tinged with ochreous and irrorated with brown. Forewing with indistinct slightly curved antemedial line; a diffused oblique medial line; a discoidal striga; the postmedial line indistinct, oblique from costa to vein 4, then incurved; an indistinct waved subterminal line with dark points on it towards costa. Hindwing with slight discoidal point and traces of curved subterminal line.

♀. Forewing with diffused black on outer side of antemedial line and inner side of postmedial line except at costa; the discoidal point more distinct and no medial line; a terminal series of points; hindwing with diffused medial line except towards costa.

Habitat.—Kashmir, Nubra (McArthur). *Exp.* 28 mill. *Type*—In B. M.

3181*a*. VENILIA RUMIFORMIS, n. sp. (pl. C., f. 2).

Bright sulphur yellow; palpi and frons at sides, antennæ and shoulders rufous. Forewing irrorated with a few dark scales; the basal area rufous except towards inner margin, its outer edges sinuous; a large somewhat tridentate rufous discoidal spot with white point on it; an oblique sinuous postmedial line bent outwards at vein 3, the area beyond it rufous except towards apex. Hindwing usually with more or less prominent dark discoidal point; a slightly sinuous dark subterminal line recurved to costa and inner margin and with the area beyond it rufous except towards apex.

Habitat.—Tibet, Chumbi Valley, Yatong (Hobson). *Exp.* 40 mill. *Type*—In B. M.

3183*a*. LOXASPILATES SERIOPUNCTA, n. sp. (pl. C., f. 28).

♀. Pale ochreous irrorated with black-brown scales; abdomen with lateral series of black points. Forewing with diffused nearly erect brownish antemedial line with series of blackish points on its outer edge; an obscure discoidal spot; a rather oblique brownish postmedial band with blackish line and series of longitudinal striæ on its inner edge, its outer edge waved; a diffused sinuous brown subterminal band with four black points on it towards costa and two above inner margin, the points above and below vein 5 larger; a terminal series of points. Hindwing paler with indistinct dis-

coidal spot and oblique postmedial line excurved below costa ; traces of a subterminal series of spots ; a terminal series of black points.

Habitat.—Tibet, Yatong (Hobson). *Exp.* 40 mill. *Type*—In B. M.

3186. Stenorumia ablunata (syn.) insert, *Stenorumia kashmirica*. Warr. Nov. Zool. VI., p. 65.

3194*a*. Corymica immaculata. Warr. Nov. Zool. IV., p. 116.

♂. Bright sulphur yellow ; palpi, frons, antennæ and tegulæ rufous ; vertex of head and base of antennæ pure white ; wings irrorated with rufous. Forewing with the basal half of costal area tinged with rufous ; the elliptical fovea very large ; a sinuous antemedial rufous line ; a black discoidal speck ; a medial rufous line very strongly angled beyond cell and ending in a small white spot on inner margin, two black points on costa towards apex ; an oblique postmedial rufous line, sinuous towards inner margin. Hindwing with black discoidal point, ante and postmedial rufous lines bent inwards to costa ; the termen rufous ; cilia of both wings rufous at base, whitish at tips.

♀. With the lines less distinct.

Habitat.—Sikhim ; Bhután. *Exp.* ♂ 30, ♀ 34 mill.

3199*d*. Eurytapuria viridulata. Warr. Nov. Zool. IV., p. 259.

♀. Dull green ; head fuscous ; wings sparsely irrorated with brown. Forewing with some dark striæ on costa ; an obscure antemedial brown line, slightly bent inwards to inner margin ; a discocellular point ; a postmedial brown line excurved below costa and incurved below vein 3 and with brown spots beyond it between vein 4 and inner margin, the two upper large, then becoming points. Hindwing with discocellular point and sinuous fuscous medial line. Underside fuscous grey with discocellular points and slightly curved postmedial line.

Habitat.—Khásis. *Exp.* 24 mill.

3202*a*. Xenographia tenuis. Warr. Nov. Zool. IV., p. 249.

♀. Pale grey, thickly irrorated with dark brown. Forewing with dark point at base of median nervure ; an obscure curved antemedial line with dark points at subcostal and median nervures and vein 1 ; an oblique postmedial series of short black streaks on the veins connected by an obscure diffused fuscous line ; traces of a submarginal series of points with a **V**-shaped mark on it at vein 5 ; both wings with marginal series of points.

Habitat.—Dalhousie, Punjab. *Exp.* 34 mill.

3204*a*. Xenographia hetera, n. sp. (pl. C., f. 11).

♂. Antennæ bipectinate with long branches, the apex simple.

Pale olive-yellow ; head and tegulæ dark olive-yellow ; antennæ black ; legs streaked with fuscous ; abdomen irrorated with brown. Forewing slightly irrorated with black ; a rather indistinct antemedial line arising from a triangular black spot on costa ; a black discoidal point ; a postmedial triangular black spot on costa ; an oblique minutely waved dark line with greyish spots on it from apex to middle of inner margin. Hindwing more strongly

irrorated with fuscous ; a black discoidal point ; a purplish postmedial band diffused to apex and becoming blackish towards inner margin.

Habitat.—Sikhim (Pilcher). *Exp.* 28 mill. *Type*—In B. M.

P. 190. Under SPILOPERA insert (syns.) *Plesiomorpha*, Warr. Nov. Zool. V., p. 38 (1898), type—*vulpecula*, Warr. *triaplecta*, Warr. ; Nov. Zool. VI., p. 64 (1899), type—*ferrifera*, Moore, and *trotocraspeda*, Warr. Nov. Zool. VI., p. 66 (1899), type—*divaricata*, Moore.

3212*b*. SPILOPERA VULPECULA, Warr. Nov. Zool. V., p. 38.

♂. Pale ferruginous ; patagia with fuscous band ; abdomen dorsally strongly irrorated with black ; wings irrorated with black specks, especially on basal half. Forewing greyish towards costa ; a black discoidal point ; traces of a crenulate subterminal line with series of black points on it. Hindwing with black discoidal point ; cilia white at tips.

Forewing with vein 11 touching 12, then anastomosing with 10.

Habitat.—Khásis. *Exp.* 32 mill.

3217*a*. RHYNCHOBAPTA IRRORATA, n. sp.

♀. Dark brown irrorated with black scales. Forewing with traces of slightly curved antemedial line ; both wings with black discoidal spot and postmedial line with grey outer edge, straight and oblique on forewing, slightly angled at vein 6 on hindwing and with diffused black sub-apical mark beyond it on forewing ; hindwing with the outer margin crenulate between apex and angle.

Habitat.—Nilgiris S. slopes (Lindsay), Gudalur (Cardew). *Exp.* 40 mill. ;

3230*a*. ZEHEBA KALUGA, Swinh. A. M. N. H. (7) 6, p. 308.

♀ Forewing with the apex produced to a fine point, the termen dentate below it but not excised.

Bright sulphur-yellow. Forewing slightly striated with rufous ; an oblique rufous line from apex to inner margin just beyond middle, the area beyond it suffused with rufous except towards inner margin, where it is striated. Hindwing slightly striated with rufous ; an oblique rufous medial line with some rufous on its outer edge ; cilia rufous.

Habitat.—Jaintia Hills. *Exp.* 44 mill.

3242. MACARIA ATMALA, insert (syn.) 3205*a*. *Spilopera subcinerea*.

3247. MACARIA EFFUSATA, insert (ab.) *uniformis*, Warr. Nov. Zool. VI., p. 355.

3261*a*. OXYMACARIA CEYLONICA, n. sp.

♂. Pale ochreous strongly irrorated with fuscous. Forewing with olive-brown subbasal line strongly bent inwards to costa and sinuous below the cell ; a similar medial line with dark points on discocellulars, median nervure and veins 2 and 1 ; a fine double postmedial line strongly angled at vein 6, then sinuous and with large black patch on it between veins 3 and 5 ; an obscure subterminal series of white points. Hindwing with oblique sinuous medial line with black discoidal spot just beyond it; a fine double curved postmedial line ; an obscure subterminal series of white points.

Habitat.—Ceylon, Pundaloya (Green). *Exp.* 36. *Type*—In B. M.

In this genus vein 10 is free, 11 given off from 12.

3261*b*. OXYMACARIA PECTINATA, n. sp. (pl. C., f. 33).

♂. Antennæ bipectinate with rather long branches.

Ochreous tinged with red-brown and irrorated with fuscous; tibiæ banded with black at extremity. Forewing with indistinct antemedial, medial and postmedial sinuous greyish lines incurved to costa, each with some minute black points and the last with blackish spot on its outer edge between veins 3 and 5; a prominent slightly incurved olive-brown subterminal line with white striæ on its outer edge above and below vein 6; a terminal series of black points. Hindwing paler with greyish antemedial and medial lines obsolescent towards costa and the latter excurved at middle; a more prominent olive-brown subterminal line slightly angled inwards in discal fold, then incurved and ending at tornus; a terminal series of black points.

Habitat.—Palnis 7,000′ (Campbell). *Exp.* 40 mill. *Type*—In B. M.

3278*b*. HYPEPHYRA ETAWA, Swinh. A. M. N. H. (7) 6, p. 308 (1900).

♂. Purple-brown mixed with silvery-grey; head rufous. Forewing with numerous dark striæ; a pale antemedial line oblique from costa to median nervure, where it is angled, then incurved; a black discoidal point; a pale waved postmedial line incurved between veins 4 and 6; traces of a pale curved subterminal line with some dark points on its outer edge towards costa. Hindwing with pale antemedial line angled in submedian fold; a pale waved postmedial line; a pale terminal band; cilia of both wings dark at base, rufous at tips.

Habitat.—Assam, Jaintia Hills. *Exp.* 32 mill.

3282*a*. ANTHYPERYTHRA CALADSAOTA, n. sp.

♀. Orange-yellow; head and thorax tinged with brown; tegulæ grey, abdomen ochreous, dorsally irrorated with fuscous; wings thick, irrorated with reddish brown and fuscous spots. Forewing with the medial area less spotted; nearly straight whitish ante- and postmedial lines, the former indistinct, the latter oblique; a dark discoidal spot; the terminal area with the ground color reddish-brown from apex to middle of inner margin, with large fuscous blotches at apex and beyond middle of postmedial line. Hindwing with nearly straight white medial line, the ground color beyond it wholly reddish-brown.

Habitat.—Simla, 7,000′ (Pilcher). *Exp.* 40 mill. *Type*—In B. M.

3301*a*. FASCELLINA PUNCTATA, Warr. Nov. Zool. V., p. 38.

♂. Olive-green. Forewing with indistinct, slightly waved, oblique, antemedial, medial, and postmedial lines; a sinuous subterminal line strongly excurved below costa and with greyish suffusion on its inner edge and beyond it. Hindwing with indistinct oblique antemedial line and prominent straight medial line with grey on its inner edge and beyond it. Underside yellow-green; with dull green striæ; forewing with white suffusion on basal half of costal area, on outer edge of subterminal line, which is strongly produced

outwards below costa and has a yellow patch in its bend, and on terminal area below apex; hindwing with straight medial and strongly curved postmedial lines.

Habitat.—Khâsis. *Exp.* 40 mill.

3312*a*. LEPTOMIZA RUFITINCTARIA, n. sp. (pl. C., f. 3).

♀. Palpi short, porrect, hairy; forewing with vein 11 slightly anastomosing with 12. Grey mixed with rufous; tibiæ and tarsi orange-yellow irrorated with black. Forewing more strongly tinged with rufous except on terminal area, which is grey irrorated with fuscous; traces of curved rufous antemedial and oblique postmedial lines. Hindwing silky grey tinged with rufous; a dark discoidal spot; traces of a curved postmedial line. Underside of both wings with prominent dark discoidal spot and waved postmedial line prominent on hindwing.

Habitat.—Simla, 7,000′ (Pilcher). *Exp.* 36 mill. *Type*—In B.M.

3326*a*. GARÆUS FULVATUS, Warr. Nov. Zool. V., p. 40.

♀. Orange-fulvous irrorated with black; vertex of head and tegulæ purplish; wings with fine striæ. Forewing with rather indistinct antemedial greyish-fuscous line oblique from costa to median nervure, where it is acutely angled, then sinuous; a discoidal spot with small obscure wedge-shaped mark on costa above it; an oblique blackish line with grey line on its outer edge from apex to inner margin beyond middle and with grey suffusion beyond it on inner half. Hindwing with straight blackish medial line with fine whitish line on it and a whitish discoidal bar before it; the terminal area with greyish suffusion; cilia of both wings dark brown at tips. Underside suffused with dark brown.

Habitat.—Khâsis. *Exp.* 42 mill.

3357*a*. BISTON BURMAENSIS, n. sp.

♂. White irrorated with black; palpi black above; frons at sides and above black; tegulæ edged with brown; fore femora above and tibiæ at base black. Forewing with black antemedial line slightly angled on median nervure, then oblique and again angled on vein 1, a curved pale cinnamon-brown band just before it; an indistinct waved cinnamon-brown medial band; a black postmedial line strongly produced outwards to a rounded tooth on vein 5, then strongly incurved angled outwards in submedian fold, then slightly inwards on vein 1; the subterminal line dentate, white, very indistinct, defined by a large, pale, cinnamon patch on its inner side on costal area, diffused black marks before and beyond it at vein 5, a cinnamon patch with some diffused black on it between veins 4 and 2, and a cinnamon line to inner margin, the area beyond it tinged with cinnamon, some black striæ on termen. Hindwing with waved cinnamon medial line, outwardly oblique below cell; a black postmedial line, obsolete towards costa and strongly incurved below vein 4; an indistinct waved white subterminal line defined by pale cinnamon patches on its inner side and black irroration on its outer; cilia of both wings pale cinnamon.

Habitat.—Burma, N. Khyen Hills (Watson). *Exp.* 60 mill. *Type*—In B. M.

3369*a*. GNOPHUS ORPHNINARIA, n. sp.

Hind tibiæ of male dilated; forewing with veins 7, 8, 9, 10 stalked, 10 anastomosing with 11 and then with 8, 9 to form a double areole.

Grey largely mixed with white; palpi and sides of frons black, the frons brown. Forewing with indistinct waved antemedial line; the medial area tinged with ochreous; a grey discoidal lunule defined by a rather diffused black annulus; the postmedial line fuscous dentate and produced to slight white points on the veins, excurved to vein 3, then incurved and with grey suffusion between it and the irregularly waved whitish subterminal line which is incurved at vein 5. Hindwing with discoidal lunule defined by fuscous; a curved dentate postmedial line produced to slight white points on the veins and a sinuous whitish subterminal line incurved at vein 5. The underside of both wings suffused and striated with grey and with a distinct white-defined postmedial line on forewing excurved from costa to vein 3, then incurved, on hindwing slightly angled outwards at veins 6 and 4.

Habitat.—Kashmir, Goorais Valley (Leech), Barra Larcha, Kokser (McArthur). *Exp.* 44-46 mill. *Type*—In B. M.

3369*b*. GNOPHUS RUFITINCTARIA, n. sp.

Hind tibiæ of male not dilated; forewing with veins 7, 8, 9, 10 stalked, 10 anastomosing with 11 and then with 8, 9 to form a double areole, 11 anastomosing with 12.

Pale-brownish strongly irrorated with fuscous. Forewing with small fuscous spot at base of cell; an oblique antemedial bar from costa and points on median nervure and vein 1; a grey discoidal lunule defined by a diffused black annulus; a postmedial series of short streaks on the veins, bent inwards to costa and incurved below vein 4; an irregularly waved subterminal band diffused and with some rufous suffusion on its inner side; cilia with series of fuscous spots. Hindwing with fuscous discoidal spot; a postmedial series of short striæ on the veins; a diffused waved subterminal line with some rufous on its inner edge; cilia with series of fuscous spots. Underside of both wings grey-white, discoidal spots and a subterminal band from costa to vein 5 and towards tornus, forewing with patch on termen below apex.

Habitat.—Kashmir, Barra Larcha, Kokser (McArthur). *Exp.* 36-42 mill. *Type*—In B. M.

3372*a*. GNOPHUS STOLICZKARIA, Moore. A. M. N. H. (5) i. p., 235 (1878).

♀. Greyish-ochreous thickly irrorated with pale reddish-brown; both wings with obscure brown discoidal spot and traces of maculate postmedial and subterminal lines; a terminal series of dark striæ.

Habitat.—Yarkand. *Exp.* 38 mill.

3377*a*. OPHTHALMODES STRIATIFERA, n. sp. (pl. C., f. 14).

♀. White suffused with pale red-brown; palpi, back of head, tips of tegulæ and outer edge of patagia black; abdomen dorsally irrorated with black and with slight segmental lines; wings striated with pale red-brown and

irrorated with dark-brown scales. Forewing with some black streaks on edge of costa ; a waved antemedial line expanding into a spot at costa and excurved in and below cell ; a fuscous-edged reniform discoidal stigma ; the postmedial line expanding into a spot at costa, strongly excurved from costa to vein 3, where it is joined by a second strongly excurved dentate line arising from costa beyond it, below vein 3 incurved and dentate ; a prominent black streak on vein 4 from lower angle of cell to the subterminal line which is highly dentate, curved and defined by whitish on outer side ; a terminal series of black points, those above veins 4, 5 developed into short streaks. Hindwing with oblique, sinuous, antemedial line ; a fuscous-edged discoidal annulus ; an indistinct dentate curved postmedial line with black striga at inner margin ; a slightly dentate black subterminal line, angled at discal fold and defined by whitish on outer side ; a terminal series of points. Underside grey ; both wings with large black discoidal spot and diffused subterminal band, angled outwards to termen at discal fold.

Habitat.—Travancore, Trivandrum (Fergusson). *Exp.* 70 mill. *Type*—In B. M.

3378*a*. OPHTHALMODES POLIARIA, n. sp.

♀. White thickly irrorated with fuscous ; palpi fuscous ; abdomen with paired dorsal fuscous points on fourth and fifth segments. Forewing with traces of curved fuscous antemedial line ; a rounded discoidal spot with some white scales at middle and spot above it on costa ; a highly dentate postmedial line excurved from costa to vein 4, then incurved to below end of cell ; a dentate white subterminal line with fuscous spots on its inner side; the termen tinged with fuscous and with terminal series of points. Hindwing with indistinct diffused fuscous medial band ; a discoidal annulus ; a dentate postmedial line excurved from costa to vein 4, then incurved ; a dentate somewhat maculate subterminal line and a terminal series of points. Underside slightly irrorated with fuscous, large blackish discoidal spots, the terminal area broadly suffused with fuscous.

Habitat.—Burma, Thayetmyo (Watson). *Exp.* 48 mill. *Type*—In B. M.

P. 257. Under BOARMIA, insert *Hirasodes*, Warr. Nov. Zool. VI., p. 51 (1899). Type—*contubernalis*, Moore.

Lophobates, Warr. Nov. Zool. VII., p. 54 (1899). Type—*ochreicostata*, Hmpsn.

Sysstema, Warr. Nov. Zool. VII., p. 57 (1899). Type—*semicircularata*, Moore.

3380*a*. BOARMIA CYCLOPHORA, n. sp.

♂. Red-brown strongly irrorated with black ; thorax suffused with black. Forewing with reddish-brown ante- and postmedial lines, the former slightly curved and defined with black on outer side, the latter sinuous and defined with black on inner side ; the medial area suffused with black ; a large rounded ochreous spot on middle of termen traces of a blackish subterminal line. Hindwing paler except towards tornus ; traces of postmedial and subterminal lines ; a fine crenulate black terminal line on both wings.

Habitat.—Sikhim 7,000′ (Pilcher). *Exp.* 44 mill. *Type*—In B. M.

3387*a*. BOARMIA SUBTOCHRACEA, n. sp.

♂. Head and thorax olive-brown mixed with black; abdomen ochreous irrorated with black and with black segmental lines; wings ochreous suffused with olive-green and irrorated with black. Forewing with curved black antemedial line; an oblique black discoidal bar with the medial black line just beyond it, angled at vein 7, then oblique; the postmedial line punctiform except towards inner margin, straight from costa to vein 5, then oblique to near medial line, dentate on vein 1, a dentate grey subterminal line with some black suffusion on its inner side; a terminal series of small dentate black spots. Hindwing with oblique black subbasal line; a discoidal point; the postmedial line punctiform except towards inner margin, excurved from costa to vein 4, then strongly incurved; a dentate grey subterminal line with black suffusion on its inner side; a terminal series of black points. Underside ochreous yellow irrorated with fuscous, the terminal area broadly suffused with black, leaving ochreous patches on forewing at apex and middle of termen and towards tornus of hindwing.

Habitat.—Nilgiris, S. slopes 4000′ (Cardew). *Exp.* 36 mill. *Type*—In B.M.

3387*b*. BOARMIA DISCISTIGMARIA, n. sp.

♂. Olive-brown irrorated with black. Forewing with diffused curved black antemedial band; a diffused discoidal spot; an indistinct dentate postmedial line with points at the veins, oblique below vein 5 and with a black mark on it and lunule beyond it between veins 3, 4; traces of a pale waved subterminal line with black points before it on each side of vein 5 and beyond it below costa; a terminal series of small black spots. Hindwing with indistinct antemedial line angled on median nervure; traces of a discoidal spot; a curved postmedial series of black points on the veins with lunule beyond it between veins 3 and 4; traces of a pale waved subterminal line with obscure black points on its inner edge and more distinct spot above vein 4; a terminal series of small black spots. Underside ochreous grey irrorated with fuscous; forewing with distinct large discoidal spot, hindwing with indistinct spot; the terminal area suffused with fuscous, leaving some grey on termen of hindwing.

Habitat.—Assam, Khásis. *Exp.* 40 mill. *Type*—In B. M.

3400*a*. BOARMIA SERRATILINEA, insert (syn.) *Scotopteryx submigrata*, Warr. Nov. Zool. VIII., p. 34.

3402*a*. BOARMIA BISERRATA, n. sp. (pl. C., f. 20).

♂. Antennæ with two pairs of serrations from each joint ending in long fascicles of cilia.

Grey-brown strongly irrorated with black; tarsi black with ochreous bands. Forewing with indistinct curved dark antemedial line; some dark points running obliquely from middle of costa to lower angle of cell; the postmedial line represented by some dark points from costa to vein 3, then incurved and better defined from submedian fold to inner margin; an

irregularly sinuous subterminal dark line defined by grey on outer side; a terminal series of points. Hindwing with discoidal point, a slightly curved postmedial line; some dark subterminal spots and a terminal series of points.

Habitat.—Kulu (Pilcher). *Exp.* 30 mill. *Type*—In B. M.

3410*a*. BOARMIA LONGIRAMARIA, n. sp.

♂. Head, thorax and abdomen grey irrorated with fuscous. Forewing yellowish-white suffused with rufous and very strongly striated with black; an ill-defined curved black antemedial line; a black discoidal bar; a diffused black medial line with the area between it and the nearly straight postmedial series of black points paler followed by rufous before the indistinct pale waved subterminal line which has a series of maculate black marks on its inner side; a terminal series of small black lunules. Hindwing rufous striated with fuscous; an indistinct antemedial straight line; a slight discoidal striga; a straight postmedial punctiform line; a pale waved subterminal line with maculate fuscous band on its inner side; a crenulate terminal black line.

♀. Hindwing whitish, thickly mottled with fuscous, the markings almost obsolete.

Forewing with veins 7, 8, 9 stalked; antennæ of male with the branches very long, the apex simple.

Habitat.—Sikhim. (Möller, Dudgeon). *Exp.* 48 mill. *Type*—In B. M.

3415*a*. BOARMIA HEMIGLAUCARIA, n. sp.

♂. Head, thorax and abdomen fuscous and grey, the last with the first segment whitish and some dorsal black spots; wings grey striated with black and with some olive-brown suffusion near the lines. Forewing with subbasal black points on median nervure and vein 1, an indistinct waved antemedial line angled just below median nervure; the veins of medial area, which is much paler than the rest of wing, streaked with white with antemedial black points on median nervure and vein 1 and medial and postmedial series on the veins, the last on an indistinct dentate line followed by another dentate line which is bent inwards below vein 5; a terminal series of black points. Hindwing with the basal half pale; an antemedial line from cell to inner margin; a discoidal striga; a curved postmedial series of dark points with an obscure diffused line beyond it below vein 4; an obscure dentate subterminal line defined by white and with black point on it in discal fold; a crenulate terminal line and series of black points. Underside of forewing with large fuscous patches on apical area and on termen below middle.

♀. Darker, the wings more thickly and uniformly irrorated and striated with black.

Ab. 1. Wings wholly irrorated and striated with black; the olive brown suffusion more distributed and prominent.

Ab. 2. Wings with the black irroration and striation very thick and evenly distributed; the olive-brown tints slight and confined to the lines.

Forewing with veins 10, 11 shortly stalked, 11 anastomosing with 12.

Habitat.—Tibet, Yatong (Hobson); Bhutan (Dudgeon). *Exp.* 46 mill.

3416*a*. BOARMIA DELATINA, Swinh. A. M. N. H. (7) 6, p. 308 (1900).

♀. Pale reddish-brown; forewing with indistinct brown antemedial line excurved from costa to submedian fold, then oblique, and with black spot at costa; a curved slightly waved medial line with dark streaks on the veins; a postmedial line incurved from costa to vein 6, then obliquely waved and with dark streaks on the veins. Hindwing with nearly straight indistinct medial line; a curved postmedial line produced to slight points at the veins. Underside whitish; both wings with oblique dark medial line; the postmedial line excurved beyond cell and with dark streaks at the veins the terminal area dark with pale patches at apex and middle.

Habitat.—Shan States, Koni. *Exp.* 46 mill.

3426*a*. BOARMIA EURYDISCARIA, n. sp.

Head and thorax red-brown mixed with dark brown; tegulæ blackish at tips; abdomen greyish mixed with fuscous and with dorsal black segmental lines, the anal tuft and ventral surface fuscous-yellow. Forewing rufous irrorated and striated with black; a black discoidal bar; a diffused medial blackish band with waved outer edge, strongly incurved below vein 2, the area beyond it pale yellowish, becoming rufous towards the subterminal line which is indistinct, pale, crenulate, with a series of black lunules on its inner side and diffused black marks between it and termen below apex and vein 3; a terminal series of black points. Hindwing pale yellowish irrorated with fuscous points; a small discoidal spot and crenulate terminal line; the underside with indistinct post medial series of points on the veins.

Forewing with veins 7, 8, 9 stalked; antennæ of male with the branches long, the apex simple.

Habitat.—Sikhim (Möller). *Exp.* 34 mill. *Type*—In B. M.

3431*a*. BOARMIA POLYSTICTA, n. sp.

♂. Yellowish white, strongly irrorated with black, the wings striated and with groups of black scales. Forewing with indistinct antemedial line with a black point on it in cell, bent inwards and more prominent at costa; an indistinct sinuous medial line, with a spot on it below costa and small triangular spot on costa; postmedial and subterminal spots on costa and traces of a dentate subterminal line; black patches on termen below apex and middle and a terminal series of black points; cilia chequered black and white. Hindwing with terminal crenulate line; a discoidal spot on underside.

Habitat.—Ceylon, Maturata (Mackwood). *Exp.* 26 mill. *Type*—In B. M.

3434*a*. BOARMIA ARCEARIA, n. sp.

♂. Antennæ bipectinate to apex with moderate branches; forewing with veins 7, 8, 9, 10 stalked, 10 from beyond 7.

Grey mixed with reddish brown and irrorated with black. Forewing with the antemedial line strongly bent outwards below costa, then very oblique to

inner margin near base; a slight discoidal point; an indistinct minutely dentate postmedial line, angled at vein 5, then very oblique with a similar but stronger line beyond it, becoming almost confluent with it towards inner margin, with points at the veins and almost a spot at lower angle of cell, and with a similar indistinct brown line beyond that from costa to vein 5, defining the inner edge of the waved grey subterminal line, then approximated to the postmedial line; a crenulate black terminal line. Hindwing with oblique diffused antemedial line; a slight discoidal point; a minutely dentate postmedial line defined by grey on outer side, slightly excurved from costa to vein 4, then incurved; an indistinct waved grey subterminal line; a crenulate black terminal line.

Habitat.—Kashmir, Scinde Valley (Leech). *Exp.* 30 mill. *Type*—In B. M.

3442*a*. BOARMIA PUNCTILINEARIA, Leech, A. M. N. H. (6) XIX, p. 426 (1897).

Forewing of male without fovea; veins 7, 8, 9, stalked, 10 from cell, 11 anastomosing with 12; antennæ bipectinate to apex; mid tibiæ dilated with fold and tuft.

Grey-brown thickly irrorated and striated with black. Forewing with waved black antemedial line, angled outwards below costa and inwards on median nervure and vein 1; a small eliptical discoidal annulus; a highly dentate postmedial line angled outwards at vein 6 and incurved between veins 3 and 1; two dentate greyish subterminal lines, with some dark marks between them; a subterminal series of small black lunules. Hindwing with black discoidal point; a highly dentate postmedial line and two indistinct dentate grey subterminal lines; a terminal series of small black lunules. Underside grey irrorated with fuscous: both wings with black discoidal point and dentate postmedial line with the area beyond it dark.

Habitat.—W. China, Huang-mu-Chang 7000′; N.-W. Himalayas, Kulu. *Exp.* ♂34, ♀ 40 mill.

3444*a*. BOARMIA OCHRICOSTATA, insert (syn.) *Lophobates ochricostata*, Warr. Nov. Zool. VI., p. 54.

3458*a*. BOARMIA CUPRISCOTIA, n. sp.

Head and thorax dark-brown; frons pale; abdomen whitish irrorated with fuscous. Forewing cupreous-brown striated with dark-brown; an indistinct dark antemedial line with dark points on the veins and slightly angled below costa and on median nervure; a very prominent cell spot; a slightly crenulate postmedial line with dark points on the veins; a subterminal greyish line with series of nearly conjoined black spots on it, of which two above vein 4 and two below 2 are larger; a terminal series of black points. Hindwing grey with a yellowish tinge thickly mottled with fuscous and with discoidal spot and curved postmedial line prominent on underside. Forewing with vein 10 not anastomosing with 11.

Habitat.—Tibet, Yatong (Hobson), Sikhim 12,000′ (Dudgeon). *Exp.* ♂ 38, ♀ 42 mill.

Genus PROMETOPIDIA, nov.

Proboscis fully developed; palpi porrect, slender, hardly reaching as far as the large conical frontal prominence; antennæ of male laminate; legs slender; wings slender. Forewing with the termen oblique; vein 3 from close to angle of cell; 5 from middle of discocellulars; 7, 8, 9, 10 stalked from before upper angle; 11 approximated to 12, then 10. Hindwing with vein 3 from before angle of cell; 5 obsolescent from middle of discocellulars; 7 from before upper angle; 8 approximated to cell to middle.



Prometopidia conisaria ♂ ¾.

3463*a*. PROMETOPIDIA CONISARIA, n. sp.

Brownish-grey irrorated with brown; frontal prominence black; wings irrorated with some large black scales. Forewing with waved blackish antemedial line; a small discoidal tuft of black scales; an oblique postmedial line slightly dentate at the veins and incurved between veins 3 and 1; a terminal series of black points; the cilia intersected with white. Hindwing with black discoidal point; a slightly dentate postmedial line and traces of a subterminal line; a terminal series of black points; cilia whitish at base.

Habitat.—Kashmir, Narkundah (McArthur). *Exp*. 30 mill. *Type*—In B. M.

3469*a*. MEDASINA NEPALENSIS, n. sp.

Antennæ of male with very long branches; hind tibiæ dilated with fold and tuft.

♂. Whitish strongly irrorated with red and dark-brown; palpi, frons and branches of antennæ dark-brown. Forewing with traces of diffused antemedial line; a diffused discoidal spot; an indistinct dentate postmedial line; a highly crenulate whitish subterminal line defined on each side by brown; a terminal series of points. Hindwing with the basal area more thickly irrorated with blackish; a dark discoidal spot; a dentate medial line with obscure spot beyond it in discal fold; a crenulate whitish subterminal line defined on each side by brown; a terminal series of points. Underside white; both wings with discoidal spot; forewing with the terminal area suffused with fuscous except towards tornus, widely at costa and leaving a whitish mark at apex; hindwing with indistinct subterminal line.

Habitat.—Nepal (Wright). *Exp*. 66 mill. *Type*—In B. M.

3497*a*. ARICHANNA PLAGIOGRAMMA, n. sp. (pl. C., f. 8.).

White very slightly tinged with yellow; palpi, antennæ, a band across frons, tegulæ and tips of patagia black; legs striated and abdomen banded with black. Forewing with subbasal, two antemedial and a medial black line; a fascia from base just above median nervure to the double postmedial line, of which the inner is excurved below costa and in submedian fold bent inwards to join the medial line, the outer of the two lines crenulate and joined by short streaks to the waved subterminal line, which is connected with the terminal line by two patches above middle and one below it; cilia chequered

black and white. Hindwing with subbasal line obsolescent towards costa ; a slight discoidal mark ; a medial line excurved beyond cell and incurved below it and connected by a streak on vein 4 with the subterminal line which is angled outwards to the termen at vein 4 and connected with it by a diffused patch at veins 2 and 3, a crenulate terminal line ; cilia chequered with black.

Habitat.—Tibet, Yatong (Hobson). *Exp.* 40 mill. *Type*—In B. M.

3509. Should stand as EREBOMORPHA COMPOSITATA, Wlk. XXIV., 1120 *nec* Guen.

Genus ABRAXESIS, nov.

Type.—A melaleucaria.

Palpi upturned not reaching vertex of head, the second joint fringed with long hair, the third short and clothed with long hair ; antennæ of male bipectinate with short branches dilated at extremity ; hind tibiæ with the medial spurs absent. Forewing with vein 5 from near angle of cell ; 5 from above angle of discocellulars ; 6 from upper angle ; 7, 8, 9 stalked ; 10, 11 from cell ; no fovea. Hindwing with veins 3, 4 from angle of cell ; 5 obsolete ; 6, 7 stalked ; 8 approximate to cell for about half length of cell.



Abraxesis metaleucaria ♂ ♩.

3510*a*. ABRAXESIS MELALEUCARIA, n. sp.

♂ Head white ; palpi black ; the second joint fringed with white and black hair ; sides of frons, antennæ and a band between their bases black ; tegulæ white, black at base ; thorax black and white ; pectus white ; legs white, banded with black ; abdomen white with dorsal series of triangular black patches excised in front except on subterminal segment, the patch on anal segment almost linear. Forewing white with numerous black spots coalescing in places into very irregular patches ; some forming a curved antemedial band connected by a very irregular patch with an extremely irregular postmedial band ; others forming a subterminal maculate band expanding as patches to termen below apex and middle. Hindwing white ; a discoidal black spot ; postmedial spots on veins 6, 4, 2, 1 ; a subterminal maculate band connected in places with some spots on termen and with some black points near it.

Habitat.—Simla, 7,000′ (Pilcher). *Exp.* 54 mill. *Type*—In B. M.

3516. ABRAXAS SYLVATA, insert (syn.) *Abraxas abrasata*, Warr. Nov. Zool. V., p. 246.

3528. ABRAXAS POLIARIA, insert (syn.) *Abraxas fumicolor*, Warr Nov. Zool. V., p. 247. Melanic aberration with the abdomen and wings entirely suffused with uniform dull brown except at extreme base.

3528*a*. ABRAXAS DIVERSICOLOR, Warr Nov. Zool. VIII., p. 198 (pl. C., f. 12).

♂. Head, thorax and abdomen bright orange ; palpi, a spot on frons, antennæ, patches on tegulæ, patagia and mesothorax black ; pectus and legs black, the coxæ orange, abdomen speckled with black, the ventral surface mostly black, wings fuscous black. Forewing with fasciæ composed of orange spots conjoined in places below costa and on median nervure and some subterminal spots between costa and vein 5. Hindwing with fasciæ of yellowish-white partly-conjoined spots below costa and on median nervure to beyond end of cell, followed by a few subterminal spots.

Habitat.—Cuddapah ; Palni Hills, 5,500'. *Exp*. 54 mill.

ORTHOSTIXINÆ.

3589*a*. OZOLA LEPTOGONIA, n. sp.

♂. Pale purplish-red-brown irrorated with fuscous. Forewing with indistinct dark antemedial line angled below costa ; a discoidal point ; a very indistinct postmedial line excurved below costa, then incurved and again excurved above inner margin with one or two slight points beyond the cell ; some subterminal black points from costa to vein 5 with dark patch on terman below apex ; a terminal series of points. Hindwing with obscure medial line with discoidal black point just before it, the postmedial line arising from the same point on costa excurved to vein 5, then straight ; a terminal series of points.

♀ Much more strongly suffused with red-brown, especially on terminal half of wings ; the fuscous irroration much stronger ; both wings with more distinct subterminal line.

Habitat.—Ceylon Puttalam (Green). *Exp*. ♂ 26, ♀ 32 mill. *Type*—In B. M.

LARENTIANÆ.

3596*b*. DYSETHIA QUADRIPUNCTA, Warr. Nov. Zool. V., p. 21.

♂ Yellow-brown irrorated with dark brown. Forewing with small triangular blackish ante- and postmedial patches on costa and inner margin ; a dark discoidal point and traces of a postmedial series of dark points. Hindwing dull orange-yellow with traces of a pale curved postmedial line ; a dark point on inner margin towards tornus ; underside with dark discoidal point ; a postmedial dark line obtusely angled at vein 4 and arising from a dark point on costa.

Habitat.—Khásis. *Exp*. 32 mill.

3600*b*. CRYPTOLOBA ETAINA, Swinh. A. M. N. H. (7) 6, p. 310.

♂ Purplish-grey ; head paler. Forewing with the costa striated with white and black ; a fine antemedial outwardly oblique line angled outwards on median nervure ; a similar postmedial waved line excurved at vein 5 ; a fine dark terminal line. Hindwing with traces of curved postmedial line.

Habitat.—Khásis. *Exp*. 16 mill.

3600*c*. CRYPTOLOBA OLIVESCENS, n. sp.

♂ Grey ; palpi and tegulæ olive-brown ; antennæ fuscous. Forewing irrorated with fuscous ; some olive-green suffusion at base ; the whole area from

before middle to near termen suffused with olive-green except a large patch on costa ; a short oblique black bar from costa before middle and another beyond middle with another below it between veins 3 and 5. Hindwing paler irrorated with fuscous ; traces of a curved postmedial line.

Habitat—Sikhim 7000' (Pilcher). *Exp.* 24 mill. *Type*—In B. M.

3616*a*. EUBOLIA LEUCOCYPTA, n. sp.

♂ Head and thorax brown, largely mixed with white ; abdomen white irrorated with brown. Forewing reddish brown, suffused in parts with fuscous ; a very indistinct oblique whitish antemedial line from inner margin to an obscure white streak, which extends from it to well beyond upper angle of cell ; a prominent discoidal black point on a white spot ; a curved white band traversed by a fuscous line from termen below apex to inner margin beyond middle and with a subterminal whitish line from it to inner margin. Hindwing whitish, slightly tinged with brown ; a fine fuscous terminal line.

Habitat.—Cuddapah, Horsleykhonda, 3—5000' (W. H. Campbell). *Exp.* 30 mill. *Type*—In B. M.

3619*a*. SCOTOSIA MELANOPLAGIA, n. sp.

♀. Head, thorax and abdomen pale reddish brown. Forewing pale reddish brown with numerous waved darker lines covering the greater part of wing ; a black patch at base of costal area ; a medial black patch from costa to just below origin of vein 3 with waved whitish edges and a figure of 8-shaped mark with darker brown centre below it on inner area ; the antemedial and postmedial lines more prominent, the former strongly excurved at middle, the latter bent inwards below vein 4 ; the terminal area darker red-brown with a waved white subterminal line with a pale patch on its inner side at middle and a white spot on it above its termination at tornus ; a black terminal line interrupted at the veins. Hindwing pale brown with traces of discoidal point and crenulate postmedial line more distinct on underside ; a waved white subterminal line and black terminal line interrupted at the veins.

Habitat.—Tibet, Yatong (Bingham) ; Sikhim (Dudgeon). *Exp.* 46 mill. *Type*—In B. M.

3622*a*. PHIBALAPTERYX TERSATA, Schiff. Wien. Verz. p. 109. Hübn. Eur. Schmett. Geom. f. 268.

Geometra testaceata, Hübn. Eur. Schmett. Geom. f. 338.

Phibalapteryx tetricata, Guen. Ur. and Phal. II., p. 433.

" *tersulata*, Staud. Cat. Lep., p. 192.

" *tersata* var *chinensis*, Leech, A. M. N. H. (6) XIX, p. 561 (1897).

Brownish grey, thickly irrorated with fuscous ; abdomen with whitish band on 1st segment followed by a black line. Forewing with numerous minutely waved oblique fuscous lines excurved below costa, of which the most distinct is a subbasal line, an antemedial line with whitish band on its outer edge ; a

medial line, a postmedial line angled at vein 6 and followed by a whitish band with waved outer edge ; a white subterminal line, dentate from costa to vein 3, then incurved ; a fine terminal black line interrupted by white points at the veins. Hindwing with black discoidal point ; numerous minutely waved oblique lines obsolescent on costal area, the most prominent being ante- and postmedial lines ; terminal area rather browner with a white subterminal line dentate between veins 7 and 3, then incurved ; a fine black terminal line interrupted by white points at the veins.

Habitat.—Europe ; Central Asia ; Amur ; Japan ; W. China, Chang-yang; Kashmir, Kuijar, Kokser. *Exp.* 32 mill.

3625*a*. PHIBALAPTERYX OLIVATA, Warr. Nov. Zool. VIII., p. 29.

Pale olive-green ; tibiæ and tarsi streaked with fuscous ; abdomen with dorsal brown points. Forewing with two subbasal and an antemedial indistinct waved lines with blackish marks on them at costa ; a prominent black discocellular spot ; a postmedial series of black points on the veins excurved between veins 7 and 4 and with blackish patch at costa ; a subterminal series of small white spots with black points before and beyond them ; a terminal black line ; cilia pale reddish. Hindwing with indistinct subbasal line ; a black discoidal point ; an indistinct medial line followed by a series of points on the veins ; a subterminal series of small wedge-shaped white spots ; a terminal black line. Underside of both wings dull pink with prominent discoidal black spots ; a postmedial line excurved below costa and indistinct subterminal series of patches.

Habitat.—Sikhim 1800′ (Khásis). *Exp.* ♂ 34, ♀ 36 mill.

3626*a*. PHIBALAPTERYX INTERRUBRESCENS, n. sp.

Grey-brown ; thorax mixed with black ; abdomen with the basal and terminal segments and ventral surface grey. Forewing with two minutely waved subbasal black lines angled in cell, the latter followed by a dull red band ; the medial area suffused with black, defined by diffused waved lines with fine lines beyond them, its outer edge slightly angled at vein 6 and strongly at vein 4 ; a prominent black discoidal spot and two fine waved medial lines ; a dull red postmedial band ; an indistinct waved subterminal line. Hindwing with indistinct waved subbasal and antemedial lines and discoidal spot ; an indistinct medial line followed by a prominent line angled on veins 6 and 4 ; an indistinct crenulate subterminal line ; both wings with prominent terminal series of black strigæ.

The specimen from Dalhousie is more uniform red-brown.

The species has the characters of Section II, except that the mid tibiareæ not dilated.

Habitat.—Dalhousie ; Tibet, Yatong (Hobson). *Exp.* ♂ 38, ♀ 42 mill.

Type—In B. M.

P. 349. Under CIDARIA insert (syn.) *Diactinia*, Warr. Nov. Zool. V., p. 27 (1898).

3635. CIDARIA FULVIDORSATA, insert (syn.) 3655*a*. *Cidaria subnexcens*.

3641*a*. CIDARIA RAVARIA, Led. Verh. Zool. Bot. Wien 1853. p. 381, pl. 6, f. 4.

Grey-white ; head, thorax and abdomen thickly irrorated with ochreous-brown. Forewing grey-white thickly irrorated with ochreous-brown, leaving waved white lines, two subbasal, two antemedial, and two postmedial, forming bands with waved dark lines on them and one subterminal ; a terminal series of pairs of black points on each side of the veins. Hindwing whitish, suffused with brown towards termen ; an indistinct curved dark postmedial line and a waved white subterminal line ; a terminal series of paired black points on each side of the veins.

Habitat.—C. Asia, Altai, Ala Tau ; Kashmir, Rala, Kokser. *Exp.* 44 mill.

3645. CIDARIA CATENARIA, insert (syn.) *Epirrhoë clathrata*, Warr. Nov. Zool. VIII., p. 27.

3647. CIDARIA AURATA, insert (syn.) *Cidaria niveinotata*, Warr. Nov. Zool. VIII., p. 26.

3647*a*. CIDARIA DELETARIA, n. sp.

♀. Head, thorax and abdomen white tinged with dull rufous, the last dorsally irrorated with black. Forewing pale ochreous, sparsely irrorated with black ; the basal area pale dull rufous with curved outer edge ; a dull rufous medial band with minutely waved edges, the inner slightly angled at median nervure, the outer angled outwards at veins 6 and 4, then incurved ; traces of a subterminal line ; a semi-circular black irrorated dull rufous patch on termen from below apex to above vein 4. Hindwing ochreous-white with traces of medial line on inner area.

Habitat.—Kashmir, Kokser (McArthur). *Exp.* 36 mill. *Type*—In B. M.

3647*b*. CIDARIA NIGRIFULVARIA, n. sp.

♀. Head and thorax whitish marked with black-brown; abdomen whitish, the dorsal surface fulvous except at base and with black and white segmental lines. Forewing fulvous ; a black-brown antemedial band edged by white lines, the one on inner edge curved and slightly waved, the outer acutely angled inwards on median nervure and less acutely on vein 1 ; a very irregular black-brown medial band edged by dentate white lines, the one on inner edge very acutely angled outwards in cell, the outer line angled outwards on veins 6 and 4, inwards in discal fold and retracted at vein 2 to below angle of cell; a white edged black discoidal bar with two sinuous white lines beyond it, enclosing a rather more fulvous tinged patch between costa and vein 4 ; an irregularly dentate subterminal white line angled inwards in discal fold and incurved below vein 2, the area beyond it suffused with black except above the oblique waved streak which meets it from apex ; an indistinct sub-terminal white annulus at vein 4 ; a terminal series of black and white striæ ; cilia chequered black-brown and white. Hindwing whitish irrorated with brown ; an indistinct waved postmedial line excurved at middle and with less irrorated band on its outer edge ; a fine terminal black line interrupted at the veins ; the underside irrorated with black, a black discoidal spot, curved waved medial and postmedial lines and traces of a subterminal series of small spot.

Habitat.—Kashmir, Rala (McArthur). *Exp.* 38 mill. *Type*—In B. M.

3660*a*. CIDARIA LEUCOGLYPHICA, Warr. Nov. Zool. V., p. 27.

♀. Head whitish; palpi brownish at sides, frons brownish at middle and sides; thorax dark brown with two white stripes; legs banded with dark brown; abdomen whitish with subdorsal and lateral series of brown spots. Forewing dark brown; a white antemedial line angled in submedian interspace; a white streak in cell; a short oblique white streak below origin of vein 2; a rather eliptical white patch on costa beyond middle with two brown spots on it, extending down to vein 3 and with a yellowish white **W**-shaped mark round its lower end, its arm extending to below costa; a more rounded white patch with brown spot on it on inner margin surrounded by a yellowish hoop-shaped mark; a postmedial line very strongly dentate except towards costa connected with a curved white mark extending from apex to middle of termen; the area near tornus ferruginous with a round white spot above vein 2 and oblique mark above tornus; a terminal white line; cilia dark brown with rufous line through them and white marks at apex and middle. Hindwing whitish with fuscous spot on discocellulars; a curved fuscous line just beyond the cell ending at a dark streak on median nervure; the terminal area irrorated with brown with a postmedial line of obscure fuscous spots, and obscure spots on termen between veins 3 and 6; a terminal blackish line. Underside with the dentate postmedial spots on both wings more prominent, also the discoidal spot and curved line of hindwing.

Habitat.—Khásis. *Exp.* 38 mill.

3662*a*. CIDARIA CYMATIA, n. sp. (pl. C., f. 29).

♀. Head, thorax, and abdomen grey and red-brown. Forewing grey, the basal area with ill-defined rufous bands defined by waved grey lines; a pale orange-rufous subcostal streak; a broad rufous medial band contracted at middle with waved edges, two waved lines on it and a discoidal point, the area beyond it pale rufous with a waved grey line; the sub-marginal area with five highly crenulate blackish lines on a grey ground; the marginal area and cilia rufous. Hindwing fuscous, greyer towards margin, six waved lines more distinct towards margin; the margin and cilia rufous. Underside of both wings with dark discoidal lunule and medial line angled beyond cell.

Habitat.—Sikhim 1,800′ (Dudgeon). *Exp.* 40 mill. *Type*.—In B. M.

3662*b*. CIDARIA CERVA, n. sp.

Head and thorax black, the frons and collar mixed with grey; pectus and legs white and fuscous; abdomen whitish. Forewing white; a large diffused pale fawn colored patch from near base to just before tornus extending nearly up to costa and rounded above; a black basal patch with oblique outer edge; a medial spot on costa and discoidal point; a patch on apical part of costa irrorated with grey, traversed by a short white line and with a black point below it. Hindwing white, slightly tinged with fawn colour; an indistinct fuscous sub-terminal line.

Habitat.—Sikhim 2,700′ (Pilcher). *Exp.* 16 mill.

3669*a*. CIDARIA BRUNNEARIA, Leech, A. M. N. H. (6) XIX, p. 553 (1897).

Reddish-brown; thorax and sub-dorsal patches on abdomen blackish. Forewing with an antemedial blackish band interrupted at median nervure defined by grey lines, traversed by a brown line, and followed by a series of black spots angled in cell; a large quadrate black medial patch from costa to vein 5 defined by grey lines and with brown lines on it forming a V-mark, two similar elliptical spots below it and a quadrate patch on inner area, the two former each with two brown lunules, the last with a conical mark; an obscure postmedial line angled at vein 4, then waved and followed by a series of lunules decreasing in size from costa to inner margin; a large terminal lunulate patch below apex with two small spots below its extremity and a black terminal line. Hindwing with two indistinct pale crenulate lines on outer area; some dark striæ on outer part of inner margin and on termen towards tornus. Underside with dark discal points; forewing with two waved medial lines; hindwing with medial, postmedial and subterminal lines.

Habitat.—W. China, Pu-tsu-fong; Sikhim. *Exp.* ♂ 44, ♀ 50 mill.

3674*a*. CIDARIA DIMIDIARIA, Motsch. Bull. de l' Acad., 1866, i., p. 197.

Xanthorhoë castanea, Warr. Nov. Zool. VIII., p. 30.

Head, thorax and abdomen dark brown mixed with grey and rufous. Forewing with five or six waved black lines on basal third; the base rufous followed by a grey band with some rufous on inner side of one of the lines; the medial area rufous, its outer edge waved, angled outwards at middle, then incurved, the band being more or less constricted at inner margin; two waved lines on outer part of band, the one nearest base often connected with the last antemedial line at places; a line beyond the band; a waved white sub-terminal line on some rufous suffusion; a series of black points on termen. Hindwing white suffused with brown; some six waved lines, the medial line angled outwards at middle; a terminal punctiform line.

Habitat.—Amur; Japan; Kashmir, Goorais and Scinde Valleys. *Exp.* 32 mill.

3674*b*. CIDARIA MICROGYNARIA, n. sp.

♂ Grey-white strongly irrorated with fuscous brown. Forewing with trisinuate brown subbasal line; the antimedial line dentate, angled outwards in cell and submedian fold and inwards on vein 1; two rather indistinct minutely dentate medial lines, approximated below the cell, the outer angled outwards beyond angles of cell and with a black discoidal striga between them; the postmedial dentate line angled outwards at veins 6 and 4, then retracted to below angle of cell; a dentate white subterminal line; a fine dark terminal line. Hindwing brownish grey; an indistinct curved postmedial line and fine dark terminal line.

♀ Smaller and rather greyer; forewing with the apex more acute.

Habitat.—Kashmir, Kokser, Dras, Goorais Valley (Leech, McArthur). *Exp.* ♂ 36-40, ♀ 28 mill. *Type*—In B. M.

3704. LARENTIA AFFINIS, insert (syn.) *Perizoma constricta*, Warr. Nov. Zool. VIII., p. 28.

3715*a*. LARENTIA RECTIFASCIATA, n. sp.

Head, thorax and forewing ochreous-white irrorated with black, sides of palpi and frons black; abdomen with black dorsal crests. Forewing ochreous irrorated with fuscous brown; a nearly straight subbasal line; two antemedial lines slightly angled outwards in cell; a double slightly sinuous medial line angled outwards below costa and with the black discoidal striga placed on them, the area between it and the similar double postmedial line more tinged with brown; a similar double line before the terminal area which is suffused with brown and with a sinuous white subterminal line; cilia with a dark line through them. Hindwing ochreous-white; a discoidal point; a nearly straight postmedial line; the terminal area suffused with fuscous and with traces of a maculate whitish subterminal line; cilia with a dark line through them.

Habitat.—Sikhim (Pilcher). *Exp*. 20 mill. *Type*—In B. M.

3721*a*. LARENTIA SUBVIRIDIS, n. sp.

Head, thorax, and abdomen black variegated with white. Forewing black-brown irrorated with white; broad ante and postmedial green bands defined by crenulate punctiform white lines; a prominent discoidal black striga on a greenish patch; a subterminal series of white points, the postmedial green band diffused to termen below apex and at middle; cilia chequered black and white. Hindwing white suffused with fuscous; a black discoidal point; traces of a crenulate postmedial line with whitish band on its outer side; a fine terminal dark line; cilia chequered black and white.

Habitat.—Tibet, Yatong (Hobson). *Exp*. 26 mill. *Type*—In B. M.

3722*a*. LARENTIA POLIOTARIA, n. sp.

Head, thorax and abdomen black mixed with white, the last with whitish segmental lines. Forewing grey sometimes tinged with ochreous or pale fulvous in places; the basal area with some five ill-defined waved dark lines; a dark discoidal point; an indistinct dentate postmedial line with grey band beyond it on which is a series of black points on the veins; a dentate grey subterminal line with black suffusion on its inner edge; a terminal series of pairs of black points on each side of the veins. Hindwing white slightly irrorated with fuscous, especially towards inner margin and termen; an indistinct curved subterminal line; a terminal punctiform line; the underside with discoidal point and indistinct curved postmedial line.

Habitat.—Kashmir, Kokser (McArthur, Thompson); Chobia (Harford). *Exp*. 30-38 mill. *Type*—In B. M.

3724. LARENTIA TRUNCATA, insert (syn.) *Polyphasia dentifera*, Warr. Nov. Zool. III., p. 387.

3724*b*. LARENTIA FULVIPENNIS, n. sp.

♂ Head, thorax and abdomen dark brown mixed with grey. Forewing grey irrorated and suffused with dark brown; an antemedial rufous band some-

what constricted in submedian fold and edged by waved grey and dark lines; the medial area with dark discoidal point and with two waved dark lines, the inner angled outwards in cell and submedian fold, the outer oblique from costa to vein 4, where it is acutely angled, then retracted; a dark postmedial line with blackish suffusion before it between costa and vein 4, oblique from costa to vein 4, but angled inwards at vein 6, below vein 4 oblique and highly dentate to vein 2, then erect and slightly dentate, and with a grey then rufous band beyond it; a more or less indistinct dentate grey subterminal line. Hindwing bright ferruginous with the basal half tinged with dark brown, the underside with discoidal point and medial line angled outwards at vein 4; a fine, dark terminal line.

♀ Forewing with the medial area greyish white except before the postmedial line towards costa.

Habitat.—Kashmir, Goorais Valley (Leech, Thompson). *Exp.* 40 mill. *Type*—In B. M.

3735*a*. PHOTOCOTOSIA CHLOROCHROTA, n. sp. (pl. C., f. 21).

Head, thorax and abdomen black-brown irrorated with grey. Forewing black-brown irrorated with grey-green; waved subbasal, antemedial and postmedial dark lines with grey-green suffusion between the two former and beyond the last from costa to vein 5, some indistinct waved lines on medial area and a grey-green patch below costa; an indistinct waved line beyond the postmedial line and three slight whitish strigæ below costa towards apex; a terminal series of black strigæ. Hindwing fuscous brown; the costal area white, in male extending to vein 4 beyond the cell; traces of a discoidal spot and postmedial line angled on vein 4.

Habitat.—Tibet, Yatong (Hobson). *Exp.* ♂ 48, ♀ 54 mill. *Type*—In B. M.

3747*a*. POMASIA SPARSATA, n. sp. (pl. C., f. 17).

♂ Dark-brown; palpi whitish at extremity of second and third joints; frons banded with whitish; tegulæ and patagia edged with whitish; tarsi yellowish; abdomen with yellowish segmental rings. Forewing with five or six irregularly waved whitish lines on basal half becoming yellowish at costa; the terminal half with six waved series of spots which are whitish except the yellowish subterminal series; cilia yellow intersected with brown. Hindwing with three waved whitish lines on basal half, the terminal half with four waved series of spots; cilia yellow intersected with brown.

Habitat.—Travancore, Cardamom Hills, Udumashola 3000′ (Brodie). *Exp.* 26 mill.

3748*a*. POMASIA NEXILINEA, Warr. Nov. Zool. V., p. 26.

♀ Pale-brown. Forewing with fine brown subbasal line edged by stronger white lines, some grey and dark-brown scaling in cell and two whitish strigæ forming an inverted **V**, the outer arm being continued to inner margin as a curved line with an irregularly dentate brown medial line just beyond it; the median nervure and veins beyond the cell prominently streaked with white; a postmedial line acutely angled outwards on vein 7 and less acutely

inwards on vein 5 and outwards on vein 3, then oblique and minutely waved; a white subterminal line nearly straight from costa to vein 3 where it is obtusely angled with an irregularly sinuous brown line before it and brown marks beyond it below apex and below veins 4 and 2; two fine white lines just inside termen and one on termen; some brown striæ on cilia. Hindwing with some brown marks on inner margin and two obscure grey subterminal lines.

Habitat.—Khásis; S. E. Borneo. *Exp.* 24 mill.

LES FORMICIDES DE L'EMPIRE DES INDES ET DE CEYLAN.

Par Auguste Forel.

Part IX.

(*Continued from page 477—Vol. XIII.*)

5e Sous Famille : MYRMICINÆ.

Tableau des Genres.

1. Épistome ne se prolongeant pas en arrière entre les arêtes frontales : celles-ci très rapprochées l'une de l'autre ; antennes de 12 articles (tribu des Pseudomyrmii)..... 2
   Épistome presque toujours prolongé entre les arêtes frontales qui sont plus ou moins écartées ; dans le cas contraire, antennes de 11 articles 3
2. Épistome descendant brusquement en avant, ou comme infléchi ou subtronqué, ordinairement muni de dents au niveau de cette inflexion ; rarement en pente uniforme et fortement échancré au bord antérieur (espèces d'Afrique, Asie et Océanie) .....*Sima*—Rog.
3. Antennes de 7 articles, sans massue distincte (de 13 chez les ♂) ; les arêtes frontales sont, comme d'habitude, éloignées des bords latéraux de la tête ; corselet épineux (tribu des Myrmicarii) .....*Myrmicarii*—Saund.
   Antennes autrement conformées (lorsqu'elles sont de 7 articles, le dernier est renflé ou fait partie d'une massue différenciée, ou bien le scape peut rentrer dans un profond scrobe, ou le corselet n'a pas d'épines) 4
4. Fossette antennaire ou scrobe placée aux côtés de la tête ; l'arête qui forme son bord dorsal (et qui ne correspond pas à l'arête frontale des autres Fourmis) passe en dehors de l'oeil ; angles postérieurs de la tête pointus ou prolongés ou dentelés ; antennes de 11 articles dans tous les sexes (tribu des Cataulacii) .....*Cataulacus*—F. Sm.
   Autre conformation 5
5. Pédicule de l'abdomen articulé à la surface dorsale du segment suivant (tribu des Crematogastrii) .....*Crematogaster*—Lund.
   Pédicule inséré à l'extrémité antérieure du segment suivant... 6
6. Tête cordiforme, échancrée derrière, avec les angles postérieurs fortement arrondis et dépourvus d'epines; dernier article des antennes beaucoup plus grand que le précédent (tribu des Dacetii) ; antennes de 6 articles.....*Strumigenys*—F. Sm.
   Tête autrement conformée..... 7
7. Massue des antennes de 2 articles, le dernier notablement plus grand que l'autre (tribu des Solenopsidii) 8
   Massue des antennes autrement conformée ou indistincte ... 12

8. Antennes de 9 articles (de 10 chez la ♀ et de 13 chez le ♂) ; pas de dimorphisme des neutres ..? ..... *Carebara*—Westw.
Antennes de 9 articles chez les ☿ qui sont très dimorphes ..... *Oligomyrmex*—Mayr.
Antennes de 10 ou 11 articles 9
9. Antennes de 10 articles 10
Antennes de 11 articles 11
10. Dimorphisme des neutres ordinairement peu marqué, ou, dans le cas contraire, la tête des ☿ major subcarrée ou plus large que longue (antennes de 10 à 11 articles chez la ♀) ..... *Solenopsis* Westw.
11. Tibias postérieurs munis d'éperons ; neutre fortement dimorphes ..... *Pheidologeton*—F. Sm.
12. Fossettes antennaires profondes, capables de contenir tout le scape at placeés le long des côtés de la tête 13
Fossettes antennaires moins profondes ou autrement placées. 14
13. Antennes de 9 articles (de 13 chez les ♂) ; mésonotum à bord postérieur tranchant et ordinairement armé d'épines ..... *Meranoplus*—F. Sm.
14. Poils dressés du corps trifides ..... *Triglyphothrix*—For.
Poils non trifides 15
15. Bord postérieur de l'épistome relevé en arête tranchante qui borde en avant la fossette antennaire 16
Bord postérieur del'épistome ne formant pas d'arête 20
16. La partie de l'épistome qui se trouve en avant de l'insertion des antennes est étroite, mais non réduite à une simple arête (antennes des ♂ de 10 articles) (forment, avec les 4 genres précédents, la tribu des TETRAMORII) 17
La partie de l'épistome qui se trouve en avant de l'insertion des antennes est réduite à une arête tranchante (antennes du ♀ de 13 articles) 18
17. Antennes de 12 articles ..... *Tetramorium*—Mayr.
Antennes de 11 articles ..... *Xiphomyrmex*—For.
18. Antennes de 12 articles ; dimorphisme des neutres très marqué ; soldats à tête énorme ; sculpture comme chez *Pristomyrmex* ..... *Acanthomyrmex*—Emery.
Antennes de 11 articles, pas de dimorphisme remarquable ... 19
19. Épistome à bord crénelé ; la sculpture du corps consiste en de gros points ou fossettes, quelquefois plus ou moins confluents ; 1er segment du pédicule allongé et pétiolé en avant ..... *Pristomyrmex*—Mayr.
Épistome non crénelé, à 2 dents plus ou moins marquées; sculpture consistant en sillons plus ou moins réguliers ; Ier segment du pédicule court, non-pétiolé... *Myrmecina*—Curt.

20. Pas d'yeux ..... *Liomyrmex*—Mayr.
Dés yeux, parfois petits, mais bien distincts 21
21. Antennes de 11 articles sauf chez *Leptothorax* et *Monomorium* ou elles en ont 11 ou 12 22
Antennes de 12 articles 26
22. Corselet et pédicule sans aucun vestige de dents ou d'épines ; pronotum jamais anguleux 23
Métanotum presque toujours muni de dents ou d'epines; lorsqu' elles font défaut, le pronotum a des épaules anguleuses ou la tête et les mandibules ont une conformation gramivore 24
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Épistome inerme ..... *Vollenhovia*— Mayr.
24. Dos du corselet profondément impressionné à la suture mésométanotale ..... *Lophomyrmex*— Emery.
Dos du corselet peu on point impressionné 25
25. Neutres fortement dimorphes; tégument luisant ; 1er segment du pédicule pétiolé ..... *Machomyrma*— For.
Neutres non dimorphes ; corps en partie sculpté ; poils claves ..... *Leptothorax*— Mayr.
Neutres non dimorphes. Poils non clavés. Noeuds du pedicule plus ou moins squamiformes (épais)..*Stercomyrmex*— Emery.
26. Neutres dimorphes, pas de formes intermédiaires entre les soldats à grosse tête et les ouvrières. Antennes à massue de 3 articles, plus longue que le reste du funicule (de 4 articles chez *Ph. Smythiesii* For) ; aiguillon très faible... *Pheidole*—Westw.
Neutres monomorphes ou dimorphes, dans ce cas, les formes extrêmes sont reliées par des intermédiaires et la massue est ordinairement indistincte ou plus courte que le reste du funicule 27
27. Les 3 derniers articles des antennes sont bien plus courts que le reste du funicule et ne forment pas de massue bien distincte 28
Les 3 derniers articles des antennes forment ensemble une massue environ aussi longue que le reste du funicule 30
28. Éperons postérieurs pectinés ..... *Myrmica*—Latr.
Éperons postérieurs simples ou nuls 29
29. Épistome sans dent ..... *Stenamma*—Westw.
Épistome bidenté ..... *Holcomyrmex*—Mayr.
30. L'abdomen, vu de côté, paraît triangulaire, l'angle antérieur attaché au pédicule; épines du métanotum recourbées en avant ..... *Trigonogaster*—For.
Autre conformation 3

31. Pas de poils dressés ; 1er segment du pédicule pétiolé, avec un noeud arrondi ; 2e segment ordinairement fort large
Cardiocondyla—Emery.

Genre PHEIDOLE, Westw.

Tableau analytique des soldats.

Massue des antennes de trois articles subégaux 1

Massue des antennes de quatre articles subégaux. Polymorphe, passant à l'ouvrière par diverses transitions. Pas trace de scrobe ; tête énorme, rétrécie devant. Pronotum sans tubercules. Un bourrelet transversal au mésonotum. Epines robustes, triangulaires, assez courtes. Second noeud du pédicule trois fois large comme le 1er, à côtés en angles obtus et arrondis. Tête mate, finement réticulée, et ridée en long, luisante devant. Mandibules striées et ponctuées. Pédicule et métathorax plus ou moins réticulés ou ridés. Le reste luisant avec de gros points piligères. Abondamment hérissée de poils assez courts, d'un roux jaunâtre. D'un brun roussâtre. Tibias, tarses et funicules roussâtres. Premier article du pédicule inerme en dessous, L. 6 à 8, 8 mill .....*Ph. Smythiesii*, n. sp.
(*Ceratopheidole*).

1. Le premier article du pédicule porte en dessous un appendice rectangulaire comprimé, long et transparent, dirigé en avant en bas, plus long ou aussi long que la hauteur du reste de l'article. Ce dernier est rectangulaire (vu de dessus), plus large ou au moins aussi large que long, avec le bord latéral translucide, les angles antérieurs sub-dentiformes ou dentiformes et le noeud cunéiforme à bord supérieur tranchant et échancré. Le mésonotum a un sillon profond et un fort bourrelet transversal derrière. Epistome échancré et caréné. Second article du pédicule très large, avec les côtés arrondis et munis d'un bord un peu translucide. Sauf chez la *Ph. Naoroji* les scapes sont courts 2

Le premier article du pédicule a en dessous un lobe opaque ou un appendice translucide plus court que la hauteur du reste de l'article. Du reste mêmes caractères mais le sillon mésonotal en général moins profond et le 1er article du pédicule souvent plus allongé. Espèces poilues à forte sculpture ..... 7.

Premier article du pédicule sans trace de lobe ni d'appendice 10

2. Tout le corps très lisse et très luisant, sauf le front et les joues qui sont longitudinalement striés. Tête rétrécie de-

vant, yeux au tiers antérieur. Pas de scrobe, mais une large impression pour l'extrêmité du scape qui n'est pas atteinte par les arêtes frontales et qui est aussi distante de l' angle occipital que de l'origine de l'antenne. Deux larges tubercules au pronotum. Epines tres courtes, presque dentiformes. Second noeud du pédicule transversal, trois fois plus large que long. Abdomen tronqué à la base, avec de gros points effacés. Pilosité dressée nulle. Pubescence dilnée. D'un brun roussâtre ou d'un roux plus clair. Pattes et antennes jaunâtres ; thorax souvent plus clair, L. 4, 3 a 4, 7. mill .....*Ph. lamellinoda*, n. sp.

Tête et thorax sculptés. Tout au plus l'occiput en partie lisse 3

3. Epines courtes, presque dentiformes. Tête fortement échancrée derrière, moins épaisse à l'occiput qu'au front... 4

Epines médiocres. Tête très faiblement échancrée derrière, où elle est plus épaisse qu' au front 5

Epines longues, minces à leur base, renflées ou obtuses à l'extrémité. Tête en abricot 6

4. Tres semblable à la *lamellinoda*, mais la tête à peine elargie derrière, les tubercules du pronotum faibles, le 2me noeud du pédicule plus long, seulement deux fois plus large que long, et les épines à peine plus longues. Luisante. Tête ridée-striée en long avec l'occiput en partie lisse, à gros points espacés et quelques réticulations. Thorax et pédicule avec des rides transversales ; abdomen comme chez la *lamellinoda*. Pilosité dressée éparse, nulle sur les tibias. Pubescence fort distincte et assez longue sur l'abdomen. D'un rouge ferrugineux, en partie un peu brunâtre. Abdomen brun. Pattes et antennes jaunes, L. 3, 8 à 4, 1 mill .....*Ph. Grayi*, n. sp.

Tres semblable à la précédente, mais la tête est entièrement et plus fortement ridée, grossièrement réticulée à l'occiput. Les tubercules du pronotum sont beaucoup plus forts, comme chez la *lamellinoda*. Yeux un peu plus gros. 1er segment de l'abdomen est ridé-strié en long et finement réticulé sur sa 1ere moitié. Le sillon du mètanotum est moins profond. Un scrobe distinct pour les scapes (chez la *Grayi* les arêtes frontales sont seulement continuées par une ride.) Pilosité bien plus abondante, oblique sur les tibias. Même couleur, mais les pattes et les antennes brunâtres, L. 4, 5 à 4, 8 mill .....*Ph. Malinsii*, n. sp.

5. Tête presque carrée, faiblement échancrée derrière. Yeux gros. L'extrémité des scapes n'est éloignée de l'angle oc-

cipital que de moins de la moitié de leur longueur. Epines longues comme plus de la moitié de l'intervalle de leurs bases. Du reste pronotum, sculpture et pilosité comme la *Ph. Grayi*. Luisante ; tête rideé sauf le derrière de l'occiput qui n'est que ponctué. D'un rouge jaunâtre, avec l'abdomen et les mandibules bruns. L. 4 à 4,3 mill ..... *Ph. Naoroji*, n. sp.

6. Pronotum avec deux tubercules assez pointus et fort proéminents, presque dentiformes. Mandibules longues, à bord externe peu courbé. La face basale et la face déclive du métanotum ne forment ensemble qu'une seule et faible convexité déclive du milieu de chaque côté de laquelle part une épine en spatule qui ressemble à un balancier de diptère, mince à la base, courbée avec un renflement allongé vers l'extremité. Premier noeud si profondément échancré qu'il en est bicorne ; ses angles sont même prolongés. Appendice inférieur beaucoup plus long que la hauteur du noeud. Second noeud plus de deux fois plus large que long. Mate, densément réticulée, sauf les derniers segments de l'abdomen et les mandibules, moins la base, qui sont en partie lisses et luisants. En outre la tête est grossièrement ridée devant et réticulée derrière, le thorax et le pédicule sont transversalement ridés et le 1er segment abdominal densément strié en long, ce dernier avec les points piligères tuberculés, espacés. Pattes réticulés. Pilosité jaunâtre, courte, assez fine, abondante partout, dressée sur les tibias et les scapes. D'un noir brunâtre. Une partie du thorax, mandibules et devant de la tête d'un rouge ferrugineux sombre. Pattes et scapes bruns ; tarses et funicules d'unbrun roussâtre. L. 5,5 à 6, 5 mill ..... *Ph. spathifera*, n. sp.

Ecaille ou noeud du premier article du pédicule à peine ou pas échancré. Une forte impression sur le vertex (on la voit aussi, mais moins forte chez le type). Même taille etc. ..... var *Yerburyi*, n. var.

Epines droites, non renflées à l'extrémité, mais obtuses, second noeud du pédicule trois fois plus large que long. Sculpture un peu plus faible. Du reste comme la forme typique ..... var *aspatha*, n. sp.

7. Le premier article du pédicule a en dessous un appendice comprimé, translucide et court. Epines courtes ou dentiformes 8

Le premier article du pédicule n'a en dessous qu'un lobe arrondi, opaque. Epines plus fortes 9

8. Tête rétrécie devant, faiblement imprimeé sur le vertex. Tubercules du pronotum distincts, mais mousses. Arêtes frontales aussi longues que les scapes, mais pas de scrobe distinct. L'extrémité des scapes atteint la moitié de la distance de leur origine a l'angle occipital. Epines métanotales plus longues que la largeur de leur base, robustes, obtuses. Les angles antérieurs du premier article du pedicule aigus, mais pas dentiformes. Second noeud à peine deux fois plus large que long. Finement réticulé et luisant ou subopaque. La grosse sculpture est la même que chez la *spathifera*, mais l'abdomen n'a parfois pas de stries. Appendice subpétiolaire triangulaire, plus long que haut. Articles 3 à 6 des funicules aussi longs que larges. Pilosite dresseé abondante. D'un rouge ferrugineux. Abdomen brun. Cuisses er tibias brunâtres. L. 6 à 6, 5 mill ....*Ph. Fergusoni*, n. sp.

Tête rétrécie devant et parfois derrière avec une profonde impression transversale sur le vertex qui est comme enfoncé, scapes plus courts que la distance de leur extrémité à l'angle occipital; scrobe plus marqué. Le métanotum n'a que deux dents aussi larges que longues. Angles du premier article du pédicule longs at dentiformes. Articles 3 à 6 des funicules plus épais que longs. Du reste comme la *Fergusoni*, mais l'abdomen est presque mat et fortement strié, et le corps entierement d'un brun foncé avec ledevant de la tête et les mandibules rougeâtres, L. 5, 5 à 6, 1 mill ....*Ph. Sharpi*, n. sp. (sens strict.)

L'extrémité du scape dépasse sensiblement la moitié de la distance de son origine à l'angle occipital. Second article du pédicule moins de deux fois plus large que long. Quelques stries seulement à la base de l'abdomen. Pilosité assez clair semeé. Articles 3 à 6 des funicules aussi longs que larges. Appendice subpétiolaire arrondi, plus court que chez les précédentes. L. 4, 2 à 4, 5 mill. Du reste identique a la *Ph. Sharpi*, n. sp. mais souvent la tête et le thorax ferrugineux.....*Ph. Sharpi* r. *Hoogwerfi*, n. subsp.

9. Le scape n'atteint pas les deux tiers de la distance de son origine à l'angle occipital. Yeux situés au tiers antérieur. Face basale du mètanotum carrée. Epines du métanotum longues et robustes. Lobe subpétiolaire arrondi, fort distinct. Second noeud environ deux fois plus large que long. Stature robuste. Tête fortement rétrécie devant. Pilosité dressée longue et abondante. Brunâtre, thorax, mandibules, devant de la tête, pattes et antennes d'un

brun rougeâtre. Sculpture grossière de la *Fergusoni*, mais l'abdomen luisant, sans stries, sauf parfois à la base. Luisante. L. 5 à 6, 2 mill..... *Ph. latinoda*, Roger.
(et. v. *major* Forel).

Le scape dépasse un peu les 2/3 de la distance de son origine à l'angle occipital. Yeux situés un peu en avant du milieu des côtés. Tête moins rétrécie devant. Face basale du métanotum bien plus longue que large ; épines plus grêles et plus courtes que chez la forme typique. Lobe subpétiolaire réduit à une faible convexité longetudinale. Second article du pédicule variable, souvent à peine plus large que long. Pilosité plus courte surtout sur les tibias. Sculpture plus serrée et plus fine. Abdomen parfois mat, réticulé ou même strié, par fois luisant. D'un noir a peine brunâtre, avec les mandibules, les funicules, les pattes et le dessous du thorax rougeâtres. L. 4 à 5, 2 mill. Plus étroite et moins robuste. Tête moins grosse...*Ph. latinoda*, Roger.
(La variété de Thana a le 2me article du pédicule large et l'abdomen strié) .....r. *angustior*, n. subsp.

10. Bord antérieur de la tête à angles subdentés, plus large que tout le reste de la tête qui est, allongée et se rétrécit d' avant en arrière ou elle est le plus étroite et échancrée. Front et vertex striés de grosses stries obliques divergeant en arrière et allant aux côtés. Bord externe des mandibules presque droit. Epistome un peu concave au milieu, sans carène. Scape long comme à peine ⅓ de la tête. Une place lisse pour le scape. Bosse pro-mésonotale courte, élevée et bituberculée. Un faible sillon et un faible bourrelet au mésonotum. Métanotum bas, a face basale horizontale avec deux petites dents tres pointues ou spinules. Premier noeud du pédicule assez squamiforme, longuement pétiolé devant, à bord supérieur obtus; second noeud à peine plus large, en rhombe obtus. Abdomen allongé, ovale. Le dessous du bord antérieur de la tête a deux fortes dents ; yeux petits et plats, en avant du tiers antérieur. Lisse et luisante, aussi l'épistome, sauf les stries indiquées, les joues ridées en long et le métanotum faiblement reticulé. Pilosité jaunâtre assez courte et abondante, aussi sur les tibias et les scapes. Brune. Mandibules, un large triangle autour de l' épistome et thorax d'un roux jaunâtre. Pattes et antennes jaunes. Parfois tête et thorax roux jaunâtre. L. 2, 9 à 3 mill...*Ph. Watsoni*, n. sp.

Le bord antérieur de la tête n'est pas plus large que le reste. Front et vertex autrement sculptés 11

11. Le pro-mésonotum forme une seule convexité sans sillon. Cependant le mésonotum a derrière un faible bourrelet transversal fort vague. Métanotum bas, cubique, denté ou subdenté. Mandibules lisses, avec quelques points et le bord externe fort convexe. La strie qui continue les arêtes frontales atteint à peine l'extrémité du scape et ce dernier à peine la moitié de la distance de son origine à l'angle occipital. Tête profondément fendue en abricot, plus longue que large, grande, peu rétrécie devant, à côtés subparallèles. Yeux au tiers antérieur. Tubercules pronotaux obtus. Premier noeud subsquamiforme, entier. Second noeud large comme deux fois le premier, étiré en cônes de côté. Le vertex a une impression transversale large. Sculpture de l'*indica*, mais les lobes occipitaux plus réticulés, le thorax plus lisse et les points de l'abdomen plus élevés. Pilosité abondante, aussi sur les tibias et les scapes. Brune. Tête d'un rouge ferrugineux sombre avec les antennes. Tarses, articulations et côtés du thorax d'un roux jaunâtre. L. 6 à 6, 3 mill.....*Ph. Phipsoni*, n. sp.

Le pro-mésonotum forme une seule convexité, sans trace de sillon transversal et sans bourrelet 12

Le mésonotum a un sillon transversal et un bourrelet derrière ou au moins ce dernier 19

12. Pas de scrobe pour les scapes ou tout au plus un espace à plus faible sculpture 13

Un scrobe profond qui loge tout le scape, puis se recourbe en avant jusqu' à l'œil pour loger une partie du funicule. Œil au quart antérieur. Arêtes frontales très longues et tres divergentes, bien plus près derrière du bord de la tête que de la ligne médiane. Tête profondément échancrée derrière, en rectangle allongé, avec les angles anterieurs anguleux. Tubercules pronotaux très gros, surplombant de chaque côté en oreilles ou cornes. Epines grêles, courtes, longues comme la moitié de la face basale. Premier noeud du pédicule squamiforme. Second noeud petit, étiré en cônes de côté. Une impression transversale au vertex. Epistome concave, sans carène, lisse. Joues et front grossièrement ridés en long, sauf le scrobe. Vertex et occiput lisses avec des fragments transversaux et interrompus de rides ou réticulations. Tout le reste lisse, sauf ça et là quelques rides sur le thorax. Pilosité jaune très fine, aussi sur les tibias, plutôt abondante. « D'un jaune brunâtre ; tête d'un jaune rouge ; abdomen plus brunâtre. L. 3, 6 à 4, 5 mill.....*Ph. pronotalis*. n. sp.

13. Grande espèce. L. 6, 2à 7,2 mill. Tête énorme, aussi large que longue, assez élargie derrière, où elle est très échancrée, fort convexe, sans trace d'impression au vertex, ni d'espace pour les scapes. Arêtes frontales très courtes. Scapes atteignant à peine la moitié de la distance de leur origine aux angles occipitaux. Articles 3 à 7 des funicules plus larges que longs. Tubercules pronotaux obtus. Epines plus courtes que la moitié de leur intervalle. Premier noeud squamiforme, entier, le 2me 1½ fois plus large que long, étiré en angles de côté. Mandibules et tête, sauf le milieu lisse de l'épistome, densément et finements striées ridées en long ; tête très finement réticulée et subpaque ou mate entre les stries. Quelques vagues rides au métanotum. Reste du corps lisse. Pilosité dressée et pubescence abondantes et longue partout. D'un roux ferrugineux sombre. Abdomen brun. Devant de la tête plus clair.....*Ph. Sykesii.* n. sp.

Petites espèces de 2 à 4 millim. au plus 14

14. Lisse et luisante, sauf le devant, ridé, de la tête. Tête longue, rectangulaire. Jaune. Yeux très petits, situés au 5me antérieur. Taille variable ; L. 2, 5 à 4 mill.
Ph. Wood-Masoni—Forel.

Même sculpture, mais tête à côtés convexes, aussi large que longue. Yeux au tiers antérieur. L. 3, 7 à 4, 3 mill.
Ph. megacephala—Fab.

Tête entièrement sculptée. Face basale du métanotum rectangulaire, bordée, avec deux courtes épines. Premier noeud du pédicule squamiforme, entier. Second noeud petit, un peu plus large seulement que le premier, plus ou moins rhombiforme. Pilosité dressée, jaunâtre, médiocre sur le corps... 15

15. L. 1, 9 à 2, 1 mill. Tibias sans poils dressés. Yeux situés au tiers antérieur. Epistome caréné, à peine échancré au milieu. Tête et thorax subopaques ou mats densément et très finement réticulés ; tête en outre assez finement et fortement ridée devant et réticulée derrière. Assez pubescente. Pilosité dressée très courte, éparse ; mandibules pubescentes. D'un roux ferrugineux, avec le dessus de la tête et du thorax bruns. Abdomen, pédicule, pattes et antennes d'un jaune brunâtre. Tarses et funicules jaunâtres. Arêtes frontales courtes ; pas d'espace pour les scapes..... *Ph. mus.* n. sp.

L. 2, 5 à 3, 8 mill. Tibias avec des poils dressés 16

16. Tête large, à peu près aussi large que longue, à côtés assez convexes. Tubercules pronotaux obtus. Yeux au quart

antérieur. Mandibules lisses, à rares points. Epistome caréné et échancré. Un espace un peu plus faiblement sculpté pour les scapes et la base des funicules. Scapes courts, longs comme chez la *Sykesii*. Une large impression transversale au vertex. Echancrure occipitale médiocre. Abdomen et derrière de l'occiput lisses ; reste du corps finement réticulé-ponctué et mat. Tête en outre assez finement et densément striée-ridée en long, en partie réticulée à l'occiput. Quelques rides transversales sur le pronotum. D'un roux ferrugineux. Abdomen brun. Pattes et antennes jaunâtres. L. 2, 5 mill.....*Ph. Sagei*, n. sp.

Tête rectangulaire-allongée, bien plus longue que large, étroite. Tubercules pronotaux proéminents 17

17. Côtés de la tête parallèles. Yeux situés au quart antérieur. Scapes comme chez la *Sagei*, mais pas d'espace faiblement sculpté pour les loger, par contre une impression oblique pour loger leur extrémité qui est distinctement renflée. Tête assez faiblement échancrée derrière, largement et faiblement imprimée transversalement au vertex. Arêtes frontales courtes. Epines épaisses à la base, pointues, aussi longues que leur intervale. Tête assez luisante, fortement striée-ridée devant, grossièrement et profondément réticulée derrière. Thorax en grande partie, lisse et luisant, avec quelques rides et réticulations vagues, surtout de côté. Abdomen assez lisse, ponctué. D'un rouge brunâtre ; tête noire ; abdomen brun ; pattes et antennes jaunâtres L. 3 mill. .....*Ph. templaria*, n. sp.

18. Côtés de la tête faiblement convexes. Tête fort allongée. Yeux situés au cinquième antérieur, très petits. Un espace faiblement sculpté (réticulé) pour les scapes qui sont à peine plus longs que le tiers de l'espace qui sépare leur origine de l'angle occipital. Tête luisante, ridée en long, avec quelques réticulations entre deux à l'occiput. Thorax finement réticulé—ponctué et mat ainsi que le pédicule. D'une jaune rougeâtre, avec l'abdomen d'un jaune brun, les pattes et les antennes jaunes. Epistome subcaréné, sans échancrure. L. 2, 5 à 3 mill...*Ph. parva*—Mayr.

Epistome échancré au milieu, sans carène, concave. Tête et thorax d'un rouge jaunâtre terne. Abdomen d'un brun jaunâtre. L. 3, 2 à 3, 8 mill ....*Ph. parva*—Mayr. var. *decanica*, n. var.

19 Derrière de la tête, occiput et une partie du vertex lisse et luisant, comme le reste du corps. Tête plus longue que large. Pilosité dressée longue et abondante partout.

Arêtes frontales prolongées en ride. D'un rouge jaunâtre. Abdomen et dessus de la tête et du thorax bruns. L. 3, 5, mill .....*Ph. Nietneri*—Emery.

Toute la tête sculptée 20

20. Epistome et devant de la tête entre les arêtes frontales formant une surface subtronquée, presque plane. Arêtes frontales longues, fortement divergentes, aigues, subhorizontales, formant en dehors un scrobe très marqué pour toute la longueur des scapes. Tête et thorax ridés devant, du reste assez mats et réticulés-ponctués. Tubercules pronotaux forts. Epines aussi. L. 5, 5 à 5, 7, mill .....*Ph. Capellinii*—Emery.
v. *asperata*—Em.

Tête de forme ordinaire. Pas de scrobe, sauf chez la *Magrettii* et la *sulcaticeps* r. *yeensis*..... 21

21. Pas d'espace spécialement sculpté ni émprimé pour les scapes. Arêtes frontales courtes 22

Un espace plus faiblement sculpté ou imprimé pour recevoir les scapes. Arêtes frontales prolongées au moins par une forte ride jusqu'à l'extrémité du scape ou à peu près 23

22. Tête énorme, longue de 2, 5, large de plus de 2 mill., avec la sculpture de la *Ph. Sykesii*, mais transversalement ridée à l'occiput, avec les côtés subrectilignes. Scape bien plus court que la distance de son extrémité au lobe occipital. Vertex avec une large impression transversale. Occiput fortement échancré. Pronotum bossu, pas, ou à peine tuberculé. Sillon et bourrelet du mésonotum étroits et distincts. Le métanotum à deux fortes dents ou courtes épines. Premier article du pédicule court, cunéiforme, échancré au sommet. Second article grand, large, à côtés proéminents, en angles tres arrondis, trois ou quatre fois plus large que le premier. Thorax et pédicule subopaques, ridés en travers et finement réticulés. Abdomen lisse, avec une abondante ponctuation piligère élevée. Pilosité dressée abondante, d'un roux jaunâtre, plutôt, courte. D'un rouge brunâtre sombre. Abdomen, pédicule et mandibules d'un brun noir. Cuisses et tibias bruns ; Tarses jaunâtres. L. 5, 5 à 6 mill...*Ph. Wroughtonii*, n. sp.

Tête moins énorme, faiblement échancrée derrière, à sculpture plus grossière et bien moins serrée, luisante, ridée devant, réticulée à l'occiput, où l'échancrure est incisée et pas excisée comme chez la *rhombinoda*. Pas d'impression au vertex. Côtés convexes. Extrémité du scape plus rapprochée de l'angle occipital que de l'articulation antennaire.

Yeux situés un peu en avant du tiers antérieur. Tubercules pronotaux petits et obtus. Mésonotum sans sillon, avec un bourrelet aigu, en arête transversale. Epines longues comme la moitié de la face basale. Premier article du pédicule avec un noeud moitié cunéiforme, moitié squamiforme, faiblement ou pas échancré en haut. Second noeud environ deux fois plus large que long, avec les cotés en cônes très larges et fort arrondis ; le noeud est bien moins grand que chez la *rhombinoda*. Thorax irrégulièrement rugueux ; face déclive du métanotum, pédicule et abdomen lisses et luisants. D'un jaune brun ou d'un brun jaunâtre ; tête et thorax d'un rouge un peu brunâtre. L. 4, 3 à 5 mill.....*Ph. Constanciae*, n. sp.

Entièrement noire. Epines tres courtes .. *Ph. Constanciae* v. *nigra*.

23. Grande espèce, L. 7, 5 à 8 mill. Scape aplati à sa base et tranchant à son bord antérieur. Tête et abdomen énormes, globuleux ; thorax étroit. Tubercules pronotaux obtus. Mésonotum sans sillon, avec un bourrelet en arête aiguë, horizontale, derrière laquelle le mésonotum tombe verticalement. Epines métanotales grêles, obtuses, longues comme les $\frac{3}{4}$ de la face basale. Premier article du pédicule court, avec un noeud moitié cunéiforme, moitié squamiforme, profondément échancré au sommet. Second noeud court, transversal, à côtés coniques. Mate ou subopaque, finement réticulée, et, en outre, grossièrement réticulée. Les grosses réticulations s'effacent derrière l'abdomen. Dos du métanotum et devant de la tête grossièrement ridés. De gros points espacés entre les rides du devant de la tête. Une pilosité roussâtre abondante partout. Epistome, mandibules, pattes et scapes lisses avec des points épars. D'un brun foncé, parfois un peu rougeâtre sur la tête et le thorax. Pattes et antennes d'un jaune brunâtre .....*Ph. rugosa*—Smith.

Taille d'au plus 6 mill. Scape cylindrique. Forme ordinaire 24

24. Second article du pédicule démesurément grand, plus long que le 1er (incl. pétiole) et au moins trois fois plus large que lui, convexe, rhombiforme, avec les pans latéraux un peu convexes, le pan latéral postérieur ayant un bord un peu translucide. Vertex avec une forte impression médiane. Tête ridée en long thorax et pédicule en travers ; occiput grossièrement réticulé, abdomen lisse, souvent strié a sa base. Tête fortement échancrée (excisée). Un fort sillon et un fort bourrelet au mésonotum. Epines courtes. Pétiole du 1er noeud court, large, denté à ses

angles antérieurs. L'extrémité du scape atteint les 2/3 de la distance de son origine à l'angle occipital. L. 4, 5 à 5 mill ..... *Ph. rhombinoda*—Mayr.

Tête plus grosse, plutôt incisée, scape plus court ; vertex peu imprimé. Taille plus robuste et plus grande ; thorax plus large. L. 5 à 5, 5 mill. Poils des tibias subadjacents, *Ph. rhombinoda*—var. *taprobanae*, n. var.

Abdomen entièrement mat, finement réticulé et en outre strié ..... *Ph. rhombinoda*. v. *micantiventris*—Mayr.

Second article du pédicule tout au plus aussi long et (sauf chez la *Ph. Horni*) moins de trois fois plus large que le premier, sans bord translucide 25

25. Occiput transversalement ridé. Une profonde impression transversale sur le vertex, derrière laquelle les lobes occipitaux se recourbent légèrement en avant. Epistome imprimé au milieu et échancré, arêtes frontales tres distinctement prolongés jusqu'à l'extrémité du scape, dont la loge est finement réticulée. L'extrémité des scapes atteint à peine la moitié de la distance de leur origine à l'angle occipital. Tête fortement incisée derrière. Tubercules pronotaux obtus. Un fort sillon mésonotal; derrière le bourrelet, le mésonotum tombe verticalement en escalier. Epines longues. Le premier noeud du pédicule entier. Second noeud transversal, étiré en cônes. Abdomen lisse, avec la base finement réticulée. Le reste du corps ridé, assez luisant ; pronotum parfois lisse en dessus. Pilosité dressée, jaunâtre, assez abondante. D'un rouge brunâtre foncé. Abdomen brun. Pattes et antennes d'un jaune brunâtre. L. 5 mill ..... *Ph. sulcaticeps*—Roger.

L. 4, 5 à 5 mill. Tubercules pronotaux indistincts. Bourrelet mésonotal très marqué, étroit; derrière lui une forte incisure rentrante. Premier noeud légèrement échancré au sommet; second noeud moins étiré en cône. D'un rouge souvent plus clair..... *Ph. sulcaticeps* var. *punensis*, n. var.

L. 6 mill. Les arêtes frontales forment en dehors un scrobe assez distinct pour loger les scapes. Mésonotum en escalier, comme chez la forme typique. Premier noeud assez squamiforme et fortement échancré au sommet. Abdomen entièrement mat, finement réticulé-ponctué et strié d'un bout à l'autre ..... *Ph. sulcaticeps*. r. *yeensis*, n. subsp.

L'occiput n'est pas transversalement ridé. Pas d'impression transversale sur le vertex ou seulement une faible impression ..... 26.

26. Abdomen au moins en partie sculpté. Tibias et scapes presque sans poils dressés 27

Abdomen lisse et luisant ..... 28.

27. Tête et une partie du thorax luisants, ridés. Le tiers antérieur seulement de l'abdomen mat, finement réticulé, souvent strié. Abdomen brun, sauf une tache rougeâtre à la base. Le reste rougeâtre. Tête assez étroitement échancrée, de taille moyenne, en rectangle. Scapes un peu plus longs que chez la *sulcaticeps*. Echancrures du thorax profondes. Pronotum à peine tuberculé. Epines moyennes. Second noeud en rhombe transversal, à cônes latéraux courts. L. 4 à 4, 4 mill..... ...*Ph. striativentris*—Mayr.

Tout le corps, y compris l'abdomen, entièrement réticulé-ponctué et mat : abdomen sans stries; tête et devant du thorax ridés. Tête largement échancrée derrière. Yeux gros et assez plats. Les scapes atteignant au moins les $\frac{2}{3}$ de la distance de leur origine à l'angle occipital. Echancrures du thorax moins profondes, plus évasées que chez la précédente. Pronotum à peine tuberculé. Epines plutôt courtes. Face basale étroite. Second noeud en rhombe à cônes courts, mais pointus. Tête assez petite. Parfois le derrière de l'abdomen est lisse et luisant. L. 3, 3 à 3, 6 mill. D'un brun noirâtre; funicules, tarses et articulations jaunâtres. Abdomen noir.....*Ph. ghatica*, n. sp.

28. Un scrobe ou loge concave très distincte pour les scapes, avec sculpture très fine. Ce scrobe se recourbe à l'extrémité du scape et se continue de côté, en avant, vers l'œil, pour recevoir une partie du funicule. Tête ridée devant, ponctuée et finement réticulée derrière. Rougeâtre. Abdomen, cuisses et scapes bruns. Tarse et funicules jaunâtres. Yeux au quart antérieur. L. 3, 5 à 4 mill. Scapes courts .....*Ph. Magrettii*—Emery.

Pas de scrobe distinct 29

29. Les tibias et les scapes n'ont qu'une pubescence entièrement adjacente et n'ont aucun poil dressé. Tête plus petite que chez la *rhombinoda*, mais de même forme et de même sculpture. L'extrémité des scapes approche beaucoup de l'angle occipital. Sans former de scrobe distinct, ni de sculpture spéciale, la fossette antennaire se prolonge en arrière jusqu'à la moitié de la distance entre l'œil et l'angle occipital ; elle est grossièrement sculpté

comme le reste de la tête. Premier article du pédicule longuement pétiolé, avec un noeud petit, etroit et entier. Second article aussi long que large, petit, avec deux cônes latéraux obtus. Pilosité assez éparse sur le corps. Stature grêle D'un brun rougeâtre. Abdomen brun. L. 3, 3 à 4, 5 mill .....*Ph. jucunda*—Forel.

Les tibias et les scapes ont des poils entièrement dressés..... 30

Les tibias et les scapes ont seulement des poils obliques..... 36

30. Le métanotum n'a que deux petites dents triangulaires, pointues. Premier noeud échancré et bidenté. Tubercules pronotaux petits, subdentiformes. Extre eux, un peu en arrière, le mésonotum forme deux petites éminences peu apparentes. Bourrelet du mésonotum étroit, peu élevé. Second noeud plutôt large, avec deux cônes. Tête assez faiblement ridée devant et reticulée derrière, plutôt, petite, à échancrure médiane. Epistome caréné, sans échancrure, L'extrémité du scape atteint les 2/3 de la distance de son origine à l'angle occipital. Pronotum lisse ; mésonotum et métanotum finement réticulés, pedicule à peine. Pilosité longue, fine et abondante partout. D'un jaune sale ou brunâtre. Dessus de la tête et derrière de l'abdomen plus foncés. L. 3, 6 mill.....*Ph. multidens*, n. sp.

Le métanotum à deux petites épines qui sont moins longues que la moitié de la face basale. Taille petite : 2, 7 mill. Tête relativement grande, assez fortement échancrée, à côtés convexes. Le scape atteint les $\frac{3}{4}$ de la distance de son origine à l'angle occipital. Tubercules pronotaux assez petits. Sillon et bourrelet du mésonotum faibles. Premier noeud étroit, entier, cunéiforme. Second noeud petit, en carré arrondi. Luisant. Tête ridée, finement réticulée, avec de gros points à l'occiput, lisse et luisante dessous (aussi sous l'occiput). Thorax, surtout derrière avec quelques rides et réticulations vagues. Pilosité plutôt diluée. Rougeâtre. Abdomen d'un jaune brun. Pattes et antennes jaunes. L. 2, 7 mill.....*Ph. Rogersi*, n. sp.

Métanotum avec deux dents; sillon du mésonotum presque nul. Scape atteignant à peine la moitié de la distance de l'angle occip ut .....*Ph. Rogersi* v. *Taylori*, n. var.

Sauf chez la *Ph. javana* (qui a au moins 3, 5 mill) les épines sont au moins aussi longues que la moitié de la face basale. 31

31. Tête grande, formant bien plus d' 1/3 de la longueur totale... 32

Tête petite, ne formant pas plus d' 1/3 de la longueur totale... 33

32. Epistome avancé au milieu, échancré et bidenté. Vertex avec une assez forte impression médiane. Yeux situés au quart

antérieur. Tête à côtés fort convexes, échancrée en abricot. Thorax large, mais pas très bossu. Tubercules pronotaux obtus, mais distincts. Bourrelet mésonotal épais. Epines longues, grêles, très aigues. Premier noeud moitié squamiforme, moitié cunéiforme, entier. Second noeud moyen, à conules. Luisante ; tête grossièrement ridée; les rides se recourbent et deviennent réticulaires à l'occiput. Pronotum parfois lisse dessus. Thorax et pédicule vaguement sculptés. Points piligères, de l'abdomen élevés. Pilosité dressée très abondante, longue, jaunâtre, assez fine. Rougeâtre; abdomen d'un brun jaunâtre; pattes et antennes jaunâtres. L. 5, 5 à 6 mill..... *Ph. peguensis*— Emery.

Epistome échancré, mais à peine avancé et pas bidenté. Vertex à peine imprimé. Yeux situés en arrière du quart antérieur. Thorax étroit. Pronotum très bossu, sans tubercules distincts. Mésonotum un peu rétréci; bourrelet très élevé, mais moins épais; le mésonotum beaucoup plus abrupt (en escalier) que chez la *peguensis*. Epines très longues, robustes, pointues. Pédicule et sculpture comme chez la *peguensis*, mais moins luisante (la fine réticulation plus forte). Pilosité plus courte, beaucoup plus diluée et moins fine, d'un jaune roussâtre vif. Rougeâtre, avec l'abdomen, les pattes et les funicules jaunes. L. 4, 8 mill. Peut-être une race de la précédente .....*Ph. Roberti*, n. sp.

L. 3, 4 à 3, 6 mill. Epistome non avancé, échancré. Vertex pas ou à peine imprimé. Yeux situés au quart antérieur. Tête fortement rétrécie devant, fortement élargie et profondément incisée derrière, avec les lobes occipitaux assez rétrécis et divergents (ils sont bien plus rapprochés chez les deux précédentes dont la tête se rétrécit à l'occiput). Les scapes atteignent les 3/5 de la distance de leur origine à l'angle occipital. Pronotum sans tubercules. Mésonotum à sillon profond et large bourrelet, en escalier. Epines longues, grêles. Tête plus réticulée, à rides plus irrégulières que chez la *peguensis*; thorax plus ridé. Pilosité plus courte et bien moins abondante, surtout aux tibias, ou elle est un peu oblique, plus terne que chez la *Roberti*. D' un brun à peine roussâtre; pattes et funicules roussâtres. Pédicule réticulé, mat; pronotum luisant. 2me noeud rhombiforme à cônes obtus, plutôt petit.....*Ph. Feae*—Emery.

33. Second noeud du pédicule grand, rhombiforme, trois fois plus large que le premier, mais pas plus long (moins grand que chez la *rhombinoda*). Abdomen tronqué en ligne droite devant. Tubercules pronotaux forts. Epines

grêles dès la base. Aspect semblable à la *rhombinoda*, mais plus rougeâtre. L. 4, 8 mill. .. ..*Ph. Horni*— Emery.

Second noeud du pédicule petit, environ deux fois plus large que le premier et assez court. Abdomen non tronqué devant 34

34. Pilosité dressée diluée, même fort éparse sur les tibias et les scapes. Tête presque ovale, à côtés très convexes, médiocrement échancrée, grossièrement ridée et réticulée. L'extrémité des scapes ne dépasse pas les 2/3 de la distance de leur origine à l'angle occipital. Pronotum extrêmement élevé et bossu, presque sans tubercules. Bourrelet mésonotal épais. Epines robustes, un peu courbées en arrière, pointues, longues comme les 3/5 de la face basale. Second noeud court, plus large que long, avec deux cônes latéraux. Yeux au quart antérieur. Thorax luisant, irrégulièrement et vaguement rugueux. D'un roux sombre ; abdomen brun. Pattes et antennes jaune sale. L. 3, 8 à 4 mill.
Ph. Binghamii— n. sp.

Pilosité dressée abondante, fine et longue. Tête carrée (*javana*) ou un peu trapéziforme (*plagiaria*), faiblement échancrée, ridée-réticulée. L'extrémité des scapes atteint les $\frac{3}{4}$ de la distance de son origine à l'angle occipital. Pronotum peu convexe. Second noeud sans conules. Yeux vers le tiers antérieur. Couleur brune ; pattes et antennes un peu plus claires 35

35. L. 4, 7 mill. Pronotum avec deux forts tubercules. Epines longues comme la moitié de la face basale. Pilosité très abondante. Sculpture plus forte, pattes longues.
Ph. plagiaria— Smith

L. 3, 8 à 4, 2 mill. Pronotum presque sans tubercules. Epines courtes, longues comme le tiers de la face basale. Pilosité moins abondante. Pattes moins longues.....*Ph. javana*— Mayr.

(Chez la *javana* typique la tête est élargie derrière et a les côtés plus convexes) .....v. *dharmsalana*, n. var

36. Tête assez grande, médiocrement rétrécie devant. L'extrémité des scapes dépasse un peu la moitié de la distance de sa base à l'angle occipital. Sillon et bourrelet mésonotaux forts. Epines assez longues. Premier noeud entier, subcunéiforme. Second noeud à cônes obtus. Tête sans impression distincte. Yeux gros, au tiers antérieur. Luisante. Tête ridée, à rides lâches, se recourbant sur le lobe occipital pour passer du devant aux côtés. Thorax vaguement ridé. Corps assez poli. D'un

brun de poix ; thorax en partie rougeâtre. Pattes et antennes d'un jaune brun. L. 4, 2 à 5, 5 mill...*Ph. indica*— Mayr.

Tête allongée rectangulaire, aussi large devant que derrière, assez distinctement imprimée au vertex. Yeux gros, fort convexes, situés au quart antérieur. L'extrémité du scape atteint à peine la moitié de la distance de sa base à l'angle occipital. Epines courtes. L. 3, 4 à 4, 1 mill. .....
Ph. indica r. *rotschana*, n. subsp.

Pronotum fort bossu, presque sans tubercules. Tête un peu moins élargie derrière que chez l' *indica* typique. Epines courtes. Rougeâtre, avec l'abdomen d'un jaune brunâtre, devant, et brun derrière. L. 3, 4 à 4, 1 mill.....
Ph. indica r. *himalayana*, n. subsp.

Les rides du front serrées, se continuant encore plus serrées sur l'occiput. Epines fortes. Pronotum bien tuberculé. Forme de la tête et taille de la *rotschana*, mais le vertex à peine imprimé.....*Ph. indica* v. *coonoorensis*, v. var.

Les varietés de taille, de sculpture, de forme, &c., de la *Ph. indica*, répandues à profusion dans toute l'Inde sont si nombreuses que je me borne à ces trois aberrations qui me paraissent les plus caractéristiques.

N.B.—Les espèces *ceylonica* Motschulsky, *diffusa*, *malabarica* et *minor* Jerdon, *providens* Sykes sont indéchiffrables.

Je dois à l'obligeance de M. Emery les types de ses *Ph. Horni*, *Feae*, *Capellénii* v. *asperata Magrettii*.

LISTE DES ESPÈCES.

1. *Pheidole* (*Ceratopheidole*) *Smythiesii*, n. sp. Assam (Smythies).

☿. L. 3,6—4,6 mill. Massue de 4 articles. Bord terminal des mandibules denticulé. Mésonotum échancré. Epines assez longues. Second noeud très grand, en cloche. Tête carrée, à bord postérieur rectiligne chez la grande ☿, rétrécie, et arrondie sans bord postérieur chez la ☿ minima. Cette dernière entièrement lisse et luisante. Le passage de l'ouvrière maxima au soldat minimum me manque encore, mais il existe sans nul doute.

☿. L. 12 à 13 mill. Noire. Ailes manquent. Toute semblable au soldat. Tête plus large que le thorax. Deux larges épines triangulaires.

♂. L. 5, 3 à 6 mill. Jaune sale. Ailes longues, d'un brun pâle, avec les nervures et la tache assez pâles. Mandibules quadridentées. Scape long comme les 3 premiers articles du funicule. Tête en arc de cercle d'un œil à l'autre. Thorax large. Parfois le 2me noeud, fort grand, a une petite dent latérale.

2. *Pheidole lamellinoda*, n. sp. Poona (Wroughton); Inde centrale (Betham).

☿. L. 2, 5 mill. Yeux grands. Tête à bord fort distinct. 1er noeud court, sans appendice dessous (*je n' indique plus ce caractère négatif chez le*

autres espèces). Second noeud grand, en cloche. Thorax biéchancré. Métanotum à peine subdenté, parfois inerme. Jaune sale, luisante. Des poils dressés sur le corps et obliques sur les tibias et les scapes.

♂. L. 4, 8 mill. Mandibules sans dents. Scape comme les deux premiers articles du funicule. Tête en trapèze derrière les yeux. Une arête blanchâtre longitudinale sous le 1 noeud. Ailes jaunâtres à tache et nervures pâles. Jaune sale ; abdomen brunâtre.

3. *Ph. Grayi*, n. sp. Poona (Wroughton).

☿. L. 2, 5 mill. Jaune assez pâle. Abdomen brunâtre. Latête a un bord postérieur assez net. Second noeud gros, en cloche. Lisse et luisante. Métanotum à peine subdenté. Pronotum arrondi. Sillon du mésonotum faible.

4. *Ph. Malinsii*, n. sp. Ceylan (Yerbury).

☿. Comme la précédente, mais la tête plus large, à bord postérieur très net. Pronotum un peu déprimé devant, avec deux tubercules assez distincts, un peu concave entre deux. Sillon mésonotal faible. Métanotum, pédicule et couleur comme la *Grayi*.

5. *Ph. Naoroji*, n. sp. Poona (Wroughtou).

☿. L. 2 mill. Le pronotum est arrondi, mais il a deux petits tubercules dentiformes. Métanotum subdenté. Premier noeud un peu convexe dessous. Du reste comme la *Grayi*.

6. *Ph. spathifera*, n. sp. Ceylan (Yerbury) ; Coonoor (Daly, Wroughton) ; Trevandreum (Ferguson) ; Nilgiris (Wroughton) ; Cochin (Ferguson).

☿. L. 3, 1 à 3, 5 mill. Tête carrée a bord postérieur net. Thorax fortement biéchancré. Pronotum peu convexe, a deux forts tubercules. Deux fortes épines au métanotum. Premier article du pédicule court, rectangulaire, à angles antérieurs dentés et à noeud subéchancré. Second noeud gros, en cloche, plus large que long. Entièrement réticulée—ponctuée et mate, sauf une partie des derniers segments du l'abdomen; tête en outre ridée. Une dent dirigée en avant sous le 1 article du pédicule. D'un brun ferrugineux foncé. Pilosité brune.

♀. L. 7, 5 mill. Ailes manquent. Semblable au soldat, mais les épines du métanotum, grêles dès la base, sont de forme ordinaire, à peine un peu obtuses à l'extrémité, très longues. Second noeud quatre fois plus large que long. L'écaile du 1er noeud a deux longues cornes plates ; appendice aussi long que chez le soldat.

♂. L. 5 mill. Tête plus large que longue, faiblement convexe derrière les yeux. Mandibules tridentées. Scape plus court que le 2me article du funicule. Noeuds courts et épais, sans appendices. Les ailes brunâtres n'ont qu'une cellule cubitale. Nervures et tache brunes. Tête et thorax mats, finement sculptés et pubescents. Pubescence forte ; peu de poils dressés. D'un brun foncé ; pattes et antennes jaunâtres.

Var *Yerburyi*, n. var. Ceylan (Yerbury).

☿. Tête plus étroite, arrondi derrière, sans bord postérieur distinct. Epines un peu plus courts.

♀. L. 6, 5 mill. Deux courtes épines robustes au métanotum. L'écaille du 1er noeud a deux lobes arrondis et une échancrure entre deux. Un lobe opaque et arrondi en dessous, au lieu d'appendice.

Race *aspatha*, n. subsp. Assam (Smythies); Cochin (Ferguson).

☿. Tête comme chez la v. *Yerburyi*. Métanotum denté ou subdenté. Tête et thorax a peu près lisses et luisants, faiblement réticulés.

7. *Ph. Fergusoni*, n. sp. Travancore et Trevandrum (Ferguson).

☿. L. 3, 2 à 4 mill. Sculpture de la *spathifera* mais l'abdomen est lisse sauf a la base. Pronotum plus convexe avec deux petits tubercules. Tête rétrécie derrière les yeux, avec un court bord postérieur. Pilosité d'un brun noirâtre, longue et abondante. Epines du métanotum fort courtes, robustes. Premier noeud court, convexe en dessous sans dent. D'un rouge ferrugineux foncé. Abdomen d'un brun noir.

8. *Ph. Sharpi*, n. sp. Salem, Madras Pres. (Sharp); Bombay (Hoogwerf); Bangalore (Rothney).

☿. L. 2, 5 mill. Tête rétrécie et arrondie derrière les yeux. Sillon métanotal assez faible. Pronotum sans tubercules. Métanotum inerme. Premier article du pédicule un peu convexe dessous, sans dent. Second assez gros, en cloche. Lisse et luisante. Mésonotum et métanotum réticulés. D'un jaune roussâtre; tête et abdomen brunâtres.

Race *Hoogwerfi*, n. subsp. Bombay (Hoogwerf).

☿. Un peu plus claire que la *Sharpi* typique, du reste identique.

♀. L. 6, 5 mill. Diffère de la *spathifera* v. *Yerburyi* par ses épines plus longues et robustes, par le noeud squamiforme étroit et entier du 1e article du pédicule qui n'a pas trace d'appendice en dessous.

♂. L. 3, 8 mill. Scape long comme les deux premiers articles du funicule. Mandibules très petites, bidentées. Tête très rétrécie, en triangle arrondi au sommet derrière les yeux. Noeuds du pédicule allongés. Ailes d'un jaune brunâtre à nervures brun clair. D'un brun assez clair. Etroit et grêle, poilu. Abdomen luisant, le reste subopaque finement sculpté; tête presque mate.

9. *Ph. latinoda*: Roger. Commune dans toute l'Inde, de l'Himalya à Ceylon et de Calcutta à Bombay. Var. *major*; grands individus surtout à Calcutta.

Race *angustior*, n. subsp. Poona (Wroughton); Thana (Gleadow).

☿. L 3 mill. Tête plus étroite, mais pas plus rétrécié derrière que chez la *latinoda* typique. Mésonotum avec une vague impression au lieu de sillon. Métonotum subdenté (ex. de Poona) ou épineux (ex de Thana). Premie article du pédicule légèrement convexe dessous, second bien plus étroit que chez *latinoda* typique. Noire, luisante.

10. *Ph. Watsoni*, n. sp. Myingyan, Birmanie supérieure (Watson); Orissa (Taylor).

☿ L. 1, 5 à 1, 7 mill. Tête en carré arrondi. Promésonotum sans sillon. Métanotum subdenté. Lisse, luisante, derrière du thorax réticulé. D'un roux terne; tête et abdomen d'un brun foncé. Pattes et antennes jaunes.

11. *Ph. Phipsoni*, n. sp. Kanara (Wroughton).

☿. L. 2, 8 à 3 mill. Tête bien plus longue que large, à bord postérieur marqué, pas de sillon au mésonotum. Pronotum faiblement tuberculé. Une profonde échancrure entre le mésonotum et le métanotum, le dernier convexe, inerme. Second noeud à peine deux fois plus large que le premier qui est squamiforme. Lisse; métanotum reticulé. Poilue. D'un brun de poix. Mandibules, antennes, tarses et articulations jaunâtres.

12. *Ph. pronotalis*, n. sp. Ceylon (Yerbury).

☿. L. 1, 8 à 2 mlll. Tête subrectangulaire, peu dépassée par les scapes Pronotum avec deux forts tubercules proéminents, formant une seule convexité avec le mésonotum. Deux petites dents au métanotum. Second noeud étroit. Sculpture de la précedente. Pilosité fine, mediocre, jaunâtre. Tête d'un jaune brunâtre. Seconde moitié de l'abdomen brune.

♂. L. 4, 3 à 4, 5 mill. Mandibules quadridentées. Scape plus long que les deux premiers articles du funicle. Tête en trapèze aigu derrière les yeux. Lisse et luisant, sauf la tête. D'un jaune brunâtre. Poils épars. Ailes teintés de brun clair, avec les nervures et la tache brun clair.

13. *Ph. Sykesii*, n. sp. Poona (Wroughton).

☿. L. 3 à 3, 5 mill. Tête carrée, a bord postérieur distinct. Mandibules denticulées sur tout leur bord terminal. Pro-mésonotum formant une seule convexité. Pronotum avec deux tubercules distincts. Echancrure méso-métanotale profonde. Métanotum inerme, assez convexe. Second noeud petit, le premier à long pétiole. Lisse, luisante, très poilue ; poils longs, fins, jaunâtres. Brunâtre ; thorax brun rougeâtre.

☿. L. 10 mill. Mésonotum lisse avec une fine ponctuation espacée. Epines larges, robustes, en long triangle. Premier noeud un peu échancré ; le second 4 fois plus large que long, avec les longs cônes lateraux. Ailes, nervures et tache jaunâtres. D'un rouge brunâtre terne ; abdomen brun. Tête bien plus large que longue.

♂. L. 5, 8 à 6 mill. Mandibules tridentées, étroites à leur base. Scape plus court que les deux premiers articles réunis du funicule. Derrière les yeux, la tête forme un court trapèze. D'un jaune brunâtre sale. Le métanotum a deux élévations arrondies. Sculpture, ailes et pilosité de la ☿ et du soldat.

14. *Ph. Wood-Masoni*, Forel, Calcutta (Wood-Mason) ; Ceylon (Yerbury) ; Belgaum, Poona, Coonoor (Wroughton) ; Orissa (Taylor) ; Dehra Dun (Smythies), etc.

☿. Lisse, jaune clair ; L. 1, 7 Mill. Tête carrée, les scapes n'atteignent pas le bord occipital.

♀. L. 4, 5 à 5 mill. Un espace lisse pour l'extrémité des scapes sur la tête entièrement ridée, aussi large que longue. Le reste lisse et luisant. Deux larges dents au métanotum. Second noeud à conules aigus. Très poilue. D'un brun jaunâtre sale.

☿. L. 3, 5 à 3, 7 mill. Mandibules bidentées. Scape à peine long comme les deux premiers articles du funicule dont, le 2me est à peine plus long qu' épais. Derrière de la tête en trapèze long, à côté très obliques et a bord postérieur court, mat, finement ridé et réticulé. Le reste lisse et luisant, comme chez la ♀ et le ☿ de la *Sykesi*. D'un jaune pâle, tête d'un jaune brun ; ailes jaunâtre, subhyalines, longues.

15. *Ph. mus*, n. sp. Kanara (Wroughton) ; Calcutta (Walsh).

☿. L. 1, 5 à 1, 6 mill. Tête rectangulaire, un peu plus longue que large, rétrécie devant. Yeux au tiers antérieur. Les scapes dépassent légèrement l'occiput. Pronotum subtuberculé. Mésonotum sans sillon. Deux très petites épines pointues au métanotum. Second noeud pas ou à peine plus large que le premier. Régulièrement et densément réticulée-ponctuée, mate, brune. Abdomen, pédicule, pattes, antennes et mandibules lisses, luisants et d'un jaune brunâtre ou d'un brun jaunâtre. Pilosité médiocre.

☿. L. 3, 2 mill. Mandibules tridentées. Antennes comme chez la *Wood-Masoni* ; tête, derrière les yeux en trapèze plus court. Métanotum bas Sculpture comme chez la *Wood-Masoni*, mais quelques stries fines au thorax ; pilosité moindre. D'un jaune brunâtre. Ailes courtes, teintées de brunâtre à nervures et tache pâles.

16. *Ph. Sagei*, n. sp. Dharmsala (Sage).

☿ L. 1, 8 mill. Identique à la précédente, mais plus robuste ; promésonotum plus convexe. Epines plus robustes, plus longues (comme la moitié de la face basale) ; devant de la tête plus ridée. Couleur d'un rouge brun, ferrugineux. Tête presque carrée.

17. *Ph. templaria*, n. sp. Nissor, Assam (Smythies). Le soldat seul est connu.

18. *Ph. parva*, Mayr. Poona (Wroughton). Pour l'ouvrière, voir la var. *decanica*.

var. *decanica*, n. var. Kanara (Aitken) ; Cochin (Rothney) ; Belgaum, Poona, Kanara (Wroughton); Ceylon (Yerbury).

☿. L. 1, 6 mill. Tête allongeé, comme chez la *mus*, ridée d'un bout à l'autre, outre les réticulations. Du reste identique à la *Ph. Sagei*, mais un peu moins robuste.

♀. L. 4 á 4, 4 mill. Tête carrée aussi large que le thorax. Métanotum avec deux épines assez fortes. Mésonotum lisse avec quelques stries ; métanotum réticulé. Brune ; devant de la tête, antennes et pattes d'un jaune rougeâtre. Ailes teintes de brun pâle nervures et tache brunâtres. Assez poilue ; poils des tibias et des scapes obliques.

☿. L. 2, 8 à 3, 2 mill. Mandibules bidentées. Antennes comme chez la *Wood-Masoni*, mais le 2me article du funicule presque deux fois plus long

que large. Du reste comme la *Wood-Masoni*, mais les ailes plus brunies, la couleur d'un jaune plus brunâtre (tête brunâtre), le thorax plus déprimé, la pilosité des tibias oblique.

19. *Ph. Nietneri*, Emery: Ceylan (Horn).

20. *Ph. capellinii* Emery, *asperata* Emery. Asciuñ Ghecú, Carin (Fea).

21. *Ph. megacephala*, Fab. Birmanie et Tenassrim (Fea), d'après, Emery.

22. *Ph. Wroughtonii*, n. sp. Poona, Thana (Wroughton); Kanara, Thana (Gleadow); Karwar, Kanara (Aitken); Ahmednagar.

☿. L. 2, 7 à 3, 4 mill. Tête rectangulaire, presque carrée. Yeux gros, situés à peine en avant du milieu. Les scapes dépassent l'occiput d'$\frac{1}{3}$ de leur longueur. Sillon mésonotal distinct; pronotum sans tubercules; métanotum subdenté; second noeud gros, en cloche. Réticulée; subopaque; front en partie lisse. Devant de la tête ridé; des rides vagues sur le thorax; abdomen, lisse. Pilosité médiocre, oblique sur les tibias. D'un brun noir; thorax rouge sombre; mandibules, tarses et articulations jaunâtres.

♀. L. 7 à 7, 5 mill. Tête plus large que le thorax. Deux larges épines courtes au métanotum. Sculpture plus grossière que chez le soldat. Du reste identique. Ailes teintes de brun roussâtre. Nervures brun clair, tache brune. D'un brun noirâtre. Devant de la tête, pattes et antennes d'un brun rougeâtre ou jaunâtre.

♂. L. 4, 7 mill. Les mandibules ont deux dents obtuses. Scape un peu plus long que les deux premiers articles du funicule. Tête en bosse très convexe derrière les yeux. Face basale du métanotum et mésonotum finement striés en long, subopaques; le reste lisse. Poils des tibias obliques. D'un brun un peu jaunâtre.

23. *Ph. constanciæ*, n. sp. Coonoor (Wroughton).

☿. L. 2, 5 à 3 mill. Tête en rectangle arrondi, un peu rétrécie devant et derrière. Pronotum peu convexe devant, bituberculé. Le mésonotum a un sillon et un bourrelet élevé, fort-apparent, formant une courte arête transversale. Le métanotum a deux dents très aigues, subepineuses, Premier noeud longuement pétiolé. Second noeud gros, en cloche. A peu près lisse. Joues ridées jusque derrière les yeux. Pilosité éparse. Tibias poilus. D'un brun jaunâtre. Mandibules, antennes et pattes jaune sale.

♀. L. 7, 5 mill. Mésonotum mat, densément ridé, aussi large que la tête. Epines assez longues, grêles, plates, obtuses. Second noeud rugueux, $2\frac{1}{2}$ fois plus large que long. Mêlée de rougeâtre et de brun. Abdomen brun foncé; pattes et antennes jaune brunâtre. De reste comme le soldat. Ailes manquent.

Var. *nigra*, n. var. Nilgiris (Wroughton).

♀. Noire avec le devant de la tête rouge; ☿ d'un noir brun. La ♀ à 7 2 mill de long et les épines courtes, assez robustes.

24. *Ph. rugosa*, Smith. Ceylan (Yerbury).

☿. L. 2, 7 à 3 mill. Tête elliptique, presque sémicirculaire, derrière les yeux. Bord terminal des mandibules entièrement denticulé. Une large impression ou sillon évasé au mésonotum. Métanotum inerme à face basale bien plus longue que la déclive. Second noeud assez large. Lisse ; mésonotum et métanotum réticulés et subopaques ; quelques rides aux joues. Pilosité médiocre. Pronotum très également convexe. Les scapes dépassent la tête de la moitié de leur longueur. D'un brun un peu jaunâtre, uniforme. Incroyablement petite relativement au soldat pris avec elle.

25. *Ph. rhombinoda*, Mayr. Orissa (Taylor) ; Barrackpore (Minchin) ; Mysore (Lee) ; Cochin (Rothney) ; Poona (Wroughton) ; Dehra Dun (Smythies) ; Travancore (Ferguson) ; Calcutta (Rothney), &c.

v. *Taprobanæ*, n. var. Ceylan (Yerbury).

☿. Tête fort atténuée et rétrécie derrière les yeux, sans trace de bord postérieur (un bord postérieur plus ou moins distinct chez la *rhombinoda* typique ou la tête est moins rétrécie). Les tibias n'ont que des poils très obliques, presque couchés. L. 2, 7 à 3 mill, (chez la *rhombinoda* typique les tibias ont une pilosité dressée). Le 2me noeud est comme chez la *rhombinoda* typique, très gros, en cloche.

v. *micantiventris*, Mayr. Ceylan (Madarasz).

26. *Pheidole sulcaticeps*, Roger. Orissa (Taylor) ; Wallon ; Ahmednagar (Heim).

v. *punensis*, Forel. Poona (Wroughton).

☿. Tête subrectangulaire, lisse (chez la forme typique aussi). Thorax en partie réticulé. Mésonotum à faible sillon. Métanotum denté. Second segment en cloche, plutôt petit. L. 2, 3 mill.

r. *Yeensis*, n. subsp. Ye Valley, Birmanie (Bingham). soldat seul connu.

27. *Ph. striativentris*, Mayr. Poona, Kanara, Konkan (Wroughton) ; Bombay (Rothney) ; Kanara (Bell) ; Orissa (Taylor); Dehra Dun (Smythies).

☿. L. 2, 4 à 2, 6 mill. Tête à côtés convexes et bord postérieur assez marqué, luisante. Thorax biéchancré, mat, réticulé-ponctué, avec deux petites épines. Pronotum indistinctement tuberculé. Second noeud rhombiforme. Abdomen lisse. Poils des tibias subadjacents. D'un jaune rougeâtre, un peu brunâtre sur la tête. Abdomen brun. Chez une variété plus foncée de Dehra Dun, le pronotum lisse.

♀. L. 5, 2 à 5, 7 mill. D'un noir brunâtre ou d'un rouge brunâtre selon les variétés. Mate, finement réticulée et densément ridée. Second noeud transversal au moins 4 fois plus large que long, étiré en longs cônes. Abdomen lisse et luisant, sauf la base qui est mate, réticulée et striée. Tarses, funicules, mandibules et articulations d'un jaune rougeâtre. Ailes faiblement jaunâtres, à nervures assez pâles.

28. *Ph. ghatica*, n. sp. Poona (Wroughton).

☿. L. 2, 4 à 2, 6 mill. Tête ovale-rectangulaire. Les scapes la dépassent d'environ un quart de leur longueur. Un sillon transversal évasé sur le mésonotum. Métanotum fortement bidenté. Second noeud petit, rhombiforme. Tout le corps, y compris l'abdomen, finement et densément réticulé-ponctué et mat. Tête en outre, en partie ridée. Les tibias et les scapes n'ont qu' une pubescence subadjacente. D'un noir brunâtre. Mandibules, tarses et articulations jaunâtres ; antennes roussâtres.

29. *Ph. Magrettii*, Emery. Thagatà, Tenasserim (Fea).

30. *Ph. jucunda*, Forel. Calcutta (Wood-Mason) ; Poona (Wroughton).

☿. L. 2, 6 mill. Mésonotum profondément échancré, avec un bourrelet très fort derrière. Epines fortes. Tête et thorax subopaques, finement réticulés et ridés. Tête allongée, subrectangulaire, à bord postérieur peu distinct. Second noeud rhombiforme arrondi, réticulé. Abdomen lisse et luisant, sauf à sa base qui est subopaque. Les scapes dépassent la tête de près e la moitié de leur longueur (à peine d' $\frac{1}{4}$ chez la *striativentris* à laquelle elle ressemble). Pilosité du soldat. D'un roux ferrugineux. Abdomen brun. Cette ☿ appartient à la grande variété de Poona.

31. *Ph. multidens*, n. sp. Poona (Wroughton).

☿. L. 2, 3 mill. Tête sémicirculaire derrière les yeux. Les scapes dépassent l'occiput des 2/5 de leur longueur. Pronotum bas, faiblement convexe, avec deux tubercules fort élevés, tout à fait dentiformes. Le mésonotum a quatre petites éminences subdentiformes, deux devant et deux derrière le sillon médian qui est faible ; un poil sur chaque éminence. Métanotum bidenté. Second noeud en cloche, médiocre, plutôt grand. Joues ridées, mésonotum et métanotum réticulés et mats ; le reste lisse. Pilosité longue, fine, dressée sur les tibias et les scapes comme ailleurs. D'un jaune terne ; tête et abdomen d'un jaune brunâtre.

32. *Ph. Rogersi*, n. sp. Siwalliks (Rogers).

☿ L. 2, 2 à 2, 3 mill. Tête ovale—rectangulaire, bord postérieur net. Les scapes dépassent l'occiput d' 1/3 de leur longueur. Le pronotum a deux tubercules subdentiformes. Mésonotum à peine imprimé au milieu. Deux petites épines métanotales. Second noeud petit, en carré arrondi. Thorax en partie réticulé, joues striées, le reste lisse. Poils des tibias un peu obliques. D'un jaune rougeâtre. Tête et abdomen d'un brun jaunâtre (en partie d'un jaune brunâtre).

v. *Taylori*, n. var. Orissa (Taylor).

☿. L. 1, 7 à 1, 8 mill. Plus étroite. Métanotum seulement denté. Les scapes dépassent l'occiput d' $\frac{1}{4}$ à peine de leur longueur.

33. *Ph. peguensis*, Emery. Palon et Tikekee, Pegou (Fea). M. Emery en a fait à tort une race de la *latinoda*. C'est tout autre chose.

34. *Ph. Roberti*, n. sp. Kanara (Wroughton).

☿. L. 2, 4 à 2, 6 mill. Tête ovale rectangulaire, à bord postérieur fort peu distinct. Les scapes dépassent l'occiput des $\frac{1}{3}$ de leur longueur. Le pro-

notum forme une forte convexité égale. Sillon mésonotal profond; le mésonotum est convexe derrière le sillon, sans former de bourrelet. Deux petites épines métanotales. Second noeud arrondi. Lisse et luisante; côtés du thorax réticulés et subopaques. Pilosité des tibias courte et un peu oblique. D'un jaunee rougeâtre. Abdomen jaunâtre.

35. *Ph. Horni*, Emery. Ceylan (Horn).

36. *Ph. Binghamii*, n. sp. Ye Valley, Birmanie (Bingham).

♀ L. 2, 4 mill. Tête et scapes comme chez la *Roberti*, mais tête plus alongée. Pronotum faiblement tuberculé. Mésonotum fortement incisé, mais un large bourrelet derrière le sillon. Métanotum allongé, bidenté. Second noeud petit, un peu en cloche. Sculpture de la *multidens* ♀. Pilosité éparse. Trois ou quatre poils obliques sur les tibias ; scapes plus poilus. A peine plus foncée que la *Roberti*.

37. *Ph. plagiaria*, Smith. Mte. Mooleyit, Tenasserim (Fea).

38. *Ph. javana*, Mayr. Bhamó et Teinzo, Birmanie (Fea).

v. *Dharmsalana*, n. var. Dharmsala (Sage).

☿. L. 2, 2 à 2, 3 mill. Le sillon du mésonotum est faible, plus faible que chez la forme typique. Du reste identique.

39. *Pheidole indica*, Mayr. Répandue dans toute l'Inde, de l'Himalaya à Ceylan, et de Bombay à Calcutta et la Birmanie. La forme la plus typique est du Bengale.

♂. L. 4, 8 à 5 mill. Robuste. Mandibules avec 2 ou 3 dents. Epistome caréné. Scapes longs comme les deux premiers articles du funicule. Tête rugueuse, en trapèze derrière les yeux. Thorax large, en partie lisse, en partie strié ; le reste lisse. Pilosité du soldat. Brun foncé. Ailes subhyalines, nervures jaunes, tache brun clair.

v. *Coonoorensis*, n. var. Coonoor (Wroughton).

☿. L. 2, 3 mill. Thorax mat, réticulé (en partie lisse chez le type) Couleur plus foncée. Bord postérieur de la tête plus distinct.

r. *rotschana*, n. subsp. Poona (Wroughton) ; Orissa (Taylor) ; Trevandrum (Ferguson) ; Thana (Wroughton).

☿. L. 1, 7 à 2, 2 mill. Bord postérieur de la tête distinct. Les scapes ne dépassent l'occiput que d' 1/5. Sillon mésonotal faible. Métanotum denté. Du reste sculpture, couleur et pilosité de la forme typique.

♂. L. 3, 8 à 4, 1 mill. Tête en trapèze plus court que chez l'espèce typique. Stature beaucoup plus grêle. Premier article du pédicule très long et très grêle. Du reste comme l'espèce typique.

r. *himalayana*, n. subsp. Cachmir (de Lobinière) ; Darjeeling (Wroughton) ; Dharamsala (Sage).

☿. L. 2, 4 à 2, 6 mill. Couleur du soldat, mais d'un jaune plus pâle. Du reste comme l'espèce typique.

40 *Ph. Feae*, Emery, Ghecú, Carin (Fea).

(To be continued.)

A CATALOGUE OF THE *HETEROCERA* OF SIKHIM AND BHUTAN.

By G. C. Dudgeon, F.E.S., &c.

With Notes by H. J. Elwes, F.Z.S., F.E.S., &c.,

and

Additions by Sir George F. Hampson, Bart., B.A., F.E.S., &c.

Part XIII.

(*Continued from page 355 of this Volume.*)

Family ARCTIADÆ—continued.

Sub-family Arctianæ—continued.

Genus Nicæa, Moore.

1243. *N. longipennis*, Wlk.

Sikhim. I have not seen a specimen in any Sikhim collection. (Sikhim, *Lidderdale* in B. M.—*G. F. H.*)

(I have a single specimen from the old Wilson collection, another from the Khasia hills—*H. J.E.*)

Genus Mænas, Hübn.

1193. *M. venosa*, Moore.

Sikhim and Bhutan, 1,800—3,000 feet. This appears to be not uncommon at Punkabaree in September. I have one male in my collection, taken by me at light at Badamtam in May, which has been identified by Sir George Hampson as *Thyrgorina venosa*, Moore, and which seems typical. Other specimens which I have taken at Punkabaree have no markings on either wing or have the forewing and hindwing with large orange subbasal patches as well as other orange marginal markings. I fail to see, if my specimens have been correctly identified, why this species is placed in the genus *Mænas*, which is described as differing from *Diacrisia*, Hübn., in the hind tibiæ being without the medial spurs. These spurs are present in all my specimens, and the species seems to me to be inseparable from the latter genus. It occurs together with *D. flavens*, Moore, which is similarly constructed; indeed *M. venosa*, in specimens where the orange markings are well pronounced, has the fuscous markings left on the wings similarly distributed to the fuscous markings in the heaviest marked forms of *D. flavens* as well as the structural likeness. I do not mean to infer that I consider the two to be one species, although, until lately, they were put together as one variable species in my collection, probably owing to some misconception arising from having taken them together. I think

that they seem fairly nearly allied, though. All my specimens of *M. venosa* have a black spot on the tegulæ which is not found in *D. flavens*. I consider that the species requires re-examination. Sir George Hampson remarks that the two specimens from me in British Museum, both males, have only got terminal spurs to hind tibiæ. (I have only two specimens from Sikhim so named by Sir George Hampson. They are not like Moore's figure, however, being black without markings, but too much worn to describe properly; they might be a melanic variety of *flavens*, Moore.—*H. J. E.*)

Genus DIACRISIA, Hübn.

1189. *D. nigrifrons*, Wlk.

Sikhim, 4,500—7,000 feet. This species is common at light in Darjeeling in July, August, and September. It is conspicuous by the front of the thorax being tufted with bright orange, whereas the remainder is pure white.

1199. *D. rhodophila*, Wlk.

Sikhim and Bhutan, 2,500—3,000 feet. Rather scarce in May and June. Taken at light at Fagoo. (Commoner in the Nagas at higher elevation than in Sikhim, where I never took it at Darjeeling. Möller got it in May.—*H. J. E.*)

1188. *D. multivittata*, Moore.

Sikhim and Bhutan, 2,500 feet up. Common in April, May, and July. Some specimens are without a trace of the dark markings on the forewing. (I took it at Darjeeling at light in August.—*H. J. E.*)

1200. *D. melanosoma*, Hmpsn.

Sikhim and Bhutan, 3,000 feet. This is apparently a rare species, which I have only taken at light in May. It is easily distinguished from the other white species of the genus by the abdomen being banded with black. My only example, a female, has the terminal segment orange. (I have three specimens from Möller's collection, one of which was taken on April 18th.—*H. J. E.*)

1163. *D. punctata*, Moore.

Sikhim. I do not recognise this insect from the description. The record is uncertain.

1192. *D. obliquivitta*, Moore.

Sikhim and Bhutan, 3,000 feet. This occurs rarely in May and October attracted to light. (I have this only from Knyvett's collection, and I believe he took it at Darjeeling.—*H. J. E.*)

1194. *D. flavens*, Moore.

Sikhim and Bhutan, 1,800—3,000 feet. A common insect at Punkabaree in June, September, and October. Taken with *Mænas venosa* in numbers attracted to light, especially in September. The male, which appears to be undescribed, has the markings arranged almost exactly as in Hampson's figure of *D. indica*, Guer. (*Moths of India*, Vol. II, p. 12.). It may be described as follows :—Deep ochreous ; palpi at sides and antennæ blackish ; abdomen darker ochreous with dorsal, lateral and sub-lateral series of black spots. Forewing with an elongate fuscous spot on the costa ; a curved ante-medial series of elongate fuscous spots between the veins, sometimes running into a straighter medial series, which latter is excurved round the end of the cell ; a triangular spot in the upper angle of the cell, one just outside the discocellulars, and sometimes a small one in the lower angle of the cell ; post-medial series of elongate spots terminating at the apex in two round spots. Hindwing with a discoidal spot, and generally a complete sub-terminal series of elongate fuscous spots, sometimes obsolete at the middle or reduced to round spots. In the female the spots beyond the medial series on the forewing are generally wanting or represented by one or two elongate spots between veins 4, 5, and 6. One specimen in my collection has five large spots of the post-medial series present. The hindwing of the female has the sub-terminal series reduced from one to four usually conjoined spots towards the tornus with a speck above vein 5 ; one specimen has in addition a post-medial row of 5 conjoined spots towards the inner margin. A black streak is also generally present from near the base of the wing, running parallel to the inner margin to half the extent of the latter. (Judging from the figure in *Moths of India*, Vol. II., p. 12, I should say that *D. indica* was the male of *D. flavens*. I have only 3 females of the latter from Möller's collection, which agree very fairly with the figure of *D. indica*.—*H. J. E.*)

1171. *D. flavalis*, Moore.

Sikhim and Bhutan, 5,000 feet. I have two forms of an insect identified by Sir George Hampson as *Thyrgorina flavalis*, Moore, one of which is typical *lativitta*, Moore, and the other a pale unmarked form with the forewings buff and the hindwings white. It seems very distinct from the other, but there are doubtless intermediate forms. It occurs at light in June, August and October. (This was common at Darjeeling in July and August, 1886. I have 12 males, which show every variation from spotless forewings to the well marked band of *lativitta*. Of my 2 females

one has no band, the other a faint and narrow one. I think there is little doubt they all belong to one species, and were so placed by Sir George Hampson in my collection—*H. J. E.*)

1184. *D. rubritincta*, Moore.

Sikhim and Bhutan, 6,000—7,000 feet. Taken by me at Pasheteng and Rissoom in September. (This occurs from May to September and seems common in some seasons. Though I never took it myself, there were several in Möller's and Knyvett's collections.—*H. J. E.*)

1165. *D. stigmata*, Moore.

Bhutan, 3,000—6,400 feet. I took this at light at Fagoo and Rissoom in June and September. (I took this at light at Darjeeling in July. It varies a good deal in the amount of black markings.—*H. J. E.*)

1164. *D. dentilinea*, Moore.

Sikhim. I have never seen a specimen of this. (I have not been able to identify this, and have little doubt that it is a synonym or a variety of one of the above species.—*H. J. E.*)

1162 & 1172. *D. obliqua*, Wlk.

Sikhim and Bhutan, 1,800—3,000 feet. Typical *obliqua* occurs at Fagoo in May, August and September, and is common there. The form *confusa*, Butl., was common at light at Punkabaree in July, August and September. The distinguishing point of this species, or rather that which distinguishes it from some specimens of the next species, is that the palpi are crimson, whereas those of *casigneta*, Koll., are dark. *D. dalbergiæ*, Moore, and *D. todara*, Moore, are synonyms. Walker's name *obliqua* has precedence by date. (I should certainly treat this as a variety of *D. casigneta*, it is a very wide ranging and variable species, I have very nearly, if not quite, the same thing from Amurland and Japan as *striatopunctata*, Motsch.—*H. J. E.*)

1179. *D. casigneta*, Koll.

Sikhim and Bhutan, 2,500—5,000 feet. In addition to the difference in the colour of the palpi between this and the last species, the abdomen in my specimens appears to be more thickly clothed in long hair. My examples were taken in March and June, and are of the form called *sanguinalis*, Moore. (Common at light at Darjeeling in June, July and August.—*H. J. E.*)

1159. *D. multiguttata*, Wlk.

Sikhim and Bhutan, 1,800 feet up. Common at light everywhere, occurring in May, July, August, September and October.

(I took this in the Tista Valley on 14th August, but not at Darjeeling.—*H. J. E.*)

1167. *D. gopara*, Moore.

Sikhim, 1,800 feet. I have taken this handsome species at light at Punkabaree in June and August. The branches of the antennæ in the male in this and the last are shorter than that of any of the preceding species. (I never took it at Darjeeling, and believe it is, like the last, a low-valley species.—*H. J. E.*)

1203*a*. *D. bretaudiaui*, Oberth.

Yatung. I have only one specimen in my collection received through Mr. J. Lister from Mr. Taylor of the Chinese Commission.

1176. *D. rubilinea*, Moore.

Sikhim, 1,800 feet up. This occurs fairly commonly in Darjeeling, I believe. My own specimens which were taken at low elevation by me, where it is rare, are dated March, June and August. (Comes to light at Darjeeling in the rains, but is not abundant.—*H. J. E.*)

1196. *D. sordidescens*, Hmpsn.

Sikhim. I have never received this, Moore's name *sordida* having been used by Hübner for another species, Sir Geo. Hampson has renamed this species.

1197. *D. sikkimensis*, Moore.

Sikhim. This must be rare as I have never seen it. (? Sikhim.—*G. F. H.*) (I expect this may be the female of the last. I have only one from Knyvett's collection, which agrees with Moore's figure. I never saw a ♂ that could belong to it.—*H. J. E.*)

1213. *D. fulvohirta*, Wlk.

Sikhim, 7,000 feet. Taken at light in May. (Common on the Jorpokri ridge at 7,000 feet, but not taken by me at Darjeeling.—*H. J. E.*)

1227. *D. impleta*, Wlk.

Sikhim and Bhutan, 5,000 feet up. I have taken this on several occasions at Tukvar in July.

Genus Amsacta, Wlk.

1239. *A. lineola*, Fabr.

Sikhim, 1,800 feet. I only obtained this on one occasion at Punkabaree in June. The abdomen of my specimen is orange, and the forewing has four indistinct specks below the median nervure. This form occurs with the crimson-bodied one in the Punjab also. It has not previously been recorded from this locality.

1235. *A. lactinea*, Cram.

Sikhim and Bhutan, 1,800 feet. I reared a female from an egg laid by a torn female found at 1,000 feet at Fagoo. I subsequently took four more specimens at Punkabaree in June, July, August and September. As the larva I bred differs somewhat from the description in the *Moths of India*, I give its different stages below.

Larva.—1st stage orange, studded with reddish hairs, except the 4th and 11th somites which are black. In the last two moults the form changes completely. In the penultimate stage the 3 anterior somites and the 3 posterior ones are black, studded with black hairs, the remainder being dark-brown with reddish hairs; there is also a dorsal line of pale yellowish spots. The last stage differs in the whole of the somites, being velvety-black, with the first 8 somites clothed in rather short golden hair mingled with longer black ones, some on the first 3 somites being very long. The 3 last somites are clothed in long black hairs, with no reddish or golden ones; the only markings are the yellowish spiracles. Head dark-brown, prolegs pinkish-brown, undersurface black.

Food plant, *Urena lobata*, Linn.

The first abdominal segment in the perfect insect from this locality is white, with a central patch of pink. Punjab specimens are usually without the pink patch.

Genus CREATONOTUS, Hübn.

1231. *C. gangis*, Linn.

Sikhim and Bhutan, up to 1,800 feet. I took a female at light in March in the Buxar Dooars and another in June at Punkabaree. These are the only specimens I have seen. It is an insect of the plains rather than the hills.

1242. *C. transiens*, Wlk.

Sikhim and Bhutan, up to 5,000 feet. A very common insect. The hindwing of the male is generally fuscous, being darker than the forewing and without the submarginal row of spots; that of the female being paler than the forewing, often nearly white and with the submarginal spots present.

Genus ESTIGMENE, Hübn.

1215. *E. imbuta*, Wlk.

Sikhim and Bhutan, 5,000 feet up. I have only taken two males in August and one female in June. It seems to be rather scarce. (I took 2 males at Darjeeling in June, but it seems a rare species.—*H. J. E.*)

1214. *E. florescens*, Moore.

Sikhim, 6800 feet. Occurs at Darjeeling at light in June. (I have never taken this myself, and should consider it rare.—*H. J. E.*)

1216. *E. quadriramosa*, Koll.

Sikhim. I do not remember ever having seen a specimen from this locality, although it is an extremely common insect in the Kangra Valley, extending to Kashmir and Simla; it is here recorded on the authority of a specimen so marked in the British Museum collection. (I doubt the occurrence of this in Sikhim.—*H. J. E.*)

Genus PERICALLIA, Hübn.

1228. *P. galactina*, van der Hoev.

Sikhim and Bhutan, 1800—6000 feet. A common insect, occurring in May and June. *P. imperialis*, Koll, has been recorded from this locality, I think, in error. Neither Mr. Elwes nor I have seen a specimen from here.

Genus BAROA, Moore.

1307*a*. *B. vatala*, Swinh.

Sikhim and Bhutan, 3000 feet. Occurs at light in May and August. It is not uncommon at Fagoo, but appears to be rarer westward.

Genus UTETHEISA, Hübn.

1279. *U. pulchella*, Linn.

Sikhim and Bhutan. This is found in April at low elevation, and is often seen flying by day in April and July. The record of *U. cruentata*, Butl., from this locality is said to be erroneous.

Genus RHODOGASTRIA, Hübn.

1256. *R. astrea*, Drury.

Sikhim, 1800 feet. I took this on one occasion only, settled on the trunk of a tree at Punkabaree, where it had very much the resemblance of a species of *Cicada* which occurred commonly in the same locality. (I have two specimens from Möller's collection, probably from the Terai.—*H. J. E.*)

THE BIRDS OF THE MADHUBANI SUB-DIVISION OF THE DARBHANGA DISTRICT, TIRHUT, WITH NOTES ON SPECIES NOTICED ELSEWHERE IN THE DISTRICT.

By C. M. Inglis.

Part IV.

(*Continued from page* 371 *of this Volume.*)

Order—STRIGES.

Family *Strigidæ*.

(149) Strix flammea.—The Barn-Owl.

Blanford, No. 1152. *Hume*, No. 60.

I have not found it very common, but Scroope says it is so. It at any rate cannot be called rare. I have only taken one clutch of eggs, three in number, which were situated on a pillar, between it, the roof and the wall of the press-house at Narhar. This was on the 21st February 1898. Native name *Madoosa*.

(150) Strix candida.—The Grass-Owl.

Blanford, No. 1153. *Hume*, No. 61.

I have found this species decidedly rare. Half a dozen were flushed in a 20 biggah grass E. of Jainagar and one shot. Two nests were found in the same grass on the 26th October 1899. One contained five highly incubated eggs; three of the eggs were cracked, and two were saved for my collection. The other nest was empty. Where the eggs were found the grass appeared to have been pressed down for a considerable space round them. Another nest with a single egg was found on the 1st November which was left, but on being visited on the 6th it was found to be deserted and the egg smashed. A bird of this species was caught at Jainagar during some heavy rain, quite unable to fly. I kept it a few days, feeding it on gerbilles (*G. indicus*). It latterly escaped. In some parts of the district I believe this species is not so rare, often rising in front of the beaters during a partridge shoot. Their flight is slow and even, they keep their hind legs hanging down. They only fly a few yards and then settle.

Sub-family *Asioninæ*.

(151) Asio accipitrinus.—The Short-eared Owl.

Blanford, No. 1157. *Hume*, No. 68.

This species is scarce. The first specimen was secured in broad daylight, on the 12th November, seated on a ridge in a waste field. There was no grass near the place, and the nearest crops were paddy. Its stomach only contained the remains of a hard coleopterous insect. On the 17th December eight were seen in a good-sized but patchy grass. The birds kept to the ground near the roots of some small kheir and other thorny trees; when disturbed flew into the *rabi* fields. Three were shot, one being a dark-coloured one and the others light. On the 27th January one was snared at Baghownie in a noose set for duck.

(152) SYRNIUM OCELLATUM.—The Mottled Wood-Owl.

Blanford, No. 1161. *Hume*, No. 65.

Round about Jainagar and Narhar I have seldom seen or heard this species, but Scroope says it is common everywhere. I have never taken its nest, though I thought I had got hold of one a few miles from Baghownie. The owl flew out of a hole in a mango tree, towards the end of April, but there were no eggs. A few days later the bird was again flushed from the same place, and there was more grass in the hole than noticed the first day. It was again visited later on, but the hole had been swamped with rain and was deserted. On the 12th April 1897 a nestling was brought me which had been taken out of a hole in a mango tree not far from Narhar. A favourite position it had was to lie flat on its stomach with its legs sticking straight out behind. The irides were black and eyelids lake red. Several haunted the bamboos at Hatauri, but I am unaware whether they still do so.

Sub-family *Bubonincæ*.

(153) BUBO BENGALENSIS.—The Rock-horned Owl.

Blanford, No. 1168. *Hume*, No. 69.

A single specimen, a female, was shot by one of my collectors, in a mango grove near Jainagar and close to the Nepal frontier on the 30th July. I have never seen nor have any of my men ever come across this species before.

(154) SCOPS GIU.—The Scops Owl.

Blanford, No. 1173. *Hume*, No. 74.

A single specimen of what I take to be this species was secured on the 12th July 1900.

(155) SCOPS BAKKAMŒNA.—The Collared Scops Owl.

Blanford, No. 1178. *Hume*, No. 75.

Scops owls are, I think, uncommon everywhere in the district. They certainly breed here, though I have been unsuccessful in finding the nest. A party of five newly-fledged young were seen on the 23rd May in a bamboo grove at Narhar. Some boys chased them, and one bird went near a tree on which a pair of *H. indus* had a nest; one of the kites swooped at the owl which crouched in the grass, where it was caught.

(156) ATHENE BRAMA.—The Spotted Owlet.

Blanford, No. 1180. *Hume*, No. 76.

Exceedingly common. They breed in March, April and May in any kind of hole. Even when molested they stick to their old nesting sites. I continually robbed a pair that infested my bungalow at Narhar, taking nine eggs on three different occasions from the one nest during the year; even then they would not leave the place. I had also robbed the nest twice the preceding year. Eggs are found in all stages of incubation in the same nest. One nest contained one young one, two highly incubated eggs and one fresh egg. Native name *Pencha*.

(157) NINOX SCUTULATA.—The Brown Hawk-Owl.

Blanford, No. 1187. *Hume*, No. 81.

Very rare. I have only secured three specimens here. A male was shot at Jainagar on the 17th August in a mango grove. A female was brought me on the 10th January, which had been snared in a noose set for duck; and the third, a female, was shot in the bamboos at Baghownie on the 29th July. The bird that was snared was brought to me alive and emitted a most weird wail on being touched. It was quite a human-like sound. Native name *Choghad*.

ORDER—ACCIPITRES.

Family *Pandionidæ*.

(158) PANDION HALIAËTUS.—The Osprey.

Blanford, No. 1189. *Hume*, No. 40.

Common during the cold weather near water. Scroope wrote me on the 16th February 1899 from Benipatti: "I should not be surprised if Ospreys breed in these parts; from the movements of a pair in a *gachi* yesterday I thought they might not improbably be breeding. Unfortunately I had not the time to search." They are occasionally seen here in the hot weather, I having noticed one at Baghownie on the 13th June 1900. Native name *Macharang*.

Family *Vulturidæ*.

(159) OTOGYPS CALVUS.—The Black Vulture.

Blanford, No. 1191. *Hume*, No. 2.

Common. Breeds here from December to March. The nests I have taken have been either on pipal, banyan or simal trees, and there is never more than one nest on the same tree, unlike *Pseudogyps bengalensis*. They commence building about the middle of November. Native name *Raj gidh* or *Kanwara gidh*.

(160) GYPS INDICUS.—The Indian Long-billed Vulture.

Blanford, No. 1194. *Hume*, No. 4.

I am not certain about this species. The *Gyps* found here may be either this species or *tenuirostris* or probably both species occur. I have never shot any of these loathsome birds as they are not nice to skin, and natives rather object touching them. I am, however, certain that either one or both of these species occur. Native name *Gidh*.

(161) PSEUDOGYPS BENGALENSIS.—The Indian White-backed Vulture.

Blanford, No. 1196. *Hume*, No. 5.

The commonest vulture found here. They breed from November to March. November is the month during which most eggs are to be got. Most of my nests were situated on pipal trees; out of sixty-six nests noted, forty-three being found on those trees, thirteen on mangoes, and six on simuls, and four on banyans. I have noticed this species increasing the size of the nest as the young gets older. One of my men was once attacked by one of these birds whilst robbing a nest; he had to keep it at bay with a stick. I have never found more than one egg. Several nests are found on the same tree. Native name *Gidh*.

(162) NEOPHRON GINGINIANUS.—The Smaller White Scavenger Vulture.

Blanford, No. 1197. *Hume*, No. 6.

Very common. It breeds from February to May. All my nests were found on pipals, and ranged from 15 to 50 feet from the ground. If a single egg is found in a nest and taken, the bird often lays another, but never in any nest in which there were two eggs. They often use the same nest for successive years. On once taking an addled egg from a nest, the bird sat on a branch above the nests and uttered a wailing cry. Native name *Göt gidh*.

Family *Falconidæ*.

Sub-family *Falconinæ*.

(163) AQUILA VINDHIANA.—The Indian Tawny Eagle.

Blanford, No. 1203. *Hume* No. 29.

I have a bird shot on the 25th March, which I take to be this species. Mir-shikar's name *Madoom*.

(164) A. HASTATA.—The Small Indian Spotted Eagle.

Blanford, No. 1206. *Hume*, No. 30.

I have found this species rather rare, but have been fortunate in taking its nest several times. The earliest nest was taken on the 17th April, and the latest with eggs on the 20th of June. A young one I had, when first taken, used to sprawl on its stomach like the young *S. acillatum*; in a week's time it began to help itself about with beak and wings, climbing from perch to perch, and in another week was able to fly. In the nest from which this bird was taken were the remains of a number of frogs.

(165) HIERAËTUS PENNATUS.—The Booted Eagle.

Blanford, No. 1208. *Hume*, No. 31.

I *think* I have noticed this species, but not having shot it, cannot be certain.

(166) SPIZAËTUS NEPALENSIS.—Hodgson's Hawk-Eagle.

Blanford, No. 1213. *Hume*, No. 36.

On the 19th March 1896 I came across a pair of these birds flying over the river at Hassowlie Factory. I saw one three times strike at a fish, twice it missed, but the third time was successful and caught one. It carried it off to a small tree some distance away. On going towards it, it flew off, but was brought down with a charge of No. 8. It had finished the fish, but the remains of the same were found in its gullet. The specimen shot was a very fine bird with a beautiful crest. Another Hawk-Eagle, which I think is this species, was got at Jainagar on the 6th April 1899.

(167) CIRCAËTUS GALLICUS.—The Short-toed Eagle.

Blanford, No. 1216. *Hume*, No. 38.

I saw a bird, which I am almost certain was this species, quartering the ground like a harrier, not far from Baghownie, on the 18th October 1900.

(168) SPILORNIS CHEELA.—The Crested Serpent-Eagle.

Blanford, No. 1217. *Hume*, No. 39.

Common during the cold weather, but also occasionally found at other times, Mr. Gordon Dalgliesh having shot one at Dalsing Serai in July, and I saw one not far from Jainagar in August.

(169) BUTASTUR TEESA.—The White-eyed Buzzard-Eagle.

Blanford, No. 1220. *Hume*, No. 48.

Very common, breeding from March to May. I have seen this species carry sticks to its nest in its feet. They never, so far as I know, lay a second clutch after having been robbed of their first one. Native name *Teesa*.

(170) HALIAËTUS LEUCORYPHUS.—Pallas's Fishing-Eagle.

Blanford, No. 1223. *Hume*, No. 42.

Very common near Baghownie, but rather scarce round Jainagar and Narhar. They have a very powerful call, greatly appreciated by the natives. Besides feeding on fish and water birds, they also sometimes feed on carrion, as I once saw one in company with a *Pseudogyps* and some *C. macrorhynchus* feeding on the remains of a small dead animal. The Fish-Eagle carried off the carcases to a tree. They breed from November to February. Native names *Sorail* and *Kootair*.

(171) POLIOAËTUS ICHTHYAËTUS.—The Large Grey-headed Fishing-Eagle.

Blanford, No. 1226. *Hume*, No. 41.

Fairly common. Breeds from November to January. Native name *Madhuya*.

(172) HALIASTUR INDUS.—The Brahminy Kite.

Blanford, No. 1228. *Hume*, No. 55.

Very common, breeding from February to April. They commence building about the middle of December. They catch termites on the wing with their feet and then transfer them to their bills. Native name *Khemankari*.

(173) MILVUS GOVINDA.—The Common Pariah Kite.

Blanford, No. 1229. *Hume*, No. 56.

Abundant, and also breeding from February to April. As a rule they desert nests which have been once robbed, at least that is my experience. They take a long time in building, often commencing as early as the end of October. A Kite once swooped down at the man who was robbing the nest and broke one of the eggs in his hand with its claws. I have watched them pick up sticks. They fly close to the ground, catch the stick with their feet, and then still on the wing transfer it to their bill. Native name *Chil* or *Chilor*.

(174) ELANUS CÆRULEUS.—The Black-winged Kite.

Blanford, No. 1232. *Hume*, No. 59.

Fairly common. I have found nests in September, October, November, January and July. A young bird had the iris brown. The bird commences sitting from the time of laying the first egg, as eggs in all stages of incubation are to be found in the same nest. They sometimes build on bamboos as well as on trees.

(175) CIRCUS MACRURUS.—The Pale Harrier.

Blanford, No. 1233. *Hume*, No. 51.

Not uncommon during the cold weather. Native name *Pattai*.

(176) C. CYANEUS.—The Hen-Harrier.

Blanford, No. 1235. *Hume*, No. 50.

Mr. G. Dalgliesh in the "Zoologist" for June says he is certain he saw this species in January 1901.

(177) C. MELANOLEMCUS.—The Pied Harrier.

Blanford, No. 1236. *Hume*, No. 53.

Common during the cold weather. The earliest arrival noted was on the 3rd September. They remain till the middle of April. Scroope saw a female of some species of harrier in July. Native name *Pattai*.

(178) C. ÆRUGINOSUS.—The Marsh-Harrier.

Blanford, No. 1237. *Hume*, No. 54.

Very common during the cold weather, and a great nuisance to sportsmen. They arrive in September. In the stomach of one I dissected were the remains of a *Pal: cynocephalus*, one leg and foot being quite undigested and the remainder was simply a ball of flesh and feathers. Native name *Kutar*.

(179) ASTUR BADIUS.—The Shikra.

Blanford, No. 1244. *Hume*, No. 23.

Abundant, breeding in April. Their nests are often situated in a tangle of that parasite (*Loranthus* sp ?) common on mango trees. On the 30th July I saw several *D. ater* chasing a shikra; after having been chased a short distance the little hawk suddenly poised in mid-air and one of the king crows shot ahead. The shikra then struck it and carried it screaming away. Native name *Shikra*.

(180) ACCIPITER NISUS.—The Sparrow-Hawk.

Blanford, No. 1247. *Hume*, No. 24.

Mr. G. Dalgliesh says he once shot a specimen of this bird in March 1898.

(181) A. VIRGATUS.—The Besra Sparrow-Hawk.

Blanford, No. 1248. *Hume*, No. 25.

G. Dalgliesh says he found it very common and saw a specimen with a white head. I have not found it as common as *A. badius*. Native name *Baska*.

(182) PERNIS CRISTATUS.—The Crested Honey-Buzzard.

Blanford, No. 1249. *Hume*, No. 57.

Fairly common. They lay in May. A pair commenced building towards the end of February, but deserted the nest. Some of the eggs of this species are very handsome. I have found them very shy during the breeding season, readily deserting their nests. Scroope saw one devouring an oriole, a fact which I have already mentioned in this Journal. Native name *Madhoa*.

(183) FALCO PEREGRINUS.—The Peregrine Falcon.

Blanford, No. 1254. *Hume*, No. 8.

In February 1899 Scroope sent me an interesting note on this species from Benipatti. He says:—"I am sending you a peregrine which I knocked over this evening . . . . . I have seen plenty of peregrines (or *peregrinators*,

as I suppose one cannot distinguish safely without examination) this winter; they are always about water and prey, I suppose on the waders and ducks. In this part of the country they seem particularly common. Those that I have seen close have no rufous on the underparts, and I am sure are all *F. peregrinus.*" I generally see a few every cold weather. The earliest was noticed on the 13th September and the latest on the 6th April. Native name *Bhyri.*

(184) F. PEREGRINATOR.—The Shâhin Falcon.

Blanford, No. 1255. *Hume*, No. 9.

I got a female of this species on the 3rd August 1896 at Anarh. It was seated on a tree close to the bungalow. I have also noticed one or two other falcons which were probably this species.

(185) F. JUGGER.—The Laggar Falcon.

Blanford, No. 1257. *Hume*, No. 11.

I have found all falcons rather scarce here, but Scroope says he has found this species common. He was very successful in obtaining their eggs and sent me a couple of clutches taken in February. I got three highly incubated eggs from a nest on the 10th March, some miles from Baghownie, and also two young, a couple of miles from Jainagar, on the 18th April 1898. The young on being taken down began to croak something like a frog. The nestlings were brown all over with pale rufous margins to the feathers. Bill pale bluish horny, dusky at tip; legs tinged greenish. Description of plumage on 20th November 1898. Forehead, supercilium, earcoverts and chin whitish, shafts of feathers on forehead black and tips of ear coverts deep brown; a deep brown band from behind eye, below supercilium and above ear coverts and also a paler one from gape to below ear coverts. Upper plumage deep brown tinged with ashy and feathers edged with rufous, the rufous being more pronounced on the head; feathers of lower neck more or less pale fulvous with dark tips; a few pure white feathers on the breast, vent and thigh coverts, remainder of lower plumage deep brown with fulvous edges, lower tail coverts pale fulvous with a few crescentic brown bars along the shaft; tail feathers deep brown tinged with ashy above, beneath the inner webs are barred with pale rufous. Quills brown tinged with ashy, inner web of primaries, except near the tip, with buff bars. On the 7th September 1899 the upper plumage was that of the adult, and there was far more white than brown in the lower plumage.

I saw one strike a drongo and eat it on the ground. Native name *Laggar* and *Jugger.*

(186) F. SEVERUS.—The Indian Hobby.

Blanford, No. 1261. *Hume*, No. 14.

I saw one at Narbar on the 3rd February 1900. It was evidently taking some sort of locust or grasshopper from off the ground.

(187) ÆSALON CHICQUERA.—The Red-headed Merlin.

Blanford, No. 1264. *Hume*, No. 16.

Rather scarce. I have only secured five specimens. A male shot on the 25th December 1897, a pair on the 20th October 1898, a male on the 30th

July 1899, and another male on the 1st September 1899. The latter was sent me by Mrs. Sherman, who lives at Jainagar. It had been hit by a boy in their garden and was alive when brought me, but died during the night. In its stomach were the remains of some grasshoppers and the head of one of the large ants. Scroope wrote, Madhubani, 5th June 1899 : " There are a few red headed merlins around here at present, probably they have flown from a nest somewhere in the neighbourhood." I saw one fly past the vats at Narhar on the 19th August 1899, and a pair were seen on the 24th December 1900 between Hatauri and Russelpore Factories. Native name *Turumti*.

(188) TINNUNCULUS ALAUDARIUS.—The Kestrel.

Blanford, No. 1265. *Hume*, No. 17.

Very common in the cold weather. They arrive in October. Native name *Karontia*.

ORDER—COLUMBÆ.

Family *Columbidæ*.

Sub-Family *Treroninæ*.

(189) CROCOPUS PHŒNICOPTERUS.—The Bengal Green Pigeon.

Blanford, No. 1271. *Hume*, No. 772.

Very common. I have a specimen shot at Baghownie on the 25th September 1901, which appears to be intermediate between this species and *chlorogaster*. It has the lower plumage largely suffused with yellow, this colour reaching from the breast to vent, the sides of the body however, are ashy grey. I have never found what I take to be the true *chlorogaster* here. This green pigeon breeds here in April, May and June. I have found three nests on the same tree, and have often found nests on trees close to each other. At Belahi, in the Mozufferpur District, I found three eggs in one nest. A fresh egg and a nearly hatched one were found in the same nest. I have never seen these birds drinking. Native name *Harial*.

Sub-Family *Columbinæ*.

(190) COLUMBA INTERMEDIA.—The Indian Blue Rock-Pigeon.

Blanford, No. 1292. *Hume*, No. 788.

Fairly common, and in some places, according to Scroope, abundant. I have found eggs in every month except February. Numbers of them breed at Laheria Serai in the old wall of a temple. I have found there eggs in one nest. Native name *Katretar* and *Páraváh*.

(191) C. LIVIA.—The Blue Rock-Pigeon.

Blanford, No. 1293. *Hume*, No. 788 *bis*.

A single specimen was got by me on the 12th March 1899 at Jainagar. I have never seen any since then.

(192) C. EVERSMANNI.—The Eastern Stock-Pigeon.

Blanford, No. 1295. *Hume*, No. 787.

Some put in an appearance every cold weather. I first noticed and obtained this species in January 1899. I believe they used to commonly affect a large simal tree here, but since I have been here I have seldom noticed them, only seeing one or two flocks last cold weather. Native name *Bon páraváh* and *Bagar*

(193) TURTUR FERRAGO.—The Indian Turtle-Dove.

Blanford, No. 1305. *Hume*, No. 792.

Rather scarce near where I have been, but Scroope found it fairly common during the cold weather. I have only come across a few stray specimens each winter. This year I was successful in securing this bird's eggs for the first time. I shot a male in March, which was evidently breeding, and so had a good look out kept wherever any of these birds frequented ; it was not, however, till the 25th of May that the first nest was secured at Jainagar, it contained a single egg. On the 20th June near Baghownie a second nest was found containing two eggs. Both nests were on mango trees. I have never come across *orientalis* here, and believe all the birds seen belong to this species. Native name *Kullak*.

(194) T. SURATENSIS.—The Spotted Dove.

Blanford, No. 1307. *Hume*, No. 795.

Exceedingly common. I have taken nests during every month in the year. Mr. G. Dalgliesh found what he took to be a hybrid between this species and the following one. Doves are seldom snared by the *mir shikars* as their plumage is too loose, the feathers coming off on the bird lime. Native name *Kodaya* and *Panduk*.

(195) T. RISORIUS.—The Indian Ring-Dove.

Blanford, No. 1310. *Hume*, No. 796.

Abundant. I have taken nests in every month except February. Their nests are, as a rule, placed higher off the ground than those of *suratensis*. Native name *Dowla*.

(196) ŒNOPOPELIA TRANQUEBARICA.—The Red Turtle-Dove.

Blanford, No. 1311. *Hume*, No. 797.

I found this species rather scarce round Jainagar and Narhar, but near Baghownie it is fairly common. I have taken several nests from April to July. These handsome little doves are sometimes seen in small parties in the paddy-fields. Native name *Itoo-ah*.

ORDER—GALLINÆ.

Sub-Order *Alectoropodes*.

Family *Phasianidæ*.

(197) EXCALFACTORIA CHINENSIS.—The Blue-breasted Quail.

Blanford, No. 1354. *Hume*, No. 831.

In August 1900 a quail of this species rose from some sugar-cane at Hatauri. On the 10th June this year a number were flushed in the Ramowlie grass, which lies between Hatauri and Anarh. They all rose singly. I have not had an opportunity of visiting the place since then, and have not been able to secure specimens, but there is no mistaking the species.

(198) COTURNIX COMMUNIS.—The Grey Quail.

Blanford, No. 1355. *Hume*, No. 829.

Exceedingly common, especially in February and March. A few, however, remain here all the year round. I have got its eggs in March. At Belsund

in the Mozufferpore District, large numbers of quail are shot during the season. A continual fusillade goes on during the whole shoot, and the guns get quite hot. Native name *Batair*.

(199) C. COROMANDELICA.—The Rain Quail.

Blanford, No. 1356. *Hume*, No. 830.

I have never got this species, but they probably occur, as Blanford says they visit Behar during the monsoon.

(200) FRANCOLINUS VULGARIS.—The Black Partridge.

Blanford, No. 1372. *Hume*, No. 818.

Scarce round Jainagar, and never seen either round Narhar or Baghownie. It is curious their not being found here, as they are not scarce in the indigo at Hatauri, and are also to be had near most of the neighbouring factories. Scroope wrote that they were common in the Khatauna jungle. I have been unsuccessful in getting their eggs. Native name *Kala-titir*.

(201) F. PONDICERIANUS.—The Grey Partridge.

Blanford, No. 1375. *Hume*, No. 822.

I have found it commoner than *vulgaris*, but have not come across their eggs. Some are generally to be found wherever there is any fairly thick scrub jungle, such as occurs along the Nepal boundary near Jainagar. I have also flushed it from a big grass. The flesh of both species I have found to be dry and tasteless.

ORDER—HEMIPODII.

Family *Turnicidæ*.

(202) TURNIX PUGNAX.—The Bustard-Quail.

Blanford, No. 1382. *Hume*, No. 832.

Blanford says that this species is found all over India except on the higher hills, in dense forests, and in deserts. I have never, however, come across it here, neither have any of the many fowlers who come here ever seen it. I may state that we have no hills, deserts or forests here.

(203) T. DUSSUMIERI.—The Little Button-Quail.

Blanford, No. 1383. *Hume*, No. 835.

Button-quail are common, but I cannot say which species is most abundant, having handled too few specimens.

(204) T. TANKI.—The Indian Button-Quail.

Blanford, No. 1384. *Hume*, No. 834.

An egg belonging to a *Turnix* was brought me, but I am not certain to which species to assign it. Button-quail are seldom shot and scarcely ever snared. The coolies have several times caught them in their hands, as when frightened they prefer crouching on the ground to taking flight. I have a couple of *C. communis* and three button-quails in my aviary, which are so tame that the man has to shunt them out of the way when he wants to clean the portion of the floor on which they are seated.

(*To be continued.*)

THE CAGE-BIRDS OF CALCUTTA.

By F. Finn,

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The taste for keeping pet birds is a very old one in India, exotic forms, such as Cockatoos, having been imported so long ago as the time of Jehangir, to judge from the representation of a yellow-crested species in a picture dating from the reign of that monarch which I had an opportunity of inspecting some time ago. And even to-day in Calcutta many birds are commonly to be seen in captivity hailing both from various parts of India itself and from other countries, although "the fancy" is no longer what it was, and both the demand and supply have dwindled away sadly. Nevertheless, enough birds are to be seen to arouse keen interest in English amateurs; and this is especially noticeable in the case of "soft-billed" or insectivorous and frugivorous forms, which are very extensively kept in India.

Calcutta rejoices in a very well-known bird-market in Tiretta Bazaar; and as this is within an easy walk of the Museum, I have long been in the habit of paying it frequent visits. One or two dealers in the Provision Bazaar also keep cage-birds; but Tiretta is the leading emporium for pets, always excepting Mr. W. Rutledge's establishment in South Road, Entally. There business has been carried on for nearly half a century, Mr. Rutledge dealing in living animals of all kinds; and many very choice birds pass through his hands, though he naturally does not trouble himself greatly about the commoner species. To him I have long been indebted for much information concerning birds and the methods pursued in keeping them.

Few birds seem to be kept or bred in aviaries here; small cages with a single inmate, or larger receptacles containing several, are chiefly in vogue; and as the objectionable custom of covering up birds kept for song is almost universally followed, it is not easy to determine the exact species of the occupants in many cases, though the note often affords a clue to the captive's identity. Cages for small singing-birds are usually oblong with a vaulted roof, and provided with two perches, or are square with a pyramidal top, containing only one perch; they are fitted with large comfortable handles, as it is the custom to take cage-birds out continually in order to give them fresh air.

Larger birds are kept in big wicker cages with a domed or hemispherical top, and Parrots in similar round domiciles of iron, or chained to iron swings. All native cages have a barred floor, instead of the drawer arrangement so familiar to home amateurs, but a mat is often provided to cover the bottom. Food and water-vessels are always placed inside, in my opinion very wisely. Sand is not given, except to Larks and Partridges.

"Soft-billed" birds are fed on the flour of gram, a kind of pulse, made up into a paste with ghee (clarified butter). This "satoo" seems to suit them very well; it is supplemented, in the case of purely insectivorous species, by a daily ration of live maggots and grasshoppers. The breeding of the former and the collection of the latter form the trade of a number of professional

bird-feeders, who, on the receipt of a small monthly sum, will call daily at the houses of their patrons and supply insectivorous birds with everything needful. With the exception of Parrots, few seed-eating birds are kept simply as pets, and their treatment calls for no special remark.

Many birds are imported from China, and come over in excellent condition being housed in strong but light oblong or square cages of split bamboo, well put together and fitted with trays. The insectivorous birds are fed on shelled millet and small insects, mixed together and given quite dry and plain; they thrive excellently on this diet, which is far better than the mess of "satoo" and repulsive maggots given here.

From the farther East come chiefly Lories and Cockatoos, fastened to perches by a wide ring of cocoa-nut shell, through a hole in the circumference of which the foot of the bird is slipped—I think by pressing the third toe back against the shank. Although so closely attached to the perch—which is merely passed through the ring that plays upon it—these birds appear to fare well and to keep in good condition. The Lories are fed upon rice-and-milk sop, which food is not given to any other birds, so far as I am aware.

It is a curious fact that, to all appearance, the species brought down from the hills often stand the Calcutta climate nearly or quite as well as those which naturally inhabit warm countries. The same remark applies to the few European kinds imported; some, indeed, of these temperate-climate species seem to feel the heat *less* than denizens of the tropics.

I am very glad to say that, on the whole, the captives are well treated here. The custom above alluded to, of wrapping up the cages in cloths, is certainly regrettable, but the general condition of the birds shows that they are well looked after. Nor are they confined in such a miserably small space as is sometimes the case in Europe, notably with Linnets in England.

The importation of foreign birds is not likely, in my opinion, to have any great influence on the Indian fauna. Of course many escape, but these, if they evade the numerous Crows, ever watchful for a stranger or a weakling are not numerous enough to establish themselves, even if the climate prove suitable for their propagation. I have some reason, however, for thinking that the Java Sparrow (*Munia oryzivora*) is becoming established here, as in so many other places. But this need be no matter for regret, as the species is one of exceptional beauty, and, though it is undoubtedly destructive in some places, it has never become a pest in India, where it has existed in a wild state ever since Jerdon's time. I therefore feel no shame in confessing to having liberated at different times some scores of individuals, in the hope of giving it a footing as a wild species in this part of the country; especially since, being so numerously imported, so often escaping, and being so well able to look after itself, it was likely to take up such a position without deliberate assistance on the part of anyone.

I will now proceed to treat of the various species of cage-birds to be met with here under their families as given in the Bird-volumes of the "Fauna of

British India," the scientific nomenclature of which I shall employ, interpolating the exotic forms under the names employed in the British Museum Catalogue of Birds.

Family CORVIDÆ.

Considering the popularity of the members of the Crow-tribe in England, I was rather surprised to find that in Clacutta they did not commonly figure as pet birds. The Magpie (*Pica rustica*) may, however, occasionally be met with, usually as a Chinese importation, and the common Indian Tree-Pie (*Dendrocitta rufa*) is often to be observed in the Bazaar. A few Himalayan forms are also pretty regularly brought down—the two species of *Urocissa* (most often *U. occipitalis*), the beautiful *Cissa sinensis*, *Garrulus lanceolatus*, and sometimes *G. bispecularis*; while Mr. Rutledge occasionally gets a few Red-billed Choughs (*Fregilus graculus*), which actually do not seem to suffer from the heat. I noticed that these birds looked distinctly larger than the European specimens I used to see at the London Zoological Gardens, and had deeper red bills and feet.

Of exotic Corvidæ I have seen at Mr. Rutledge's establishment *Corvus australis* and the Chinese *Corvus torquatus*, while quite lately he had a fine specimen of the Brazilian *Cyanocorax cyanopogon*.

Among the Tits the only species I have met with in confinement is *Machlolophus xanthogenys*, a few individuals which had been brought to Calcutta having done very well.

Family PARADISEIDÆ.

Birds of Paradise are of course always scarce and very expensive, but a few males of the two ordinary yellow-plumed species (*Paradisea apoda* and *P. minor*) have appeared for sale during the six years I have spent in Calcutta. They thrive well in confinement, and are much thought of by the natives, who identify them with the legendary *Huma*, which never alights, and confers royalty on whomsoever it chances to overshadow in its flight! Mr. Rutledge tells me that the Ameer sent a man from Cabul on purpose to inspect the first specimen he obtained, and to report on its identity with the bird of tradition.

Family CRATEROPODIDÆ.

The Babblers and Bulbuls are particularly suitable for cage-birds, as they bear captivity remarkably well, and have many recommendations as pets, especially in the case of the former.

Most esteemed, perhaps, is the Chinese Jay-Thrush (*Dryonastes sinensis*), which is only known here as an imported bird and under its Chinese name of *Peko*. It is a very fine songster and an excellent mimic. A few arrive from time to time and find a ready sale. I know of a very good specimen which is at least 14 years old and certainly shows no signs of age. Another Chinese bird of this type, and similarly imported in small numbers, is the Huamei (*Trochalopterum canorum*), also much prized as a songster.

Some common Indian Jay-Thrushes, *Garrulax leucolophus*, *G. albigularis*, *G. pectoralis*, *G. moniliger*, *Grammatoptila striata*, *Ianthocincla rufigularis* and one or two others, are pretty regularly brought down in the winter, especially the first-named, which is in some demand for export.

Other Babblers which also arrive in consignments from the hills are *Pomatorhinus schisticeps*, *P. erythrogenys*, and *Lioptila capistrata*, and, among the smaller species, *Mesia argentauris*, *Siva cyanuroptera*, and *Yuhina nigrimentum*. None of these, however, come in to the market in any quantity.

The charming little "Pekin Robin" (*Liothrix lutea*) is numerously imported in winter—generally from China—and hence is almost always to be procured. *Zosterops simplex* is also a very common captive, and attempts are sometimes made by Bazaar dealers to pass it off as a "Humming-bird"!

Chloropsis aurifrons, well known as the *Hareca*, is often on view, and is one of the most delightful of cage-birds, being easily kept, and possessing the recommendation of being a very clever mimic as well as very ornamental. If hand-reared, it is very tame; but individuals vary much in temper, and some are quite impossible companions for any small bird, while others are perfectly peaceable. As the sexes are so much alike in this species, I have not been able to discover the reason of this difference of disposition, whether it be personal or sexual. The fine *Chloropsis hardwickii* is comparatively scarce, and *C. jerdoni* is seldom to be had.

The species of *Chloropsis* are often called Green Bulbuls, but they cannot be placed far from *Ægithina tiphia*, obviously a small Babbler, which is sometimes kept here (but rarely, being a delicate species). It is locally known as "Tofik." Another small Timeliine form occasionally on sale is the Gulab-Chasm (red-eye) (*Pyctorhis sinensis*)—a most amusing little bird, very impudent, and mischievous when in company with others.

Of the true Bulbuls, the common *Molpastes bengalensis* is by far the most popular captive. It is not so often caged, however, as tethered to an iron **T** shaped perch padded with cloth, the cord being fastened to a soft string round its body. This is to further its employment as a fighting-bird, that being the purpose for which it is commonly kept. Two individuals are made hungry, and then their jealousy is excited by offering food to one only, which of course provokes a fight. The sport is carried on during the winter, after which the birds are released, with the exception of such as have proved worthy of maintenance for the future.

This is the only species employed in such a way, but several other Bulbuls may be seen caged, especially the almost equally abundant *Otocompsa emeria*. *O. flaviventris* comes to hand occasionally in small numbers, and sometimes considerable supplies of *Molpastes leucotis*, *M. leucogenys*, and the Chinese *Pycnonotus sinensis* arrive, but these cannot be reckoned on. A few examples of *Hypsipetes psaroides*, *Hemixus flavala*, and *H. macclellandi* have been brought down in the winter of late years.

Before leaving the Crateropodidæ, I should mention that a few specimens of the splendid *Myiophoneus temminckii* have passed through Mr. Rutledge's hands, and that lately my friend Mr. E. W. Harper secured from him a fine imported specimen of the Chinese *M. cæruleus*, which he has sent to the London Zoological Gardens. But undoubtedly the members of this fine genus are wrongly placed in this family, being certainly true Thrushes. The distinction between them and the Babblers is perfectly obvious to any bird-keeper or field-naturalist, however hard it may be to make out from skins.

Family DICRURIDÆ.

Only one bird of this family is commonly kept here—the Bhimraj (*Dissemurus paradiseus*); but few specimens are brought in, and these are hand-reared birds in poor condition, which seldom live long, as they require—but do not usually get—a very large cage. This species is, as Jerdon correctly remarks, an excellent mimic. I have even heard that it will occasionally talk, and I have myself known one individual that could imitate the song of a canary to perfection, and also mew like a cat; while another with which I am at present acquainted not only possesses the latter accomplishment, but whistles two or three lines of a song with absolute accuracy of execution.

The Kesraj (*Chibia hottentotta*) is sometimes on sale, but is not popular, so far as I know; the Dhouli (*Dicrurus cærulescens*) is occasionally to be procured, and is said to whistle very well.

Family LANIIDÆ.

The Indian members of this family are hardly ever caged here, though some consignments of Minivets (*Pericrocotus speciosus* and *P. brevirostris*) have arrived but have not thriven.

The Australian Crow-Shrikes or Magpies (*Gymnorhina leuconota* and *G. tibicen*) are, however, not unfrequently imported; they thrive well and fetch good prices on account of their well-known whistling and talking abilities. I lately saw a specimen in the possession of Mr. Rutledge which had pale grey on one side of the back and black on the other. This was, I presume, a hybrid between the two species.

Family ORIOLIDÆ.

Orioles are not generally kept, and the few that are to be seen do not thrive well, especially the common *Oriolus melanocephalus*. *O. trailli* bears confinement far better than the yellow species, being less restless. It also looks very different from them in life, as it keeps the head-feathers erect, and has a more upright carriage, in addition to its striking light-yellow irides. The eyes of young birds are, however, dark brown.

Family EULABETIDÆ.

The common Hill or Talking-Mynah (*Eulabes intermedia*) is one of the best-known cage-birds in Calcutta, being brought into the Bazaar by scores at a time, which include both adult and newly-fledged specimens. As everyone knows, some of these birds are very fine talkers, but I have only heard one that was really good, whose imitation of the human voice was perfect.

They often prove but short-lived pets, and I am inclined to think that the "*satoo*" diet is too rich for these fruit-eating birds, as they usually seem to die in fits, and those I have handled have been very plump and heavy and were probably unduly fat. Recently I saw one with a nearly white iris, the only such specimen I have ever observed among a great number of individuals from India and the Andamans. The smaller Talking-Mynah (*E. religiosa*) is not often caged here, and I have seen no other bird of this family in captivity.

Family STURNIDÆ.

As might be expected where the family is so well represented, the various Starlings and Mynahs are often seen caged. Much the commonest of them is the ordinary *Acridotheres tristis*, which is even more commonly kept than *Eulabes intermedia*, and sometimes talks nearly or quite as well. It also becomes so tame that it may be allowed full liberty. I have seen several more or less perfect albinos of this species in confinement; two very curious specimens are at present in the Calcutta Zoological Garden, for which I procured them from Mr. Rutledge. Both were white when he first obtained them, but one has now completely assumed the normal coloration of the species, and the other has partly done so. A similar phenomenon occurred with a common Babbler (*Crateropus canorus*) recently in his possession, which unfortunately escaped.

Another common Starling (*Sturnopastor contra*) is frequently seen caged, and from its very sweet liquid notes is certainly better suited than any other of its family for a pet. It does not appear to have been noticed that the coloration of the soft parts of the young of this species is quite different from that of the adult, the bill and legs being black, with the inside of the former orange, while in old birds the legs are white and the bill orange and white, with the inside of the mouth black.

All the other common Indian Starlings may be seen at times caged in Calcutta, namely:—*Acridotheres ginginianus*, *Æthiopsar fuscus*, *Sturnus menzbieri*, *Pastor roseus*, *Temenuchus pagodarum*, and *Sturnia malabarica*. The last two are known as *Pawi*, and this title is shared by *Sturnia andamanensis*, which is occasionally imported and is called "*Sada Pawi*," *Sada* meaning "white." *Graculipica nigricollis* is also brought in small numbers from China. The male is a most amusing bird, with his habit of erecting his crest and bowing and muttering to visitors.

Family MUSCICAPIDÆ.

The only Flycatchers I have seen in captivity here are *Stoparola melanops* and *Niltava sundara*, of which a few have been brought down from the North and have thriven very well on the *satoo*-and-maggot régime.

Family TURDIDÆ.

As in other countries, the birds of this family are popular captives here. In fact, if a census of the cage-birds of Calcutta were taken, I should expect the Shama (*Cittocincla macrura*) to come very near the head of the list, as it

is extensively kept, and thoroughly deserves its popularity on account of its splendid song. Indeed, after the common Green Parrot, it might, I think, be called the characteristic cage-bird here. Many individuals are also sent to Europe, where the species is yearly becoming better appreciated. Both wild-caught birds and hand-reared fledglings, still in the mottled plumage of immaturity, appear in the shops of the dealers, while the great majority of the birds exposed for sale are males. A few females may, however, be seen, being presumably hand-reared birds, whose sex could not be determined at first. These have given me the opportunity of observing that this favourite songster is a most pugnacious bird; the cocks will at once fight if put together, and so will the hens. At the same time, old wild-caught cocks and young spotted birds arrive, in many cases at least, in cages containing half a dozen or more, though Shamas are more usually brought in long wicker-cages divided by bars into separate partitions for the several inmates.

Other small Turdidæ not uncommonly kept are the "Dhyal" (*Copsychus saularis*) and the "Pidha" (*Pratincola caprata*). *Chimarrhornis leucocephala* is also occasionally brought down from the hills in winter. The "Bulbul bostha," or true Eastern Nightingale (*Daulias golzi*), is sparingly imported at this season, the birds fetching high prices—from fifty to two hundred rupees. I am told that a man will come all the way from Cabul with a few of these much-esteemed birds as his main venture.

Of the large Indian Turdidæ the only species at all frequent in captivity here are the "Kastura" (*Turdus boulboul*) and the "Dama" (*Geocichla citrina*), and I have not seen many even of these. A few English Song Thrushes (*Turdus musicus*) have been imported and do fairly well, but I have noticed that they are very liable to an overgrowth of the scaly covering of the feet. A silly attempt is now being made to introduce the Song-Thrush and Blackbird into Darjeeling, which is already well stocked with more attractive species of birds, especially *Lioptila capistrata* and *Liothrix lutea*.

Family Ploceidæ.

The typical Weavers of the genus *Ploceus* all occur commonly in the Bazaar, except the true *P. megarhynchus* (see Ibis, 1901, p. 29), which is unknown to the dealers. *P. atrigula* (*P. megarhynchus* of the 'Fauna of British India') is often brought in as a young bird, and evidently breeds near here. *P. baya* is only known as a bird brought down from Lucknow, most of the specimens being males. Many of that sex of *P. atrigula* show a few yellow feathers on the breast when in full plumage.

Foudia madagascariensis used to be occasionally imported in very small numbers, but I have not seen any lately.

Of the small Munias and Waxbills, *Sporæginthus amandava*, *Munia atricapilla*, *Uroloncha punctulata*, and *U. malabarica* are all very common, as might be expected. *Stictospiza formosa*, *Munia malacca*, and *Uroloncha striata* are much less often seen, but may be obtained now and then. Intermediate forms

between *M. malacca* and *M. atricapilla* often occur, and are doubtless hybrids. Wild specimens of *Uroloncha acuticauda* are rarely seen, but the domesticated Japanese race (known to home amateurs as the "Bengalee") is constantly present in the Bazaar in one or other of its three forms—the brown-and-white (grading completely into the wild type), the fawn-and-white, and the pure white, the last being the rarest. It is somewhat curious that no form exists, apparently, intermediate between the fawn-and-white and brown-and-white types, but a similar broad distinction exists between the cinnamon and green forms of the domestic Canary.

Of the small exotic Ploceidæ, *Munia maja*, *M. castaneithorax*, *Taeniopygia castanotis*, and *Estrelda astrild* are the most common; but *Poëphila mirabilis*, *P. gouldiæ*, *P. acuticauda* and *P. cincta* have been imported, the two former most frequently, and the latter only quite recently, together with *Ædemosyne modesta*.

Erythrura prasina, though occurring in our empire, is of course only known here as an imported bird, and does not usually do well.

I have in my prefatory remarks already alluded to the Java Sparrow as a commonly introduced bird, and now need only mention that the more or less pure white domestic form from Japan is even more constantly an occupant of the dealers' cages, presumably because it sells at a much higher price and is therefore not so readily disposed of.

Family FRINGILLIDÆ.

The ubiquitous Canary is, of course, a very common cage-bird in Calcutta, and will probably tend to displace many native species in the affections of the people. Most of those sold here come from China; they are small birds, generally of the pale whitish-yellow tint known to fanciers in England as "buff," green or pied birds being relatively few, and full bright yellow and cinnamon being rarely if ever seen.

I once saw a green bird (not a hybrid of any sort) marked with yellow on the quills and tail, like a Greenfinch. The note of these Chinese Canaries is very soft and pleasant, and they generally resemble the German type of bird. Maltese and a few English Canaries are also imported, the latter fetching three or four times the price of Chinese forms.

The only Indian Finch commonly kept as a songster is the "Tuti" (*Carpodacus erythrinus*), this of course loses the red colour after moulting in confinement, like other carmine-tinted Finches. Several other species, however, appear in the Bazaar, generally to form part of mixed collections, viz.:—*Emberiza luteola*, *Hypacanthis spinoides*, and, less commonly, *Emberiza melanocephala*, *E. aureola*, *Melophus melanicterus*, *Gymnorhis flavicollis*, and *Carduelis caniceps*. A large consignment of the last-named came down during the past winter, but the birds did not thrive as a rule. A few individuals of the Eastern form of Linnet (*Acanthis fringillirostris*) have also been brought in, and I noted that the males, when kept over the moult, lost the red, as the home Linnet does. I have also seen a few specimens of *Metoponia pusilla*.

Of exotic Fringillidæ, *Chloris sinica* is the most common, except of course the Canary; a good many examples of *Eophona melanura* used to be imported, but they were greatly subject to disease of the feet and have not been very popular. The European Goldfinch (*Carduelis elegans*) is generally to be found, but comes in very small numbers; it does not feel the heat at all, nor does it gasp, as many native species do. Bullfinches (*Pyrrhula europæa* and *P. major*) may sometimes be had, as may also the Brambling (*Fringilla montifringilla*), the specimens of this bird being imported. A species of *Serinus*—I think *S. icterus*—is not uncommon. American Cardinals (*Cardinalis virginianus* and *Paroaria cucullata*) have been brought here and have done well, but have not sold very readily.

Family Alaudidæ.

Larks are popular here as cage-birds, especially the "Chendool" (*Galerita cristata*) and the "Agheens" (*Mirafra*). *Melanocorypha bimaculata* is also brought down to Calcutta in numbers at the close of the cold season, while a few specimens of *M. mongolica* may generally be seen, as it is pretty regularly imported. Another Chinese Lark is often to be noticed, *Alauda gulgula*, I think—at any rate it differs, like that bird, from *A. arvensis* in its smaller size, shorter wings and tail, and larger feet. These birds are expensive, costing between ten and twenty rupees, although not apparently different from Indian specimens of *A. gulgula*, which I have never seen caged. But the custom of wrapping up the cages has limited my knowledge of Larks to a very great extent.

Family Nectariniidæ

Both *Arachnechthra asiatica* and *A. zeylonica* may be occasionally seen at the dealers' establishments, but can hardly be expected to thrive. Nevertheless, I have known the latter kept by Europeans for many months, and I deposited one of the former safely in the London Zoological Gardens in 1897, although it was in poor condition and did not live long. Mr. Rutledge informs me, however, that this species is kept in some places as a song-bird, so that certain natives must understand how to treat it.

Family Dicæidæ.

A few examples of *Dicæum cruentatum* are occasionally on sale, but these birds, though they will eat bananas greedily, are not easy to keep. This is a great pity, as they are not only very pretty, but quite the tamest and most fearless of any small birds I know.

Family Pittidæ.

A few specimens of *Pitta brachyura*—hand-reared birds—occasionally come into Mr. Rutledge's hands, but this species is certainly not common in cages. Although not a songster, it makes a very nice pet, owing to its tameness and amusing gestures.

Family Picidæ.

The only Woodpecker caged here, and that but rarely, is the common *Brachypternus aurantius*, hand-reared specimens of which get very tame and

thrive well in confinement. From the readiness with which they partake of plantains, I fancy that the species must be naturally more or less of a fruit-eater. The outer hind toe (third toe) is certainly reversible in this species—and, indeed, in some other Wood-peckers that I have noticed—for it often points laterally forwards when the bird is moving about in a cage. Nestlings of this species have a warty pad on the hough, and shuffle about on it without the aid of the toes.

Family CAPITONIDÆ.

I have more than once seen a statement in print that Barbets do not thrive well in captivity; but this is quite a mistake, at all events as regards most Indian forms. The first Barbet I ever saw alive was an example of *Cyanops asiatica*, which lived for at least six years in the London Zoological Society's Parrot-house. This species is the easiest of all to keep, both hand-reared and wild-caught birds being exposed for sale in the Tiretta Bazaar, where some may practically always be found. Several individuals may safely be placed together in one cage, which is not the case with other Barbets, and a great many must reach Europe; indeed, the bird is only kept for export, and is certainly not unfrequently on sale in England. A few specimens of *Megalæma marshallorum* and of *Thereiceryx zeylonicus* are occasionally seen here, and *M. virens* sometimes arrives from China. The Coppersmith (*Xantholæma hæmatocephala*) is often brought in to the dealers, but never lives long, as they *will* feed it on "satoo," a diet which kills it in a very few days. Yet on bread-and-milk and fruit, or the latter only, it lives well.

Family CUCULIDÆ.

The male Koël (*Eudynamis honorata*) is a very popular pet with natives, and is always on sale here. Many examples are reared from the nestling stage by hand. The young birds that I have observed do not seem to bear out the theory that both sexes are at first entirely black, and that the female assumes her proper livery later. Some young males are quite black, and others are black sparsely spotted with buff. The young females are much like the adults of that sex, but have the upper half of the head and the nape black. In all young birds the bill is black, not green, as in the old. The only other Cuckoo I have met with commonly in cages is the "Popiya," or Brain-fever-bird (*Hierococcyx varius*), the note of which is as much esteemed by natives as it is disliked by Europeans. It does not keep its plumage in such good condition as the Koël, which seems to do very well as a cage-bird. The Crow-Pheasant (*Centropus sinensis*) is often brought in, not as a pet, but on account of some fancied medicinal virtue. I have noticed two types of young Crow-Pheasants, which never seem to occur in one brood, at least they are not sent in together. One is a large barred bird, usually taken as the typical young of the species, which is very easy to tame. The other is smaller, especially as regards the bill and feet, and shows no trace of bars, but is a dull edition of the adult. When full-fledged it is wilder than the first, has a longer tail,

and is inclined to hop as well as walk. It also moults much later. This is as much as I have yet been able to make out from studying the live birds, and I am not sure whether these uniformly-coloured young are merely the males, as Jerdon says, or a distinct race, or even species. Against the latter view, and tending to prove the existence of much variation, may be instanced the fact that we have in the Indian Museum the skin of a nestling which is in *perfectly bright adult plumage*, whereas the young birds of the second type mentioned above resemble those of *C. chlororhynchus* as figured in Captain V. Legge's 'Birds of Ceylon,' or may be even duller and darker. All the young birds I have seen have grey eyes and black bills, flesh-coloured at the base in the case of the barred specimens.

PSITTACI.

The Parrots are of course very important in the present connexion, though many of them are not cage-birds in the literal sense, for they are quite as often chained, as mentioned above; this is the case even with Parrakeets and Lories. Many foreign species are imported, and some very rare forms occasionally occur; but, not being specially interested in the group, I have not kept any record of these, and must confine myself to the more usual importations. But I would strongly advise any member of the B. O. U. who likes rare Parrots, or wants specimens of them, not to neglect examining the Calcutta dealers' stocks, if he ever has the opportunity of so doing.

Family LORIIDÆ.

The justice of what I have remarked above is evidenced by the fact that *Trichoglossus forsteni*, which was not even in the British Museum ten years ago, and was only received by the London Zoological Society in 1896, has been, at any rate since I came here in 1894, quite the most commonly imported Lory; indeed, I am not sure that it has not been brought in more numerously than any other exotic Parrot. It thrives very well in captivity, and has bred in the Calcutta Zoological Garden. *Trichoglossus swainsoni* and *T. ornatus* are also not uncommon. Of the other Lories, *Eosriciniata* is, perhaps, the most abundant; but *Lorius garrulus* is also plentiful, *L. domicella* far from rare, and *L. lory* often to be seen.

Family CACATUIDÆ.

The commonest Cockatoos imported are *Cacatua sulphurea* and *C. Roseicapilla* which come in large numbers and are sold for a few rupees only. *C. galerita* is also common, *C. alba* much less so, and *C. leadbeateri* rather rare. The great *C. moluccensis* is always on sale, though not imported in any very great quantity at one time, each bird being anchored in the manner above described to an L-shaped perch of wood, and so kept unless transferred to a swing. I have particularly noticed the great tameness and intelligence of these birds. All of them are eager for notice, and they will frequently invite me to scratch their heads by beginning to ruffle their feathers with one foot—in fact, will make a sign of their wishes. The only other species I have ever seen do this was a Red Macaw lately in Mr. Rutledge's possession; but

the action is so universal with these Cockatoos that it may fairly be put down as a characteristic piece of intelligence, though their tameness is, no doubt, due to their being hand-reared.

The Cockateel (*Calopsittacus novæ-hollandiæ*) is often imported and generally to be bought; it has bred in the Zoological Garden here. I have noticed that this bird's plumage is remarkably impervious to wet; water poured on it glides off as from a Duck's back.

Family PSITTACIDÆ.

The cage-brid of India *par excellence*, and one of the longest-and-best-known anywhere, is of course the familiar Ring-Parrakeet (*Palæornis torquatus*), which is popular both with natives and Europeans, and may be met with, chained or caged, in almost every street. Hundreds of fledged and unfledged young, and of wild-caught adults of both sexes, come into the hands of the dealers. Many of the latter are more or less heavily splashed with yellow; while perfect *lutinos* are far from rare and are extremely beautiful birds.

The males in these cases retain the pink neck-ring, and the bill is always red. Such birds fetch very high prices—about eighty rupees—and consequently seldom reach Europe, though some have been exhibited in the London Parrot-house. No attempt has, however, been made to breed the variety in captivity, and the dealers depend for their supply on chance "sports."

Yet the form probably has the elements of permanence in it, for Mr. Rutledge assures me that he knows of a case of a pair of normally-coloured birds which always nest in the same tree and always produce a yellow brood, the young being eagerly watched until fit to be taken. Lately I have seen a particularly curious *semi-lutino*, not splashed, but of a shade midway between green and yellow throughout.

Nearly as numerous as the common Parrakeet is the larger "Rock-Parrot" (*P. nepalensis*), but most, if not all, of the examples are, I think, brought in as young birds. In the Tiretta Bazaar there are at the time of writing (February) a good many examples of this species still so young as to show the dark irides which when immature this and the common Ring-neck exhibit. I have never seen a *lutino* of this large Parrakeet.

The "Blossom-head" (*P. cyanocephalus*) is common in the Bazaar, but is not so popular a cage-bird as the Ring-neck. The Eastern form (*P. rosa*) is also often to be seen. Another common *Palæornis* is *P. fasciatus*, but only quite lately have *P. magnirostris*, *P. schisticeps*, and *P. columboides* appeared here, so far as I am aware, and then there were only a few individuals, except of the last species, of which a good many pairs arrived, and some are still on sale. *P. finschi* I have seen only once; the specimen was secured for the London Zoological Gardens by Mr. Harper.

The common little Lorikeet is often to be met with, and the Malayan *Loriculus galgulus* is frequently imported, both being in favour as inmates of minor aviaries. I have only once seen *L. indicus*. The only small foreign

Parrot numerously imported beside *L. galgulus* is the well-known Budgerigar (*Melopsittacus undulatus*), which thrives and breeds as well here as elsewhere. Mr. Rutledge has seen escaped birds nesting in the open, but I am not aware that the species has established itself. I have never seen or heard of *lutinos* of this species in India, though in Europe such are not uncommon and are advertised for sale.

Several of the larger Australian Parrakeets are imported, *Platycercus eximius* being much the commonest. *P. elegans*, *Polytelis barrabandi*, and *P. melanura* are brought in small numbers, as are also *Ptistes erythropterus*, *Aprosmictus cyanopygius*, and some form of *Barnardius*.

More constantly present than any Australian Parrots, except the Cockatoos; are the common *Eclecti*, especially *E. roratus*. *E. pectoralis*, and very probably other species, occur, but I cannot be certain about this under the circumstances. A species of *Tanygnathus* is also often imported.

The African Grey Parrot (*Psittacus erithacus*) not uncommonly appears, generally in good health and condition, unlike the majority of its unhappy fellows in England. *Coracopsis vasa* may also sometimes be procured.

American Parrots, as might be expected, are not often to be seen, but the common Blue-fronted Amazon (*Chrysotis amazonica*) is not very rare, and a few Macaws (*Ara macao*, *A. chloroptera*, and *A ararauna*) are on sale from time to time, being highly valued by the natives. Mr. Rutledge knew of an individual of the red-and-blue species being kept for no less than three generations in a native family. I once saw two most beautiful dark-blue, red-vented Parrots, somewhat similar in size and style to the common African Grey Parrot, which I took to be examples of *Pionus chalcopterus*, a species I never remember to have seen elsewhere.

COLUMBÆ.

Almost the only other cage-birds remaining to be dealt with are the various Doves and Pigeons, some of which are, however, more properly aviary or menagerie birds. Such is *Goura coronata*, which is imported quite numerously at times, and has been bred by a native amateur, according to information given me by Mr. Rutledge.

The only species of this group really common and popular as a cage-pet is the well-known domestic Turtle-Dove, which is found both in the ordinary cream-coloured form with black half-collar, and in more or less completely albino varieties. It is certainly not identical with the wild *Turtur risorius*, so far as the note goes, this being a very marked point of specific difference in all the ring-necked species of *Turtur* I have seen alive.

The common wild Turtle-Doves are frequently to be seen for sale—*Turtur suratensis*, *T. cambayensis*, *T. risorius*, *T. orientalis*, and *T. tranquebaricus*. Mr. Rutledge once gave me a very peculiar albinoid cream-coloured male of the last species. *Chalcophaps indica* and *Geopelia striata* are also often to be had, and *Calœnas nicobarica* is pretty commonly imported.

Of the Fruit-Pigeons, the "Hurrial" (*Crocopis phœnicopterus*) is generally for sale in the Bazaar, and, more rarely, one may meet with the "Kokla" (*Sphenocercus sphenurus*), which, although much esteemed in some parts, is apparently not often kept in Calcutta. *Osmotreron bicincta* is commoner. *Carpophaga ænea* and *Myristicivora luctuosa* are sometimes imported in considerable numbers, but cannot be called abundant. On a few occasions recently Mr. Rutledge has procured the lovely *Ptilopus jambu*, and I once saw a splendid *Butreron capellii* in his possession. Fruit-Pigeons are quite easy to keep, as they live well on any *soft* vegetable food, such as *satoo*-paste or boiled rice, and I wonder that the home dealers do not take more trouble to introduce these most exquisitely coloured birds.

Of foreign Pigeons, the most frequently imported are *Ocyphaps lophotes* and *Phlogœnas luzonica*, not to mention the great Ground-Pigeon alluded to above. Other species occasionally occur, such as *Leucosarcia picata*, *Phaps chalcoptera*, and *Geopelia cuneata*, while a short time ago a good many *Turtur chinensis* and *T. bitorquatus* were imported, especially the latter, which proved quite a drug in the market. Before leaving the Pigeons, I ought to record the curious fact that the Alpine *Columba leuconota*, which Mr. Rutledge sometimes obtains, bears the heat perfectly well, and even shows a desire to breed. As its note has apparently not been recorded, I may mention that it is not a coo, but a repeated croak, not unlike a hiccough, and, much as the bird resembles the domestic Pigeon, I have never seen it sweep the ground with its tail when courting, but rather raise it.

GALLINÆ.

The *Phasianidæ* are usually regarded in the light of aviary birds, but as one of them is among the commonest species kept in confinement here, the family demands some notice.

Family PHASIANIDÆ.

The Grey Partridge (*Francolinus pondicerianus*) is very widely kept for fighting, and in consequence is one of the birds most commonly seen in cages. Those used are small, with the interstices of the pyramidal top filled in many cases with string netting, to avoid injury to the bird's head. These Partridges, however, become so tame that they can be let out for a run, and I have seen one following its owner over the grass like a little dog.

The Common and Rain-Quails (*Coturnix communis* and *C. coromandelica*) are also occasionally kept in cages for fighting. The Pheasants, which are brought down from the hills for exportation, hardly come within the scope of the present paper, but it may perhaps be allowable to mention a few birds of this family which have long been imported for ornamental purposes, although they cannot be called cage-birds. These are the Java Peacock (*Pavo muticus*) and the white and pied forms of the common *P. cristatus*, together with the "Japan Peacock" (*P. nigripennis*). Mr. Rutledge tells me that this form really does occur in Japan to his positive knowledge (no

doubt introduced), and there is certainly a Japanese specimen of Temminck's in the Paris Museum. The Ring-necked Pheasant (*Phasianus torquatus*) and Silver Pheasant (*Gennæus nycthemerus*) are frequently brought over from China, as is the Golden Pheasant (*Chrysolophus pictus*), the male of which often has a hen of *P. torquatus* assigned to him as a companion. The male Golden Pheasant occurs in the old picture to which I alluded at the commencement of the present paper, so that it may fairly claim to have been one of the earliest fancy birds exported from its own country.

(*The above appeared in "The Ibis."*)

THE LATE MR. OLIVER COLLETT.

THE untimely death of Mr. Oliver Collett, on the 10th June, at the early age of thirty-five, deprives our Society of a member who was keenly interested in Natural Science,—more particularly in the Biological branches. He was an enthusiastic student of Terrestrial Mollusca, and presented many Ceylonese species to the Museum of the Society. He formed an almost complete collection of the land shells of Ceylon and of the animals that occupy them. It is hoped that all this material will be acquired by the Colombo Museum. Mr. Collett was the author of various papers on the subject in the Malacological journals and discovered many new species, some of which bear his name, *e.g.*, *Cataulus colletti*, *Cyathopoma colletti*, *Corilla colletti*, *Kaliella colletti*, and *Euplecta colletti*.

As a tea-planter, Mr. Collett directed his attention to economic questions, such as the several fungus blights of the tea plant, the action of enzymes and the processes of tea manufacture, &c.

Mr. Collett was born at Stratford-on-Avon in the year 1867; was educated at Dedham Grammar School; and came out to Ceylon in 1887. In addition to the Bombay Natural History Society, he was a Fellow of the Royal Microscopical Society, the Malacological Society and a member of the Royal Asiatic Society.

MR. Collett, by his sterling character as well as by his charming personality, endeared himself to all who knew him. His sudden death, from an enteric disease, is very deeply deplored by his many friends.

E. E. G.

REVIEW.

GNATS OR MOSQUITOES.

BY

LIEUT.-COLONEL G. M. GILES, I.M.S., F.R.C.S.

Of Colonel Giles' book the worst that can be said is that it is premature, and to this there is a reply that a Manual is for beginners, and in the subject of Mosquitoes we are all beginners and must have a manual. The subject itself is only three or four years old, for until the great discovery which connected mosquitoes with malaria, those insects received very little attention from us in return for all they bestowed. When Ross found that the malarial parasite was carried by a particular kind of mosquito with spotted wings, he could get no name for it. Entomologists declared it to belong to the genus *Anopheles* and called it *A. rossii*, and it proves to be the commonest and most widely-spread species of the genus in India. Since that time there has been a boom in *Culicidæ*, and the most obscure gnats are being collected and described and named and classified all over the world and a mosquito literature is sprouting everywhere in periodicals and fugitive papers like grass after rain. That it is a great convenience to collectors to have this brought together into one book is obvious enough, but it is equally obvious that any book published at such a time must be out of date in six months. It is like cutting grass which is growing all the while. Nor will the book be out of date only in a very short time: it will be found to be full of errors also, because the knowledge we have now is so fragmentary that the conclusions drawn from it are certain to be falsified in many points when we know more. In all probability this will be true in a special degree of the classification. Colonel Giles has followed the classification adopted or devised by Mr. Theobald of the British Museum, of which he says, "It was only after the examination of an enormous mass of material that Mr. Theobald found, in the character and arrangement of the scales that clothe the body and wings, a working basis on which to found new generic distinctions." But does Mr. Theobald yet know enough about mosquitoes in the various stages of their life to have any assurance that the forms and arrangement of their scales are trustworthy indications of their real affinities? He cannot. Nobody does as yet. His classification, in short, is of the same value as the Linnæan classification of plants by the number of their stamens and pistils. That system, indeed, served the world for a long time and was very useful, but in the present day it will not pass. We require a classification which is not merely a useful key to enable us to find what we want, but a lesson in the ture relationships of species. In the case of mosquitoes such a classification is not possible yet, and it is better to avow our ignorance and wait than to give our successors the trouble of pulling down our work. A very rough provisional arrangement for practical purposes is all that can safely be attempted

at present. This is perhaps still more true of the discrimination of species, with respect to which a great deal of Colonel Giles' work will only perplex workers in the field and have to be undone in the next edition. His book would really have been more helpful if he had described only those very distinct and conspicuous species which might serve collectors as landmarks, and then grouped under each those forms which seem to be nearest to it, mentioning the points in which they differ.

However, Colonel Giles had to sail between Scylla and Charybdis, and if he has run aground on the one side, he will doubtless be among the first to see it and make for the other! The rest of his book is not premature, but very timely and fitted to be very useful. He is an accurate observer and at the same time has that valuable endowment of imagination which so many men of science sadly want. This saves him from the method of tabulating supposed facts and deducing conclusions by arithmetic which is so much in vogue at the present day. His chapter on the Life, History and Seasonal Prevalence of Mosquitoes is genuine natural history and very readable. The next, on The Conditions Influencing the Prevalence of Mosquitoes and the Prophylaxis of Malaria, is full of valuable information and suggestions. The chapter on Collecting and Preserving is patently the work of one who has himself mastered these arts and can teach them. For the rest, let it suffice to say that the whole book is pleasantly, genially, humorously written, and will encourage many to accept the author's invitation to send him specimens of mosquitoes, ticks and other biting insects.

MISCELLANEOUS NOTES.

No. I.—WHITE ANTS' CASTLES.

Most people have seen sometime or other the large castellated structures built by white ants in the forests, &c., but few, perhaps, know how quickly the ants can build them. In the course of a stroll along a forest road a few mornings ago I idly knocked off the top of one of the pinnacles of a white ants' castle and on my return an hour later was surprised to find the damage had been repaired, a flat roof in wet mud having been built across the cavity caused by the loss of the conical top of the pinnacle.

In order to see how the repairs were executed I knocked off the top of another pinnacle causing a gaping circular chasm about 2½ inches in diameter. On looking inside I saw some half a dozen ants and these at once proceeded down below apparently to give warning of the damage done to the castle. In the space of a minute the white ants came swarming up the inside of the turret, took a preliminary look around, apparently to judge the extent of the damage, and then set to work on the repairs. These were begun at once all round the circumference of the hole, each of the workers bringing up a lump of wet mud apparently two-thirds of which was actually inside its mouth, the lump of mud was disgorged with a distinct effort, sufficient to make it stick where it was placed, and was deftly laid and pressed into place very much as a bricklayer lays bricks. The ant having made sure that the lump he had brought was well and truly laid left without delay to fetch another lump from below, his place being at once taken by another ant who had scrambled up behind him in all eagerness to add his lump to the growing mass. The operations were carried on rapidly but with no confusion, not a single ant failing to lay his contribution properly in place. Occasionally an ant in his eagerness to be off for a fresh lump tripped and fell headlong down below but apparently with no inconvenience to himself or any other ant. Twice, however, there were pauses in the progress of the work when only very few ants were left at the scene of operations, and these appeared to be due to a failure in the supply of liquid mud below, as presently the workers came rushing up again in hundreds each with his mouth full. How far down the ants went for their mud, I of course, could not see, nor could I distinguish them individually to tell how long any of them took to get a fresh supply. The mouth of the cavity was gradually built over from the inside in an ever decreasing circle no attempt being made to rebuild in the original shape of the pinnacle but only to roof over the cavity. The successive layers of mud lumps were welded into each other by continual tramping with the forelegs, and there appeared to be overseers to look after this, who gave a squeeze here and a smooth there without themselves adding any mud.

When the circle of the aperture had been reduced to about half its original size buttresses were built up along the inner surface of the turret, apparently to act as scaffolding and to afford foothold for the ants

as they worked towards the centre. The work went forward without cease until only a hole big enough to admit one's finger was left. The ants around the edges of this hole were working in almost a solid mass and with such feverish haste that the hole appeared to close up automatically nothing finally being visible but the antennæ of the ants sticking out of crevices in the mud and waving in all directions as the finishing touches were applied. The whole time occupied over the repairs was 35 minutes from the time I originally damaged the structure.

G. P. MILLETT, I. F. S.

KANARA DISTRICT, 18*th April* 1902.

No. II.—SMALL GAME SHOOTING PROSPECTS IN WESTERN INDIA.

The end of the shooting season for 1901-1902 has now passed—and a very bad season it has been—in fact, it would perhaps be wiser not to call it a shooting season at all. Coming, however, as it did as the third of a series of lean years, the opportunity seems, I think, a good one to try and form some deductions as to how these three years of famine and scanty rainfall have affected game of all kinds on this side of India.

In order to do so, it will be well to divide game into two heads, *viz*:—

(1) That of migratory species who only visit us during the cold weather.

(2) That of indigenous game which breeds with us.

Dealing with the former first, we shall have to consider the large family of ducks and geese, and also the grey quail, and in addition to these we may find it worth saying a word or two about cranes and other water birds.

It will, I think, be found best to deal with each successive year before generalizing, so I will commence with the first famine year, *viz.*, 1899-1900.

During this year we had practically no rain, and both Khariff and Rabi crops failed and there was no grass or water anywhere.

I was not in India during the cold weather, but I gather that geese and duck were plentiful but that their usual haunts being dried up they resorted in large numbers to the big rivers where very heavy bags were made. The birds, especially the geese, were tame to excess, owing of course to weakness and starvation, and the same probably held good of the duck, as their food-supplies in the rivers must have been of a very inferior nature.

The snipe had no feeding ground at all, and such as did not at once pass on must have died of starvation among their old and now dried up haunts.

The same must have applied to the quail in even a more marked degree.

It may, I think, be taken as probable that of the vast hordes of emigrant visitors to Gujrat, few of those who did not at once move on to new pastures, survived in their old haunts, and that none of them would be in a fit state to face the return journey to their breeding grounds.

The next year was not such a very dry year in so far that at the beginning of the season there was a good amount of water about, and any amount of as good quail ground as I ever saw. But as a shooting year it was a com-

plete failure. The snipe came in in some numbers at first, but by the end of November there were very few left, for they never really settled: the fact being, as far as I could see, that the feeding grounds, except in the paddy fields, were ruined. I visited the Null towards the end of the year, and found this to be the case, and the well known Null islands which are generally good for 100 couple of snipe quite comfortably, only held a dozen couple or so. There were scarcely any duck, and no coot.

Wherever I went during that year I found the same state of things, *viz.*, that except in the paddy there seemed to be no snipe. There were hardly any duck and what there were, were mostly pochard, I also found some pintail, both species addicted to large reedy lakes which might have held out during the previous year, and both very strong flyers, breeding very far north.

The great masses of gadwall, teal and shovellers, which generally form the bulk of our bags were conspicuous by their absence; quail there were hardly any.

Passing now to the year 1901-1902, the early rains were fairly good but the late rains failed. The Khariff crops were good and there was plenty of grass, but owing to the failure of the late rains the great majority of the tanks were dry; and as early as November, such places as the little Null and all the sheets of water round the Prantej district were quite dry.

Compared with former years there were no geese, duck, or snipe, and not many quail. I visited the Null towards the end of November. There were a good number of duck, but no cover and I fancy hardly any feeding grounds, no snipe, and no quail. In other parts of the country the same state of things held good (or rather bad), the few snipe I killed were in the rivers, and they were in wretched condition and could not possibly have survived the northward journey to their breeding grounds.

The quail were rather curious. There were at the beginning of the season a fair sprinkling in some places, I never saw better quail ground, but they all disappeared very soon. I am inclined to think, for reasons which I will dwell on later, that a very large proportion of those shot during the early cold weather were rain quail, though I can vouch for the fact that there were some grey quail.

This closes the history of the 3 years, as far as emigrants are concerned, and we may as well try and deduce something from what we have experienced. First as regards feeding grounds, from what I could see, the feeding grounds of the snipe are, except in paddy fields, (a very limited area unfortunately this year) entirely destroyed. I nowhere found as one usually does birds who had had a good meal and were asleep. Such get up with the startled scream of the awakened glutton and are very different from the shifting wisp or wary single birds who are onlysettling and not feeding.

This is only what one would expect. The tiny infusoria, on which snipe feed, live in the mud and I should fancy that any one year (let alone three) during which the tanks were not only quite dried up, but also in most places

ploughed up and sown with wheat and barley, must be sufficient to destroy the food-supplies altogether. It is probable that a couple of good years will do much to remedy this, but it will, I think, require more than one to do so.

As regards the feeding grounds for the ducks the same holds good. The weeds or shell-fish on which the various species feed, have in most places been entirely destroyed, and here again I fear we may have to wait for more than one year before the *status quo ante* is restored.

The case with quail is different. I have never seen better quail ground than during the past two years and this complete failure of the quail to appear must be put down to other causes which I shall touch on later.

So much for the condition of Gujarat as regards food-supply. Now as to other factors which bear on the case. In the first place *cæteris paribus*, what birds *do* visit Gujarat? This is a point on which it is impossible to speak with certainty, but common sense, which is to a great extent backed by the experience of the last two years, leads me to feel pretty confident that the usual course of event is, that the same birds who have spent a cold weather in any given feeding ground return there with their young broods after the breeding season.

Another factor to be borne in mind is that in an ordinary year an enormously high percentage of birds perish on the northern journey. It would not be too much to say judging from the experience of Seebhom and other naturalists, that half of those who start back, perish on the way.

This is probably more the case with some birds than with others—for instance, quail are probably far greater sufferers in this way than are the members of the duck tribe and it is, I think, to this, and to the fact that probably none of the regular Gujarat stock of quail survived the first famine year, that the complete failure of quail during the last two years can be traced.

It is a well-known fact, moreover, that all birds are in the very pink of condition before they start, many species having a new set of feathers for the occasion.

With the above facts before us we can easily see that the result of a year in which the usual feeding grounds of any large class of birds failed, would be that those who passed on to other feeding grounds would return to these new feeding grounds the following year, and that those who failed to so pass on would never be fit to face the return journey to their breeding grounds; the result in either case would be, as the event has proved, that few or no birds would come back to the famine-stricken province the next year.

Another result of the heavy mortality among any species who are in the habit of visiting any one feeding ground in large numbers, will be that the food-supply at the *breeding* ground will be improved for those who do get back; now this is perhaps the most important factor of all in bird-life, for the rate at which all animal life increases under favourable surroundings is so enormous that one good year will replace the destruction wrought by several bad years.

We need not, therefore, be surprised to hear, as we have this year, of the enormous bags which have been made in Scinde and other more favoured places; for the struggle for existence at the breeding places will, for those whose feeding resorts have not suffered, have been much lightened.

And it is on this that our hopes must rest, for as Scinde gets over-stocked the superfluous millions will spread southwards again in search of less crowded pastures, and let us trust that when they do so, the feeding grounds of Gujrat will so far have recovered as to hold forth some inducement for them to tarry there.

At the beginning of this paper I mentioned the cranes. Their more or less complete disappearance is a curious incident and somewhat difficult to account for. But certain it is that during the last two years in localities where I have seen them in millions: I should have had some difficulty in counting them by hundreds. They are grain-feeding birds and though the area under cultivation has been immensely restricted, yet it is difficult to say why the very good khariff crop of the last two years, for instance, did not attract more of them to Gujrat, but certain it is that hardly any came.

The whole of the closely allied class of non-emigrant waders generally known as Paddy-birds, but to the more scientific sportsman classed under the heads of Egrets, Herons, Ibises, &c., have suffered terribly. During the famine year, by a curious natural process which it is difficult to understand, they most of them did not breed at all, their breeding places which are invariably in trees standing in water, being presumably to their eyes not proper places to resort to, when standing as they did high and dry; and each succeeding year has told more severely on them so that now they are, comparatively speaking, in many places practically near extinction.

We have now only left for consideration the remaining class of game birds and animals who breed with us, *viz.*, the partridge, rain-quail, sand-grouse and hares. During 1900-1901 I do not remember noticing any thing out of the ordinary. But during the rains of 1901 every one must have remembered the enormous quantity of rain-quail who were breeding in Gujrat; the fact that they *were* breeding did not, I regret to notice, prevent a good many pseudo-sportsmen from shooting them. The same held good of sand-grouse and partridge and the season of 1901-1902 has, I fancy, been about the best on record for all these, and also for hares, of which there have everywhere been far more than I can remember during the last 20 years and more. Sand-grouse have been, in some places, innumerable and those who care to shoot them over water have been able to make enormous bags, and I never remember seeing so many large coveys of the ordinary grey partridge.

Curiously enough the Francolin or Painted Partridge seem to have suffered. Probably being less ommivorous than his grey cousin he suffered much in the famine year. It is curious how the hares managed to survive,

hunted as they always are by the snaring tribes, but that they have not only done so but also increased and multiplied exceedingly there can be no doubt.

As regards quail the fact that at the beginning of the season there was a fair number would be borne out by the probability that the majority of these were rain-quail who, as stated above, bred in immense numbers, but who being partially migratory would leave the district early in the cold season.

The reasons for this increase in local game are not far to seek. In the first place a dry year is always a good year for all ground game, *i. e.*, for all classes who like partridge, grouse and quail breed on the ground, for in an ordinary year the wet kills number of young birds and thousands of nests are swamped out.

In the second place the large area of waste and uncultivated lands afforded excellent cover for the young broods and also provided a good supply of food and also such food-supplies as there were, were reserved for them alone, and had not to be, as formerly, shared with the invading hordes of emigrants.

A third reason has I see been suggested in the pages of the Journal, *viz.*, the absence of predatory birds and beasts. This was most noticeable. Early in the year the rats of two species, neither of them the Jerboa, swarmed over the roads and open spaces in Mount Abu, in a manner which would have been suicidal had there been any hawks or owls about, but there were none.

The advantages of a dry year for ground game has received a further and far less desirable proof in the plague of rats which has coverd the whole face of the country in a way which has to be seen to be realized. They are I believe now falling victims to the usual laws of over-crowding and having no City Improvement Trust to look after them, are dying by thousands. Anyhow the first really wet year will finish them off.

This brings me to the end of my remarks and briefly to summarise I would suggest that the following points stand out as the results of these three sad famine years :—

(1) The feeding grounds have been ruined.

(2) The whole stock of Gujrat emigrants have been destroyed.

(3) The stock of indigenous game has much increased.

As regards future probabilities, it would seem possible that a good breeding season will replace the losses, but that it may take some years before the feeding grounds of the duck and snipe will recover themselves. The future, however, is a matter I prefer to deal with after the event. I can only state that if the good wishes of the community are of any use to the game birds of Gujrat they have our most sincere prayers for their well-being and I will end this paper by wishing good luck to the Shooting Season of 1902-1903.

H. D. OLIVIER,
LT.-COL., R.E., F.Z.S.

BOMBAY, *June* 1902.

No. III.—CURIOUS COURSE TAKEN BY THE HYOID CORNUA OR TONGUE MUSCLES IN CERTAIN WOODPECKERS.

All woodpeckers are, as is well known, provided with excessively long, worm-like tongues which enable them to extricate their food in the shape of insect larvæ, &c., from deep holes and crevices in the wood.

To render the protrusion and subsequent withdrawal of such a long tongue possible, specially constituted and exceedingly long hyoid cornua or muscles which work the long tongue are necessary which, as a rule, in the woodpeckers, slide round the skull from the sides of the gullet round the occiput to the base of the upper mandible.

This in itself is a strange course for the hyoids to take, but in the case of two genera of woodpeckers, which I have recently examined, there exists a much more extraordinary arrangement of these muscles which I cannot find described and which has possibly not been recorded.

The course taken by the hyoids in these two genera lies at first, in the ordinary manner around the occiput, after which instead of passing straight to near the base of the upper mandible, they turn to one side and make a complete circuit of the eye socket, side by side.

The above extraordinary arrangement of the hyoids is found in *Pyrrhopicus pyrrhotus* and in *Picumnus innominatus*. In both these species the hyoids pass completely round one and the same eye (the right in both cases) as shown in the accompanying diagrams :—



SIDE ELEVATION.



PLAN.

Head of Pyrrhopicus pyrrhotus, showing course of hyoid cornua (dotted lines).

The fact of the hyoids passing right round the eye is most unexpected in itself, but what would seem perhaps the strangest part of all is that in a bilaterally symmetrical animal like a bird the two muscles should not pass round the two eyes (the right hyoid round the right eye and the left hyoid round the left eye) but that they should both pass round one and the same eye. It is possible that the above described arrangement of the hyoids will be found in other genera besides *Pyrrhopicus* and *Picumnus*, and it would be interesting to ascertain this point, as possibly throwing some light on the affinities *inter se* of the various families of woodpeckers.

I may here add that in *Sasia* the course taken by the hyoids is normal and not as in *Picumnus* as one might have been led to expect from the apparent similarity of these two genera.

B. B. OSMASTON,

Deputy Conservator of Forests.

DARJEELING, 31*st March* 1902.

No. IV.—IDENTIFICATION OF ACCIPITRINE BIRDS.

It is not within the scope of this paper, or my intention, to write anything original on the "Raptores" of India, a task which would be at best a difficult one and far beyond my humble means. Blanford's Vol. III, pages 313 to 436 of the *Fauna of British India*, has been brought well up-to-date by that able ornithologist and leaves nothing to be desired, but for members of the Society who perchance have not got the book, or being stationed in jungles or small stations with no library within miles and though, knowing nothing of the subject, are still interested in it, a few notes on the chief characteristics leading to the identification of species, in simple language and purged of all technicalities, so far as is possible, may be of use. Many a rare bird has, I dare say often been thrown away, after being shot, through the sportsman not knowing what it was and not having a book at hand, to help him to its identification and the possibility of it turning out to be something very common, has deterred him from sending it to friends, who could have helped him. The subject in itself will be found of the greatest interest, once taken up, but as a hobby to while away pleasantly, and profitably, the weary hours of camp life in the jungles, it would be very hard to beat.

I shall in every case follow Blanford's keys to the differentiation of species which I do not think could possibly be made more lucid or concise.

The accipitrine birds are divided into 3 families which comprise no less than 87 species, as follows :—

Pandionidæ	... ...	Ospreys	... A single species.
Vulturidæ	... ...	Vultures	... 9 ,,
Falconidæ	...	Eagles, Hawks, Falcons, &c.	77 ,,

In the present number I shall be only able to deal with the first two families and perhaps a few genera of the *Falconidæ*, but I hope to continue the subject in the next number of our Journal.

Pandionidæ—The Osprey, is the only one of our diurnal birds of prey, that has its outer toe reversible and by this means alone can be easily identified. The genus *Ichthyaëtus* also a Fish Eagle, has its outer toe *partially* reversible but not so pronounced as the Osprey, which can turn it right back almost to a level with the hind toe. Like a parrot and like the owls, the Osprey has no after-shaft to its feathers. Living on fish as it does, it is always to be found (during the winter months) flying over rivers and large jheels or tanks.

Vulturidæ—The Vultures, as a family, are too well-known to need any description, but as the family comprises 5 genera and 9 species a few words are necessary to identify them.

Key to the Genera.

a. Bill stout ; height of upper mandible approximately the same as length of cere on culmen. (The cere is the naked skin in which the nostrils are placed and common to all birds of prey ; usually of a different colour to the bill.)

a' Nostrils round or oval ; tail of 12 feathers.

a'' No neck wattle ..... (1) *Vultur.*

b'' A fleshy wattle on each side of the neck of a deep yellowish red, a conspicuous naked patch on each side of the crop and a large naked oval area in front of each thigh of the same colour ..... (2) *Otogyps.*

b' Nostril a vertical narrow slit.

c'' Tail of 14 feathers : differs from the two preceding genera in having a narrower head and a longer bill which is about 3″ from gape to tip..... (3) *Gyps.*

d'' Tail of 12 feathers ; otherwise very like Gyps, though a trifle smaller measuring about 35″ from tip of beak to tail, whereas the smallest species of Gyps (*G. indicus*) is about 38″. It is also darker than *G. indicus* and differs in having the lower parts *dark* with narrow *whitish* shaft stripes ..... (4) *Pseudogyps.*

b. Bill slender ; nostril elongate, horizontal ..... (5) *Neophron.*

Nos. 1, 2 and 4 only have one species each, No. 3 has four and No. 5 has two species.

No. 5. *Neophron* : The White Scavenger Vulture is well known throughout India as a genus but the difference between the two species might here be mentioned.

N. ginginianus. The Smaller White Scavenger Vulture—Bill yellow (in adults).

N. perenopterus. The Egyptian Vulture—Bill dark, horny at all ages.

The latter is slightly larger than *ginginianus* measuring about 26" in length and *perenopterus* about 24".

No. 3, *Gyps* comprises the following four species :—

a. Larger : wing 27 to 31 inches.

a' Third primary longest : lower plumage with *narrow shaft-stripes* ..... *G. fulvus*. (The Griffon Vulture.)

b' Fourth primary longest : *shaft-stripes* on lower plumage *very broad* ..... *G. himalayensis*. (The Himalayan Griffon.)

b. Smaller : wing 22 to 25·5 inches ; bill more slender.

c' Crown of head with scattered hairs ..... *G. indicus*. (The Indian Long-billed Vulture.)

d' Crown of head quite naked ..... *G. tenuirostris*. (The Himalayan Long-billed Vulture.)

We now come to the *Falconidæ*, which comprises by far the greater number of diurnal birds of prey. This family has been again sub-divided, by various authors, by some into 5 sub-families and by others into 10 and so on and hardly any two seem to agree on this point, but Blanford leaves the family undivided, only taking therefrom (*Gypaëtus barbatus*) the Lammergeyer which, he thinks, is entitled to rank as a sub-family apart.

He gives the following key to the Sub-families :—

Gypaëtinæ : *a*. Claws blunt ; bill lengthened ; a tuft of long bristles on the chin.

Falconinæ : *b*. Claws sharp ; bill not lengthened ; no bristles on chin.

Gypaëtus : This genus has but the one species (*G. barbatus*) inhabiting India and is found all along the Himalayas, Punjab and Sind. It is easily recognized, even far up in the heavens by its great size and expanse and long wedge-shaped tail. The adult has the head, neck and under parts a bright golden yellow but the young bird is dark and the head almost black.

SUB-FAMILY—FALCONINÆ.

Genus Aquila ; or true Eagles. The Eagles are among the largest of predatory birds and comprise 9 species. We apply the word eagle to nearly all the larger birds of prey such as the Serpent-Eagles, Fish-Eagles, Hawk-Eagles, &c., &c., but the genus *Aquila* contains only the typical

eagles, which differ from the Hawk-Eagles in much the same way as falcons differ from hawks, chiefly in their habits, shape of wings and tail and other details. Whereas the true eagle scours the mountain top for its prey and prefers the open plains to the wooded tracts, the Hawk-Eagle haunts chiefly the dense forests, where it sits well in among the branches of a tree and watches the unsuspecting pheasant approach to within a few yards, when with one quick flap of its powerful wings it is down, and secures its prey before it knows what has happened. In the same way falcons hunt in the open country, following their prey for miles, whereas the hawks prefer forest lands where they make one sharp stoop, which if missed, they do not often follow up.

Let us now consider the points and characteristics of the eagles and take them in order as they appear in the *Fauna of British India*, pages 332 to 346. The 5 genera therein mentioned, though differing in many respects from each other, have one feature in common, *viz.*, tarsi feathered, and this separates them from the rest of the *Falconinæ*. The five genera are *Aquila*, *Hieraëtus*, *Lophotriorchis*, *Spizaëtus* and *Ictinaëtus* and comprise between them 18 species. They all have bills without any pointed tooth on the upper mandible with a festoon commonly present further back. The lores are clothed with bristles or with feathers terminating with bristles, and the tarsus is feathered throughout.

Key to the Genera.

a. No elongate occipital crest.
  a' Claws much curved, hind claw longer than inner.
    a'' Primaries exceeding secondaries by more than length of tarsus.
      *a*³ Culmen straight at base, then curving; bill from gape longer than middle toe ..... *Aquila.*
      *b*³ Culmen curving from cere; middle toe longer than bill from gape..... *Hieraëtus.*
  b' Claws but little curved, inner longer than hind claw ..... *Ictinaëtus.*
b. An elongate occipital crest.
  c' Primaries exceeding secondaries by more than length of tarsus.
    c'' Abdomen chestnut in adults..... *Lophotriorchis.*
  d' Primaries exceeding secondaries by less than length of tarsus ..... *Spizaëtus.*

In the above key I have altered the order in the book by putting *Ictinaëtus* next to *Hieraëtus*, instead of last, but my reason for so doing is as follows:—In *Aquila*, *Hieraëtus* and *Ictinaëtus* we have 3 genera in which all the species to a casual observer are more or less similar, though differing in coloration,

size, &c., but in the *Lophotriorchis* and *Spizaëtus* we have 2 genera in which the species all have long crests which catch the eye at once and which, if put next to or between two of the *crestless* eagles, may be confusing. The genus *Aquila* has 9 species.

Key to the Species.

a. Nostril elliptical or ear-shaped, higher than broad.

a' Claws very large, hind claw 2½ to 4 inches round curve ..... *A. chrysaëtus.* (The Golden Eagle.)

b' Claws moderate, hind claw very rarely exceeding 2 inches round curve.

a'' Wing in male 21" to 23", in female 23" to 24½".

a³ Plumage deep blackish-brown, crown and nape tawny (in adults).

b³ Lower plumage striated (in young)... *A. heliaca.* (The Imperial Eagle.)

c³ Plumage deep umber-brown throughout, or a pale patch on the nape only (in adults).

d³ Lower plumage not striated, pale tips to larger wing-coverts and to secondaries (in young)..... *A. bifasciata.* (The Steppe Eagle.)

b'' Wing in male under 21", in female under 22" .... *A. vindhiana.* (The Tawny Eagle.)

b. Nostril round, as broad as high.

c' Whole head and lower parts uniformly pale tawny or rufous ..... *A. fulvescens.* (Brooks's Eagle.)

d' Head and lower parts dark brown, or not uniformly coloured.

c'' Wing of male 19" to 20", of female 20½" to 21½" ..... *A. maculata.* (The Large-spotted Eagle.)

d'' Wing of male about 18", of female 19" ... *A. hastata.* (The Small Indian Spotted Eagle.)

The genus *Hieraëtus* has but 2 species; *H. fasciatus*, and *H. pennatus.*

Key to the species.

a. Larger: wing 19 to 21 inches. *H. fasciatus.* (Bonelli's Eagle.)

b. Smaller: wing 14 to 16·5 inches. *H. pennatus.* (The Booted Eagle.)

The Bonelli's Eagle can generally be distinguished by his white breast finely streaked and mottled with brown. When at a distance the breast appears perfectly white in the adult. The upper parts a dark umber brown.

The Booted or Dwarf Eagle is the smallest of all the eagles, measuring only about 19″ in length.

Of the genus *Ictinaëtus* there is only the one species *I. malayensis*, the Black Eagle, and it can easily be recognized by the peculiar shape of its foot. The toes are short, inner toe being thicker than the middle toe and nearly as long, whilst the outer toe is very short. The claws are much less curved than in the other eagles and the inner claw is the longest, longer even than the hind claw.

Plumage in adults is black throughout.

Now we come to the *Crested* Hawk-Eagles. Two genera, containing six species.—*L. kieneri*, The Rufous-bellied Hawk-Eagle, is the only species of the genus *Lophotriorchis*. This genus, though closely resembling the next (*Spizaëtus*), is distinguished by its longer wings, with the primaries projecting beyond the secondaries by *more* than the length of the tarsus, by its shorter tail, which does not exceed 9 inches, and its much longer toes and more powerful claws. The adult colouration, too, is peculiar, black above and the abdomen chestnut.

The genera *Spizaëtus* and *Lophotriorchis* are not likely to be confounded with any other of the sub-family *Falconinæ*, except perhaps with the genus *Baza* of which there are 3 species, all crested like *Spizaëtus*, but they can be easily distinguished.

The *largest* species of the genus *Baza* is only about 18·5″ to 19″ (male).

The *smallest* species of the genus *Spizaëtus* is over 21″ (male).

The *Baza* in only feathered for half the length of tarsus.

Spizaëtus is feathered for whole length of tarsus except in *S. cirrhatus* where the feathering does not extend to division of toes, but length of *S. cirrhatus* is over 26 inches.

Lastly the *Baza* has the upper mandible toothed, and *Spizaëtus* has the upper mandible festooned.

I have already noted the points for identification between *Lophotriorchis* and *Spizaëtus*.

The latter genus comprises five species as follows :—

a. Feathering of tarsus does not extend to division of toes.

a' A distinct crest 4″ to 6″ long, always present... *S. cirrhatus.*
(The Crested Hawk-Eagle.)

b' No crest, or a rudimentary one..... *S. limnaëtus.*
(The Changeable Hawk-Eagle.)

b. Feathers extend on to basal portion of middle toe.

c' Large: wing 17″ to 18½″.

a'' White bands on abdominal feathers interrupted at shafts..... *S. nepalensis.*
(Hodgson's Hawk-Eagle.)

b'' White bands go completely across abdominal feathers..... *S. kelaarti.*
(Legg's Hawk-Eagle.)

d' Small: wing about 9½" ..... *S. albiniger.*
(Blyth's Hawk-Eagle.)

This brings us on to the Serpent and Fish-Eagles which I have not included here as they might prove confusing. The above mentioned only contain the species which have their tarsi feathered and form the true Eagles and the Hawk-Eagles, whereas none of the Serpent or Fish-Eagles have their tarsi feathered or only partially so.

Blanford, on p. 342, gives the following distinctions between the true Eagles and the Hawk-Eagles :—

"They (Hawk-Eagles) are birds of more slender build, with smaller bills "longer and more slender tarsi, and longer tail than the true Eagles and most "of them are in some phase of plumage, partly or wholly white beneath."

C. H. DONALD.

BHADARWA,
KASHMIR STATE. *August* 1902.

No. V.—NOTE ON THE OCCURRENCE OF CERTAIN BIRDS IN SOUTH SYLHET.

The following notes may possibly be of interest as showing one or two species of birds that do not commonly occur to my knowledge in the plains of Cachar though the two districts more or less adjoin.

Coracias indica is common here though I do not think met with in Cachar unless I am mistaken. Mr. Baker does not mention it in his "Birds of N. Cachar" and personally I never came across it.

Halcyon pileata is I now find to be met with in *small* numbers here; I have collected one specimen and come across four or five others, one of which my collector fired at but unfortunately failed to bag it. I think it may breed here.

Caprimulgus monticola has been much in evidence during the past two months, March and April, breeding plentifully on the grassy and stony tilahs round the garden. It seems a fairly quiet bird at other times of the year but while breeding its peculiar plaintive cry is heard from dusk till nightfall and is again renewed from about 4 a.m. until very nearly sunrise. *C. albonotatus* on the other hand utters its monotonous notes of "chuck chak chuck" almost the whole night, at this time of the year, a most irritating sound if several birds take up their quarters near one's bungalow.

Cinnyris hasselti I do not think can at all commonly breed in the plains portion of the district as I now find that *very few* are seen after the middle of

January, though from October to about then it is exceedingly plentiful. *C. asiatica* a bird not met with in Cachar (?) however must breed here, for though like the last it is most common in the cold weather it is still to be met with in small numbers throughout the year.

A. M. PRIMROSE.

REWA TEA ESTATE,
CHANDPUR BAGAR,
S. SYLHET, 3*rd May* 1902.

No. VI.—*EUTHALIA LEPIDEA* IN WESTERN KUMAON.

Though more or less common in Burma and Assam, Sikkim has generally been considered to be the most westerly limit of *E. leptdea*, and it may therefore interest the entomological members of the Society to learn of the capture of a specimen of this butterfly as far west as Kumaon. A male was taken by me on the 19th of this month (April 1902) at Ranibagh (1,000-2,000 ft.) on the road from Kathgodam to Naini Tal, up a heavily wooded nullah with running water. I had seen one a day or two previously in the same spot without being able to get near it, but was more fortunate on presumably the same one appearing a second time. Judging from its very fine, fresh condition, it could not have been long out of the pupa, and it is not improbable was bred in the vicinity ; but I saw no others. Two gentlemen who have collected round Ranibagh for years, to whom I showed my specimen, told me they had never seen or heard of them before in the district, so its occurrence must be rare.

The Kumaon specimen shows no variation from other Burma specimens in my possession.

G. W. V. de RHÉ-PHILIPE.

LUCKNOW, 27*th April* 1902.

No. VII.—A MAN-EATING PANTHER.

(*With a Plate.*)

The following are a few notes with reference to a man-eating panther—known to have killed over 20 people in rapid succession and all within a radius of 15 miles of Gunsore village in the Seoni District.

It was not long after my arrival at Gunsore that I came to hear of the panther, so I made it my first opportunity to try and bag him, knowing he was such a source of danger to the surrounding inhabitants.

A kill was reported to me as having taken place on the 23rd of March, *i. e.*, four days before my arrival. On April the 10th another kill was reported. On hearing of this I went out to ascertain as to whether it was true and found the body in a mangled condition with one arm torn right-off. The body was lying in a nullah within 200 yards of a village (Balwara). The villagers stated that the animal must have visited them about twelve at night and dragged away the body from just outside a house and it seems there

were four people sleeping outside this house, but that none of them heard the slightest sound. I made arrangements for sitting up that night (*i.e.*, the night after the kill took place). The animal put in his first appearance about 9 p.m., again at 11 p.m., and for the last time at one o'clock. During each of these visits I thought it advisable not to shoot as I could see nothing of the animal owing to darkness, although I could distinctly hear him at the body.

On April the 21st I again heard of a kill (Somnapur village). This time the beast had actually gone into a house and dragged away the body to one side of a village only 100 feet from one of the houses and on an open plain. There were two children asleep in the house where the body was taken from but they were not disturbed.

In order not to be disappointed a second time owing to darkness, I thought it best to try a hurricane lamp which I fastened to a pole about 5 feet off the ground and about 20 feet off the body and I took the precaution to cover up part of the globe of the lamp with a dark cloth so as to allow a dark side for the animal to approach from. At 11 p.m. I noticed the animal having a quiet search round and as soon as he got down to the body I fired. The photograph reproduced shows exactly how I found the bodies, as I left a man all night to see that nobody should remove them until I came the following morning to take the picture. I might remark that the body was only mauled at the chest, neck and head, and that from these parts a good deal of flesh had been devoured.

The Government reward for the animal was Rs. 50.

W. A. CONDUITT.

SEONI DISTRICT, 21*st November* 1901.

No. VIII.—NOTES ON BIRDS NESTING IN THE SOUTHERN SHAN STATES OF BURMA.

(10.) PICA RUSTICA—The Magpie.

This Magpie is common in the valleys East of Taunggyi, keeping to the open cultivated land round villages and bazaars. On the 21st March, while on the way to Pang Long (4,000 feet) we saw a nest in a low tree by the side of the road. My companion at once got off his pony and started up the tree, from his language it appeared that the Magpies were not such fools as they had seemed as the tree trunk was covered with huge thorns. My friend, however, at length managed to get up, and brought down six eggs which were slightly incubated. The sight of the eggs awakened my old love of nesting and have the honour of being No. 1 in my present collection. The nests here seem much larger than those at home, probably owing to their being undisturbed and so enlarged from year to year, otherwise exactly the same. The eggs also seem larger in size 1·4″ to 1·47″ by 1·05″. Greenish-white, marked sparingly with sepia, and in fact more like the English Jackdaws.



Mintern Bros. Photo-engr. London.

A MAN-EATING PANTHER
AND ITS KILL.

(52.) PARADOXORNIS GUTTATICOLLIS—Austen's Crow-Tit.

On the 11th April I was lucky enough to get a nest of this bird at Taunggyi (5,000 feet). It was placed in a small sapling about 5 feet off the ground on the side of a hill. Nest very neatly made of dry blades of grass and leaves covered over with cob-webs, and lined with very fine grass, inside diameter about 2½ inches. Three eggs, slightly incubated, measuring ·75×·64, a dirty-white with small red spots chiefly at the big end. The bird shot and identified. The shell of the eggs is very thin and brittle as mentioned in Mr. Stuart Baker's account.

(64.) DRYONASTES CHINENSIS—The Black-throated Laughing-Thrush.

At Ganguoi (5,000 feet), on the 1st May, I found a nest of this bird placed in a small tree about 9 feet up. I was unable to shoot the bird as it sat for sometime on the edge of the nest just above my head and then got away. I had a good look at it, however, and noted its black throat and dark breast. The nest exactly like the next species; 3 eggs, measuring 1·04×·79, glossy white.

(67.) DRYONASTES SANNIO—The White-browed Laughing-Thrush.

Fairly common at Taunggyi (5,000 feet) breeding in April and May. Nest generally placed in small trees and bushes from 5 to 8 feet off the ground. The nest is an untidy one made of grass lined with leaf stems, inside diameter about 3½ inches. Eggs 3 or 4, pale-blue measuring about 1·0″×·79″ but vary a good bit in size.

(280.) MOLPASTES NIGRIPILEUS—The Tenasserim Red-vented Bulbul.

This is the common bulbul up here, in fact I have not found the Burmese one up here yet although it occurs, I believe, in some of the low valleys. It nests chiefly in April and May making a flimsy nest of leaves, grass, etc., lined with fine grass. I found one curious nest made of bits of the "Pioneer." Eggs generally 3, sometimes only 2. They vary a good deal in marking some being almost red in colour, others boldly spotted.

(281.) MOLPASTES ATRICAPPILLUS—The Chinese Red-vented Bulbul.

Mr. W. H. Craddock of the Forests kindly gave me the eggs of this bulbul with the following description:—"Nest very similar to that of the ordinary bulbul in construction, situated in a bush about 5 feet from the ground, and contained 2 fresh eggs. Thaton State at about 3,000 feet. Bird obtained. Date 7th May 1902." The eggs are very like those of the last species.

(287.) XANTHIXUS FLAVESCENS—Blyth's Bulbul.

I am also indebted to Mr. Craddock for the eggs of this bulbul which are not described in Blanford. "Nest similar in shape, size and materials to above. Found in a bush 3 feet above ground, on Byinkyi Tawng at 5,500 feet, 2 eggs more or less set. Bird shot." The eggs are ·9×·7 white, covered with reddish spots.

(333.) DICRURUS CINERACEUS—The Grey Drongo.

Taunggyi, 12th April 1902, nest and 4 set eggs, bird shot, nest on the end of a branch high up and consisting of a very neat saucer shape made of

lichens, leaves and cob-webs lined with fine grass. Eggs 4 in number, pinkish-white and boldly splashed with pale purple, and over which red spots chiefly at the larger end. Size ·97 to 1·0 × ·7 inches.

(474.) LANIUS COLLURIOIDES—The Burmese Shrike.

It is a wonder this bird's nest has not been described before as it is very common up here, especially during the breeding season which is from April to the beginning of June. All the young birds have left their nests now (23rd June) and everywhere one goes you are greeted with the angry chatter of the old birds. Whilst they had eggs in their nest they were very silent and generally kept out of sight. The nest is usually placed on the top of small saplings against the trunks of trees and between the forks of good sized branches at 5 to 12 feet from the ground. The nest is neatly made of leaves, lichen and feathers, etc., covered with cob-webs and lined with fine grass. The size of nest varies a good deal, if placed in between branches it is much smaller and matches the tree trunk, if concealed by leaves it is much larger. The eggs are very like the English Butcher-bird and vary in the same way, there being two more or less distinct types, one pinkish-white with brown and purple spots, the other greenish-white with sepia and ash coloured spots, a few have a dull yellow colour with spots the same as last. Size ·8 to ·86 × ·67 to ·66.

(546.) GRACULIPICA NIGRICOLLIS—The Black-necked Myna.

Makes a large conspicuous nest at the end of branches. Nest composed of straw, grass, feathers, etc., Eggs 4, pale-blue, measuring 1·35 × ·96. Breeding season April.

(553.) ÆTHIOPSAR GRANDIS—The Siamese Myna.

Builds in holes of trees making a rough nest of straw and feathers. Eggs generally 2, sometimes 3. Pale-blue, measuring 1·16 × ·85. Breeding season April and May.

(554.) ÆTHIOPSAR ALBICINCTUS—The Collared Myna.

Habits exactly the same as last, in fact the two very often build in company in holes in old trees. Eggs pale-blue, 4 in number, measuring 1·1 × ·8.

(615.) ORCICOLA FERREA—The Dark-grey Bush-Chat.

This chat breeds up in these hills. On the 15th May this year I found a nest, placed in a hole in the side of a cutting on the Government cart road at Ganguoi (5,500 feet). It was a very untidy nest made of old grass and roots containing 4 *pale-blue* eggs with very faint and few pale red spots. I saw the bird in the nest as I was riding along the road. I dismounted and shot it so there could have been no mistake. I found an exactly similar nest the next day in the same position, the eggs the same. Mr. Craddock of the forests gave me a clutch of eggs which he got while out, which are exactly the same as mine. Some of these eggs are spotless and remind one of Redstarts eggs at home. None of my eggs agree with the description given in Blanford (*Fauna of British India*, "Birds," Vol. II) which are *pale-green*, while mine are a decided *blue*. Size ·7 × ·54.

(679.) MERULA PROTOMOMELÆNA—The Black-busted Ouzel.

Two nests at Ganguoi (5,500 feet) on 15th May 1902, one with 3 eggs the other with 4, in both cases well incubated. Nest placed at the end of a branch about 12 feet off the ground and composed of moss and grass with plenty of mud, in fact the nests were very heavy for their size, lined with fine grass. Eggs greenish with brown spots and daubs, measuring 1·07 ×·8.

(975.) IYNGIPICUS CANICAPILLUS—The Burmese Pigmy Woodpecker.

On the 15th April 1902 my orderly brought me a fully fledged young one and one addled egg which he had found in a small hole in a tree. Egg measuring ·8×·64 inches.

(1104.) CUCULUS CANORUS—The Cuckoo.

I first heard this bird on the 6th of March. The majority have all gone now (I heard one calling this morning). I got 4 eggs this season and all found in the common Pied Bush Chats' nests, the eggs like those at home, white with pink spots.

H. H. HARINGTON, CAPT.

TAUNGGYI,
UPPER BURMA, *24th June* 1902.

No. IX.—FOOD OF THE KRAIT.

In Volume IX, page 499, I observe a note on this subject by Mr. W. H. Traill, and as such information is always of interest to some, I take the opportunity of adding my mite. On the 11th February while out with Major Davis not very far from this Station, he came on a *Bungarus fasciatus* in a "paddy" field, the fore half of the body was down a hole, so Major Davis put a charge of snipe shot into the exposed portion, which however did not kill him at once as he endeavoured to drag the damaged half down the hole. A Burman, however, immediately seized his tail and dragged him out when he promptly disgorged a snake, which proved to be a *Tropidonotus piscator*, evidently only recently swallowed. Length 30." The *B. fasciatus* (a beautiful specimen) measured 60".

The Burmese have some queer ideas about the *B. fasciatus*, some entertain the opinion that he is quite innocuous, others, that though poisonous his disposition is so mild that he can rarely be provoked to bite, while a few are disposed to think that it is not such a difficult matter to induce him to bite and, that if he does succeed in getting hold the results are generally fatal.

GEO. H. EVANS,
VETY. MAJOR.

RANGOON, 1*st April* 1902.

No. X.—NOTES ON THE OCCURRENCE OF CERTAIN BIRDS IN THE SOUTHERN SHAN STATES OF BURMA.

We wish to record the occurrence in Burma of the following birds which, as far as we can ascertain, have not hitherto been recorded from this Province :—

1. *Ixulus flavicollis*—Yellow-naped Ixulus.—Nine specimens shot on Loi Pang-nau 7,000′ to 8,000′ near the Mekong river.

2. *Sitta himalayensis*—White-tailed Nuthatch.—Only procured once on Loi Hsam-hsum-Salween-Mekong water-shed bordering on Siam, at 7,500′.

3. *Sitta formosa*—Beautiful Nuthatch.—One specimen shot on Salween-Mekong water-shed at 7,000′.

The above three species, strange to say, have not yet been obtained on any of the other high ranges of Burma.

4. *Syrnium nivicola*—Himalayan Wood Owl.—One bird procured on "Crag" Taunggyi at 5,500′, another seen at the same time.

5. *Aquila heliaca*—Imperial Eagle.—One bird in the young phase of plumage shot at Wanhat (Mawkmai State) at 1,200′.

6. *Alsocomus pulchricollis*—Ashy Wood-Pigeon.—A single specimen obtained on Loi Maw at 7,200′. This forms the connecting link in the distribution of this species from Assam to the Island of Formosa.

The undermentioned birds have been forwarded to Colonel Bingham for identification :—

7. *Suthora.*—An apparently undescribed species shot at 8,300′ on Loi Pang-nau.

8. *Scæorhynchus.*—A diminutive species undescribed in Vol. I, *Fauna of British India*, "Birds." Shot at 2,500′ at the head-waters of the Sittang river.

9. *Urocichla.*—A species quite distinct from the two described in Vol. I, *Fauna of British India*, Birds. Obtained on Loi Pang-nau at 8,300′.

10. } Two species of *Cyornis*, one of which is a very beautiful bird.
11. }

12. *Stictospiza formosa.*—Identification doubtful.

13. *Stachyrhis.*—A species resembling *S. nigriceps.* Shot at the head-waters of the Sittang at 1,000′.

14. *Accipiter.*—A species related to *A. virgatus.* Shot at 7,000′ on the Mènè-taung.

TAUNGGYI,
SOUTHERN SHAN STATES,
BURMA, 15*th June* 1902.

H. N. THOMPSON, F.Z.S.
W. H. CRADDOCK.

No. XI.—SWORD-FISH STRIKING A SHIP.

I am sending you the sword of some sea monster which I am unable to identify, its history may prove interesting enough to find it a place in your museum, and it is as follows :—

Last February an Arab buggalow belonging to Muscat was on its way there from Cutch. A few days out it struck something on the port bow which the

Nakodar thought was a rock. The craft was shaken up from stem to stern and after a few seconds those on board heard a loud report and she was free again.

She was making some water in the bows and the cargo lying there was shifted when this object was found sticking through the planks and firmly fixed, the leak was closed up and the buggalow reached Muscat safely. There I examined her and the owner presented me with the sword. It evidently belongs to some huge fish which after striking the buggalow and piercing a teak plank some five inches thick managed to free itself at the expense of its weapon.

Its structure seems to be of bone and it is covered with minute denticles many of which have been scraped off.

F. A. SMITH, CAPT., M.D., I.M.S.

ULWAR, RAJPUTANA, *June*, 1902.

[The sword appears to have belonged to a large specimen of the *Histiophorus* family and measures :—

Total length	24½ inches
Length from end of sword	22¼ „
Circumference at base	9 „
Circumference, 12 inches from the tip	6 „

The total length given above includes 2¼ inches of the bone of the upper jaw.

W. S. MILLARD, *Honorary Secretary,*
Bombay Natural History Society.]

No. XII.—NOTES ON BIRDS NEAR QUETTA.

Corvus corax—The Raven.—Very common about cantonments all the year. Breeds in the hills near. One nest, 6 eggs fresh, March 24th. Many other nests inaccessible. This is the small race.

Corvus frugilegus—The Rook.—I have only seen one small flock near Quetta, feeding in the plough fields in January.

Pica rustica—The Magpie.—Very common at Ziarat about 8,000 feet, 60 miles N.-E. breeds : one nest, 3 fresh eggs, May 15th. In winter a fair number come to the hills near Quetta about 6,000 feet, but I have not seen them in cantonments.

Graculus eremita—Red-billed Chough.—Very common in the cold weather all round Quetta. Saw a few near Ziarat in May.

Parus atriceps—Indian Grey Tit—Small flocks about cantonments in cold weather : in Ziarat in May.

Ægithaliscus erythrocephalus—Red-headed Tit.—Saw a pair at Ziarat in May probably breeding.

Lophophanes rufinuchalis—Simla Black Tit.—A few at Ziarat in May. This bird was identified from Jerdon, but I think it is correct.

Trochalopterum lineatum—Himalayan Streaked Laughing Thrush.—Fairly common in the hills above Harnai at about 4,000 feet in February.

Myiophoneus temmincki—Himalayan Whistling Thrush.—Shot one on rocky stream on the way to Ziarat at about 7,000 feet in May.

Molpastes leucotis—The White-eared Bulbul.

I do not know whether this bird stays the summer or not ; the only ones I have seen have been in March and April, scarce.

Sitta tephronota—Eastern Rock Nuthatch.—This bird is common in the hills, and breeds. I have found a good many nests, but never yet chanced on an egg.

Tichodroma muraria—The Wall-Creeper.—I have seen 1 or 2 specimens near Quetta in the hills in winter, and one near Sibi at about 1,000 feet.

Hypolais rama—Syke's Tree-Warbler.—This bird visits Quetta in the spring, and breeds, making a small cup-shaped nest in a low bush. The nests I have found have been about the middle of May.

Sylvia jerdoni—Eastern Orphean Warbler.—Common in the hills in April, May, probably on migration.

Sylvia althæa—Hume's Lesser White-throated Warbler.—I am not sure of this bird, as I had only Jerdon's book with me when I shot it. It was fairly common round Ziarat about 8,000 feet in May.

Sylvia minuscula—Small White-throated Warbler.—Small flocks on migration in April.

Phylloscopus tristi—Brown Willow-Warbler.—I shot one out of a small flock in my garden in February.

Lanius lahtora—Indian Grey Shrike.—I shot one near Quetta on April 1st, the only one I have ever seen here.

Lanius vittatus—Bay-backed Shrike.—Not very common, arrives in April, One nest, three fresh eggs, May 24th.

Lanius erythronotus—Rufous-backed Shrike.—This is very common in the summer, and breeds freely. Starts to lay about the first week in May.

Lanius isabellinus—Pale-brown Shrike.—Appears about middle of March, but does not stay as a rule. I found one nest in a low bush in the hills about 7,000 feet, with 3 eggs hard set, on June 1st.

Lanius cristatus—Brown Shrike.—I shot one, the only one I have seen here near Quetta in April.

Pastor roseus—Rose-coloured Starling.—I have only seen a few of these in Quetta, all in April and May. They were very common in Chaman at the end of April.

Sturnus humii—Himalayan Starling.—Rare. I have only shot one or two specimens in March and April.

Acridotheres tristis—Common Myna.—This bird is not common. A few scattered individuals seem to come here chiefly in March and April.

Muscicapa grisola—Spotted Flycatcher.—This bird is common about September on migration ; I have not noticed it at other times. Common at about 9,000 feet in May.

Siphia parva—European Red-breasted Flycatcher.—Arrives in the beginning of April and stays about a month. During April is common.

Pratincola caprata—Common Pied Bush-Chat.—Arrives at the beginning of April, leaves in October. Very common; breeds.

Pratincola maura—Indian Bush-Chat.—On migration in April,not common.

Saxicola picata—Pied Chat.—Very common, arrives March, leaves September, October. Breeds. Nests April 30th, 4 fresh eggs. May 14th, 4 young May 18th, young. All nests in holes among rocks.

Saxicola capistrata—White-headed Chat.—Shot one at the foot of the hills near Sibi in February.

Saxicola barnesi—Barnes's Chat.—Fairly common near Quetta in the cold weather. I have shot and examined two of these birds, but they do not seem to quite agree with the description in Volume II, Birds, *Fauna of British India*, the colour on the chin and throat is connected with the axillaries, and there is no band of white between, the breast being also black. *S. finschi* I do not know as there is no description of this bird in the book.

Saxicola isabellina.—Isabelline Chat.—Very common in the hot weather, arriving about middle of March. Breeds. I have found two or three nests all with young about April 20th. They were placed at the end of a hole in the ground about 2 feet in or more.

Saxicola deserti—Desert Chat.—Not uncommon in March and April. I do not know whether this bird remains to breed or not, but I think not.

Ruticilla erythronota—Eversmann's Redstart.—This redstart is common about Quetta in the cold weather, leaves about March.

Ruticilla rufiventris—Indian Redstart.—Common in the cold weather, stays later than the foregoing, in fact it may possibly breed in the hills, as I have shot one about 8,000 feet in June.

Cyanecula suecica—Indian Blue-throat.—Common on migration in March and April, in suitable places, none later.

Merula atrigularis—Black-throated Ouzel.—This black-throated ouzel is very common in Quetta in the cold weather, both in Cantonments and in the hills: it leaves about middle of April.

Petrophila cyanus—Western Blue Rock-Thrush.—This thrush is not uncommon in the hills round Quetta in the summer: it does not come into Cantonments : arrives about end of March and breeds. I have found one nest in a cave in the hills with 4 fresh eggs in April ; I have also seen young birds.

Monticola saxatilis—The Rock-Thrush.—I have shot two specimens of this bird near Quetta, one a female in January, and one male in good plumage on the 25th April. These are the only ones I have seen.

Turdus viscivorus—The Missel-Thrush.—Very common in the hills round Quetta in the cold weather. I saw a fair number at Ziarat in May at about 9,000 feet so it may breed.

Tharrhaleus atrigularis—Black-throated Accentor.—I shot one out of a small flock near Quetta in January, I do not think it is common here.

Coccothraustes humii—Hume's Hawfinch.—This, I think, must be the hawfinch that frequents these parts. It is more or less resident, but is commoner a good deal in summer than winter. I believe it breeds here, as I have seen young birds that had been taken from the nest: it has a very pleasant song.

Pycnorhampus carneipes—White-winged Grosbeak.—A fair number in the hills in the cold weather near Quetta. Very common at Ziarat in May, feeding in flocks on the juniper berries.

Propasser grandis—Red-mantled Rose-finch.—I shot one at Ziarat in May about 9,000 feet, and saw others.

Carpodacus erythrinus—Common Rose-finch.—Common at Ziarat in May. Generally to be seen in small parties at certain places in the hills near Quetta in April.

Carduelis caniceps—Himalayan Gold-finch.—I do not think that this bird is common near Quetta. I saw one that was caught out of a small flock in January, and also a pair in the hills in April.

Metoponia pusilla—Gold-fronted Finch.—This bird is common in places in the hills near Quetta. I have seen flocks of them in September, also in April, probably migrating.

Passer domesticus—House Sparrow.—Very common in summer. Arrives about middle of April, breeds: leaves entirely in the cold weather.

Passer montanus—Tree Sparrow.—Very common, resident throughout the year, breeds about April, and onwards.

Emberiza leucocephala—Pine-Bunting.—Common in large flocks round Quetta in December and January and part of February.

Emberiza stewarti—White-capped Bunting.—This bunting is common in the hills in summer, arriving in about end of April. I have no doubt that it breeds, as I have often seen them in pairs in June, but I have not found the nest.

Emberiza buchanani—Grey-necked Bunting.—Common in the hills in April. I have not seen them earlier than end of March, or later than May.

Emberiza luteola—Red-headed Bunting.—I have not seen these birds nearer Quetta than Kalat, which is about 40 miles N.-E., about 7,000 feet. There were a few there in May, one pair I think were breeding on May 30th, but I had no time to look for the nest.

Emberiza striolata—Striolated Bunting.—Not rare in the summer in the hills, probably breeds as I have seen them about at the end of June.

Chelidon urbica—The Martin.—There are always some of these birds about in May, but I am not sure whether they are *C. urbica* or *C. Kashmi-*

riensis. I shot one, which I identified as *C. urbica*, of the following dimensions. Length 5⅞", wing 4½", tail 2⅜".

Ptyonoprogne rupestris—Crag-Martin.—This is a common bird in the hills near Quetta. I have found 2 or 3 nests, all saucer-shaped, attached usually to the roof of a cave, consequently hard to get at. June 1st, young nearly fledged. May 27th, 4 young unfledged.

Hirundo rustica—The Swallow.—Very common in summer, arriving about 3rd week in February. Breeds in April and May.

Hirundo nepalensis—Hodgson's Striated Swallow.—Fairly numerous round Quetta in summer, arriving about end of March. I have only found one nest which we placed in a culvert running under the railway, and was not quite finished at the end of April.

Motacilla alba—White Wagtail.—This bird is common in the cold weather, disappears about the beginning of May. This identification, I am not sure about, as I only had Jerdon's book, when I shot the bird, and thought then it was *M. dukhunensis*, which now apparently becomes *M. personata*.

Motacilla melanope—Grey Wagtail.—There were a few of these birds at Kalat about 7,000 feet in May, but I have not seen any elsewhere near Quetta.

Motacilla borealis—Grey-headed Wagtail.—Saw a few near Quetta in April, apparently on migration.

Motacilla feldeggi—Black-headed Wagtail.—On migration in April, fairly common.

Motacilla citreola or *citreoloides*—Yellow-headed Wagtail.—Every year on migration in April.

Anthus trivialis—The Tree-Pipit.—Not uncommon near Quetta in the cold weather.

Anthus similis—The Brown Rock-Pipit.—Arrives in Quetta about the end of March. Breeds in the hills. One nest with 3 fledged young, on May 11th.

Anthus campestris—Tawny Pipit.—Fairly numerous about the fields in the cold weather.

Alauda arvensis—Sky-lark.—Very common in flocks round Quetta in the cold weather. A certain number remain through the summer, and I have no doubt breeds, though I have not found the nest.

Calandrella brachydactyla—Short-toed Lark.—Very common all round Quetta in the cold weather up to the beginning of May. I am not sure whether any stay later.

Galerita cristata—Crested Lark.—Very common and resident. Breed about April and May.

Ammomanes phœnicuroides—The Desert Finch-Lark.—Common in the low hills round Quetta in September, October, seems to get rarer later, but I have seen a few in March.

Pyrrhocorax alpinus—Yellow-billed Chough.—I am pretty certain I saw small numbers of these birds at about 10,000 feet this May. I observed with

glasses, but as I was after markhor, I was unable to shoot one for identification. The natives here say there are two sorts of Choughs, one with a long red bill, and the other with a short white one.

Terpsiphone paradisi—Indian Paradise Flycatcher.—I shot one of these birds about 5 miles from Quetta, at the beginning of May, a male in the 3rd year plumage.

Saxicola monacha—The Hooded Chat.—I saw a bird, which I believe to be a male of this species, at about 10,000 feet in May. I observed it carefully with a glass, at about 20 yards distance for some time, but I had no gun to shoot him. This is the only one I have seen.

Ruticilla rufiventris—Indian Redstart—I found a nest of this redstart in the hills, this May: as there seems no description of the nest in *Fauna of British India*, Birds, I will describe it. It was placed on a ledge of rock in a small cave about 5 feet from the ground, and was composed outside of strips of the juniper tree bark, lined with finer strips of the same and a few feathers; it contained 4 eggs, slightly incubated, on May 13th, rather long ovals, very pale blue. This nest was at about 9,000 feet. I have no doubt there were many other nests on the same hills, as the bird was common in pairs, right up to the top of the hill, over 11,000 feet.

Lanius isabellinus—Pale-brown Shrike.—I also found a nest of this bird on May 14th this year at about 9,000 feet. It was placed in the middle of a small thorny bush and contained 5 eggs of the usual shrike type. The bird was common all over the hills about this elevation.

T. E. MARSHALL, Capt., R.A.

QUETTA, *May* 1902.

No. XIII.—*EURYALE FEROX* (*NYMPHŒACEŒ*).

I see on page 356 of the last Journal of the Society, a note on *Euryale ferox* (*Nymphæaceæ*). This plant grows freely and most luxuriously in the Chatla Fen, Cachar. I have seen many specimens of it in the neighbourhood of Borakhai and Trangmara and many of the leaves are more than two feet in diameter. In places it forms such an obstruction that it is difficult to force small boats through it.

F. J. EDE.

SILCHAR, CACHAR, *June 16th*, 1902.

No. XIV.—THE PAINTED SAND-GROUSE (*PTEROCLES FASCIATUS*) AND THE WOOD-SNIPE (*GALLINAGO NEMORICOLA*) IN THE PESHAWAR VALLEY.

I am sending herewith a very delapidated skin of *P. fasciatus*, merely for purposes of identification and to prove that it is found in the Trans-Indus portion of the Punjab. *P. fasciatus* has been shot almost every year since 1895 at Rustom some twenty miles from here in the Buner foot hills by officers of the Guides.

According to Blanford—*Fauna of British India*, Birds, Vol. IV., *P. fasciatus*, "does not occur west of the Indus." When Vol. IV. was published I wrote to Professor Blanford and told him of the Trans-Indus occurrence of this sandgrouse. In his reply he suggested that the bird might be *P. lichtensteini*. Since then I have been away from Mardan and have had no chance of securing a specimen of *fasciatus* until this year. In December a flock was put up by a party from the corps shooting near Rustom and one bird was killed by a Native Officer out with us. It was badly shot and got damaged in the game bag, so it was not possible to do more than roughly skin it for identification. Painted sandgrouse 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 the numbers vary, some years there being many more than others.

Another bird not apparently recorded West of the Indus, *Gallinago nemoricola*, was shot by me near this place in 1887. It may be thought that it was *G. solitaria* and not *nemoricola* as the former is more likely to occur in this part of the country. I have, however, shot at least twenty solitary snipe in Kashmir and therefore know *solitaria* well. I carefully identified the bird both from Jerdon and Hume and Marshall and there was not the slightest doubt as to its being a specimen of *G. nemoricola*.

F. J. H. BARTON, MAJOR,
The Guides.

MARDAN,
2nd February 1902.

No. XV.—OCCURRENCE OF THE CHESTNUT-HEADED SHORT-WING (*OLIGURA CASTANEICORONATA*) AND NESTING OF THE BLACK-CHINNED YUHINA (*YUHINA NIGRIMENTUM*) IN KUMAON.

I am sending you a specimen of the Chestnut-headed Short-wing (*Oligura castaneicoronata*, Oates) which may be interesting as Oates gives its distribution as Nepal, Sikkim and the Khasi Hills. This one I shot *here* (Kumaon) at an elevation of 4,000 feet out of a party of four, they did not appear to be breeding. They are remarkably wren-like in their movements which first attracted my attention. I am afraid the specimen is rather badly prepared.

I also send you a Black-chinned Yuhina (*Yuhina nigrimentum*), shot off its nest. The nest was placed under an overhanging bank and slung among a lot of fine roots from which the earth had fallen away, an ordinary open nest made of moss and a very little cobweb externally and lined entirely with very fine hair-like fern root. The eggs (3) were not white as given in Oates but greenish-white spotted with brown, mostly at the larger end. I cannot find any other record of this bird's eggs.

S. L. WHYMPER.

JEOLIKOTE, N.-W. P.,
April, 1902.

No. XVI.—"INDIAN HOBBY" (?) AND "BULBUL."

While on a visit to Pundaluóya (elevation 4,000 feet) in April last, I witnessed the attack of a small black hawk, which I believe to have been the "Indian Hobby" (*Falco severus*), upon a common "Bulbul" (Pycnonotus hæmorrhous). From a back view, the hawk appeared to be quite black. It pounced upon the Bulbul and bore it to the ground, seeming to have some difficulty in killing it, for the cries of the victim continued for some 3 or 4 minutes. On my nearer approach, the hawk picked up its prey in its claws and carried it out of sight. As they were flying off I had a good view of the hawk and its prey. The former looked scarcely larger than the dead bird in its claws.

The "Indian Hobby" is considered a very rare bird in Ceylon. I believe that less than half a dozen specimens have been actually recorded from this Island. But it seems possible that the small size and dark colouration of the bird may have led to its having been mistaken for the Ceylonese black-bird (*Turdus kinnisi*). Stories have been told me by planters, on more than one occasion, of one "black-bird" having been seen to attack, kill and carry off another "black-bird". It is probable that the aggressor in each of these cases may have been *Falco severus*.

In Blanford's account of this hawk (*Fauna of British India*, Birds, Vol. III) it is suggested that the species is crepuscular and that it feeds principally upon insects. The incident noted above occurred at about 3 p.m., and (if my identification of the bird was correct) indicates that the "Indian Hobby" will attack larger game than insects.

E. ERNEST GREEN.

PERADENIYA, CEYLON,
15th May 1902.

[*Note.*—It is somewhat difficult to understand how any one having a good view of the bird could describe *Falco severus* as appearing scarcely larger than a Bulbul; nor would the slaty grey of its back be likely to appear quite black. May not the bird have been one of the species of those beautiful little miniatures of the family—the Falconets, *Microhierax*? They certainly, it is true, have never been recorded from Ceylon, though it is quite possible they may have been overlooked, but they so exactly fit Mr. Green's description that I venture the suggestion. The black of their back and wings is unmistakeable, while their small size of but 6 or 7 inches in length is no more than that of a Bulbul, though they would certainly appear larger, as there is of them more bird and less tail.

E. COMBER,
Hony. Secretary, Bird Section,
Bombay Natural History Society.

No. XVII.—THE CAMEL BOT FLY.

I am sending you a small box to illustrate the larval, pupal, and imago stages of the Camel Bot or Nostril Fly (*Cephalomyia maculata*), *vide* Lt.-Col. Yerbury's note on page 684 of Vol. XIII of the Society's Journal. I found no difficulty in obtaining larvæ of this insect from the camelmen at Deesa. When full fed, and ready to pupate, the larva is thrown out by the camel sneezing, as stated by Col. Yerbury. This occurs usually in February, or March, I think, as at this time of year I found them easiest to obtain. The imago appeared in about ten days or a fortnight from the time of pupation, but in confinement a considerable proportion failed to appear in the imago stage, as they appeared to dry up. The specimen of the imago now sent was not bred, but was taken by me when sitting on a small shrub near Quetta, by the side of a path frequented by camels. It was the only specimen of the imago I have ever seen or taken except by breeding, though I have lived for years where camels are abundant, and am constantly on the look out for insects of all kinds.

While on this subject I may mention that I obtained when at Deesa, through the courtesy of Major A. L. Gordon, 2nd Bombay Lancers, several ova, about a dozen half-grown larvæ, and two full-fed larvæ of a horse bot fly, presumably all of the same species as those previously obtained, as one of the latter, on emerging, proved to be *Gastrophilus pecorum*. I was however away from Deesa at the time it emerged, and by the time I returned it had damaged itself irretrievably as a specimen, and was dead in the box. The half-grown larvæ, which when alive, have a curious disagreeable smell, were obtained from a horse which died, on its interior economy being subjected to *post-mortem* examination. They, however, in the absence of their usual nutriment, died.

C. G. NURSE, Major,
13th Bombay Infantry.

Quetta, *June*, 1902.

No. XVIII.—NIDIFICATION OF OGLE'S LAUGHING-THRUSH (*DRYONASTES NUCHALIS.*)

This bird is fairly common here but until last week I have been unable to get its nest. As might be expected both the latter, and eggs resemble those of *D. ruficollis*. There were three eggs much incubated in the nest. I measured them as follows :—1·12″×·8″, 1·13″×·79″, 1·13″×·8″. They are of a rather brighter blue than those of *D. ruficollis* but as far as I can see precisely similar in gloss and texture. This bird is said by the Nagas to also lay pure white eggs thus resembling *Garrulax gularis*, but this I cannot confirm as yet.

H. N. COLTART.

Margherita,
Upper Assam, *May 6th*, 1902.

No. XIX.—NOTE ON A SPECIES OF *GORDIUS* PARASITIC IN THE BODY OF A MANTIS.

In the Journal of the Ceylon Branch of the Royal Asiatic Society (No. 47, Vol. XIV., 1896), Mr. Oliver Collett has recorded the occurrence of a Nematoid Worm in the body of a Mantis. The worm in question was of an opaque milky white colour and measured 27½ inches in length with a diameter of $\frac{1}{50}$th of an inch. I have just observed a second instance of the same kind. A live Mantis was brought to me, enclosed in a paper envelope. On opening the packet I found that a *Gordius* had emerged from the still living insect. The Mantis (one of the common green kind) has a total body length of 3 inches, its abdomen being 1¾ inches long by ⅜ inch broad. The worm measures 13¼ inches in length, and is about $\frac{1}{75}$th of an inch thick. It is of a blackish brown colour. The body tapers to a fine point at the posterior extremity. It also tapers anteriorly; but has a small bulbous extremity in which is a simple pore-like aperture. The surface of the body is coarsely granular.

Gordius belongs to the sub-order *Nematomorpha* of the *Nemathelminthine* worms. There are two genera only: *Gordius*, confined to fresh water; and *Nectonema*, a solely marine form. The form of the posterior extremity shows the present example to be a female, though its dark colour is usually an indication of the male sex. The eggs of *Gordius* are deposited in water and the larval stage is passed in the bodies of aquatic insects. The Mantis doubtless acquires the parasite through eating some insect that has passed its early stages in water—such as a Caddis Fly, Perla, or May Fly. The average length of species of *Gordius* is stated to be 170 mm. My specimen (13¼ inches) equals about 330 mm.; while that found by Mr. Collett attained the gigantic length of 687 mm.

After reaching the adult state, the worm leaves the body of its host and presumably seeks the water to meet the male and deposit its eggs. Though some species of *Gordius* are said to withstand dessication, my example failed to revive when placed in water.

E. ERNEST GREEN,
Government Entomologist.

ROYAL BOTANIC GARDENS,
PERADENIYA, CEYLON,
20th May, 1902.

No. XX.—ROBIN LAYING IN BABBLER'S NEST.

I send for the Society's Museum if you think it worth preserving, the nest eggs and parent bird of *Thamnobia cambaiensis*. The curious part is that the nest belongs to the Jungle Bush Babbler (*Argya caudata*) and was evidently taken possession of by the present bird. The nest was placed in a small thorny (I think, Kurunda) bush in scrub jungle and contained two eggs which were not those of *A. caudata*, but for two days I could not catch the

bird that laid the eggs till late one evening I disturbed her off the nest and shot her. There were then three eggs.

I was not aware that this Robin ever took possession of other bird's nests. I have found numerous nests of this species but invariably built by the bird itself and placed either in holes, in banks, stumps or under the shelter of rocks, but never in the middle of a bush as this was.

I send these few notes in the hope they may interest some of the members.

F. FIELD.

GAYA, BEHAR, *May* 1902.

No. XXI.—BAT SEIZING A SHUTTLE-COCK.

I do not know whether the following occurrence is a rare one, and worth recording :—

As a party were playing at Badminton here yesterday, a bat (size about 6" to 8" across the wings) flew about following the shuttle-cock and finally seized it and bore it off just as a lady was about to strike it. We watched the bat for a short time, and expected to see it drop the shuttle-cock on finding it was not living and unedible, but it did not.

Possibly the feathers of the shuttle-cock got entangled in the animal's claws and so it could not drop it. In the evening the bats here very often hover about while a game of Badminton is going on but I have never known one seize a shuttle-cock or even strike it before.

G. E. COLES.

NARORA, *via* RAJGHAT, 25*th May* 1902.

No. XXII.—ARTIFICES PRACTISED BY BULBULS.

Referring to Mr. Aitken' note on this subject on page 162 of this volume, the following extract from my notes, dated Bushire, 5th May 1897, may be of interest :—

"NOTE ON *OTOCOMPSA LEUCOTIS*."

"On the evening of the 5th May, I was standing near a Dodonea bush about 8 to 9 feet high in the Telegraph garden, watching the different birds having their last search for food before retiring to roost for the night : when a Bulbul (*Otocompsa leucotis*) flew to the ground in front of me, about ten paces away ; it appeared hurt in one wing and unable to fly. I was about to move forward to see what was wrong with the bird, but at the moment it occurred to me, this was a common trick with Plovers to allure one away from the vicinity of their nests, but never having seen a Bulbul act in this way before, I watched the bird and as it flew with apparent difficulty on to a raised watercourse and then to the lower branches of an Oleander bush, I felt convinced the bird must really be hurt, and was about to try and capture it, when it uttered a low soft note, yet a note that could be distinctly heard

above the other noises in the garden, and which could fairly well be presented by trying to whistle the word 'you.' There was a certain amount of anxiety in the note and at once I understood it to be a warning note to its mate somewhere close at hand, and on looking up into the bush near which I stood within three feet of my head was a nest. I immediately moved away and relieved the bird of its anxiety. Visited the spot again on the 7th, one of the parent birds flew off the nest at my approach; on examining it I found it contained four eggs, which I left for the birds to hatch out."

W. D. CUMMING.

OMARA, *March* 1902.

No. XXIII.—CROW AND KOEL'S EGG.

The following account of the behaviour of a common crow may be worth recording in our Journal:—

Yesterday evening, as I was standing in the verandah, I saw a crow swoop down on to a croton pot with a green fruit-like object in his beak. This he deposited on the earth in the pot, and sat on the further edge thereof regarding it. Suspecting that he or she might be a bird of cannibal proclivities, I walked up to the croton pot and drove the bird off. I then picked up the object which the bird had deposited and found it to be a very deep sea-green coloured egg of the Indian Koel (*Eudynamis honorata*). The following thoughts at once suggested themselves to me:—Was the crow the part-owner of the nest in which the koel's egg was laid; and if so, how did he or she discern the koel's egg from amongst the other crow's eggs in the nest, or was this bird merely preying on any eggs it found in other crow's nests? I think the last of these is the most likely. The egg was absolutely uninjured, and from its weight appears to be hard set (I have not yet attempted to blow it), and was equally carefully placed by the crow on the soil in the croton pot as it had been carried there *en route* from the nest. Doubtless the crow was about to eat the egg till my curiosity led me to see what the "green fruit" was.

C. D. LESTER, CAPT.

POONA, 28*th June* 1902.

No. XXIV.—NOTE ON A FLYING-SQUIRREL (*PTEROMYS ORAL*) FOUND IN THE THANA DISTRICT (BOMBAY).

The animal was found on a tree in rather open country at Vehegaon in the Khardi Forest Range, Shahpur Taluka, on the 14th April last.

It is said to be very rare in the Thana District.

G. M. RYAN, I.F.S., F.L.S.

BANDRA, 3*rd July* 1902.

No. XXV.—ON METHODS USED TO PRESERVE COLOUR IN RELAXING ENTOMOLOGICAL SPECIMENS.

By Colonel J. G. Pilcher, F.R.C.S.

Like most of my fellow-workers in Entomology, my attention was early called to the invariably altered colour of nearly all the blue and green moths submitted to moisture in the relaxing-box; no specimen wholly retained its primitive colour, but became more or less yellowed in the process of relaxing.

The only exception to this rule were the fresh specimens which it has been my custom to put into a moist atmosphere until the *rigor mortis* had passed, when they were entirely freed from all rigidity, and yielded therefore more readily to the touch of the needle than if they had been pinned and allowed to partially dry before they are mounted. In passing I would note the very great help this method has afforded in dealing with all fresh forms, but especially with the small muscular Noctuidæ. In fresh specimens discoloration was not so frequent, though it occasionally did take place in fresh specimens submitted to a moist atmosphere for only a few hours.

The thought occurred to me in 1889 that the cause of discoloration was in free ammonia, due to the decomposition which must be presumed to begin in the killing-bottle, and is renewed with greater energy when many dried specimens are put into the relaxing-box at one time. And even before the alkali has tainted the atmosphere of the relaxing-box it would have been conducted to all parts of the specimen by its nervures and their branches.

A volatile acid suggested itself as a fit antagonist to the ammonia, and carbolic acid seemed specially suitable, but its vapour was apparently not diffusive enough, nor did it neutralize the ammonia as produced.

Glacial acetic acid was found to answer best. I placed a small capsule or measure-glass of this acid in the relaxing-box—60-90 drops as a charge—and renewed it as it evaporated, and this method I have used for many years.

The relaxing-box or vessel which appears to afford advantages above all others is a glass cylinder, covered with a round disk of glass ground to fit accurately. Into this cylinder is placed a tripod of glass, to hold the clock-glass upon which the specimens are to rest. Distilled water to the depth of half an inch is put into the cylinder. The latter is then placed over a Bunsen's burner, with wire gauze over it, and the water allowed to boil for five minutes or more. On allowing the vessel to cool, a partial vacuum is produced, and the cover must be removed with care some hours afterwards, when the specimens to be relaxed and the acetic acid are then inserted.

The vessel cannot remain completely sterilized because of the frequent movement of specimens to and from it, but heat can be applied from time to time, and it can be kept, as free as possible, from those spores which do germinate with marvellous rapidity in the saturated atmosphere of the relaxing-box.

The requisites for this relaxing-chamber can be procured for a few shillings from Messrs. J. J. Griffin & Sons, 20, Sardinia Street, Lincoln's Inn Fields, W.C.

A casual remark by Sir Geo. Hampson on the loss of colour of specimens in the relaxing-box led to an explanation as to the method I adopted, which he has been good enough to test for several months in the Natural History Museum, and with such satisfactory results that he encouraged me to make a note of the method for the benefit of fellow-workers.

These notes are the reply to his request, which it gives me great pleasure to send to him.

5, STANLEY CRESCENT, W.: 16*th January* 1902.

(*The above appeared in the "Entomologist."*)

No. XXVI.—*VIPERA RUSSELLI* BREEDING IN CAPTIVITY.

It may be of interest to record that a *Vipera russelli*, which has been in a cage in the Society's Museum for several years with two or three others of the same species, gave birth yesterday to 33 young ones. Three were born dead, but the other 30 are active and healthy young vipers. Within 48 hours of their birth, 28 out of the 30 young vipers had cast their sloughs. The three dead ones measured about 10½ to 11 inches in length.

W. S. MILLARD,

Hon. Sec., Bombay Natural History Society.

21*st June* 1902.

No. XXVII.—DROUGHT-RESISTING FODDER PLANTS.

One unhappy feature which distinguished the famine of 1900 from other Indian famines, was the wholesale destruction of cattle; a fatality specially disastrous on account of the difficulty of replacement, and the blow thus struck at the cultivator's power of recuperation. Can anything be done to prevent this evil in future? Section XX of Sir A. MacDonnell's Famine Report deals with this question: "The great mortality of cattle in the recent famine has pushed to the front the question of their preservation in times of drought and dearth of fodder. . . . . It is estimated that nearly two million cattle . . . . died in the Central Provinces and its Feudatory States; and that an equal number died in Bombay. The mortality was also great in Berar and Ajmere. . . . . Nor was this mortality confined to useless cattle; valuable bullocks and breeding cattle have perished in thousands, involving a loss to agriculturists, from which, even with the liberal assistance of Government, it will take them long to recover. This loss was most severe, as its results were most disastrous, in Gujarat, where the fodder famine was complete, and where the wealth of the people was largely sunk in cattle. In their efforts to save their cattle, the Gujarat agriculturists expended all their savings, themselves enduring great privations; they sold their jewels and even the doors and rafters of their houses, we were told, in order to

purchase fodder. Their efforts failed, their cattle died, and with their cattle all their accumulated wealth disappeared, so that Gujarat became a stricken field."

2. Among the measures suggested for dealing with such a fodder famine the Report (para. 210) gives the first place to the *Growth of fodder crops*: "We attach special importance to this remedy, not only because the fodder grown on the spot is much more valuable than the stuff imported, but because it has the collateral advantages of saving the cost of transport, of avoiding delays, of employing local labour, and of keeping the cattle at home." In para. 220 it is pointed out that "as a reserve, used to some extent in every season, the leaves of trees are valuable, and the planting of the class of trees and shrubs most useful for fodder has obvious advantages;" and the Commissioners recommend (para. 219) "that the whole question of fodder supply, in its preventive aspect, be thoroughly examined by the Agricultural Departments of Local Governments." As this question, in its preventive aspect, comes specially within the scope of the *Indian Famine Union's* enquiries, the present memorandum is submitted with reference to certain drought-resisting fodder plants.

3. On application to the Director of the Royal Botanic Gardens, Kew, he has been so good as to furnish me with valuable information, on the subject of *Sheep-bushes* and *Salt-bushes*, contained in the *Kew Bulletin* of July and August, 1896. In opening the subject, the *Bulletin* points out that "in the warmer and drier parts of the world, lands devoted to pastoral industry are not always clothed with the grassy vegetation familiar in temperate countries. Its place is taken by dwarf shrubs and herbaceous plants other than grasses, but which are no less valuable. The experience gained in South Africa and Australia admits of practical application in other parts of the world, especially where, as will be seen, the soil is intolerant of any other kind of vegetation." The following list of such shrubs and plants summarises the information given regarding them:—

(1) *Pentzia virgata*, the "Goed Karroo Bosje," or "Sheep-bush," which covers large areas of the Karroo Veldt in the centre of Cape Colony. It appears that this plant, which is a dwarf tufted composite, requires the deep fertile, lacustrine loam of the Karroo, and is not suited to barren sand.

(2) *Atriplex nummularia*. This is the first-named of the important family of Australian "salt-bushes," which grow in soil impregnated with alkaline salts, especially of soda, and are able to "live even through the direst periodic droughts." The *A. nummularia* is a shrub which attains a height of 6 to 10 feet; it is peculiar to the Macquarie, Castlereagh, and Darling rivers, and the arid western plains in New South Wales, Darling Downs in Queensland, Murray Scrub in Victoria, and the interior of South Australia; cattle, sheep, and other herbivora are extremely fond of it; and its drought-enduring qualities are remarkable, for it stands the hot winds in the Australian Central plains with little check upon its growth. The seed germinates freely, and it

will also strike readily from cuttings. The woody part of the plant amounts to 10 per cent. only ; the other 90 per cent. is food and moisture. The pasture thus afforded is particularly wholesome. Sir Ferdinand von Mueller, the Government Botanist of Victoria, sent seeds of this plant to Professor MacOwan at the Cape Town Botanic Gardens; and (mainly through the exertions of Mr. Edward G. Alston) the *Atriplex nummularia* was thus spread to all parts of South Africa, where it now flourishes.

(3) *Atriplex Halimus*, the "Vaal-Bosje," or Cape salt-bush. This indigenous variety seems to be in some respects inferior, as regards power of propagation, to the imported Australian plant. But as a fodder plant it is nearly of equal value. Analysis shows that it contains a larger proportion of carbohydrates, which constitute the fat-forming material; while the *A. nummularia* contains a good deal more albumenoid, *i.e.*, nitrogenous or strength-giving constituents. The *A. halimus* reaches the South of Europe and is cultivated in the Kew Arboretum. It is not unfrequently employed as a hedge plant in this country, in the Isle of Wight, and elsewhere near the sea. It also appears that the French Government have contemplated introducing it in the Southern portion of Algeria.

(4) *Atriplex halimoides*. A pro-cumbent or diffuse under-shrub, Queensland to South Australia, and gregarious over the greater part of the saline desert interior of Australia. Mueller describes it as "one of the best dwarf species for salt-bush pastures." Raised readily from seed. Cultivated at Kew.

(5) *Atriplex leptocarpa*. A strong plant with a thick stock and herbaceous pro-cumbent stems extending to 1 or 2 feet. East Australia. Mueller states: "Another of the perennial salt-bushes which render many dry and sterile tracts valuable for sheep pastures. It will bear a great amount of drought."

(6) *Atriplex semibaccata*. Stems herbaceous, pro-cumbent or prostrate, spreading to 1 or 2 feet. Queensland to West Australia. Mueller says, "very much liked by sheep, and considered among the best of saline herbage of the salt-bush country." Mr. Farrer pronounces this herb to be "wonderful for its productiveness and its drought-resisting power." This plant has proved most valuable in some of "the worst alkali spots" in California, single plants having reached a diameter of 16 feet in one season: "the yield of a full crop is about 20 tons of green material, or calculating on a basis of 75 per cent. water, 5 tons of dry matter per acre. A good season would permit of two such crops." The Agricultural Experimental Station of the University of California issued the following account of this variety: "The past year's experience with this plant, both on the University Station ground at Tulare and on the lands of scores of those furnished with seed or plants, shows that this plant has peerless adaptation for growth on soils too alkaline to support any other useful growth. So strongly are owners of alkali lands impressed with this fact that thousands of acres will be sown this winter. . . . . The introduction of the plant to owners of waste alkali lands is certainly one of the most striking achievements in the University's long-continued policy of

trial and distribution of economic plants. . . . . When the plant once gets a hold on the soil, it covers the ground very thickly with self-sown seeds, which are produced in abundance."

(7) *Atriplex vesicaria*. A bushy shrub, Central and South-Eastern Australia. According to Mueller, "one of the most fattening and most relished of all the dwarf pastoral salt-bushes of Australia, holding out in the utmost extremes of drought, and not scorched even by sirocco-like blasts. Its vast abundance over extensive salt-bush plains of the Australian interior to the exclusion of almost every other bush except *A. halimoides* indicates the facility with which this species disseminates itself. Splendid wool is produced in regions where *A. vesicaria* and *A. halimoides* almost monopolise the ground for enormous stretches. With other woody species it is also easily multiplied from cuttings, but, as remarked by Naudin, it produces thousands of fruits in less than three months after sowing, and as stated by Millardet it has become (of late years since its introduction) the marvel of the Delta of the Rhone, in the south of France."

(8) *Kochia eriantha*. A stout shrub with the branches covered with woolly tomentum: "an excellent fodder herb for sheep on the hot and dry pastures of Central Australia, where the temperature in summer reaches 120° F. in the shade, and in the winter falls to 27°."

(9) *Kochia pyramidata*. Prof. W. A. Dixon found 65 per cent. of digestible substance in this plant.

(10) *Kochia villosa*. An under-shrub found in most of the depressed and saline regions of Australia, particularly inland, also on sand lands. According to Mueller, "renowned amongst occupiers of pasture runs as the cotton bush, so called on account of the downy covering on the branches and leaves. This rather dwarf shrub resists the extremes of drought and heat of even the trying Central Australian climate. The roots sometimes penetrate into the ground to a depth of 18 feet. With all other animals, dromedaries like this and some other salt-bushes, particularly for food. These plants can be readily multiplied from cuttings."

(11) *Rhagodia parabolica*. This shrub is found in the interior of Queensland, New South Wales, and South Australia, and usually in or near moist places, but is nowhere very plentiful. It is probably one of the best known of all salt-bushes by stockmen, and on account of its mealy-white appearance they have given it the common name of "old man salt-bush." At one time this shrub was a prominent feature in many places in the interior, but of late years it is gradually becoming more scarce.

4. From the above it appears that there exist a large variety of drought-resisting fodder plants, some of them specially suited to soils impregnated with alkaline salts. Will any of these suit the soil and climate of India? Experiments have been made in India with regard to (1) *Pentzia virgata*, or Cape sheep-bush; and four varieties of Australian salt-bush, including (2) *Atriplex nummularia*, and (4) *Atriplex halimoides*. In 1883, seeds of the Cape sheep-

bush were received by the Superintendent of the Government Botanical Gardens at Saharunpur, from Dr. Schomburgk, Director of the Botanic Garden, Adelaide. But the attempt to establish this plant on the saline or "usar" lands in North-Western India was unsuccessful; and after repeated efforts the Superintendent, Mr. Duthie, reported in 1887 that "it is needless to make further attempts to cultivate the sheep-bush in this part of India." The reasons for the failure are not stated. Experiments with the Australian Salt-bush were more successful. In the North-West Provinces and the Punjab there are large tracts of land rendered more or less sterile by surface deposits of efflorescent salts, known as "reh," "kallar," and "usar"; and in 1880, seeds were obtained from the Melbourne Botanical Gardens for experimental cultivation on such land. In his Saharunpur report for 1882, Mr. Duthie wrote, "The Australian salt-bushes and their allies have been only very lately sown, but the progress they have made is so far in their favour. There are several plants of *A. halimoides, nummularia*, and of two other species thriving very well." In 1883, "the small plantation of salt-bush plants continued to thrive. The plants were 4 to 6 feet high." In 1888, the report regarding the *A. nummularia* was as follows: "the plantation of this fodder plant continues to exist in a healthy state. The seeds produced last year by the plants in the plantation proved to be the soundest lot we have as yet obtained from them. Formerly the seeds collected from these plants germinated very sparingly, but this season nearly every seed came up, with the result of a stock of 3,500 young plants. These have all been bespoken by the Director of the Botanical Department, Northern India, for planting out next autumn in the 'usar' reserves. The whole stock is therefore being retained for that purpose." Experiments with salt-bush were also carried on by the Director of the Department of Agriculture of the North-West Provinces and Oudh. The plants were put out on "usar" soils, and the reports upon the early experiments were encouraging. In the report of 1883, Mr. W. J. Wilson stated that plants of *A. nummularia* and other species were received from the Saharunpur Gardens in July 1882, and again in July 1883: "of these plants *A. nummularia* promises to be the most valuable as it has an abundant leaf growth and should yield a large supply of fodder." In 1884, the plants were thriving. In 1885, Mr. Wilson reported that "the Australian salt bush..... gave promise even in bad 'usar'." In 1886, the Awa "usar" plantation was handed over to the Raja of Awa, and the further experiments were transferred to the "usar" land near Cawnpore and Aligarh. In 1889, the Director of the Botanical Department inspected the Aligarh plantation, and made the following note: "The salt-bush (*A. nummularia*) promises to be a success as far as the soil is concerned, the most healthy specimens being those which were planted in soil strongly infected with 'reh' salts; but being essentially a desert species the excessive damp to which it is exposed in the Doab during the hot rainy months is prejudicial to its nature. At this season also it is liable to attacks of innumerable caterpillars, which devour the leaves and weaken the plants."

5. This is the latest information contained in the *Bulletin* regarding the experiments in N.-W. Provinces and Oudh. The last official note on the salt bush at Saharunpur is contained in the following extract from the Report on the Garden for the year ending March, 1890: "A few plants of this fodder were planted out last rains to take the place of some which had died. A considerable number of plants remain on hand for distribution, but there was no call for them during the year. The Director of the Botanical Department Northern India, having now been supplied with as many plants as he cares to try in the Aligarh and Cawnpore 'usar' reserves, there is littleprobability of any extensive demand springing up until something definite has resulted from his experiments. For the present we will therefore discontinue propagation, but keep up a small stock plantation in case the Aligarh and Cawnpore experiments should turn out to be sufficiently encouraging for trying this plant on a larger scale at some future period."

6. We may now ask the India Office to favor us with information showing the result of the experiments up to date. As pointed out by the Famine Commission, the fodder famine of 1900, and the consequent destruction of agricultural stock have vastly increased the importance of all questions relating to the preservation of cattle, the growth of fodder crops coming first among preventive measures; so that the introduction throughout India of drought-resisting fodder plants, from being merely an interesting botanical experiment now takes a prominent place among practical measures of famine prevention. No doubt, as recommended by the Famine Commission, the subject will be taken up earnestly by the Agricultural Departments of all the Local Governments.

7. In the meantime a few points may be noted. First, as regards the localities selected for experiment. Fortunately, the salt-bush favours generally those arid saline tracts, found in most Indian Provinces, which are useless for other purposes. But from the list given in para. 3 it will be seen that the different varieties exhibit special characteristics. It appears, therefore, that the various Local Governments should be careful to select localities suited to the special requirements of the species chosen for experiment. For example, it does not appear why the *A. nummularia*, whose natural habitat is in the arid plains of Central Australia, was located in the Doab, where it was exposed to excessive damp, and was devoured by innumerable caterpillars. The *Raghodia parabolica* (11) is the only variety shown in the list which is said to prefer moist places. In this connection it may be noted that, as the salt-bush is particularly relished by camels, it might with great advantage be introduced into the deserts of Sind and Rajputana. The Famine Commissioners point out (para. 220) that in Gujarat many fields are hedged with a useless Euphorbia, and suggest the substitution of shrubs useful for fodder. Rewards might be given to the headmen of villages where this advantageous arrangement is carried out; also where, by their exertions, the salt-bush is spread over the arid wastes, supplying food for the cattle, while mitigating the heat from the bare and sun-baked surface.

8. A detailed account of the salt-bushes will be found in Sir Ferdinand Mueller's "Iconography of Australian Salsolaceous Plants," and "Select Extra-Tropical Plants;" also in Mr. F. Turner's monograph on "The Forage Plants of Australia." The subject of drought-resisting forage plants has also been enquired into recently by Mr. Robert H. Elliot, who has made experiments at Clifton Park, Kelso, in Scotland.

W. WEDDERBURN.

INDIAN FAMINE UNION,
Palace Chambers,
Westminster, S. W.
30*th December* 1901.

(*From the "Indian Famine Union Leaflet," No. 5.*)

No. XXVIII.—BIRDS' NESTING AT OOTACAMUND.

Having obtained 90 days' leave, I decided visiting Ooty, the climate being ideal and many birds are found there which are local to the place and unobtainable elsewhere. On the whole I was fairly successful though I should have liked to have obtained the eggs of the Nilgiri Wood-Pigeon (*Alsocomus elphinstonii*), the Black-backed Pied Shrike (*Hemipus picatus*), the Velvet-fronted Blue Nuthatch (*Sitta frontalis*) and the Indian Blue Chat (*Larvivora brunnea*), all of which I saw. At Ooty one only desires to be out all day, so that lovers of nature cannot but enjoy themselves I got there towards the end of March, which is about the best time for birds' nesting.

THE NILGIRI LAUGHING-THRUSH—(*Trochalopterum cachinnans*). Very common, fond of thick jungle but nesting, as a rule, on the outskirts or in small trees more or less in the open: a merry joker always on the laugh. The nests are neat and cup-shaped, placed firmly in the fork of a small tree or sapling within reach of hand, composed of twigs, leaves, grass and moss on the outside, neatly lined and finished off with a few of the bird's own feathers to give the finishing touches. Though a shy bird, it does not bother about concealing its nests. On several occasions, I came on nests just inside thick sholas, quite low down on bare forks, so that one could not but see them. When built in more exposed places more care seemed to be taken in selecting leafy sites. Two eggs, bluish-green, speckled and streaked with reddish brown, is the complement. April and early May is the best time to look for eggs.

THE RUFUS-BELLIED SHORT-WING—(*Brachypteryx rufiventris*) is fairly common but requires looking for, it is of a retiring nature and loves deep shade but not thick jungle. I obtained 3 nests, *viz.*, on the 4th, 15th and 29th May, the two first contained callow young (two) and the last two fresh eggs, so that two would seem to be the full complement of eggs. The sites chosen were natural holes or hollows in trees, a few feet from the ground, these are filled up with a mass of green moss and finished off in a neat cup lined with fine black moss roots and are very pretty. The nests were not difficult to see as no attempt is made to conceal them and the trees selected were free

from moss, lichen or any sort of parasitic growth. The crux is to find the haunts of the birds : once this has been discovered, the nest is not difficult to see. The eggs are of an olive-green tinge with dim brick-red specks and fade very rapidly. The cock has a very pretty low song, which is not very easily heard.

THE SOUTHERN-INDIAN BLACK BULBUL—(*Hypsipetes ganeesa*) is very common and very noisy, a regular scamp, at times they are almost deafening. It is not very easy to obtain their eggs for they usually select a very tall eucalyptus or similar tree and build about 30 to 40 feet up, one cannot get up oneself and it is by no means easy to get any one else to. I found several nests but only got eggs out of two. The best way to find the nest is to watch the birds. They are noisy birds, as I have mentioned, when building the male usually accompanies the female to and from the nest, which I think she makes unaided, and shouts all the time at the top of his voice. If you watch her you can easily tell whether she is nesting as she will then go to the same spot each time. They are very fond of the parasite resembling mistletoe, which is common at Ooty and is leafy, in this the nest is well concealed so that one may not even see it but merely surmise it is there. The nest is of the bulbul type as are the eggs : 2 is the complement. I fancy if they chose less inaccessible places one would get many eggs. April and early May I think is the best time to look for them.

THE JUNGLE MYNA—(*Æthiopsar fuscus*) is very common and behaves like all other Mynas. They were breeding when I arrived and when I left, so I fancy their season is long. They seem to prefer, if they have a choice, a hole in a tree in jungle, though I found nests in houses, under bridges, in fact almost anywhere.

THE NILGHIRI BLUE FLYCATCHER—(*Stoparŏla albicaudata*) is the common Flycatcher and a very cheery fellow into the bargain : he is always singing and is not ashamed of raising his voice. The site they like for nesting is a mossy bank, if a hole or hollow exists in such, they fill it up with green moss with no lining and on this lay 3 pretty little pinky-white eggs. At Ooty, deep channels are cut to protect the forests from cattle and also to carry the water off, these soon get coated with moss and make ideal nesting places for this Flycatcher, although he is not averse to holes in trees and such like. When walking or driving along by keeping ones eye's some way ahead, one can often spot a nest by the hen darting off, at your approach, out of a bank or hedge. April and May are the best months to search for eggs.

THE BLACK-AND-ORANGE FLYCATCHER—(*Ochromela nigrirufa*) is a pretty little bird, very robin-like, and common at Ooty. He has no voice to speak of but just chirrups. He is not a bit like a Flycatcher in his domestic arrangements, building quite an unorthodox nest. A lot of old leaves are used as a foundation and on this the nest proper is built up of strips of grass, leaves, etc., globular in shape, very untidy, no lining and with an entrance more or less at the top. I took one or two nests but could not preserve them as they

rapidly fell to pieces being loosely put together. They reminded me more of the nest of the small White-throated Babbler (*Dumetia albigularis*) more than anything else though one cannot say they are domed. They place their nests in ferns, quite low down almost on the ground, in a small bush very like holly and in brambles: once you know the class of place they like, their nests are not difficult to discover for if you see the birds hanging about, you have only to look round and you can easily spot a nest if there is one. Two eggs only are laid, of a greenish-white colour, speckled with rusty red, not unlike those of the Jungle Wren-Warbler (*Prinia sylvatica*). They nest through April and May.

The Grey-headed Flycatcher—(*Culicicapa ceylonensis*) is fairly common but somehow I had no luck. It takes a pretty 'cute bird to beat me when I am on the look out for his nest. I watched these birds very carefully but only succeeded in finding one nest, on the 6th May, containing young birds very nearly ready to fly. This nest was purse-shaped and attached to the trunk of a tree about 30 feet from the ground. I did not go up to have a look at it so am unable to describe it.

The Southern Pied Bush-Chat—(*Pratincola atrata*) is very common and similar in habits to all birds of this class. It breeds in March, April and early May and is not very particular as to site, any hole in a bank, wall, hedgerow, house or even on the ground does not come amiss, provided it is fairly sheltered. They make a very comfortable nest, lining it with hair, down, roots or any suitable materials, and lay four greenish-white eggs, speckled with brown.

The Nilghiri Blackbird—(*Merula simillima*) is very common and a beautiful songster, he is to be heard all day and quite late in the evenings. I found numberless nests, and they are not at all particular as to sites but prefer open country, especially small trees along the banks of nullahs. The nest is a massive structure in which a lot of mud is incorporated, moss, roots, leaves and grass, are all used, while the nest is neatly lined and finished off. It is usually placed in the stout fork of a tree and within hand-reach though occasionally they may be some way up. Three greenish-blue eggs spotted, blotched and streaked with brown are laid. I found one nest in a very curious position. It was built where a small branch had been broken off the main trunk: there was so little room for it that as soon as the bird commenced incubating, her weight overbalanced the nest, and when I found it she was sitting with the nest hanging down at an angle of about 45°; in all probability, had I left the nest, it would have come down altogether in time. They have a long breeding season as they were breeding when I went up and when I left.

The Nilghiri Thrush—(*Oreocincla nilgiriensis*). This beautiful Thrush may be common but being of a shy and retiring nature, I saw very little of it. On the 31st May I was fortunate enough to find a nest containing two fresh eggs, I left them a day but no more were laid, they were of a dull or olive-greenish colour, dimly speckled with red. The nest was situated on a

horizontal branch about 15 to 20 feet from the ground, in a big shady shola with little or no undergrowth, and was composed of quantities of moss lined with blackish roots, a most beautiful and compact structure.

THE NILGHIRI HOUSE-SWALLOW—(*Hirundo javanica*) is partial to certain localities, where it is more or less abundant. It seems to prefer the neighbourhood of streams and gulies. Its nesting habits are very similar to those of the Wire-tailed Swallow (*Hirundo smithii*), building a nest of mud-pellets in a house, on rocks in streams, under bridges and similar places which it lines with feathers, straw, etc. They are apparently early breeders, as I only found young in their nests in April and never came on eggs, which was a disappointment.

THE NILGHIRI PIPIT—(*Anthus nilgiriensis*) seems to confine itself more to the higher and wilder peaks and hills. I found a nest on the 31st May, containing 2 fresh eggs, I left them a day but no more being laid, took them. The eggs look like very heavy thunder clouds, a deep grey being the prevailing color, which is all splotched and clouded. The nest was situated on some sloping ground, not far from the side of the road, in fact my attention was drawn to it by the bird being disturbed at our passing. It was well sheltered and like all larks' nests: what took my fancy was a small fern situated just at its entrance or rather over it, which kept it well shaded from the rays of the sun.

THE INDIAN EDIBLE-NEST SWIFTLET—(*Collocalia fuciphaga*). I believe there are several colonies of this little Swiftlet in the neighbourhood of Ooty. Captain Packard and I visited one, which shall be nameless, on the 11th May and had a very interesting day. We made all the *bandobust* but thought we were doomed to disappointment, as after having searched all the likely spots, as we thought, we only got 2 nests, containing 2 fresh and 2 incubated eggs each. On making further explorations, we came on a cave inhabited by them but to our disgust found we could not effect an entrance, the exit being so small. We were obliged to use lamps as it was pitch dark. This made a considerable flutter in the dovecots and the birds came flying out, and as they came they flew straight into your face, which was rather disconcerting. We were awfully disgusted, just as we were resigning all hope, Captain Packard noticed another cave, down which we promptly went and were rewarded. In this cave there were 8 nests, 7 containing 2 more or less fresh eggs each, while one had 2 young birds. The nests were made almost entirely of white lichen, a little moss being used in some and were glued to the rock by inspissated saliva of a whitish colour: the nests were all within reach of hand and looked like the little saucers natives use so much for illuminations. As we went in, the nests showed up white with the light shining on them. There was not much saliva in each nest and I fancy it would take a good number to make soup for John Chinaman and some trouble to separate the lichen from the saliva.

THE RUFOUS-BACKED SHRIKE—(*Lanius erythronotus*) is the common Shrike and is very fond of the open slopes and wet bottoms so common a feature in Ooty topography. It has a long breeding season, beginning in February

and ending, I know not when, as I got fresh eggs in June before leaving. Their nests are of the usual Shrike type compact, massive and well-built, all sorts of material being used and the nest is well finished and lined. It is usually placed in a low thorny bush in the open and not difficult to find. If one sees a pair of birds, ten to one if breeding, you have only to search the few bushes round about, when the nest will be found.

POONA,
July 26th, 1902.

R. M. BETHAM, MAJOR,
8th Bombay Infantry.

No. XXIX.—WEEVILS IN MANGOES.

I send a Weevil taken out of a Mango seed, which I obtained, together with some interesting information about its habits, from Mr. Vinayak Laxuman Bhave. He finds a very large percentage of the fruit of two trees in his garden infested with this insect, while the rest are quite free. He brought me fifteen mangoes, nearly ripe, which I cut open and found mature weevils in three and a grub in one. They had consumed a portion of the cotyledons in each seed, but they had not touched the shell of it, nor was there any mark whatever outside of the seed to betray their presence. From this I infer that the egg must be laid before, or very soon after, the fruit begins to form. Mr. Vinayak says that the weevils do not emerge until the mango has been eaten and the seed thrown away. It is difficult to account for their attacking two trees and neglecting others which are in all respects the same, but Mr. Vinayak tells me that these two trees come into fruit a little later than the others, so it may be that, when the weevils are ready to lay their eggs, the development of the fruit in all the other trees has advanced too far.

In the first volume of "Indian Museum Notes," at page 45, there is an interesting extract from a paper by Mr. W. J. Simmons on a Mango Weevil, which he calls *Cryptorhynchus mangifera*, and which is very probably the same species, though the writer speaks of it as an insect which was at that time spreading westward and northward from the region of Dacca, to which it was formerly restricted. Arguing from the extent to which the people of India depend upon the mango, especially in seasons of scarcity, he is apprehensive that the depredations of this weevil may become a very serious matter; but it is difficult to follow his argument in view of the fact (stated by himself) that the insect does the edible part of the fruit no harm. Of course it might restrict the natural reproduction of mango trees to an appreciable extent by destroying the seeds.

E. H. AITKEN.

19th August 1902.

No. XXX.—BIRDS' NESTING IN KUMAON.

The following notes on some nests and eggs taken this season in Kumaon may be of interest as they are either not recorded, or doubtfully only, in Hume's "Nests and Eggs" and Oates' and Blanford's "Birds" (*Fauna of*

British India). They were all taken at an elevation of from four to five thousand feet and in every case the parent bird was secured and identified.

THE GREEN MAGPIE—(*Cissa chinensis*). Two nests of this bird which is decidedly rare in these hills were discovered, both in the same nullah and within quarter of a mile of each other at about 4,000 ft. elevation. Both nests were precisely similar in position and structure, being placed about ten feet up in a fork and made of good sized twigs and a few leaves externally and lined with finer rootlets and grass, internal diameter five inches and two and a half deep. The nests were much better made and neater than that of any magpie or jay that I know of.

The eggs (three in one nest and four in the other) were taken on the 19th and 20th June and are elongated ovals rather pointed at the small end, averaging 1·31 inches in length and 1·87 in breadth. They are entirely jay-like in markings though somewhat yellower in colour; two of them had a few yellowish-brown good sized spots scattered over them; none showed the black hair markings of the jay.

THE ORANGE-BELLIED CHLOROPSIS—(*Chloropsis hardwicki*). Only one nest with two fresh eggs was secured though two others were watched while building but were deserted owing to their being discovered by Tree-pies (*D. himalayensis*). The nests were all placed towards the extreme top of fairly large trees thirty to forty feet high and were well concealed among the leaves, they are slung between two twigs (not in a fork) and are very like bulbul's nests, made of fine roots and fibres with a partial lining of black rootlets, measuring two inches in diameter and one and three-quarter inches deep. The eggs are yellowish-white rather thickly spotted and clouded especially towards the larger end with light reddish-brown, measuring ·94 by ·62 (taken on July 8).

THE BROWN-EARED BULBUL—(*Hemixus flavala*). This bulbul seems to come up to about 4,500 feet, five nests in all were discovered but only seven eggs resulted. The nests were of the ordinary bulbul type but slung like an orioles though of course a very much flimsier structure; one nest was placed only eight feet up in a bramble bush but the others were from twenty to forty feet up in large trees. The eggs, which were all taken between June 8—19, are pinkish white speckled all over with pale purple and purplish brown but chiefly at the larger end where in some eggs there is a well-marked cap of colour. Length ·94 to 1 inch and width ·69.

THE BLACK-CHINNED YUHINA—(*Yuhina nigrimentum*). A pair of these birds was discovered building under an overhanging bank by the side of a path on March 18, and three fresh eggs were taken from it on April 5. The nest was slung between several small roots that hung down, the earth having crumbled away, and was made of moss externally with a little cobweb plastered on and lined entirely with very fine black rootlets, an ordinary open nest. The eggs are greenish white spotted with brown chiefly at the larger end.

As a second nest with two eggs was discovered on July 3, it seems probable this bird has two broods.

THE SLATY-BACKED FORKTAIL—(*Henicurus schistaceus*). One nest was found on May 20 at an elevation of about four thousand feet in a mossy bank by the side of a small stream with three fully fledged young and this was the only pair of these birds seen. I was able to identify these birds perfectly while feeding their young and hope to secure their eggs next year, the common forktail here (*H. maculatus*) frequently builds on a last year's nest or actually by the side of it.

THE PURPLE THRUSH—(*Cochoa purpurea*). One nest with two fresh eggs was found on a tree sloping across a nullah, about twenty feet up. The nest was unfortunately lost on the way home but appeared very like that of other thrushes, moss externally and lined with black rootlets. The eggs are rather long pointed ovals, greenish white thickly marked all over with reddish brown and measured 1·25 by ·87. The bird is very rare up here.

THE LARGE YELLOW-NAPED WOODPECKER (*Chrysophlegma flavinucha*). This bird is by no means uncommon in the lower valleys about here but although I watched several pairs digging what were apparently nest-holes these were all deserted and the only eggs secured were a hard-set pair from a hole thirty feet up in a decayed oak. They are of the usual woodpecker type and measure 1·25 by ·87. They were taken on May 30.

JEOLIKOTE, N.-W. P.,
July 28th, 1902.

S. L. WHYMPER.

No. XXXI.—A CORRECTION. *TURDINULUS ROBERTI.* SUPPRESSION OF *CORYTHOCICHLA SQUAMATA* (BAKER).

I find that my *Corythocichla squamata* is only the true *Turdinulus roberti* and my name must therefore be suppressed.

The bird, No. 186 of Oates' "Fauna of India" is on the other hand not *T. roberti* but *T. exul* (*vide* appendix to F. of India). I most unfortunately had not read this appendix when I named my bird and seeing that it was not *roberti* re-named it *squamata*. The two genera *Turdinulus* and *Corythocichla* are, I should say, in my own opinion, synonymous. Oates separates *Turdinulus* from *Drymoicataphus* on account of its shorter tail and *Corythocichla* on account of its squamated plumage. As however *Turdinulus* has the same curious lax, squamated plumage as *Corythocichla* has, and the tails of the three genera all vary in degree I do not see how the two genera *Turdinulus* and *Corythocichla* can be separated.

E. C. STUART BAKER, F. Z. S., &c.

August 1902.

No. XXXII.—OCCURRENCE OF THE "MANDARIN DUCK" IN INDIA.

To Mr. Stevens of the Rungagora Tea Estate in Dibrugarh belongs the honour of obtaining the first Indian specimen of the Mandarin duck (*Aex*

alericulata). The bird, an extremely fine female, was one of a party of six and was shot in a small back-water close to the estate. Unfortunately Mr. Stevens, not knowing the value of what he had shot, made no attempt to get further specimens.

Mr. F.J. Greening and I saw a party of six of these ducks in July 1901, flying across the Subansiri river close to its junction with the Ranganadi. We had no guns out at the time so failed to get any specimens, but I have no doubt about their identity.

E. C. STUART BAKER, F. Z. S., &c.

August 1902.

No. XXXIII.—*MEROPS APIASTER* BREEDING IN BALUCHISTAN.

I have found the European Bee-eater (*Merops apiaster*) very common both at Peshin and Quetta during the early part of the present summer. I first noticed them about the beginning of April, and shortly after that they became abundant. They have certainly been breeding here, and I have several times seen them go into their breeding holes, but I have not actually dug any out to obtain eggs.

I do not think that this bird has been recorded as breeding within British Indian limits before, though it is well known to breed in Kashmir. Colonel Unwin, in the chapter on birds which he wrote for Lawrence's "Valley of Kashmir" says that it "appears in great numbers in the valley in April. After keeping together in flocks and holding counsel for a day or two, they separate to breed, which they do in holes in banks. In August the birds again congregate. The migration commences almost immediately, and by September hardly a bee-eater is left in the valley."

This year by about the middle of July all the birds seemed to have left the neighbourhood of Quetta, and I thought that they had gone for good. However, they appeared again about the middle of August, so I conclude that they must have made a temporary migration to some place in the district where rain has fallen, and insects have become consequently more plentiful than they have been at Quetta. They are now leaving, but I have not noticed that they have assembled in the large numbers in which they appeared in the spring.

I may mention that the present species is the only bird I have seen capture and eat the fierce yellow wasp, *Polistes hebraeus*, which is so common in many places down country, and the sting of which I know to my cost is very painful.

C. G. NURSE, MAJOR,
13th Bombay Infantry.

QUETTA, *24th August* 1902.

No. XXXIV.—OCCURRENCE OF THE SOOTY TERN (*STERNA FULIGINOSA*) IN THE DARBHANGA DISTRICT, TIRHUT.

I have pleasure in announcing the occurrence of this species in this District. On the 20th of last month a dark tern was brought to me by a boy, who says

he shot it with a pellet-bow about a mile and-a-half from here. I was just starting for Calcutta so had not time to identify it. I took it with me to the Museum, and Mr. Finn and I looked it up in the "British Museum Catalogue," the "Fauna of British India", and identified it as *Sterna fuliginosa*.

This species has only occasionally been found on Indian coasts and is an ocean bird so it is rather surprising its being found so far inland, but as a tropic bird was once got in Cachar, one cannot be surprised at anything! I fancy it must have found its way up the Ganges and been blown from there to here.

CHAS. M. INGLIS.

BAGHOWNIE FACTORY, TIRHUT,
23*rd August* 1902.

No. XXXV.—NOTES ON THE HIMALAYAN NUTCRACKER (*NUCIFRAGA HEMISPILA*).

In sending for the Society's collection a stuffed specimen of the Himalayan Nutcracker (*Nucifraga hemispila*) I wish to offer a few remarks regarding the habitat of this bird, in the pine forests of the Himalayas, and on a few other points which may be of interest.

I have never seen the Nutcrackers in the lower Himalayan valleys, I mean those at about five to six thousand feet elevation. The bird seems to prefer the higher forests on mountains at about eight to nine thousand feet.

The Nutcracker remains secluded during the day, but in the mornings and afternoons it may be seen moving about among the pine trees. In the mornings it is especially lively and its harsh grating call is frequently heard. Its food appears to be the seeds which it extracts from certain pine cones, and below the pine trees on which it feeds, its presence, in the branches above, can often be detected by the fallen debris of the pine cones which it pulls to pieces.

When the wild walnuts are in season, they form the principal food of the Nutcrackers and when one considers that the shell of the Himalayan wild walnut is exceedingly dense, thick, and hard, it is remarkable how easily the bird perforates it with its powerful bill, first on one side, and then on the other. This work it executes in the most perfect and systematic manner. All the nuts are perforated in exactly the same way, through the centre of each shell, the holes thus made being rather larger than a six-pence.

I think the Nutcracker also lives on grubs, the larvæ of beetles and boring insects, as I have sometimes seen it on decaying logs and the rotting stumps of pine trees.

On dissecting one of these birds I found the cervical vertebræ and the muscles of the neck to be strongly developed. I expected to find the skull composed of thick dense ivory like bone similar to those of the woodpeckers, but it possessed none of the characteristics, though it is strongly built. I know

nothing as yet of the migration of the bird but I think, as the winters on these mountains are severe, and the snowfall very heavy, that it must migrate to some more suitable climate for food and shelter.

With regard to the locality in which I have met with the Himalayan Nutcracker, I have seen several and shot the specimen I have sent to the Society, on the top of the mountain range on the left bank of the river Beas where it passes through the upper Kullu valley.

With the stuffed specimen, I send six wild walnuts perforated on both sides. These nuts furnish a good example of the great power with which the Nutcracker uses its bill and of the regularity of its work.

W. OSBORN, LT.-GENERAL, I.S.C.

KULLU, KANGRA DISTRICT, PUNJAB,
July 27th, 1902.

Note.—Prior to General Osborn's notes printed above, little or nothing appears to have been recorded of the habits and food of either this species or *M. multipunctata* which is also an inhabitant of the Himalayan Range. But not only for this reason are the present notes interesting, but they also afford direct and actual proof that the birds of this genus do fulfil in practise the powers that have been implied to them from time immemorial in their popular name of Nutcrackers as well as in their generic designation. Considerably more has of course been known and recorded of the third species of the genus, *N. caryocatactes*, which occurs at times in considerable numbers in most parts of Europe, than of its Himalayan cousins. This species has been found to be almost omnivorous like most members of the crow family, for besides its favourite food, consisting of the seeds of the Siberian Cedar, it is known to eat Caterpillars, Wasps and insects of various sorts and scraps from the kitchen, and is generally believed to feed also on acorns, berries, nuts and even on land-shells, but its power of picking nuts has never been previously proved and has even been questioned. That it does possess the power of doing so most effectually is now established beyond question.

E. COMBER,
(*Honorary Secretary, Bird Section,*
Bombay Natural History Society).

September 1902.

No. XXXVI.—FOOD OF THE KING COBRA.

I have just received a very interesting note from Mr. V. H. Hoogwerf, Inspector of the Salt Department at Diggi, near Castle Rock, on the Goa Frontier, to whom the Society owes the live King Cobra at present in the rooms. In the same region Mr. Hoogwerf lately fell in with another King Cobra, 12 feet 1 inch in length, in the act of swallowing a huge snake, which, from his account could be nothing else than a Python. When Mr. Hoogwerf arrived on the scene the natives said that the two had been struggling together, for an hour. The

King Cobra appeared to have got at least three feet of the Python down its throat but on being disturbed it disgorged it and escaped. Mr. Hoogwerf retreated and returned after an hour to find that the King Cobra had come back to its prey. He shot it and sent it and its dinner together to Castle Rock, but by the time they got there they were not in a condition to be forwarded. The Python measured 9 feet 2 inches but was half as big again in girth as the King Cobra. When first found it was still alive, but very sick.

E. H. AITKEN.

BOMBAY, 19*th August* 1902.

PROCEEDINGS

OF THE MEETING HELD ON 15TH JULY, 1902.

A meeting of the members was held at the Society's Rooms on Tuesday, the 15th July, 1902, Mr. E. H. Aitken, presiding.

NEW MEMBERS.

The election of the following new members was announced :—

LIFE MEMBERS.—Mr. Dhunjeebhoy Bomanjee Petit, (Bombay), and Mr. Dhunjeebhoy Bomanjee, (Bombay).

MEMBERS.—Mr. Thomas Rennie, (Rangoon) ; Mr. R. B. Wood, I.C.S. (Kaira); Captain H. N. Packard, R.A. (Ootacamund) ; Mr. S. M. Toppin, R.G.A. (Mussoorie) ; Major H. S. Nelson, R.G.A. (Bombay) ; Major W. H. Cummings, R.G.A. (Bombay) ; Captain H. B. Mayne, R.G.A. (Bombay) ; Mr. A. H. Bastow, (Trevandrum) ; Lieutenant R. M. Carter, I.M.S. (Poona) ; Nawab Imad-ul-Mulk Bahadur, B.A. (Hyderabad, Deccan) ; Mr. J. Mollison, (Nagpur, C. P.) ; Mr. G.C. Godfrey, (Calcutta) ; Mr. W. H. J. Wilkinson, I.C.S. (Bombay) ; Mr. A. E. L. Emanuel, I.C.S. (Prantij, Ahmedabad) ; Mr. Albert Pam, (London) ; Mr. G. A. Phear, (Nagpur, C.P.) ; Mr. S. B. Murray, (Ootacamund) ; Major T. N. Bagnall, (Ootacamund); and Major-General D. J. S. McLeod, C. B., D. S. O. (Meerut).

CONTRIBUTIONS.

Mr. W. S. Millard, the Honorary Secretary, acknowledged receipt of the following contributions since the last meeting :—

CONTRIBUTIONS TO THE MUSEUM.

Contributions.	Description.	Contributors.
1 Long tailed Bat	*Rhinopoma macrophyllum*...	Mr. D. Ommanney.
18 Snakes (10 species), and 5 Lizards (4 species) from Upper Burma and the Nilgiris.	.....	Lieut. R. Meinertzhagen.
8 Snakes (4 species) from Cawnpore.	.....	Col. P. Baddeley.
1 Egg of the Common Sand-piper.	*Totanus hypoleucus*	Lieut. G. A. Hawks.
4 Eggs of the Whiskered Tern.	*Hydrochelidon hybrida*	Do.
3 Eggs of the European Bee-Eater.	*Merops apiaster*	Do.
1 Egg of the Mallard.....	*Anas boscas*	Do.
1 Snake (alive)	*Eryx johnii*	Mr. R. W. Hanson.
1 Skin, nest and eggs of the Brown-Backed Robin.	*Thamnobia cambaiensis*	Mr. F. Field.
18 specimens of Fishes from the Arabian Coast.	.....	Capt. C. J. Kendall, R.I.M.
1 Lizard	*Varanus bengalensis*	Mr. R. B. Wood, I.C.S.
Some marine specimens from Bombay Harbour.	.....	Mr. J. McGlashan, C.E.
1 Krait (juv.)	*Bungarus cæruleus*	Mr. E. Gray, I.C.S.

Contributions.	Description.	Contributors.
A collection of 161 Botanical specimens from Aden.	.....	Lt.-Col. W. S. Birdwood.
1 Indian Koel.....	*Eudynamis honorata*	Miss Atkinson.
1 Skin of large Red Flying Squirrel.	*Pteromys flavigula*	Capt. H. T. Fulton.
1 Skin of Indian Marten...	*Mustela flavigula*.....	Do.
1 Skin of Beech Marten.....	*Mustela foina*	Do.
1 Skin of a Rat.....	*Nesocia sp.*	Do.
1 Skin of Black Flying Squirrel.	.....	Do.
234 Bird skins.....	.....	Do.
1 sword of Sword Fish.....	*Histiophorus sp*.....	Capt. F. A. Smith, M.D., I.M.S.
1 Snake.....	*Tropiaonotus platyceps* ...	Major C. T. Hudson, I.M.S.
1 Great Stone Plover.....	*Esacus recurvirostris*	Capt. J. W. Watson, I.M.S.
1 Alpine Swift.....	*Cypselus melba*.....	Do.
1 Grey-necked Bunting.....	*Emberiza buchanani*	Do.
1 Hume's Willow Warbler..	*Phylloscopus humii*.....	Do.
A number of Bird skins...	.....	Mr. C. H. Donald.
1 Painted Sand Grouse.....	*Pterocles fasciatus*	Mr. F. J. H. Barton.
4 Collared Pratincole.....	*Glareola pratincola*.....	Do
1 Indian Three-toed King-Fisher.	*Ceyx tridactyla*	Mrs. A. J. Paterson.
30 Daboias (alive).....	*Vipera russellii*...	Born in the Society's Museum.
1 Panther's Skull.....	*Felis pardus*	Mr. A. H. A. Simcox, I.C.S.
Specimens illustrating the Parval, Papal and Imago Stages of the Camel Bot-Fly.	*Cephalomyia maculata.*	Major C. G. Nurse.
2 Skins of the Great Nuthatch.	*Sitta magna*...	Mr. H. N. Thomson and Mr. W. H. Craddock.
1 Skin of Hume's Siva.....	*Siva castaneicauda*	Do.
1 Skin of Yellow-Naped Ixulus.	*Ixulus flavicollis*	Do.
1 Skin of Purple Thrush....	*Cochoa viridis*.....	Do.
1 Skin of Austin's Nuthatch	*Citta nagaensis*.....	Do.
1 Skin of Sikhim Tree-creeper.	*Certhia discolor*...	Do.
1 Skin of Bulbul.....	*Corasophila thompsoni*	Do.
2 Skins of Tits.....	*Ægithaliscus pulchellus*.....	Do.
1 Skin of Black-spotted Yellow Tit.	*Machlolophus spilonota*	Do.
1 Skin of Slaty-bellied Short wing.	*Trsia cyaniventris*	Do.
1 Skin of Siamese White-cheeked Laughing Thrush.	*Garrulax diardi*	Do.
1 Skin of Ramsay's Barwing.	*Actinodura ramsayi*	Do.
1 Skin of Gould's Broadbill	*Serilophus lunatus*	Do.
1 Skin of Chestnut-Headed Tit-Babbler.	*Sittiparus castaneiceps* ...	Do.
4 Skins of Warblers.....	*Suya sp*.....	Capt. H. H. Harington.
1 Nest and Eggs of Burmese Shrikes.	*Lanius collurioides*	Do.
2 Skins of Squirrel.....	*Sciurus locroides*	Do.
1 Skin of Squirrel	*Sciurus sp.*	Do.
1 Skin of Squirrel.....	*Sciurus erythræus*	Do
1 Skin of Squirrel.....	*Sciurus ferrugineus*.....	Do.
1 Skin of Squirrel.....	*Sciurus macclellandi*	Do.

Contributions.	Description.	Contributors.
1 Skin of Flying Squirrel...	*Pteromys oral*	Capt. H. H. Harington.
2 Skins of Tree Shrews.....	*Tupaia ferruginea*	Do.
3 Skins of Bamboos Rats....	*Rhizomys badius*	Do.
1 Snake (alive).....	*Tropidonotus piscator*	Mr. C. Glover-Wright.
1 Hamadryad (juv.)	*Naia bungarus*	Mr. P. W. Mackinnon.

MINOR CONTRIBUTIONS.

From Mr. J. McGlashan, Mr. E. C. Cholmondeley, and Captain E. O'Brien.

CONTRIBUTIONS TO THE LIBRARY.

Entomological Society's Proceedings, 1901 .....In exchange.
Illustrations of Indian Botany, Vol. I.....Col. P. Baddeley.
Descriptions of some New Species of Orchideal from North-West and Central India, by J. F. Duthie, B.A., F.L.S.....The Author.
Annals of the Royal Botanic Gardens, Peradeniya, Vol. I., Part III.....The Author.
On some cases of abrupt variation in Indian Birds, by F. Finn, B.A., F.Z.S.....The Author.
Journal of the Asiatic Society of Bengal, Vol. LXXI, Part II, No. 1, 1902.....In exchange.
Report of the Zoological Gardens, Ghizeh, near Cairo, for 1901.....
The Mammals of the Andaman and Nicobar Islands.....Smithsonian Institution.

PAPERS READ.

The following papers were then read and discussed :—"Small Game Shooting Prospects in Western India," 1901-02, by Lieut.-Col. H. D. Olivier, R.E., F.Z.S. ; "White Ants' Castles," by G. P. Millett, I.F.S. ; "Curious course taken by the Hyoid Cornua or tongue-muscles in certain Woodpeckers," by B. B. Osmaston, I.F.S. ; "Indian Hobby (?) and Bulbul," by E. Ernest Green, F.E.S. ; "Food of the Krait," by Vet.-Capt. G. H. Evans ; "The Camel Bot-Fly," by Major C. G. Nurse, F.R.G.S., F.E.S. ; "Sword Fish striking a Ship," by Capt. F. A. Smith, M.D., I.M.S.

The papers will appear in full in the Society's Journal.

PROCEEDINGS

OF THE MEETING HELD ON 19TH AUGUST, 1902.

A meeting of the members was held at the Society's Rooms on Tuesday, the 19th August, 1902, Colonel H. D. Olivier, R.E., F.Z.S., presiding.

NEW MEMBERS.

The election of the following new members was announced :—

Major J. R. Loudon, (Singapore) ; Mr. G. E. S. Cubitt, (Maymyo, Upper Burma) ; Mr. H. S. Cameron, (Ceylon) ; Mr. W. O. Alcock, I.C.S., (Prantij, Ahmedabad) ; and Mr. Francis W. Gore, (Sibsagar, Assam).

CONTRIBUTIONS.

Mr. W. S. Millard, the Honorary Secretary, acknowledged receipt of the following contributions since the last meeting :—

CONTRIBUTIONS TO THE MUSEUM.

Contributions.	Description.	Contributors.
2 Green Tree Vipers (alive)	*Trimeresurus gramineus* ...	Mr. P. Gerhardt.
1 Green Tree Snake (alive)	*Dryophis mycterizans*.....	Do.
1 Cobra (alive)	*Naia tripudians*	Maj. W.E. Jennings, I.M.S.
1 Cobra, juv. (alive)	*Do.*	Do.
1 Lizard	*Hemidactylus maculatus* ...	Col. C. Grant.
1 Skin of Tree Pipit.....	*Anthus trivialis*	Major K. Buchanan.
1 Skin of Himalayan Ruby Throat.	*Calliope pectoralis*	Do.
2 Skins of Yellow-headed Wagtail.	*Motacilla citreola*	Do.
2 Eggs of Hodgson's Short-wing.	*Hodgsonius phœnicuroides*...	Do.
1 Masked Booby	*Sula cyanops*.....	Mrs. Raikes.
1 Snake	*Dipsas forstenii*	Mr. C. E. C. Fischer.
2 Nests and 1 Egg of the Nilgiri Thrush.	*Oreocincla nilirienstis*.....	Major R. M. Betham.
1 Nest and 2 Eggs of the Rufous-bellied Short-wing.	*Brachypteryx rufiventris* ...	Do.
2 Nests and 2 Eggs of the Nilgiri Laughing Thrush.	*Trochalopterum cachinnans.*	Do.
1 Nest and 3 Eggs of the Nilgiri Blackbird.	*Merula simillima*.....	Do.
1 Nest of Indian Golden Oriole.	*Oriolus kundoo*.....	Do.
1 Nest of Southern Indian Black Bulbul.	*Hypsipetes ganeesa*	Do.
1 Nest of Indian Edible nest Swiftlet.	*Collacalia fuciphaga*	Do.
1 Nest of Southern Red-Whiskered Bulbul.	*Otocompsa fuscicandata*.....	Do.
1 Nest of Rufous-backed Shrike.	*Lanius erythronotus*	Do.
3 Eggs of Nilgiri Blue Fly-Catcher.	*Stoparola albicaudata*.....	Do.
2 Eggs of Black and Orange Fly-Catcher.	*Ochromela nigrirufa*	Do.
4 Eggs of Southern Pied Bush-chat.	*Pratincola atrata*	Do.
3 Eggs of Black-headed Myna.	*Temenuchus pagodarum*	Do.
1 Snake (alive) (juv).....	*Gongylophis conicus*	Lieut. H. N. Sitwell, R.A.
2 Skins of the Southern Tree-pie.	*Dendrocitta leucogastra*.....	Mr. T. R. D. Bell.
1 Skin of the Large Rufous Babbler.	*Argya subrufa*	Do.
1 Skin of the Spotted Babbler.	*Pellorneum ruficeps*.....	Do.
1 Skin of the Malabar Woodshrike.	*Tephrodornis sylvicola*	Do.
1 Skin of the Indian Pitta.	*Pitta brachyura*	Do.
3 Skins of the White-bellied Blue Fly-Catcher	*Cyornis pallidipes*	Do.

Contributions.	Description.	Contributors.
1 Skin of the Heart-spotted Wood-Pecker.	*Hemicercus canente*	Mr. T. R. D. Bell.
1 Skin of the small Ceylon Barbet.	*Xantholæma rubricapilla*	Do.
2 Skin of the IndianThree-toed King-Fisher.	*Ceyx tridactyla*	Do.
2 Skins of the Velvet-fronted Blue Nuthatch.	*Sitta frontalis*	Do.
2 Skins of the Nilgiri Flower-pecker.	*Dicæum concolor*	Do.
2 Skins of Tickell's Flower-pecker.	*Dicæum erythrorhynchus*	Do.
2 Skins of the Indian Plaintive Cuckoo.	*Cacomantis passerinus*	Do.
2 Skins of the Malabar Trogon.	*Harpactes fasciatus*	Do.
4 Cobras (juv.) (alive)	*Naia tripudians*	Mr. O. Meyer.
1 Snake (juv.) (alive)	*Trop. piscator*	Do.
1 Egg of the Woodcock	*Scolopax rusticula*	Mr. C. Donald.
1 Egg. of the Chukor	*Caccabis chukar*	Do.
1 Egg of the Shikra	*Astur badius*	Do.
1 Pair Sambhur horns from Kumaon, N.-W. P.	*Cervus unicolor*	Capt. M. B. Roberts.
1 Nest and 2 Eggs of the Black-chinned Yuhina.	*Yuhina nigrimentum*	Mr. S. L. Whymper.
2 Eggs of the Brown-eared Bulbul.	*Hemixus flavala*	Do.
1 Skin of the Blue-bearded Bee-Eater.	*Nyctiornis athertoni*	Do.
1 Skin of the Striated Laughing Thrush.	*Grammatoptila striata*	Do.
1 Skin of the Maroon Oriole.	*Oriolus traillii*	Do.
1 Skin of the Orange-bellied Chloropsis.	*Chloropsis hardwickii*	Do.
1 Skin of the Himalayan Nutcracker.	*Nucifraga hemispila*	General W. Osborn, I.S.C.
2 Skins of the Plumbeous Redstart.	*Rhyacornis fuliginosus*	Do.
1 Skin of the Indian White-eye.	*Zosterops palpebrosa*	Do.
1 Skin of the Eastern Meadow Bunting.	*Emberiza stracheyi*	Do.
1 Snake	*Lycodon aulicus*	Mr. T. J. Spooner.
2 Indian Mole Rats	*Nesocia bengalensis*	Mr. C. Hudson, I.C.S.
1 Snake (juv.)	*Gongylophis conicus*	Sir. R. Westmacott, K.C.B.
1 Garganey or Blue-Winged Teal.	*Querquedula circia*	Mr. D. Hardinge.

MINOR CONTRIBUTIONS.

From Mr. J. Stiven and Mr. James Martin.

CONTRIBUTIONS TO THE LIBRARY.

"Catalogue of the Lizards in the British Museum" (Natural History), Vols. I, II and III	Presented by the Trustees of the British Museum.
"Catalogue of the Snakes in the British Museum" (Natural History), Vols. I, II and III	Do.

PAPERS READ.

The following papers were then read and discussed :—

1. "Description of a new Sea-Snake from Rangoon," by G. A. Boulenger, F.R.S.
2. "Some remarks on Mosquitoes," by E. H. Aitken.
3. "Birds' nesting at Ootacamund," by Major R. M. Betham.
4. "Weevils in Mangoes", by E. H. Aitken.
5. "Curious modifications of structure in a Water-Grasshopper," by L. C. H. Young.

A vote of thanks was passed to the authors of all the papers and the meeting then terminated.

PROCEEDINGS

OF THE MEETING HELD ON 23RD SEPTEMBER, 1902.

A meeting of the members was held at the Society's Rooms on Tuesday, the 23rd September, 1902, Mr. E. H. Aitken presiding.

NEW MEMBERS.

The election of the following new members was announced :—

LIFE MEMBER.—Shrimant Parashram Ramchandra Patwardhan, the Chief of Jamkhandi, (Kolhapur).

MEMBERS.—Mr. W. P. Okeden, (Rangoon); Rev. H. T. H. Rountree, (Bombay); Mr. F. H. Beath, (Bombay); Captain H. D. Watson, (Dehra-Dun); Mr. H. Stevens, (Dibrugarh District, Upper Assam); Lieutenant A. W. White, (Bhuj, Cutch); Mr. R. J. C. Swinhoe, (Mandalay); Mr. C. A. Souter, I.C.S. (Nellore); Mr. J. M. Bourne, (Nellore); Captain C. Ainslie, R.E. (Poona).

CONTRIBUTIONS.

The Honorary Secretary, Mr. W. S. Millard, acknowledged receipt of the following contributions since the last meeting :—

CONTRIBUTIONS TO THE MUSEUM.

Contributions.	Description.	Contributors.
1 Snake	*Dendrophis pictus*	Mr. R. P. Lambert.
1 Snake	*Dryophis mycterizans*	Mr. J. Stiven.
1 Skin and 5 Eggs of the Banded Crake.	*Rallina superciliaris*	Major R. M. Betham.
1 Snake	*Lycodon aulicus*	Mr. J. Stiven.
1 Snake	*Zamenis mucosus*	Do.
3 Snakes (alive)	*Dipsas hexagonotus*	Mr. T. J. Spooner.
1 Krait (juv.)	*Bungarus cæruleus*	Major A. E. S. Searle.
1 Tree Snake (Brown variety).	*Dryophis mycterizans*	Mr. J. Stiven.
1 Snake (alive)	*Tropidonotus subminiatus*	Mr. T. J. Spooner.
4 Chameleons (alive)	*Chameleon calcaratus*	Mr. A. M. Masani.
1 Snake (alive)	*Simotes albocinctus*	Mr. T. J. Spooner.
1 Head of Grant's Gazelle, male.	*Gazella Granti*	Do.
1 Head of M'Palla, female	*Aepyceros melampus*	Do.
2 Heads of Thomson's Gazelle, female.	*Gazella Thomsoni*	Do.

Contributions.	Description.	Contributors.
1 Head of Coke's Hartebeest, female.	*Bubalis Cokei*	Mr. T. J. Spooner.
1 Tree Pit-Viper (alive).....	*Trimeresurus gramineus*.....	Do.
2 Himalayan Black Bears, juv. (alive).	*Ursus torquatus*	Mr. C. Donald.
1 White-breasted Water Hen, juv. (alive).	*Amaurornis phœnicurus*.....	Mr. F. G. Hutchinson.
1 Snake (alive) juv.....	*Lycodon striatus*	Mr. T J. Spooner.
1 Snake (alive).....	*Dipsas hexagonotus*.....	Do.
1 Snake (alive).....	*Simotes albocinctus*.....	Do.
1 Musk Deer, juv.....	*Moschus moschiferus*.....	Mr. C. Donald.

MINOR CONTRIBUTIONS.

From Mrs. S. B. Arthur, Dr. M. D. Cama, Mr. Narotamdas Morarji Goculdas and Mr. H. Hayn.

CONTRIBUTIONS TO THE LIBRARY.

"The Flora of the Presidency of Bombay," Part II, by Theodore Cooke, C.I.E., presented by the Author.

"Memoirs of the Geological Survey of India," Vol. XXXIII, Part 2. (In exchange.)

EXHIBITS.

The large Sword Fish (*Histiophorus sp.*), caught by Mr. C. J. I. Jones (R. I. M. S. "Canning") off the Laccadive Islands, and presented to the Society some few months ago, was now shown mounted for the Society's Museum.

PAPERS READ.

The following papers were then read:—"Note on the Himalayan Nutcracker, (*Nucfraga hemispila*)," by General W. Osborn, I.S.C.; and "Notes on Plants introduced into the Victoria Gardens," by C. D. Mahaluxmivala.



G.E. Lodge del.

THE POCHARD OR DUN-BIRD.

Nyroca ferina.

¾ Nat. size.

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JOURNAL
OF THE
BOMBAY
Natural History Society.

Vol. XIV. BOMBAY. No. 4.

THE MOTHS OF INDIA.

SUPPLEMENTARY PAPER TO THE VOLUMES IN "THE FAUNA OF BRITISH INDIA."

SERIES II. PART VIII.

By Sir G. F. Hampson, Bart., F.Z.S., F.E.S.

(*Continued from page 519 of this Volume.*)

Moths of India—5a.

Genus Neoscelis, Nov.

Type.—*N. rivula.*

Palpi porrect, extending about the length of head ; frons with tuft of hair ; antennæ of female ciliated ; mid tibiæ with the medial spurs absent ; abdomen with dorsal tufts. Forewing with vein 5 from near angle of cell ; 6 from below upper angle ; 7, 8, 9, 10, 11 stalked, 11 anastomosing with 12. Hindwing with veins 3, 4 and 6, 7 very shortly stalked ; 8 anastomosing with the cell to near its extremity.



Neoscelis rivula ♀ ¾.

3748*b*. Neoscelis rivula, n. sp.

♀. Head, thorax and abdomen purplish-red strongly irrorated with black ; tegulæ edged with white. Forewing black-brown mixed with grey ; purplish-red streaks on inner area and above veins 3 and 6 ; a very indistinct curved subbasal black line ; tufts of raised black scales at origin of vein 2 and on discocellulars ; a very obscure curved whitish medial band ; a similar, more prominent postmedial band traversed by a dark line and excurved between veins 7 and 2 ; a terminal series of pale points. Hindwing rather redder ; an indistinct medial whitish band ; more distinct postmedial and terminal bands from vein 5 to inner margin traversed by waved dark lines. Underside whitish ;

both wings with diffused black ante- and postmedial bands, excurved at middle; the terminal area black, interrupted by a white fascia at middle.

Habitat.—Ceylon, Gampola (Mackwood). *Exp.* 24 mill. *Type*—In B. M.

3749*a*. GYMNOSCELIS SEMIVINOSA, Warr. Nov. Zool. III., p. 389 (1896) (pl. C., f. 23).

♀. Head, thorax and abdomen whitish; palpi and frons purplish-red and black; pro and mesothorax with transverse black lines; abdomen dorsally tinged with red with slight segmental black lines. Forewing whitish; the costa reddish and fuscous to the postmedial line; an antemedial black-irrorated greenish band expanding towards costa; traces of a medial line; a postmedial line strongly excurved from below costa to vein 3 with some dark suffusion on its inner side and a less distinct line on its outer; a subterminal ochreous band with diffused black patches on it at costa, below apex and at tornus. Hindwing whitish, suffused in parts with bright-purplish red and slightly irrorated with black; the red irroration most prominent on costal half of wing, before the indistinct curved medial and postmedial blackish lines and on apical area.

Habitat.—Ceylon, Gampola; Java. *Exp.* 18 mill.

3750. GYMNOSCELIS DELETA, insert (syn.) *Gymnoscelis cristata*, Warr. Nov. Zool. III., p. 229, Jaintia Hills.

3750*a*. GYMNOSCELIS ATTENUATA, Moore. Lep. Ceyl. III., p. 479 (pl. 206, f. 3).

♂. Head, tegulæ and patagia green; thorax dark brown; abdomen dark brown, green at base and towards extremity, the ventral surface greyish. Forewing dark reddish-brown; traces of numerous waved dark lines on basal area; waved grey antemedial and postmedial lines, the latter angled at lower angle of cell; a black discoidal spot; a dentate grey subterminal line with white spot at middle. Hindwing with two indistinct minutely waved pale brown antemedial lines and two similar postmedial lines; a dentate grey subterminal line with white spot at middle. Underside black-brown with four pale lines on each wing.

Habitat.—Ceylon, Haputale. *Exp.* 22 mill.

3752*b*. GYMNOSCELIS ALBICAUDATA, Warr. Nov. Zool. IV., p. 228 (1897).

Forelegs of male with fringes of hair on inner side of coxæ and basal two-thirds of femora; forewing with the costa fringed with long hair on underside on basal two-thirds. Head, thorax and abdomen pale greenish tinged with rufous and irrorated with black, the last with black segmental bands; genital tufts of male white. Forewing pale greenish sparsely irrorated with black, the costal area tinged with rufous, an oblique subbasal black and white striga from costa; an antemedial line angled below costa, then oblique; the postmedial line black defined by white on outer side, minutely waved, angled outwards at veins 7 and 4, and inward in discal fold, then oblique; an indistinct waved whitish subterminal line with black points on its inner side and crossed by blackish streaks, at costa, discal and submedian folds; terminal line black interrupted at the veins. Hindwing pale greenish sparsely irrorated

with black; indistinct dark subbasal and antemedial lines; a prominent postmedial black line excurved below costa and slightly angled inwards in discal fold; a dentate whitish subterminal line with diffused black on its inner edges; a fine terminal black line interrupted at the veins; cilia of both wings blackish intersected with luteous.

Habitat.—Sikhim; Bhutan; Khásis; Ceylon, Pattalam, Nawalapitiya. *Exp.* 18-22 mill.

3755. GYMNOSCELIS POLYCLEALIS, del. EUPITHECIA ATTENUATA.

Genus HYBRIDONEURA.

Hybridoneura, Warr. Nov. Zool. V., p. 24 (1898).

Type—*H. abnormis*, Warr.

Range—Assam.

Proboscis fully developed; palpi oblique, extending hardly the length of head, the third joint porrect, frons with tuft of scales; antennæ fasciculate (mid and hind tibiæ wanting); abdomen with dorsal tufts. Forewing with veins 2 from near angle of cell; 3, 4 from angle, male with a patch of naked membrane between veins 2 and 4 and vein 3 distorted; 5 from middle of discocellulars; 6 from upper angle; 7, 8, 9 stalked; 10, 11 stalked, anastomosing with 7, 8, 9, so as to form a minute areole; then 11 anastomosing with 12. Hindwing with vein 2 from middle of cell; 3, 4 from angle; 5 from above middle of discocellulars; 6, 7 on a long stalk and bent downwards towards termen; 8 from near end of cell.



Hybridoneura abnormis ♂ ¾.

3755*a*. HYBRIDONEURA ABNORMIS, Warr. Nov. Zool. V., p. 24.

♂ Dull greenish, very strongly irrorated with black. Forewing with traces of numerous waved lines; a subbasal black line more strongly developed; a black discoidal bar and a spot between bases of veins 3 and 4; a more distinct pale waved subterminal line. Hindwing with black discoidal bar and antemedial, postmedial and subterminal diffused black lines.

Habitat.—Khàsis. *Exp.* 22 mill.

3756. CHLOROCLYSTIS PALPATA, insert (ab.) *decolorata*, Warr. Nov. Zool. VII., p. 109.

3762*b*. CHLOROCLYSTIS OLIVATA, Warr. Nov. Zool. VIII., p. 196.

Male with a large patch of androconia on underside from in and beyond lower angle of cell to inner margin; hindwing with a large patch in cell on upperside, vein 3 from long before angle of cell.

♂ Head and thorax dull olive-green; abdomen brownish-grey. Forewing dull olive-green, irrorated with fuscous; obscure oblique antemedial and medial waved dark lines with fuscous suffusion between them; a postmedial line angled at upper angle of cell and with some dark suffusion on its inner side from costa to lower angle of cell, then reduced to points on the veins and incurved; an indistinct waved subterminal line; a terminal series of black

striæ. Hindwing pale brownish-grey, the patches of androconia dark fuscous brown.

Habitat.—Bhutan ; S. India ; Ceylon, Maturatta. *Exp.* 20, 22 mill.

3763*d*. CHLOROCLYSTIS DEBILIATA, Hübn. Eur. Schmett Geom., f. 466 (1827) ; Breyer Ann. Soc. Belge. 1863, p. 27, pl. I., f. 3 (larva), Staud. Cat. Lep. Pal., p. 320.

Pale greenish, irrorated with black ; palpi blackish at sides ; abdomen with black patch on second segment and the dorsal crests black ; wings more or less strongly suffused with fuscous. Forewing with punctiform subbasal line angled below costa, then oblique ; a similar antemedial line ; a discoidal spot placed on an indistinct medial line angled at upper angle of cell, then oblique ; a punctiform postmedial line obtusely angled at veins 6 and 4, then oblique ; the terminal area suffused with brown and with an indistinct pale dentate subterminal line angled outwards at vein 7 ; a fine black terminal line interrupted at the veins ; cilia chequered pale and fuscous. Hindwing with obscure diffused oblique subbasal and antemedial lines ; a discoidal spot ; an indistinct medial line ; a punctiform postmedial line excurved at median nervules ; the terminal area tinged with brown and with an indistinct pale waved subterminal line ; a terminal series of black points ; cilia chequered pale and fuscous.

Habitat.—Europe ; Urals ; Amur ; Tibet, Yatong. *Exp.* 22 mill.

Larva green ; the ventral surface and segmental joints yellowish ; head brown.

Food plant—*Vaccinium myrtillus.*

3764*a*. CHLOROCLYSTIS PICTA, Warr. Nov. Zool. VIII., p. 30.

♂ Head and thorax black mixed with grey ; pectus, legs and abdomen ferruginous, the last with some black at base, a subbasal series of points and lines on the two terminal segments. Forewing black-brown, the inner margin pale ferruginous ; traces of numerous waved dark lines ; a black discoidal point with a waved white line just beyond it bent outwards below costa ; a dull rufous patch beyond the cell, the veins crossing it streaked with black ; a minutely waved curved postmedial white line with pale ferruginous patch beyond it on costa ; an indistinct waved white subterminal line and a pale ferruginous spot at middle of termen. Hindwing pale ferruginous ; a black discoidal point ; traces of waved rufous lines on terminal half with black points in the veins. Underside fuscous ; forewing with some white in cell, a black discoidal point, a white subterminal band excurved at middle and connected with middle of termen by a streak ; hindwing with the basal area whitish, a black discoidal point, a curved white subterminal band.

Habitat.—Khásis, *Exp.* 18 mill.

3768*a*. CHLOROCLYSTIS RECTARIA, n. sp.

♂ Head, thorax and abdomen clothed with grey and dull rufous scales. Wings grey and dull rufous, irrorated with large black scales. Forewing with waved grey antemedial, medial, postmedial and subterminal line, the postmedial angled inwards in discal fold. Hindwing with indistinct waved grey

lines; cilia dull rufous; termen straight; the underside uniform fuscous suffused with grey.

Habitat.—Ceylon, Matale (Pole). *Exp.* 14 mill. *Type*—In B. M.

3771*a*. CHLOROCLYSITS LANIARIS, insert (syn.) *Microlia tenuilinea*, Warr. Nov. Zool. III., p. 391.

♂ With large tufts of pale and fuscous hair on underside of hindwing at lower end of cell and anal angle.

(*Aëtheolepis*). Hindwing of male with the terminal part rounded, the apical part of costa and tornus slightly curled over on upperside; the upperside clothed with thick rough scales; the inner area reduced, very narrow and fringed with long hair.

3773*a*. CHLOROCLYSTIS PAPILLOSA, Warr. Nov. Zool. III., p. 124 and VI. p. 68 (part).

Pale yellow-green; antennæ ringed with black; thorax strongly irrorated with black. Forewing with some blackish suffusion on antemedial area except towards costa, traversed with some obscure pale waved lines; a patch of ferruginous and fuscous in and beyond end of cell traversed by the treble waved whitish postmedial line which is bent outwards below costa; some fuscous striæ in the cilia. Hindwing pale brownish.

Habitat.—Sikhim; Khásis. *Exp.* 22 mill.

The specimen marked as the type was *C. coronota*, Hübn., which also occurs in the same region, but the description was evidently taken in part from this insect.

3779*a*. EUPITHECIA EUROTOSOMA, n. sp.

♀ Pale dull olive-green; abdomen with the terminal segments from middle of third segment and ventral surface pale ferruginous. Forewing with traces of antemedial, medial and postmedial lines excurved below costa, and two rather more distinct waved subterminal lines; a black discoidal bar. Hindwing with traces of curved postmedial and subterminal lines. Underside pale; both wings with discoidal bar and curved diffused fuscous postmedial and subterminal lines.

Habitat.—Ceylon, Bogawantalawa (Pole). *Exp.* 18 mill. *Type*—In B. M.

3784*b*. EUPITHECIA INCURVARIA, n. sp.

Head, thorax and abdomen grey mixed with fuscous brown; tarsi banded with fuscous; abdomen with white basal band. Forewing whitish irrorated with fuscous brown; a diffused obliquely curved subbasal line; three diffused antemedial lines, angled below costa, then oblique and minutely waved; a large discoidal tuft of black scales; the postmedial line defined by white on each side, minutely waved and slightly incurved between vein 6 and submedian fold; a minutely dentate white subterminal line; a black terminal line interrupted at the veins; cilia chequered whitish and fuscous. Hindwing whitish, irrorated with black; a discoidal black point; a subbasal line on inner area; two waved postmedial lines, obsolescent towards costa, and incurved in submedian fold; a dentate white subterminal line defined on each side by fuscous; a terminal black line; cilia chequered white and fuscous.

Habitat.—Kashmir, Goorais Valley (Leech). *Exp.* 30 mill. *Type.*—In B. M.

3786*a*. EUPITHECIA RUFICORPUS, Warr. Nov. Zool. IV., p. 230.

♀ Head and thorax grey, palpi and frons blackish; abdomen grey, the dorsum rufous except first segment. Forewing grey, the inner half suffused with pinkish; five diffused fuscous patches on costa; numerous indistinct pale waved lines; some dark specks on median nervure and veins beyond lower angle of cell; the outer area more rufous, with the pale waved submarginal line more distinct and some slight dark streaks towards apex. Hindwing grey with numerous very indistinct waved fuscous lines; both wings with marginal series of black striæ.

Habitat.—Khásis. *Exp.* 20 mill.

3788*b*. EUPITHECIA OBLONGATA, Thnbg. Diss. Ent. I., p. 14, f. 12 (1784). Staud. Cat. Lep. Pal., p. 308.

White; head, thorax and abdomen partially suffused with pale brown and fuscous; tarsi banded with brown. Forewing with three brownish spots on basal part of costa; traces of a subbasal line; an indistinct antemedial line angled inwards in submedian fold; some brown marks on medial part of inner margin; a black discoidal lunule; three postmedial fuscous lines angled outwards below costa and minutely waved, below vein 4 only represented by some black points on the veins; terminal area pale brown with a dentate white subterminal line expanding into a patch at costa; cilia chequered brown and white. Hindwing with two antemedial brown marks on inner margin; a discoidal point; a double postmedial line excurved from costa to vein 4, then incurved; terminal area brown with dentate white subterminal line; a terminal series of black striæ and series of black points on the cilia.

Habitat.—Europe; Western and Central Asia; Persia; Kashmir, Scinde Valley. *Exp.* 28 mill.

Larva—Meyr. Brit. Lep., p. 189.

Green or ochreous; dorsal line and a series of five tridentate marks dull red, orange, darker green or absent. Food-plant, flowers and seeds of *Umbelliferæ* and *Compositæ*, etc.

3789*a*. EUPITHECIA THERMOSARIA, n. sp.

♀ Head and thorax white mixed with pale rufous and grey-green; tarsi banded with fuscous; abdomen grey and fuscous. Forewing white suffused with rufous except on basal area and costal area to the postmedial line; a subbasal black line angled below costa, then oblique; two antemedial lines angled below costa, then oblique and incurved in submedian fold; two medial lines angled below costa, then oblique and excurved in submedian fold; medial part of costa with fuscous patches at the lines; a large black discoidal spot; the postmedial line excurved from below costa to vein 5 and defined by white on outer side, then oblique and represented by short black streaks on the veins; an irregularly dentate white subterminal line slightly defined by fuscous on inner side; a fine terminal line; cilia chequered white and fuscous. Hindwing whitish, the inner and terminal areas suffused with fuscous;

a discoidal spot; subbasal, antemedial and postmedial diffused fuscous lines on inner area; an indistinct waved white subterminal line; cilia chequered white and fuscous.

Habitat.—Kashmir, Kokser (McArthur, Thompson.) *Exp.* 30 mill. *Type*—In B. M.

3799*c*. TRICHOPTERIGIA MULTIPUNCTATA, n. sp.

♂ Head and thorax pale pinkish suffused with olive-yellow; antennæ ringed with black; palpi blackish at sides; fore tibiæ and tarsi ringed with black; abdomen whitish. Forewing pinkish-grey with numerous olive yellow and fuscous lines with series of black points on them; one subbasal line, two antemedial, three on medial area followed by two others at end of cell, then two series of points on very indistinct lines; a double postmedial line and highly waved subterminal line with short streaks on the veins beyond it; a series of terminal points arranged in pairs. Hindwing white, the termen tinged with brown.

Habitat.—Sikkim, 7000′ (Pilcher). *Exp.* 44 mill. *Type*—In B. M.

3802*a*. TRICHOPTERYX POLYSTICTARIA, n. sp.

♂ Grey white; head, thorax and abdomen tinged and irrorated with fuscous. Forewing tinged with fuscous-brown and irrorated with fuscous, the veins with series of black points; an indistinct subbasal line angled at median nervure; two indistinct, slightly waved and curved antemedial lines with the area between them rather whiter; a minutely waved postmedial line strongly excurved from costa to vein 4, then incurved and with some whitish on its inner side; an indistinct whitish minutely dentate subterminal line with short black streaks on its inner side above veins 4 and 5; a terminal series of pairs of black points on each side of the veins. Hindwing white; a discoidal point; traces of a minutely waved, curved postmedial line; a curved subterminal line with the area beyond it rather browner; a fine terminal line and a series of black points at base of cilia.

Habitat.—Tibet, Moupin (Kricheldorff); Yatong (Hobson). *Exp.* 38 mill. *Type*—In B. M.

Genus LOBOPHORODES, Nov.

Type—*L. undulans*.

Proboscis well developed; palpi minute and not reaching beyond the frons which is rounded; antennæ of male almost simple; hind tibiæ with the medial spurs absent, the male with tuft of hair from femero-tibial joint. Forewing with vein 3 from well before angle of cell; 6 from upper angle; 10 anastomosing with 11, and then with 8, 9 to form the double areole. Hindwing with vein 3 from well before angle of cell; 5 from middle of discocellulars; male with vein 7 from well before upper angle; 8 connected with the cell by a bar beyond



Lobophorodes undulans ♂ ½

middle, the inner area reduced to a lobe at base ; female with vein 7 from near angle of cell ; 8 anastomosing with the cell to beyond middle.

3802*b*. LOBOPHORODES UNDULANS, n. sp.

Head, thorax and abdomen clothed with grey, olive-green and black scales. Forewing grey suffused with olive-green, irrorated with black and with numerous waved black lines, three on basal area, two on inner side of the medial greyer band with the discoidal black spot on it, two and a series of black points on its outer edge, and three subterminal with a more or less prominent double black mark on them above middle ; a series of short terminal black streaks on the veins and a terminal line with series of black points on it. Hindwing grey-white with discoidal points and indistinct curved postmedial and subterminal lines.

Habitat.—Tibet, Yatong (Hobson). *Exp.* 34 mill. *Type*—In B. M.

3823*a*. HYDRELIA AURANTIACA, n. sp. (pl. C., f. 25).

Bright yellow, thickly irrorated with orange-red ; wings with the orange-red irroration forming numerous very indistinct waved lines. Forewing with the basal half with some fuscous points on costa and vein 1 ; some fuscous marks on the veins at end of cell ; a postmedial series of short dark streaks on the veins ; two obscure series of subterminal dark points and a terminal series of black points. Hindwing with some dark irroration on basal half ; some dark points on inner margin ; two series of obscure subterminal points and a terminal series of black points.

Habitat.—Tibet, Yatong (Bingham, Hobson). *Exp.* 28 mill. *Type*—In B. M.

3826*a*. HYDRELIA RUBRARIA, n. sp.

Brown-red, irrorated with fuscous; frons brown; pectus, legs and ventral surface of abdomen pale. Forewing with antemedial black points on subcostal and median nervures and vein 1 ; an indistinct curved medial line, the area between it and postmedial line more or less strongly suffused with black, the latter angled outwards at veins 6 and 4, then incurved ; an indistinct curved subterminal line with fuscous mark at middle ; a terminal series of points. Hindwing with indistinct antemedial dark points on subcostal and median nervures and vein 1 ; an indistinct medial line angled outwards at vein 3, an obscure subterminal series of points and a terminal series. Underside pale ; forewing suffused with fuscous to the postmedial line ; hindwing with discoidal point and postmedial line angled at veins 6 and 4.

Habitat.—Tibet, Yatong. *Exp.* 28 mill. *Type*—In B. M.

3833*a*. VENUSIA LARIA, Oberth. Et. Ent. XVIII. p. 30 (pl. 3, f. 34).

Grey ; head, thorax and abdomen irrorated with fuscous and brown, the last with the first segment almost white. Forewing irrorated with fuscous and brown, and with a very slight pinkish tinge ; a fine dark curved subbasal line ; two double waved antemedial lines with olive and reddish shades in them ; a discoidal point and indistinct waved medial line ; a waved black postmedial line angled below costa and at vein 3, with a waved brown line beyond it and two similar subterminal lines ; the area between veins 3 and 4 tinged with fuscous ; a terminal series of black striæ. Hindwing white with

slight discoidal point and four fine waved lines on terminal area, sometimes more or less reduced to points; a terminal series of black striæ.

Habitat.—Tibet, Yatong. *Exp.* 26 mill.

3833*b*. VENUSIA PALLIDARIA, n. sp.

♂. White, tinged with ochreous. Forewing with oblique rufous subbasal striga from costa; an antemedial rufous line bent inwards to costa, then nearly erect; a slightly oblique postmedial line diffused on inner side, slightly excurved below costa and at median nervules and with some dark points on the veins; two indistinct subterminal lines, the inner sinuous. Hindwing with medial diffused rufous line and two indistinct subterminal lines, the inner waved.

Habitat.—Punjab, Thundiani (Yerbury). *Exp.* 30 mill. *Type*—In B. M.

3835*a*. VENUSIA CONISARIA, n. sp.

♂. Grey; head and thorax thickly irrorated with fuscous; abdomen with slight segmental lines. Forewing strongly irrorated with brown; indistinct double waved subbasal and antemedial lines; a black discoidal spot; an indistinct medial double waved postmedial line angled below costa, the latter with black points on the veins; a double crenulate subterminal line with black points on the veins; a terminal series of black points. Hindwing whitish with indistinct double postmedial and more distinct double subterminal waved lines; a terminal series of black striæ.

♀. With the irrorations much stronger and black; hindwing usually with discoidal point and sometimes with waved antemedial lines.

Habitat.—Tibet, Kuku-noor, Yatong (Hobson). *Exp.* 32 mill. *Type*—In B. M.

3835*b*. VENUSIA OCHROTA, n. sp. (Pl. C, f. 5).

♂. Ochreous-yellow; head tinged with rufous; antennæ with black rings above. Forewing with the costal area suffused with rufous; slightly waved yellowish ante- and postmedial lines with slight dark marks on them at costa and inner margin; both wings with dark discal point, a diffused spot at lower angle of cell, and terminal series of black points.

Habitat.—Tibet, Yatong (Hobson). *Exp.* 30 mill. *Type*—In B. M.

3840*a*. CAMBOGIA INGRATARIA, Warr. Nov. Zool. V. p. 23.

♂. Brown suffused with silvery grey scales; head chocolate; antennæ with the basal half of shaft above and a line between their bases white; wing with numerous indistinct minutely waved dark lines. Forewing with six of the lines more prominent; an ochreous discoidal point; hindwing with three more prominent lines and ochreous discoidal point; termen and cilia of both wings bright yellow with minutely waved inner edge, the cilia being intersected with brown at vein 3 of forewing.

Habitat.—Khásis. *Exp.* 26 mill.

3843. CAMBOGIA MARGINATA, insert pl. XXXII. f. 16 and (syn.) *Chalybo-clydon flexilinea*, Warr. Nov. Zool. V., p. 22.

Genus ASTHENIODES, Nov.

Type.—*A. polycymaria*, Hmpsn.

Palpi porrect extending just beyond the frons which is smooth and rounded; antennæ ciliated; hind tibiæ with two pairs of spurs. Forewing with vein 3 from well before angle of cell; 6, 7, 8, 9 stalked; 10 anastomosing with 11 and then with 8, 9 to form the double areole. Hindwing with vein 3 from well before angle of cell; 5 from well below angle of discocellulars; 6, 7 shortly stalked.



Astheniodes polycymaria ♂ ♀.

Section I—Hind tibiæ with the outer medial spur minute, the claspers of male very elongate; forewing with the apex produced and acute; hindwing with the termen angled at middle.

3851*a*. ASTHENIODES POLYCYMARIA, n. sp.

♂. Grey, thickly irrorated with brown; head and thorax suffused with fuscous; a white band between antennæ. Forewing with traces of numerous waved lines; the antemedial line slightly more distinct; a discoidal point; the postmedial line of both wings dentate, defined by whitish on outer side and with some diffused fuscous on inner side. Hindwing with the basal area thinly scaled.

Habitat.—"India." *Exp*. 30 mill. *Type*—In B. M.

Section II—Hind tibiæ with the outer medial spur about half length of inner spur; forewing with the apex, hindwing with the termen rounded; the areole usually very elongate.

3851*b*. ASTHENIODES ARGENTIPLUMBEA, n. sp. (Pl. C., f. 24).

♀ Silvery-grey; head and thorax largely mixed with black; abdomen dorsally banded with black. Forewing with diffused basal and subbasal black lines; two fine waved antemedial lines; the medial area suffused with fuscous defined by fine waved black lines with series of black points at the veins and with discoidal point and waved black line on it; a fine waved postmedial line with dark suffusion beyond it on apical area and towards tornus; a subterminal series of black points and a fine black terminal lines. Hindwing greyish-white with discoidal point and two indistinct postmedial and a submarginal line more prominent below; a fine terminal line and series of points on the cilia.

Habitat.—Tibet, Yatong (Hobson); Bhutan (Dudgeon). *Exp*. 34 mill. *Type*—In B. M.

4852*a*. STAMNODES ELWESI. Alph. Deutsch Ent. Zeit. Lep., VIII, p. 202 (pl. C., f. 16).

♂. Dark brown slightly irrorated with white; abdomen with whitish segmental lines. Forewing with oblique white antemedial, medial and postmedial quadrate spots on costa; some slight pink marks in cell below the first spot; the whole discal area bright pink extending into the cell and up to the medial and postmedial spots on costa and almost reaching the termen and inner margin, a small white spot on costa before apex. Hindwing with slight subterminal pink marks on costal half of wing. Underside of forewing

with white striæ on the costal area. Hindwing largely mottled and striated with white, forming an irregular subterminal band expanding towards costa ; a terminal pale red-brown band with waved inner edge.

Habitat—Tibet, Yatong ; Sikhim. *Exp.* 38 mill.

ACIDALIANÆ.

3864*a*. CRASPEDIA POLYSTIGMARIA, n. sp.

♂. Ochreous-white ; frons and a line at back of head black. Forewing sparsely irrorated with black ; traces of a curved subbasal line and of an oblique antemedial line from origin of vein 2 to inner margin ; a black discoidal point ; a diffused very oblique postmedial line ; a fine slightly curved subterminal line with a series of black spots beyond it rather larger towards inner margin. Hindwing with oblique antemedial line a black discoidal point ; a slightly curved and minutely waved postmedial line with a series of black spots beyond it obsolescent towards costa ; the termen highly angled at vein 4.

Habitat—Kashmir Rajaori (Leech). *Exp.* 26 mill. *Type*—In B. M.

3866. CRASPEDIA ADDICTARIA insert PULCHELLATA, Fabr. Ent. Syst. III 2, p. 171 (1794) which has priority.

3866*a*. CRASPEDIA BISPURCATA, Warr. Nov. Zool. V, p. 239.

Ochreous-white irrorated with black ; palpi and frons black ; neck with olive-brown rings. Forewing with pale brown curved dentate antemedial line, oblique towards inner margin ; a discoidal black point with a pale brown dentate line just beyond it, angled at vein 6, then oblique ; a postmedial dentate line oblique from costa to vein 6 where it is angled, incurved and with black patches on it below vein 6 and on inner area ; a pale waved subterminal line ; a terminal series of black points. Hindwing with the termen crenulate and hardly angled ; a slightly sinuous pale brown antemedial line ; a black discoidal point ; a crenulate postmedial line and a pale waved subterminal line ; a terminal series of black points.

Habitat—Khásis. *Exp.* 26 mill.

3883. CRASPEDIA REMOTATA, insert (syns.) *Craspedia furfurata*, Warr. Nov. Zool. IV., p. 218 (ab.) *subcarnea*, Warr. Nov. Zool. VII., p. 104, and *Craspedia atridiscata*, Warr. Nov. Zool. IV., p. 217, a form with large discoidal black points and the two outer submarginal lines obsolescent.

Page 436. Under ACIDALIA insert *Strophophila*, Warr. Nov. Zool. IV., p. 225, for Sect. I. B. 6.

3896*a*. ACIDALIA RUFARIA, Hübn, Eur. Schmett. Geom. f. 112.

Ochreous suffused with rufous ; palpi and frons red-brown ; wings irrorated with a few large dark scales. Forewing with slightly curved rufous antemedial line ; a black discoidal point ; a somewhat diffused medial line excurved from costa to vein 4, then incurved ; a fine oblique postmedial line slightly excurved between veins 5 and 3 and with two somewhat diffused minutely waved lines beyond it ; a fine terminal line. Hindwing with black discoidal point, a slightly curved, somewhat diffused medial line ; a fine postmedial line slightly angled outwards at veins 6 and 4 ; two diffused, minutely

waved subterminal lines ; a fine terminal line.

Habitat.—Europe ; Syria ; C. Asia ; Kashmir, Goorais Valley. *Exp.* 26 mill.

3896*b*. ACIDALIA CARPHERARIA, n. sp.

♂. Bright straw-yellow ; frons black. Forewing with slight dark irroration on base of costal area, a discoidal black point ; traces of diffused slightly sinuous postmedial and subterminal lines. Hindwing with discoidal black point and traces of diffused sinuous postmedial and subterminal lines ; cilia of both wings sometimes with series of minute points. Underside of forewing slightly suffused with fuscous to the subterminal line.

♀. Wings sparsely irrorated with fuscous ; forewing narrower, the apex produced and acute.

Habitat.—Kashmir (Pilcher), Chamba. *Exp.* 18-22 mill.

3896*c*. ACIDALIA PERPULVEREA, n. sp.

♀. Brownish-grey thickly irrorated with dark brown ; palpi and frons black. Forewing with rather indistinct waved antemedial line incurved in submedian interspace ; a prominent black discoidal spot ; an indistinct waved line from lower angle of cell to inner margin ; the postmedial line slightly waved, excurved between veins 7 and 2. Hindwing with discoidal point ; traces of a waved line from lower angle of cell to inner margin ; the postmedial line minutely waved, oblique from costa to vein 3, then incurved ; both wings with series of dark points at base of cilia.

Habitat.—Kashmir, Goorais Valley (Leech). *Exp.* 24 mill. *Type*—In B. M.

3900. ACIDALIA ACTIOSARIA, insert (syn.) *Ptychopoda comparanda*, Warr. Nov. Zool. VII., p. 107, an olive-ochreous form from Ceylon.

3900*b*. ACIDALIA ÆQUISINUATA, Warr. Nov. Zool. V., p. 242.

Olive-ochreous with a slight rufous tinge ; palpi at tips and frons black. Forewing with the costal edge dark ; an indistinct sinuous antemedial line ; a black discoidal point ; a medial line excurved round end of cell ; the postmedial line excurved from below costa to vein 2 and with a dark patch beyond it on inner area ; a pale sinuous subterminal line and a terminal series of dark striæ. Hindwing with sinuous antemedial line with the black discoidal point just beyond it ; a sinuous postmedial line excurved beyond lower angle of cell, the terminal area irrorated with fuscous with a dark spot at apex.

Habitat.—Bhutan ; Khásis. *Exp.* 22 mill.

3901*a*. ACIDALIA MARMORATA, n. sp.

♂. Head and thorax ochreous ; palpi and frons black ; abdomen pale ochreous, dorsally suffused with fuscous. Forewing pale silky ochreous ; the costa deeper ochreous ; the basal area suffused with black excurved from costa to below median nervure ; ill-defined irregularly sinuous medial and postmedial blackish bands, the latter diffused outwards to termen at middle and tornus. Hindwing pale silky ochreous ; an indistinct waved fuscous medial band connected at middle by a patch with the waved postmedial band ; both wings with the cilia deep ochreous with a series of black points.

Habitat.—Cuddapah, Jammalamaduga, 750′ (W. H. Campbell). *Exp.* 24 mill. *Type*—In B. M.

3906. ACIDALIA INSUAVIS, insert (syn.) *Strophophila informis*, Warr. Nov. Zool. IV., p. 225.

The male has a fold and fringe of hair on inner area of hindwing below.

3907. ACIDALIA HOLOSERICATA, insert (syns.) *Ptychopoda decidua*, Warr. Nov. Zool. VIII., p. 107, and *Ptychopoda delicatula*, Warr. Nov. Zool. VIII., p. 24.

3907*b*. ACIDALIA INDETERMINATA, Warr. Nov. Zool. VIII., p. 25.

♀ Ochreous-white, strongly irrorated with dark brown; frons black. Forewing with traces of antemedial and medial diffused oblique dark lines; a black discoidal point; a minutely dentate blackish postmedial line sometimes with diffused dark band on its outer side with irregularly sinuous outer edge; a series of black points at base of cilia. Hindwing with traces of medial line; a black discoidal point; two indistinct waved postmedial and a subterminal line.

Habitat.—Simla; Tibet, Yatong. *Exp.* 24 mill.

3907*c*. ACIDALIA CONIOPTERA, n. sp.

Grey-white, very thickly irrorated with fuscous brown; frons black. Forewing with indistinct antemedial line angled outwards below costa, then oblique; a discoidal point; an oblique dentate slightly curved postmedial line; traces of a diffused subterminal line; cilia whitish with prominent series of dark points. Hindwing with indistinct oblique subbasal and antemedial lines; a black discoidal point; a somewhat dentate postmedial line angled outwards below costa and incurved in discal fold; traces of a diffused subterminal line; the termen sinuous with a fine dark line; cilia whitish with prominent series of dark points.

The areole of forewing often minute.

Habitat.—Kashmir, Kuijar (McArthur). *Exp.* 20-24 mill. *Type*—In B. M.

3911*b*. ACIDALIA PULCHRIFASCIA, n. sp. (Pl. C., f. 13.)

♀ Differs from *gemmaria* in the ground color being slightly tinged with brown; abdomen concolorous. Forewing with discal point; the band much narrower, its inner edge straight and blackish, its outer edge less produced below vein 2. Hindwing with the band narrower; its edges nearly straight, the discal spot conjoined to the band.

Habitat.—Sikkim, 1800′ (Dudgeon). *Exp.* 22 mill. *Type*—In B. M.

3911*c*. ACIDALIA METHÆMARIA, n. sp.

♀ Head and thorax brownish ochreous; palpi and frons black; abdomen fuscous, reddish towards base. Forewing brownish ochreous, the inner area suffused with dull red and irrorated with a few darker red scales; the antemedial line represented by a dark red spot in submedian fold; the postmedial line sinuous, excurved between veins 4 and 2 and with purplish-fuscous suffusion beyond it becoming obsolete towards costa. Hindwing ochreous; the basal half strongly irrorated with blood-red; a dark discoidal

point; the postmedial line sinuous, excurved between veins 4 and 2, with an ochreous band on its inner side and the area beyond it suffused with purplish-fuscous ; cilia ochreous.

Habitat.—Sikkim 2,800′ (Pilcher). *Exp.* 16 mill. *Type*—In B. M.

3918. CHRYSOCRASPEDA PLUMBEOFUSA, insert (syn.) *Chrysocraspeda gibbosa*, Warr. Nov. Zool. IV., p. 370.

3918*b*. CHRYSOCRASPEDA CROCEICINCTA, n. sp. (Pl. C., f. 22).

♀ Purple-red ; palpi and frons pale brown ; vertex of head and shaft of antennæ white ; abdomen with the anal tuft and ventral surface ochreous. Forewing with series of white points on costa ; very indistinct ante- and postmedial lines, the latter incurved below vein 3 ; termen and cilia orange, the red extending to termen at apex and as teeth on veins 2, 3, 4. Hindwing with the termen and cilia orange, the red extending to termen as teeth on the veins.

Habitat.—Ceylon, Kandy (Pole). *Exp.* 16 mill. *Type*—In B. M.

3920*a*. CHRYSOCRASPEDA RUBRIFUSCARIA, n. sp.

♀ Head, thorax and abdomen reddish-brown ; vertex of head white. Forewing dull pink, the costal and terminal areas suffused with fuscous-brown, leaving the costal edge and termen pink ; cilia orange-yellow. Hindwing with the basal half dull pink, the terminal half fuscous-brown ; the termen pink ; the cilia orange-yellow. Underside pale grey-brown.

Habitat.—Ceylon (Mackwood). *Exp.* 20 mill. *Type*—In B. M.

3926. ANISODES OBRINARIA, del. *Caligata similaria* and *suspicaria*.

3928*b*. ANISODES SUSPICARIA, Snell. Tijd. V. Ent. XXIV., p. 80, pl. 8,f. 6.

♂ Hind tibiæ with the medial spurs absent, the hind femora with tufts of curled pink hair above.

Color and markings similar to *A. obrinaria*.

Habitat.—Ceylon, Haputala, Khàsis, Celebes, Saugir. *Exp.* 36 mill.

3931*a*. ANISODES SIMILARIA, Wlk. XXVI., 1582.

„ *caligata*, Wlk. XXVI., 1584.

Hind tibiæ of male with the medial spurs absent.

Color and markings similar to *A. obrinaria* ; hindwing with the discoidal spot smaller.

Habitat.—Ceylon ; Moulmein ; Penang. *Exp.* 28 mill.

3932. ANISODES PALLIDA insert (syn.) *Perixera rufannularia*, Warr. Nov. Zool. IV., p. 221.

3947*a*. ERYTHROLOPHUS POSTLINEATA, Warr. Nov. Zool. VI., p. 335.

Hind legs of male reduced, the tibia dilated with a tuft of hair from base and fringed with scales on outer side ; the spurs absent.

♂ Nearly pure white ; palpi above and vertex of head, antennæ and forelegs fulvous ; wings irrorated with brown scales. Forewing with the costal edge pale fulvous ; a black discoidal point ; both wings with an oblique straight pale fulvous postmedial line with a slightly sinuous line beyond it and two minutely waved subterminal lines.

♀ Both wings with the second postmedial line absent.

Habitat.—"India." *Exp.* ♂ 26, ♀ 30 mill.

Genus LEPTOSIDIA, Nov.

Proboscis fully developed; palpi upturned short, slender, the second joint with loose hairs; frons nearly smooth; antennæ of male with two pairs of short, slender branches, ending in fascicles of cilia, to each joint; legs slender, hind tibiæ with the outer medial spur absent; wings slender. Forewing with the termen oblique; vein 3 from well before angle of cell; 5 from middle of discocellulars; 6 from areole; 10 anastomosing with 11 and then with 8, 9 to form a double areole. Hindwing with vein 3 from well before angle of cell; 5 obsolescent from middle of discocellulars; 6·7 stalked; 8 touching subcostal nervure near base, then diverging.



Leptosidia araearia ♂ $\frac{1}{1}$

3957*b*. LEPTOSIDIA ARÆARIA, n. sp.

♂ Grey irrorated with brown. Forewing with the costal area slightly tinged with ochreous; dentate brownish antemedial, medial and postmedial lines, the first slightly curved, the second angled outwards below costa and at vein 4, then incurved, the third oblique and incurved in discal fold; a small discoidal spot. Hindwing less strongly irrorated; a small discoidal spot; an indistinct medial line from cell to inner margin and dentate postmedial line incurved between veins 7 and 4; both wings with fine dark terminal line.

Habitat.—Kashmir, Narkundah (McArthur), Goorais Valley (Leech); Kangra Valley (Dudgeon). *Exp.* 38 mill. *Type*—In B. M.

3965*a*. RHODOSTROPHIA SUBRUFA, Warr. Nov. Zool. IV., p. 224.

♂. Ochreous grey thickly irrorated and suffused with dull pink; both wings with discoidal dark points, traces of oblique straight medial line and sinuous submarginal line more distinct on underside.

Habitat.—Simla. *Exp.* 28 mill.

3968*a*. RHODOSTROPHIA POLIARIA, n. sp.

Grey-white irrorated with brown; palpi and frons chestnut; head and tegulæ sometimes tinged with dark pink. Forewing with brown antemedial line angled outwards in cell and submedian folds; a prominent small discoidal spot; the postmedial line oblique, sinuous, bent outwards to inner margin, dentate at the veins and with the area between it and subterminal line usually suffused with brown, this line being minutely waved and incurved in discal and submedian folds. Hindwing tinged with brown; a dark discoidal point, a rather indistinct, nearly straight postmedial line and minutely waved subterminal line incurved to costa.

The costal area of forewing, the postmedial band and cilia of both wings sometimes tinged with pink.

Habitat.—Kashmir, Goorais Valley (Leech). *Exp.* ♂ 40, ♀ 36 mill. *Type*—In B. M.

3968*b*. RHODOSTROPHIA PULVEREARIA, n. sp.

♂. Ochreous white; palpi and frons chocolate. Forewing thickly irrorated with brown, an indistinct fine oblique antemedial line; a discoidal black point; an oblique postmedial line; a fine minutely dentate subterminal line; a fine terminal line. Hindwing irrorated with brown except towards costa; a discoidal point; a medial line from vein 3 to inner margin; a curved minutely waved subterminal line; a fine terminal line.

Habitat.—Simla (Nurse). *Exp.* 34 mill. *Type*—In B. M.

3975. PROBLEPSIS DELIARIA, insert (syn.) *Problepsis albidior*, Warr. Nov. Zool. VI., p. 33.

GEOMETRINÆ.

4011*a*. PSEUDOTERPNA OCELLATA. Warr. Nov. Zool. VI., p. 207.

♀. Whitish irrorated with deep purple and variegated with dull green; palpi and frons black; wings striated with purple; an oblique green patch on basal area; traces of a curved antemedial line; both wings with large oblique eliptical discoidal annulus; diffused curved and somewhat sinuous green postmedial, submarginal and marginal lines. Underside white, orange at base; forewing with two purple spots on basal area, the upper in cell small; both wings with large purple discoidal spots and postmedial and submarginal prominent bands somewhat angled at middle and the latter diffused outwards to the margin in places.

Habitat.—Khásis. *Exp.* 56 mill.

4019*a*. PSEUDOTERPNA SUBSIMILIS, Warr. Nov. Zool. V., p. 232.

♂ Differs from *subrosea* in the dorsal tufts of abdomen being green. Forewing greener with the lines hardly traceable and not approximated on inner margin. Hindwing with the base only pale, the rest of wing pale pink mottled with fuscous; some green on termen from above middle to near tornus. Underside of forewing with fuscous line beyond the cell between vein 6 and submedian fold.

Habitat.—Sikhim. *Exp.* 54 mill.

4025*a*. PSEUDOTERPNA ELÆARIA, n. sp.

Head and thorax sap-green; palpi and lower part of frons ochreous; legs irrorated with fuscous; abdomen sap-green irrorated with fuscous; wings ochreous, almost entirely covered by sap-green striations and mottlings. Forewing with black striæ on costa; antemedial indistinct pale rufous spots irrorated with black below cell and on inner margin; a black discoidal point; a dentate green postmedial line defined by grey on outer side, angled outwards below costa, then oblique and with pale rufous black-irrorated patches beyond it between veins 6 and 4 and 3 and inner margin; a dentate grey subterminal line; a terminal series of small black lunules. Hindwing with black discoidal point; a dentate postmedial green line with black points on the veins and defined by grey on outer side; a waved grey sub-

terminal line; a terminal series of small black lunules. Underside of both wings pale orange-yellow with round black discoidal spots and broad outwardly diffused fuscous-black postmedial band; terminal area greyish irrorated with fuscous.

Habitat.—Sikhim; Khásis. *Exp.* 66 mill. *Type*—In B. M.

Page 487. Under ULIOCNEMIS insert *Chlorostrota*, Warr. Nov. Zool. IV, p.36 (1897), for Sect. III.

4054. ULIOCNEMIS ALBIVIRIDIS insert (syn.) *Chlorostrota præampla*, Warr. Nov. Zool. IV, p. 36.

4076*a*. GEOMETRA RUFIFRONTARIA, n. sp.

♂ Antennæ serrate and fasciculate; hind tibiæ dilated with a fold containing a tuft of long hair; forewing with vein 11 anastomosing with 7, 8, 9, 10, to form an areole.

Sap-green; palpi and frons red-brown; pectus and legs whitish. Forewing with indistinct minutely waved antemedial, postmedial and subterminal darker green lines and small discoidal spot; costal edge brownish. Hindwing with whitish points at angles of cell and minutely waved postmedial and subterminal lines. Underside whitish, the costal area of forewing rufous.

Habitat.—Calicut (Fellows-Wilson). *Exp.* 22 mill. *Type*—In B. M.

4082. EUCHLORIS INDUCTARIA insert (syn.) *E. subhyalina*, Warr. Nov. Zool. IV, p. 9.

4089*a*. EUCROSTES CYMARIA, n. sp.

♂ Head, thorax and abdomen white, the thorax tinged with green; a red band above frons. Forewing bright yellow green; the costa white; the veins streaked with white; a highly waved antemedial white line; an oblique discoidal bar; an oblique minutely waved postmedial white line from below costa to inner margin beyond middle. Hindwing paler green with white discoidal point and curved postmedial line; cilia of both wings white.

Habitat.—Simla, 7,000′ (Pilcher). *Exp.* 28 mill. *Type*—In B. M.

4119*a*. THALASSODES PICTURATA, n. sp. (Pl. C., f. 7.)

♂ Head, thorax and abdomen dark brown variegated with ferruginous and white scales; palpi white in front; upper edge of tegulæ deep green; legs brown and white; pectus, ventral surface of abdomen and anal tuft white. Forewing white, the costal area to beyond middle and to median nervure grey brown striated with dark brown and irrorated with white and black scales; some coppery scales near base and on middle and extremity of median nervure; an antemedial sinuous excurved black line with blue-grey on its inner side from costa to median nervure; a similar dentate postmedial line with the blue-grey beyond it; a white-striated medial green band from median nervure to inner margin towards which it is dilated; a similar dentate patch below end of cell; some copper and green below costa towards apex; some green irroration on termen below vein 6 and from vein 3 to tornus;

a coppery and brown mark between vein 2 and inner margin near tornus; some green points on termen. Hindwing white blotched with green except on costal area on subterminal area down to vein 3 and on inner area from middle to near tornus; a green discoidal point; some brown and coppery scales on inner area towards tornus and on a greyish subterminal band from costa to vein 3. Underside white with black subterminal spots on forewing above vein 4 and towards tornus, and forming a broken band on hindwing.

Habitat.—Ceylon, Gampola (Mackwood) 1 ♂ type. *Exp.* 32 mill. *Type*—In B. M.

4125*a*. THALASSODES AUREOFULVA, Warr. Nov. Zool. IV, p. 209.

♂ Head and thorax bright yellow green and white; abdomen white with greenish dorsal patch towards extremity. Forewing yellow-green with blotches of white especially on inner area and on middle of outer margin an indistinct obliquely sinuous antemedial white line; a large olive-fulvous patch on costal area between end of cell and apex crossed by the white postmedial line which is very highly dentate between veins 6 and 3. Hindwing white with some four incomplete waved green lines on outer half. Underside white with large fuscous patch on apical area of forewing and small patch at apex of hindwing.

Habitat.—Khâsis. *Exp.* 36 mill.

4129*a*. THALASSODES HYPOLEUCA, n. sp. (Pl. C., f. 34.)

♀ Bluish green; palpi white at base, tinged with fuscous at tips, vertex of head white. Forewing with the basal area striated with purplish fuscous; a white discoidal point on a purplish fuscous patch; medial and postmedial series of fuscous points and some striæ between veins 5 and 6; a diffused brownish patch with fuscous striæ on it towards tornus; cilia brownish at base, white at tips. Hindwing with the base purplish fuscous; the green area with some fuscous points, a discoidal spot, a large patch of fuscous striæ on apical area and a smaller patch on inner area before tornus; cilia brown, white at tips. Underside of body, legs, and wings to beyond middle white, the legs with black bands at the joints; the wings with discoidal black points; the green terminal area with fuscous striæ and large fuscous patches at tornus of forewing and apex of hindwing.

Habitat.—Burma, Hsipaw (DeNiceville). *Exp.* 50 mill. *Type*—In B. M.

4133*a*. THALERA FLAVITINCTA, Warr. Nov. Zool. IV, p. 211.

♂ Grass-green; frons and forelegs crimson, vertex of head and shaft of antennæ white, the branches brown; abdomen ochreous white. Forewing with the costa ochreous irrorated with black; both wings with fine black marginal line, the cilia yellowish white. Underside whitish, the costa of forewing ochreous.

Habitat.—Khâsis. *Exp.* 46 mill.

4134*a*. THALERA ALBIPUNCTA, Warr. Nov. Zool. V, p. 13.

♂ Pale yellow green or grey-green; vertex of head and base of shaft of antennæ, pectus and ventral surface of abdomen white. Forewing with

traces of waved white antemedial line below the cell ; an irregularly dentate subterminal line with white point on it in discal fold and lunulate spot in submedian fold displaced inwards ; a terminal series of white points. Hindwing with irregularly dentate white postmedial line with a white lunule on it displaced inwards in submedian fold ; a terminal series of white points.

Habitat.—Khásis. *Exp.* 28 mill.

4138*b*. THALERA MACULATA, Warr. Nov. Zool. IV, p. 208.

♀ Frons prominent ; forewing with vein 11 touching 12 and 10 but not anastomosing with them.

Yellow green ; palpi at tips, antennæ and marks on legs brown ; wings irrorated with black brown. Forewing with the dark irroration forming a patch at base and a very ill-defined subterminal band developed into a large patch above tornus ; straight ochreous ante—and postmedial lines meeting on inner margin and defined by olive green on medial area ; a black discoidal point. Hindwing with oblique ochreous medial line defined by olive green on inner side ; a patch of dark irroration above tornus.

Habitat.—Khásis. *Exp.* 58 mill.

PYRALIDÆ.

GALLERIANÆ.

Genus CORCYRA.

Corcyra, Rag. Ent. Mo. Mag., XXII., p. 23 (1885).

Type—*C. cephalonica*, Stn.

Proboscis absent ; palpi of male minute, of female extending about twice the length of head ; frons with large tuft of hair ; antennæ short, simple, the basal joint with tuft of scales ; tibiæ with the spurs long. Forewing long and narrow ; the cell long ; vein 2 from towards end of cell ; 3·4 from angle ; 5 absent ; 6 from upper angle ; 7·8·9 stalked, 7 from 8 beyond 9 ; 10·11 free. Hindwing with vein 2 from close to angle of cell ; 3·4 on a long stalk ; 5 absent ; 6·7 stalked, 7 anastomosing with 8.



Corcyra cephalonica ♂ ♀.

4141*a*. CORCYRA CEPHALONICA, Stn. Ann. 1866, p. 147.

Head, thorax and abdomen grey-brown. Forewing grey tinged with brown, the veins streaked with black. Hindwing ochreous grey-brown somewhat darker towards costa.

Habitat.—Europe ; West-Indies ; Ceylon, Pundaloya ; Christmas I ; Ké. I. *Exp.* ♂ 24, ♀ 26 mill.

Genus PRASINOXENA.

Prasinoxena, Meyr. Trans. Ent. Soc., 1894, p. 479.

Type—*P. monospila*.

Palpi of male small, upturned ; of female porrect and extending about length of head ; maxillary palpi minute ; frons smooth ; antennæ short, the 1st joint somewhat curved and long. Forewing short, broad, the apex

rectangular, the termen oblique ; the cell long ; vein 2 from middle of cell; 3·4·5 from angle ; 6 from upper angle ; 7·8·10 stalked, 9 absent ; 11 from cell ; the underside clothed with yellow androconia. Hindwing with the cell open ; veins 2·3·5 stalked, 4 absent ; 6·7 stalked, 7 anastomosing with 8 ; the inner area with a fold on underside enclosing a tuft of long hairs.

4141*b*. PRASINOXENA MONOSPILA, Meyr. Trans. Ent. Soc. 1894, p. 480 ; Rag. Rom Mem., VIII, pl. 54, f. 14.

Head and thorax green ; abdomen yellow. Forewing bright emerald green ; a small fulvous-yellow discoidal spot ; the costa towards apex and termen with a series of white points, defined by brown ; cilia brownish yellow. Hindwing golden yellow, the inner area tinged with brown. Underside of forewing with the cell clothed with yellow scales and hairs.

Habitat.—Khásis, S. E. Borneo, Pulo Laut. *Exp.* 14 mill.

4145*b*. TIRATHABA IRRUFATELLA, Rag. Rom. Mem., VIII., p. 462, pl. 43, f. 8.

Head, thorax and abdomen ochreous white. Forewing ochreous somewhat irrorated and suffused with pale brown ; traces of an antemedial line acutely angled in cell ; a dark point in middle of cell and another on discocellulars ; a minutely dentate postmedial line, very oblique from costa to vein 6 where it is angled ; a terminal series of points and a dark line through the cilia. Hindwing ochreous white.

Habitat.—Japan ; Khásis. *Exp.* ♂ 20, ♀ 34 mill.

4150*c*. LAMORIA NIGRISPARSALIS, n. sp.

♂. Forewing without the glandular swelling on costa, the cell clothed with ochreous androconia on underside.

Head, thorax and abdomen white slightly tinged with brown. Forewing pale brown irrorated with long black scales, a diffused whitish subcostal fascia, the costa darker brown. Hindwing pale brownish.

Habitat.—Ceylon, Matale (Pole), Nawalapitya (Green). *Exp.* 26 mill. *Type*—In B. M.

4152*c*. EMBRYOGLOSSA BIPUNCTA, n. sp.

Head, thorax and abdomen ochreous, thorax tinged with brown. Forewing ochreous strongly irrorated with purplish fuscous forming diffused streaks in the interspaces ; indistinct diffused pink streaks in and below cell, on the veins beyond it and on inner margin ; traces of an antemedial dark line angled on median nervure ; an indistinct pale postmedial line bent outwards to near termen at vein 6, then dentate and at vein 4 becoming very oblique to inner margin just beyond middle ; cilia chequered fuscous and ochreous. Hindwing fuscous ; the cilia ochreous chequered with fuscous and with a fine line through them.

Habitat.—Khásis. *Exp.* 30 mill. *Type*—In Coll. Rothschild.

CRAMBINÆ.

4178*a*. CRAMBUS PHŒOSTRIGELLUS, n. sp.

Head and thorax golden yellow ; abdomen grey suffused with fuscous, the anal tuft ochreous. Forewing golden orange-yellow ; black streaks from

base to near the medial line on and below costa, two in cell and one in submedian interspace; the medial line white defined on each side by black, very oblique from costa to vein 5, where it is strongly angled, then very oblique to inner margin before middle, an oblique striga beyond it from costa and some black scales below the angle; a subterminal white line defined by black on inner side and by a few black scales on outer side, oblique from costa to vein 5 where it is angled; three short black streaks on termen above tornus; a fine brown terminal line and a line at base of cilia which are golden. Hindwing pale fuscous, ochreous white on terminal area and cilia.

Habitat.—Kashmir, Goorais Valley (Leech). *Exp.* 20 mill. *Types*—In Coll. Rothschild and B. M.

4185*a*. PLATYTES TRICHIALIS, n. sp.

♀ Head and thorax creamy white; abdomen white strongly tinged with ochreous. Forewing creamy white strongly irrorated with brown hair-like scales, the terminal area tinged with ochreous. Hindwing whitish strongly tinged with brown.

Habitat.—Bombay, Nassik (Davidson). *Exp.* 44 mill. *Type*—In B. M.

4199. Should stand as EROMENE JAXARTELLA, Ersch. Lep. Turk., p. 82.

It differs from *superbella* in the medial fulvous band being slightly angled inwards to costa.

Habitat.—Turkestan; Punjab; Scind.

4202*c*. DIATRŒA ACULEATA, n. sp. (Pl. C., f. 15.)

♀ Yellowish white; head and thorax tinged with pale brown; abdomen with the 1st two segments dorsally orange. Forewing with the apex produced and acute; the interspaces of costal and terminal areas streaked with yellowish brown; a black discoidal point; traces of a very obliquely curved postmedial line from costa to lower angle of cell and of a subterminal line; a brown terminal line and two fine lines through the cilia. Hindwing pure white.

Habitat.—Sikhim, 2,000′ (Pilcher). *Exp.* 20 mill. *Type*—In B. M.

4224*a*. ANCYLOLOMIA PECTINATELLA, Zell. Isis, 1847, p. 747.

Differs from *chrysographella* in the antennæ of male having long uniseriate branches.

Habitat.—S. Europe; Belgaum. *Exp.* ♂ 26 mill.

4229*a*. Antennæ of male laminate.

CHARLTONA FUSCA, n. sp. (Pl. C., f. 18.)

♂ Fuscous irrorated with grey; antennæ pale. Forewing with diffused ochreous fascia below median nervure; a marginal series of dark points.

Habitat.—Ceylon, Puttalam (J. Pole). *Exp.* 28 mill. *Type*—In B. M.

(To be continued.)

INDIAN DUCKS AND THEIR ALLIES.

By E. C. Stuart Baker, f.z.s.

Genus Æx.

According to the British Museum Catalogue the Mandarin Duck is included in the Plectropterinæ and the key is as follows :—

No comb on base of bill.

Head crested .. ..Æx.

Both Ogilvie-Grant and E. Oates however, pointed out to me that a far better generic character is provided in the silver-grey edging to the primaries, a character by which it may be at once distinguished from any other Indian duck.

Æx galericulata.

The Mandarin Duck.

Anas galericulata—Lath., Ind., Orni. ii., p. 871.

Æx galericulata.—Gould B. of Asia, vii., p. 89. Salvadori, Cat. B. B. M., xxvii., p. 76. Oates' "Game Birds of Ind." ii., p. 136. Finn, "Fancy Waterfowl," p. 26. Bennett, "Wanderings in New South Wales," ii., p. 62. Latham, Syn., iii., p. 548.

Description. Adult Male.—Supercilium from the base of the bill to the end of the crest pure white ; forehead to nape glossy green, thence the long thick crest is metallic purple, more or less mixed with green on the basal half and entirely green on the terminal third which is sometimes shot with deep blue ; face and sides of the head buff, shading into white round the eye and into cinnamon red on the posterior cheeks, chin and throat ; the neck hackles are bright chestnut tipped with purple and with white striæ on the anterior portion ; remainder of upper plumage and lesser wing coverts dull brown glossed with bronze-green, especially on the mantle and upper tail coverts ; tail grey-brown glossed green. Lower neck and sides of breast brilliant purple-copper, sides of lower breast with three bands of black and two of white ; remainder of lower parts white ; flanks vermiculated black and brown, but with copper bars opposite the vent and with black and white bars at the end of the flank feathers. Scapulars grey-brown, the innermost completely glossed with deep blue and the median with green, the change being graded and not clearly defined ; the outermost are white with broad black edges. The innermost secondary, which is enormously broadened into a fan shape, is chestnut on the inner web, tipped paler on the outer half and with blue on the inner, on the outer web of this secondary the tip is chestnut, the remainder deep glossy blue ; other secondaries brown

with the outer web glossed green and tipped white, except the one next the innermost one which is all of this colour; primaries brown, glossed green and with broad edges of silver grey on the outer webs. Axillaries brown, under wing coverts mixed brown and grey.

"Iris dark brown with a yellowish white outer ring; bill reddish brown, with the nail blueish flesh colour; tarsus and toes reddish yellow, membranes blackish." (Schrenk.)

Wing 8·8″ to 9·4″; tail 4·2″ to 4·6″; bill, culmen 1·1″ to 1·25″, from gape 1·3″ to 1·45″; tarsus 1·3″ to 1·4″; length about 16″ to 18″.

In one specimen in the British Museum the whole chin, and in another, the border of the angle of the chin, is white.

Adult female.—Head and full crest grey, a narrow line starting above the eye and passing round the front to the back and bordering the crown, white; sides of the head pale grey, grading into the white of the chin, throat and upper neck; the face is sometimes broadly white and sometimes wholely grey and at other times, there is a broad or narrow band of white next the bill; whole remaining upper parts and wing-coverts brown, more or less tinged with grey or olive grey; lower neck, breast, sides and flanks the same colour as the back, each feather with a pale spot near the tip, these being very large on the flanks; remainder of lower parts white; primaries brown, slightly glossed green and broadly tipped white, two of the inner secondaries forming a deep blue-green speculum, sub-margined black and margined white; innermost secondaries the same colour as the back.

As with other ducks with white underparts, these are often more or less tinged with rusty.

Wing about 8″; tail about 4″; bill, culmen 1·05″ to 1·20″, from gape 1·2″ to 1·32″; tarsus 1·2″ to 1·3″.

The male in part-nuptial plumage resembles the female, but this sex, as Oates points out, "may be separated from males . . . . by the oblique white stripe which may always be found on the outer web of the first purple feather of the speculum. This stripe is just below the tips of the wing coverts and is always absent in the male."

The young male in first plumage also resembles the female with the exception just noted; it is, however, generally rather bigger and often more clearly coloured.

Amongst the first indications of sex plumage assumed by the young male is the deepening of the plumage of the breast and upper neck.

A specimen (*b*) in the B. M. collection shows this beautifully and looks much as if the change being here undergone was one of colouration in the feathers themselves.

The same bird has the broad secondary partially developed, but has no white edging to the outer web, so, presumably, this is not assumed until the second year; this feather is also not so much falcated as in the adult bird. The adult colouration of the scapulars is only indicated by a few blue tints, but the black and white bars on the sides of the breast are well advanced.

Nestling.—Above hair-brown, the edge of the wing pale buff and two indefinite bars of the same colour on the sides, one in front and one behind the thigh. Under parts wholely pale buff; a dark-brown streak running from behind the eye to the neck and another from behind the ear-coverts.

The only other species in this genus is the American species *Æx sponsa* (The Summer Duck); in this the male has the crest all green and the female differs from the female of *A. galericulata* in having the head and upper parts, glossed with purple. The bill also is differently formed in both sexes, being deeper at the base, and in *sponsa* the upper angle of the maxilla runs far back into the forehead, whereas in the Mandarin the line from gape to upper edge is practically straight.

The Mandarin is a purely Eastern Asiatic duck being distributed, according to Salvadori, throughout "Central and Southern China, Formosa and Japan; Amoorland only during the breeding season." It has also been obtained in Corea and now at last, in India.

It is not long since Oates wrote: "This beautiful duck is not unlikely to be met with on the borders of the Northern Shan States," but it has now been obtained far more West—in Assam.

Mr. A. Stevens who shot the bird and most kindly presented it to me, tells me, in epistola, how he managed to get it. He writes: "Early one dull morning I went in a dug-out down the Dibru river on a collecting trip. The Dibru, then at low water, is a small stream varying between twenty and fifty yards wide, here and there dotted with sandy banks and islands, but for the most part densely covered with jungle down to the water's edge. Twice single specimens of *Asarcornis scutulata* (The White-Winged Wood Duck) passed down the river on their way to their favourite haunts and held forth hopes of something good to be had later on. I had gone some two miles down the river and

had come to a place where it widened out and then divided into two branches. Here there was a small sandy chur (bank) and on this I saw six ducks, but what they were I was still too far off to determine. Four of the ducks were close together, two a little apart, but all six appeared to me to be exactly identical in size and colouration. Selecting the two birds which were the nearer to me, I fired both barrels at them, upon which all six birds rose and flew ahead. I was certain, however, that my shots had told, nor was I wrong, for one bird, after flying some forty yards dropped into the water. Picking the bird up I at once recognized that it was something new to me, but at the same time had no idea of the value of what I had got. Consequently, although I repeatedly flushed the pair to this bird, I made no attempt to shoot it, even though it got up well within range and gave me easy shots.

The birds when first flushed flew away strong and low, but the single bird which I afterwards put up reminded me of the stupid performance of the Little Green Bittern (*Butoroides javanica*) in the way it flew from the bank and across and down stream, only instead of selecting a small tree to perch on, he always managed to drop into the long elephant grass which, with other jungle, bordered the stream.

We found the flesh of this bird very coarse, a fact which saved the pair on several occasions afterwards when I saw it. Afterwards, when I learnt the value of my acquisition, I of course never again saw it."

This is the only occasion on which the Mandarin has actually been *obtained* in India beyond all doubt. I was, however, once told by a sportsman that he had shot a Marbled Teal in Assam, and when asked to describe it, he gave a very minute and accurate description of the female Mandarin. This bird had been shot by him near Margherita, in the Dibrugarh district of Assam, the same district as that in which Mr. Stevens shot his bird.

Again, Mr. Gruning, I.C.S., and myself saw six birds on the River Ranganadi, which I am sure were of this species. We were going along in a small launch and the birds flew across us so close that we could see their silver grey heads and the clear white speculum; unfortunately we had no guns ready and the birds flew straight away. Their flight was very strong and quick, much like that of *Nettion crecca* (The Common Teal) but less swift than that of that bird.

This splendid little duck is one far better known in a captive than in a wild state. Long ago Latham wrote: "We do not find it near so

common in China as many other birds . . . . . and the common price is from six to ten dollars a pair . . . . . nor can they be bred in this country."

Blakiston and Pryer in the "Ibis" (1878, p. 213) state: "Very common on small streams. It formerly built in the trees in Uyino Park, Tokio. Breeds in Yezo."

It seems to be a duck which keeps much to small streams, more especially such as run through forest, but at the same time to prefer such streams as are clear rather than slow sluggish backwaters and weedy pools. It is usually to be found in small flocks, seldom exceeding a dozen and very often less even in the countries where it is most common, so that very small flocks are all we can expect to meet with in India.

It is a stout, sturdy, strong little bird, equally good on water, land and air; its flight is direct and strong, similar, though inferior, to that of *Nettion crecca*; it walks well and quickly and swims with a jaunty carriage, getting over the water at a great pace. I can find nothing on record about its powers of diving, but judging from its shape and plumage these are not likely to be of the best.

Schrenk says that when in Amoor, about May to August, they are very wild and shy, not allowing an approach within gun-shot. He also states that they perch freely on trees. This is confirmed by all other observers, indeed Finn ("Fancy Waterfowl") says that the Mandarin perches as readily as a pigeon.

This same naturalist, one of our best observers and a specialist on waterfowl, remarks: "Another attractive point about this lovely duck is that he is, more than any other duck, 'a bird of position,' and much given to showing himself off, by raising his crest and slightly expanding his wings vertically, so as to bring the wing fans perpendicular and to display the beautifully striped flights, while when standing he often curves his neck back and throws out his breast like a fan-tail pigeon. He certainly looks at such times as if he were conscious of his beauty, and his little brown mate, as she caresses his orange hackles, must surely admire it."

"He is a great fighter, and will even kill ducks of his own kind should he not approve of them."

In spite of their pugnacity, however, they have a reputation in China for being wonderfully faithful little birds to each other. In-

deed, Canel says (p. 155) that "a pair of these birds are frequently placed in a gaily decorated cage, and carried in their marriage processions, and are afterwards presented to the bride and bridegroom as worthy objects of their emulation."

The same author in describing their flight writes : "Whilst on the wing these parties crowd closely together in front, whilst the birds in the rear occupy a comparatively free space."

As regards their nidification very little is known ; it seems to breed everywhere throughout the North of its range, perhaps also wherever it is found. It appears, however, to visit the Amoor and the more Northern extremes of its habitat *only* during the breeding season so that it is probably locally migratory. It is one of the species of ducks which build in trees and in captivity breeds very freely.

W. Evans in the "Ibis," giving the period of incubation for various birds, gives that of this duck as 30 days, whilst Finn gives it as 26. In the Zoological Gardens, up to 1874, the Mandarin had *hatched* eggs no less than twenty-six times, the earliest date for the young to appear being the 31st May, 1858, and the latest July, the 16th, 1874. As the normal climate in which the duck breeds is not unlike ours, except in the extreme north, these dates will probably coincide with its breeding season when in its natural state.

The British Museum possesses five eggs of *Æx galericulata* which measure 2·2″ × 1·6″; 2·15″ × 1·54″; 2·15″ × 1·6″; 2·08″ × 1·56″ and 2·16″ × 1·52″. In shape these eggs are very regular ellipses, but slightly compressed at one end. The texture is smooth and close and distinctly glossy, and the colour is a very pale fawn or yellowish white. One egg was originally, perhaps, rather darker in colour than the rest, but is so soiled that it is difficult to say with any certainty. All these eggs were laid by birds in captivity.

THE BUTTERFLIES OF CHITRAL.

By Major G. A. Leslie, R.E., and Lieutenant W. H. Evans, R.E.

So far, we believe, nothing has ever been written on the butterflies of Chitral, and it is in this belief that we are encouraged to place on record the results of two seasons' butterfly-catching in a remote and comparatively unknown country. It must, however, be understood that our opportunities of wielding the net have been limited to short and hurried tours on duty, and to occasional spells of a few days' leave, and that our native assistants, when first entered to the art of butterfly-catching, were firmly convinced that the country held only four distinct varieties. Some idea of the extent of the country contained in Chitral territory may be gained from the fact that the main valley, from the source of the Yarkhun river to the Afghan boundary at Arnawai, is some 220 miles in length, and varies in altitude from about 12,000 to 4,000 feet above sea level. Leaving out of count the numberless smaller valleys that feed the main stream, it has on its right bank two great valleys of from 50 to 60 miles in length, running up to passes on the Hindu Khush of from 15,000 to 17,000 feet in altitude, and on its left bank four valleys of over 20 miles in length, and rising to passes of from 16,000 to 17,000 feet in altitude. The hills and valleys below Chitral are mostly covered with pine and deodar forests and are thick with undergrowth and wild flowers; those above Chitral are practically bare except for the fertile and richly-cultivated "fans" which occur at intervals like oases in a desert. Two years' experience has shown that many of the smaller valleys alone hold specimens peculiar to themselves and that at some of the higher altitudes, such as the Shandur Plateau, butterfly life flourishes only for two months in the year. When in addition it must be confessed that net and collecting box have never seen three-quarters of the country being dealt with, we hope to be forgiven for our temerity in writing on "the butterflies of Chitral." We only trust that the list of our catches, which contains many common, some rare, and some quite new varieties, may encourage some keen collector, with nothing to occupy him but the all-absorbing pursuit of Nature's most beautiful creations, to venture into the far-off wilds of Chitral and to complete a record of which this list can hope to be no more than a foundation.

The late Mr. De Nicéville was engaged in the work of identifying our butterflies just before his death in December 1901. He was very interested in the specimens we had sent him, and took a great deal of trouble in naming them. There are, we fear, a great many without names, which Mr. De Nicéville had never seen and we are in hopes that this list may catch the eye of some specialist either in India or England, who could complete the work of identification.

FAMILY—NYMPHALIDÆ.

Sub-Family—Danainæ.

1. Danais limniace, Cramer.

Only one battered specimen caught at Nagar, 4,000 feet, on August 2nd, 1901.

2. DANAIS CHRYSIPPUS, Linnæus.

Common at low elevations in the main valley from April to September, occasional ones going up to 10,000 feet. The chestnut colour is much richer than that of specimens found in India.

3. DANAIS ALCIPPUS, Cramer.

Two specimens obtained at Nagar in September and October.

4. DANAIS PLEXIPPUS, Linnæus.

One specimen caught at 6,000 feet near Drosh on May 12th, 1901.

SUB-FAMILY—SATYRINÆ.

5. AMECERA CASHMIRENSIS, Moore.

Found at 6,000 to 9,000 feet in the side nallahs below Chitral from June to August. Good specimens were difficult to obtain owing to the butterfly having a fancy for flying inside prickly-leaved bushes.

6. LASIOMMATA SCHAKRA, Kollar.

One male caught at Ziarat, 8,000 feet in September and one female near Drosh in August.

7. LASIOMMATA MERULA, Felder.

Rare in the side nallahs below Chitral near water at 5,000 to 8,000 feet from June to August. The lack of the male brand and the irregularity of the discal line on the underside of the hindwing distinguishes this insect from its allies.

8. LASIOMMATA MENAVA, Moore.

In April and May common on every footpath in the main valley below Chitral: after May, the heat drives it up to 6,000 to 9,000 feet, where it may be caught commonly up to August.

9. NYTHA PARISATIS, Kollar.

Very common from June to November at 5,000 to 7,000 feet.

10. KANETISA PIMPLA, Felder.

Common on "Sanitarium Hill," 6,500 feet, near Drosh in June and July and occasionally seen at several places up to 10,000 feet. Females were rare. The higher one goes the smaller this butterfly seems to become.

11. KANETISA DIGNA, Marshall.

Very local. Common from June to August at 7,000 feet on the hills near Drosh, and in the nallah up to the Shandur Pass from Laspur at 11,000 feet.

12. KANETISA sp.

Two males caught in the nallah up to the Shandur Pass at 11,000 feet in August. It is allied to *K. digna*, Moore, but is smaller, and the fulvous band is duller and less extensive. Underneath the outer margins of both wings are broadly black. Believed to be a new species.

13. EUMENIS BALDIVA, Moore.

Local and uncommon. Found in various places from Drosh to the Shandur Pass in July and August.

14. KARANASA HUEBNERI, Felder.

Found in the Utzen nallah at 9,000 feet, and on the Shandur Pass at 12,000 feet in July and August.

15. KARANASA CADESIA, Moore.

Occurs rarely in the Utzen and Tarben nallahs at 9,000 feet in August. It differs from the preceding insect in having the band on the forewing bright fulvous with even margins instead of pale yellowish with very irregular margins; also the ocelli are very distinctly pupilled above.

16. PHILARCTA SHANDURA, Marshall.

Rare in August on the Shandur and Baroghil Passes at 12,000 feet.

17. PHILARCTA PERSEPHONE, Huebner.

Typical Persephone is common on bare hill sides at 4,000 to 6,000 feet from August to October. The variety *Hanifa*, Hardman, is found in exactly the same localities in May and June and is equally common.

18. AULOCERA SWAHA, Kollar.

Common at 6,000 to 10,000 feet from June to September below Chitral.

19. AULOCERA BRAHMINUS, Blanchard.

One specimen caught in the Tarben nallah at 8,000 feet on August 20th, 1902.

20. AULOCERA SARASWATI, Kollar.

Found fairly commonly in company with *A. swaha*.

21. MANIOLA DAVENDRA, Moore. (?)

Males were common in June amongst pines at 6,000 feet. Females were very common from 4,000 to 8,000 feet from June to September. Either this butterfly is very variable or else we have several varieties. The ordinary male has only one ocellus on the forewing, and the brand is short and wide extending from the inner margin straight to the 2nd median vein. One male caught at Laspur 9,500 feet has the brand very narrow commencing at the base of the wing and running along the lower edge of the cell up to the lower discoidal vein: it has a small ocellus on the forewing between the usual ocellus and the apex and another small one below. Two males caught on the Shandur Pass in August have the male brand thicker, extending from the middle of the inner margin up to the lower discoidal vein and all the veins are black. The females are also very variable, the discal line on the hindwing above being sometimes very distinct and outwardly bordered with white and sometimes altogether invisible.

22. MANIOLA CHEENA, Moore.

Common amongst pines at 6,000—8,000 feet from June to August.

23. CHORTOBIUS NEOZA, Lang.

Common at 6,000—13,000 feet from June to August. This was the commonest butterfly on the shores of the Shandur Lake, but differed from specimens caught elsewhere in having yellow patches on the underside of the hindwing. The latter may be a new species.

24. CALLEREBIA NIRMALA, Moore.

Locally common in the side nallahs below Chitral at 6,000—9,000 feet from June to August. One curious variety we caught has been figured, in the Journal of the Bombay Natural History Society, Vol. XIV., by the late Mr. De Nicéville; all the ocelli on the upperside were obsolete.

25. PARALASA SHALLADA, Lang.

Locally common at 9,000 feet below Chitral from June to August. A very dark butterfly with dark inconspicuous patches of a fulvous colour on both wings ; the ocellus on the forewing is small and the iris nearly obsolete.

26. PARALASA KALINDA, Moore. (?)

Found rarely in company with the above in July and August. It is a bigger and a lighter-coloured butterfly ; the fulvous patches are larger and lighter, and the ocellus is bigger with a wide yellow iris.

27. PARALASA sp.

Several insects belonging to this genus were caught by us ; they may all belong to one variable species or may be several distinct species. Two, of which one was caught by Major Leslie on the Pamirs in July and one in the Tarben nallah in the same month, are dark velvety brown above, having a small, non-pupilled ocellus, with a yellow iris, placed on a dark conspicuous patch ; the hindwing is quite plain, and the iris is very diffused underneath. Two were caught at 13,000 feet in August above the Shandur Pass ; they are much smaller, of a dark brown, not velvety colour : the ocellus is small, pupilled and with a scarcely perceptible yellow iris ; the patch on the forewing is very light fulvous, and occupies half the wing ; underneath, the iris is distinctly lighter and fairly wide. Two more, one a small and one a big butterfly were caught with the last two. They are not so dark ; the ocellus is very small with a nearly obsolete pupil and is placed on a light yellow patch with a darker fulvous patch below ; the hindwing is plain. One was caught in much the same locality ; the colour is very like that of the preceding variety ; the ocellus is bigger, distinctly pupilled and placed on a very large light yellow patch, occupying half the wing ; the hindwing has a darker fulvous patch.

SUB-FAMILY—NYMPHALINÆ.

28. MELITÆA BALBITA, Moore.

Rare at 9,000—14,000 feet in July and August.

29. MELITÆA ROBERTSI, Butler.

Common at 4,000—14,000 feet from April to October. Very variable.

30. MELITÆA PERSEA, Kollar. (?)

Found at 8,000—11,000 feet in the nallahs below Chitral from June to August. The male is much redder than *Robertsi* and with fewer markings. The female has more markings, and the forewing is yellow or brown, not red : it is bigger than *Robertsi*. New to the Indian fauna.

31. MELITÆA sp.

One specimen caught on the Baroghil Pass in August. It is a brick-red butterfly with a few black spots, half way between the end of the cell and the apex in a straight row perpendicular to the costa and a small spot just above the middle of the inner margin ; the hindwing is unmarked. Below the hindwing has none of the red bands as in *Robertsi*. Perhaps a new species.

32. MELITÆA (?) sp.

Of the same size and with the same style of markings as what we have

called . *persea*. The ground colour is, however, light fulvous instead of red; underneath the colouration is paler; there are no red bands on the hindwing. A few specimens were obtained above the Shandur Pass in August at 14,000 feet. Probably a new species.

33. ATELLA PHALANTA, Drury.

Found rarely at low elevations from August to October.

34. SEPHISA DICHROA, Kollar.

Found in nallahs at 5,000 to 9,000 feet from July to September.

35. APATURA AMBICA, Kollar.

Two battered males caught at Ziarat at 8,000 feet in September 1900.

36. JUNONIA ORYTHIA, Linnæus.

Common in nallahs at low elevations from June to November.

37. NEPTIS MAHENDRA, Moore.

A few caught at 8,000 feet in the Utzen and Ashreth nallahs from June to September.

38. HYPOLIMNAS MISIPPUS, Linnæus.

One or two males caught at low elevations in September and October. A few females, mimics of *Danais chrysippus*, also obtained.

39. ARGYNNIS HYPERBIUS, Johansen.

Common at 4,000—8,000 feet from June to September.

40. ARGYNNIS CHILDRENI, Gray.

Rare at 4,000 to 8,000 feet from July to September.

41. ARGYNNIS PANDORA, Wiener Verzeichniss.

Rare at 4,000—8,000 feet from August to October.

42. ARGYNNIS KAMALA, Moore.

Common from June to September at 7,000 feet.

43. ARGYNNIS JAINADEVA, Moore.

Common at 4,000—9,000 feet from June to September.

44. ARGYNNIS VITATHA, Moore.

Uncommon at 7,000—9,000 feet from June to August. In 1900 we only caught one specimen of this butterfly, which has been figured by Mr. De Nicéville in Vol. XIV. of the Bombay Natural History Society's Journal. This was a female with the ground colour purple. In 1901 we obtained several normal males and females, and also some of the dark females. Near the Shandur Pass we caught several, much lighter in colour and much smaller; the females in this case were much paler than the males.

45. ARGYNNIS LATONIA, Linnæus.

Common at 4,000—10,000 feet from February to October.

46. ARGYNNIS JERDONI, Lang.

One specimen caught in the Tarben nallah at 10,000 feet, and another near the Baroghil Pass in July. They differ *inter se* considerably.

47. NAJAS LIGYES, Hewitson.

Found in the nallahs below Chitral at 6,000—10,000 feet from June to August. The size of the discal spots is very variable and the margin has in some cases a prominent double row of lunular ochreous red spots, and in

others is practically uniform black.

48. PYRAMEIS CARDUI, Linnæus.

Very common from 4,000—9,000 feet, and even up to 17,000 feet from March to November.

49. PYRAMEIS INDICA, Herbst.

Common from March to October at 4,000—9,000 feet.

50. VANESSA CANACE, Linnæus.

Rare at 8,000 feet in the Utzen and Ashreth nallahs in August and September.

51. VANESSA CASHMIRENSIS, Koilar.

Common at 4,000—10,000 feet from February to November.

52. VANESSA RIZANA, Moore.

Rare at 8,000—10,000 feet from May to August. It is a much squarer insect than the preceding.

53. VANESSA XANTHOMELAS, Wiener Verzeichniss.

A few caught at 5,000 to 8,000 feet in March, May and August.

54. VANESSA VAU-ALBUM, Wiener Verzeichniss.

One specimen only obtained at Ziarat 9,000 feet on August 20th, 1901.

55. VANESSA C-ALBUM, Linnæus.

From February to April this butterfly was very common at 4,000 and 5,000 feet, and in May a few more were caught at Ziarat 8,000 feet; all these were light coloured and the two spots in the cell were usually well separated but in one or two cases coalesced into one spot. In August some more specimens were caught in the Utzen and Ashreth nallahs at 9,000 feet. These were larger, darker and with very wide dark brown margins; all the markings were bigger and the spots in the cell more often coalesced into one than separate; the outline of the wings was much more irregular and below there was a narrow blue line on the margin and a few blue spots.

FAMILY—LEMONIIDÆ.

SUB-FAMILY—LIBYTHÆINÆ.

56. LIBYTHÆA LEPITA, Moore.

Rare at 6,000—8,000 feet from April to August below Chitral.

FAMILY—LYCÆNIDÆ.

57. LYCÆNA MEDON, Huefnagel.

Common from March to October at 4,000—10,000 feet.

58. LYCÆNA sp.

Six specimens caught on the shores of the Shandur Lake in July and August. A small dark-brown insect with a faint mark at the end of the cell; below there is a white bordered mark at the end of the cell and some very faint marginal lunules on the forewing. The hindwing has the base densely powdered with black and greenish; there is a white bordered spot at the end of the cell leading off into a long white streak to the outer margin; there is also a series of pale bordered lunules on the margin. The ground colour below is only slightly lighter than above.

59. LYCÆNA sp.

One specimen caught in the same locality in August; very dark velvety brown or black above; dull dark grey below. A spot at the end of the cell, a spot on the costa and a straight discal row of four spots, all black with pale borders and a narrow black marginal line, pale bordered on the forewing. The base of the hindwing is powdered black and green; there is a spot at the end of the cell and a curved discal row of spots black with white borders, the posterior one being geminate; also a marginal row of orange and black lunules and a narrow anteciliary line. The above two may be new species.

60. LYCÆNA IRIS, Staudinger.

Locally common at 6,000—10,000 feet from May to August. A small dark butterfly of the usual *Lycæna* type, dark grey below with large black, white bordered spots; the two spots at the anal angle are sprinkled with metallic green scales. New to India.

61. LYCÆNA sp.

Twelve specimens caught on the shores of the Shandur Lake in July and August. A small blue butterfly, rather like the preceding in shape and markings, but the spots below appear quite distinctly above as well. The female is brown above. New to India, and perhaps a new species.

62. LYCÆNA PERSICA, Butler.

Very common at 4,000—10,000 feet from April to October. The female is very variable, some are completely brown above, some blue only at the base, others blue with brown or light yellow margins.

63. LYCÆNA ARIANA, Moore.

Common at 6,000—13,000 feet. Several males obtained on the Baroghil Pass were light silvery blue above.

64. LYCÆNA LŒWII, Zeller.

Common from May to August at 6,000—8,000 feet. The ordinary female is very constant, being brown with some orange near the anal angle; on both wings below the margin is bordered with orange, and the two spots at the anal angle are sprinkled with green. Six females were caught at 8,000 feet in the Tarben nallah in August, which had orange borders to both wings above, the orange being more or less diffused inwards on the forewing. Underneath there is no orange margin to the forewing, and there is a great deal more white about the hindwing. All the six specimens were constant in their markings and colouration. One specimen was caught in the same locality of a dull lead colour above with white unspotted cilia; there are a few black spots at the anal angle, surrounded with bluish grey. Below, it is similar to the form just described.

65. LYCÆNA sp.

Several insects caught on "Sanitarium Hill" near Drosh in July very like *L. Lœwii*; the blue colouration resembles *L. Ariana*; there is a spot at the end of the cell. Underneath there are several prominent white patches on the hindwing, and the orange and green at the anal angle is

inconspicuous. One specimen, probably a female, has only the base and the costa of the forewing blue, and the cilia, at the end of the veins, are prominently white spotted.

66. LYCÆNA sp.

A butterfly like the last was very common on the shores of the Shandur Lake in August. It is much smaller, and below there is no orange at all at the anal angle. The female is brown, tinged with blue at the base. The above two may form one species distinct from *L. Lœwii*.

67. LYCÆNA sp.

A few caught on the Baroghil Pass in July. Above, the male is exactly like a dwarfed *L. Persica*; below the forewing is dull grey with a spot at the end of the cell and a discal series of five small spots, all bordered with white; the hindwing is very distinct; it is slightly powdered with black and green scales at the base and the remainder of the wing is a brownish green, lighter at the margin, with 10 big white irregular-shaped spots. The female is brown above; perhaps a new species.

68. LYCÆNA METALLICA, Felder.

Fairly common on the shores of the Shandur Lake in July and August.

69. LYCÆNA GALATEA, Blanchard.

Fairly common in nullahs below Chitral at 6,000—8,000 feet from June to August.

70. LYCÆNA SAMUDRA, Moore. (?)

Common above Chitral from Sanoghar 8,000 to Laspur 10,000 feet in July and August. The male is blue above, of the same shade as *L. Persica*, with the veins black towards the margin; below the discal series consists of six large triangular spots; on the hindwing all the spots are very small, and there is a complete marginal series of metallic green spots bordered inwardly, with pale orange and black lunules. The female is dark brown, sprinkled with blue scales at the base.

71. LYCÆNA HYLAS, Wiener Verzeichniss.

Uncommon at 4,000—10,000 feet from June to September.

72. LYCÆNA sp.

A few obtained above the Shandur Pass in August. The male is very dark blue with a spot at the end of the cell, and the female is brown. On the forewing below there is a narrow streak at the end of the cell and a discal series of six small spots. On the hindwing the spots are small and disposed much the same as usual; the marginal ones are very faint, one or two near the anal angle being metallic green crowned with orange and black. Probably an undescribed species.

73. CHILADES TROCHILUS, Freyer.

Rare; a few specimens obtained at Nagar in July and September.

74. CYANIRIS CŒLESTINA, Kollar.

Uncommon, females rare, at Ziarat 8,000 feet in May, August and September.

75. ZIZERA MAHA, Kollar.

Common at 4,000—9,000 feet from March to October.

76. ZIZERA LYSIMON, Huebner.

Common at low elevations in September and October.

77. ZIZERA OTIS, Fabricius.

A few obtained at low elevations in September.

78. AZANUS URANUS, Butler.

Only one female obtained at Ziarat in August 1900.

79. EVERES ARGIADES, Pallas.

Fairly common from 4,000—8,000 feet from April to October.

80. POLYOMMATUS BETICUS, Linnæus.

Very common at 4,000—8,000 feet from April to October.

81. ARHOPALA DODONÆA, Moore.

A few caught in the Utzen and Ashreth nallahs from July to September.

82. ARHOPALA GANESA, Moore.

A few caught in the Utzen and Ashreth nallahs from July to September.

83. THECLA SASSANIDES, Kollar.

Common from 4,000—10,000 feet from May to August.

84. THECLA RUBI, Linnæus.

About ten caught at the end of April in the Kesu nallah at 6,000 feet on a small bush with small red flowers. New to India.

85. ZEPHYRUS SYLA, Kollar.

Fairly common in the Utzen and Ashreth nallahs from June to September.

86. CHÆTOPROCTA ODATA, Hewitson.

Common from 4,000—9,000 feet from May to September. At Khilas 9,000 feet in the Shishi nallah in July, this butterfly fairly carpeted the grass under the walnut trees.

87. CHRYSOPHANUS PHLÆAS, Linnæus.

Common at 4,000—10,000 feet from March to October.

88. CHRYSOPHANUS ADITYA, Moore.

A few males and females of this beautiful copper were caught on the borders of the Shandur Lake in July and August.

89. CHRYSOPHANUS KASYAPA, Moore.

Common at 6,000—10,000 feet from June to September.

90. CHRYSOPHANUS EVANSII, De Nicéville.

Described in Vol. XIV of the Bombay Natural History Society's Journal. Locally common in the Shishi, Utzen and Tarben nallahs at 10,000 feet in July and August. About 100 specimens were obtained in 1901, and no sexual difference was discernible, except that the females were rather lighter. The specimens described by De Nicéville is, we think, a male; it was the only one caught in 1900, and was found fighting fiercely with a male of *L. Ariana* in a lucerne field at Madaglasht on August 2nd.

91. ILERDA SENA, Kollar.

Common near water at 4,000—7,000 feet from March to November.

92. ILERDA TAMU, Kollar.

Found in the Utzen and Tarben nallahs at 8,000 feet in June and July. Females were rarely met with.

93. APHNÆUS HYPARGYRUS, Butler.

Common at low elevations from May to August.

94. APHNÆUS ICTIS, Hewitson.

The form *lunulifera*, Moore was common up to 9,000 feet in June and July. Two caught at Nagar 4,000 feet in September were much smaller and much lighter underneath.

95. DEUDORYX EPIJARBAS, Moore.

Common at low elevations in September and October.

96. HYSUDRA SELIRA, Moore.

Common in May and June at 7—10,000 feet in the Shishi and Ashreth nallahs.

FAMILY—PAPILIONIDÆ.

SUB-FAMILY—PIERINÆ.

97. IXIAS PYRENE, Linnæus.

Very rare at low elevations near Drosh from June to September.

98. TERIAS HECABE, Linnæus.

Common at low elevations in rice fields from August to November.

99. COLIAS EOGENE, Felder.

Common at 13,000 feet in July and August. The white form of female, which was rare, did not resemble the figure in Vol. XIV. of the Bombay Natural History Society's Journal. Our specimens are pure white on the forewing with a black spot closing the cell and a broad black border, spotted with white; the hindwing is greenish white with a white spot closing the cell and a black one some way from the margin. Underneath the forewing is white with a greenish margin, and the hindwing dark green with a white spot at the end of the cell and a yellowish green margin.

100. COLIAS FIELDII, Menetries.

Common at 4,000—12,000 feet from March to October.

101. COLIAS ERATE, Esper.

Very common at all elevations from March to October.

102. COLIAS HYALE, Linnæus.

One specimen caught at Madaglasht 10,000 feet in August.

103. COLIAS sp.

On and just below the Shandur Pass in August we caught several specimens of a pale green *Colias*, darker at the base and with the veins black. It is rather like the white female of *C. eogene*. Probably a new species.

104. COLIAS sp.

Two caught just below the Shandur Pass in August. They are orange, with very broad, unmarked borders; a black spot at the end of the cell on the forewing and a white one on the hindwing. Below the forewing is yellowish green and the hindwing dark green.

105. GONEPTERYX RHAMNI, Linnæus.

Common at 4,000—8,000 feet from March to September.

106. CATOPSILIA CROCALE, Cramer.

A few caught at low elevations in August and September.

107. PIERIS BRASSICÆ, Linnæus.

Common from March to October at 4,000 to 6,000 feet.

108. PIERIS RAPÆ, Linnæus.

Common at 4,000—6,000 feet from March to October.

109. PIERIS CANIDIA, Sparrman.

Common at 5,000—12,000 feet from March to October.

110. PIERIS sp.

A small *Pieris* with the apex of the forewing very acute and the bases black, otherwise unmarked, was common at low elevations in March and April and again in July and August near the Shandur Pass.

111. APORIA BILUCHA, Marshall.

Common at 8—10,000 feet from June to August in the nallahs near Drosh.

112. APORIA sp.

Caught in the Utzen valley at 9,000 feet in July. Bigger than *A. bilucha*, yellow, not white, with the veins blacker and the markings intensified.

113. APORIA sp.

Two specimens caught in the same locality in June; yellow above with the basal half of the forewing suffused with black; all the markings intensified; underneath the hindwing is orange.

114. BELENOIS MESENTINA, Cramer.

Uncommon at 4,000—6,000 feet from April to September.

115. PONTIA DAPLIDICE, Linnæus.

Very common at 4,000 to 9,000 feet from May to September.

116. PARAPIERIS CHLORIDICE, Huebner.

Common at low elevations from March to May, and on the Shandur Pass in July and August.

117. PARAPIERIS CALLIDICE, Esper. (?)

Common on the Shandur and Baroghil Passes in July and August.

118. SYNCHLŒ DAPHALIS, Moore.

Fairly common in March and April at 5,000—8,000 feet.

SUB-FAMILY—PAPILIONIDÆ.

119. PAPILIO MACHAON SPHYRUS, Huebner.

Common at 4,000—14,000 feet from April to October. The variety Ladakensis was found on the shores of the Shandur Lake in August.

120. PAPILIO DEMOLEUS, Linnæus.

Rare at low elevations from August to October.

121. PAPILIO POLYCTOR, Boisduval.

Found in the Utzen and Ashreth nallahs from May to August.

122. PARNASSIUS CHARLTONIUS, Gray.

One specimen caught at 12,000 feet in the Taiben nallah in July and a few more above the Shandur Pass in July and August.

123. PARNASSIUS STOLICZANUS.

A few obtained with *charltonius* above the Shandur.

124. PARNASSIUS JACQUEMONTII, Boisduval.

Very common from May to September above 10,000 feet. This butterfly

is very variable, especially as regards the black and red markings. Some have the wings quite white and others transparent; the size also varies very considerably.

FAMILY—HESPERIIDÆ.

SUB-FAMILY—HESPERIINÆ.

125. CARCHARODUS ALCEÆ.

Common at 4,000—10,000 feet from March to November.

126. HESPERIA SAO, Bergstroemer.

Fairly common from 10—13,000 feet from July to August.

127. HESPERIA CASHMIRENSIS, Moore.

Common from 9—13,000 feet from June to August.

128. HESPERIA STAUDINGERI, Speyer.

Rare; found in the Utzen and Ashreth nallahs from June to September. Very like *C. alceæ*, only whiter. New to India.

129. HESPERIA sp.

Allied to *H. alcides*, Herrich-Schaffer and *H. ahriman*, Christoph, from Turkestan. Found rarely in nallah beds at 6—8,000 feet from May to September. It is a small brown insect with three small elongate white spots between the sub-costal veins and two more between the sub-median veins. Below the markings are the same, the forewing is slightly, and the hindwing considerably, frosted over with white. Perhaps a new species.

130. HESPERIA sp.

Found in the Utzen valley at 9,000 feet in June and July. Very like the preceding, the difference being in the spots on the forewing: there is a double white spot at the end of the cell, three elongate spots beyond, and four more in the sub-median interspaces. Perhaps a new species.

131. THANAOS MARLOYI, Boisduval.

Found rarely from March to August at 5—8,000 feet. New to India.

SUB-FAMILY—PAMPHILINÆ.

132. TELICOTA DARA, Kollar.

Rare in the Utzen and Ashreth nallahs at 7,000 feet from May to September.

133. PARNARA MATHIAS, Fabricius. (?)

Found rarely at low elevations from May to August.

134. PARNARA GUTTATUS, Bremer and Gray.

Very common at low elevations from July to August.

135. GEGENES NOSTRODAMUS, Fabricius.

Fairly common at low elevations in nallah beds from June to August.

136. ERYNNIS COMMA, Linnæus var Dimila, Moore.

Common on the Shandur Pass in July and August.

137. BADAMIA EXCLAMATIONIS, Fabricius.

Rare at low elevations in August and September.

Since writing the above paper two more species have been discovered in Chitral and may be added to the above list.

138. PARNASSIUS sp.

Several specimens caught in August on the Baroghil Pass by Captain H. T. Fulton, D.S.O., 2nd Gurkhas. They are very like a dwarfed *P. charltonius*, but the arrangement of the black markings on the forewing are different. Probably a new species.

139. HESPERIA sp.

A few specimens of a small skipper were brought in from the Utzen Valley in July 1902. They are dark-brown with yellow spots on the forewing and two oblique yellow bands on the hindwing. Underneath the markings are white instead of yellow, and all the veins on the hindwing are conspicuously defined by white.

LES FORMICIDES DE L'EMPIRE DES INDES ET DE CEYLAN.

Par Auguste Forel.

Part X.

(*Continued from page* 546 *of this Volume.*)

2me Genre. Cremastogaster, Lund.

Tableau des ouvrieres.

Femelles aberrantes, à mandibules plus ou moins édentées et depourvues de bord terminal. Arêtes frontales rudimentaires..... 1 S. G. Oxygyne—Forel.

Femelles de forme ordinaire à mandibules pourvues d'un bord terminal denté de forme ordinaire. Arêtes frontales distinctes. 5 S. G. Cremastogaster—Lund.

1. Epines extrêmement épaisses, presque renflées vers leur base, courtes et obtuses. Noeuds du pédicule plus larges que longs, le deuxième trois fois plus large que long. Abdomen très court, tendant à se ratatiner.....Sp. *C. Dalyi*—Forel.

Epines de formes ordinaires. Pédicule plus étroit 2

2. Abdomen réticulé, subopaque devant et abondamment ponctué. Second noeud sillonné tout du long au milieu. Couleur, noir .....Sp. *C. sorer*—Forel.

Abdomen luisant, pas ou très faiblement sculpté 3

3. Corps, tibias et pattes avec une fine pilosité dressée. Epines métanotales grêles, très longues, divergentes, dirigées en haut, en arrière et en dehors. Suture pro-mésonotale faiblement imprimée. Pédicule étroite .....Sp. *C. travancorensis*—Forel.

Corps glabre. Tibias et scapes n'ayant qu'une pubescence adjacente 4

4. ♀ Brun ou noir. Epines assez épaisses, assez fortes, dirigées en haut, en arrière et en dehors, courbées, pointues. Suture pro-mésonotale profondément enfoncée, formant une légère échancrure du profil du thorax. L. 392 à 4, 5 mill .....Sp. *C. ebenina*—Forel. et var. *corax*—Forel.

D'un brun jaunâtre pâle. Epines horizontales, courtes, peu divergentes. Suture pro-mésonotale moins profonde. L. 3, 2 à 4 mill .....Sp. *C. aberrans*—Forel. et var. *Inglebyi*—Forel.

Note.—Tableau des femelles connues d' *Oxygyne* de l'Inde.

Métanotum armé de deux fortes épines. Mandibules tridentées (dent médiane presque obsolète). Tête non tronquée, large derrière L. 7, 6 à 8, 2 mill. ..... Sp. *C. ebenina*—Forel.

Metanotum inerme. Mandibules arquées, pointues, sans

dents. Tête tronquée devant. Couleur brun jaunâtre. L. 4, 5 mill ..... A

A. Tête un peu plus large que longue. Corps et membres presque glabres, les tibias et les scapes n'ayant qu'une faible pubescence adjacente... Sp. *C. aberrans*—Forel.

Tête bien plus longue que large, plutôt subtronquée devant, assez allongée et rétrécie derrière les yeux. Tout le corps et les membres fortement pubescentes ..... Sp. *C. soror*—Forel.

5. Métathorax démesurément renflé 6

Métathorax de forme ordinaire 8

6. Le métathorax seul renflé .....Sp. *C. deformis*—Smith.

Métathorax et mésothorax renflés..... 7

7. Lisse et luisant. Mésothorax et métathorax jaunâtres..... .....Sp. *C. inflatus*—Smith.

Subopaque, du moins la tête et le thorax qui sont finement sculptés. Entièrement noir.....Sp. *C. deformis*—Smith. race *physothorax*—Em.

8. Poils sétiformes, obtus et tronqués, comme dans le genre *Leptothorax* 9

Poils pointus, de forme ordinaire 10

9. Poils clavés ; taille un peu plus forte.....Sp. *C. Rothneyi*—Mayr. var : *civa*—Forel.

Poils simplement tronqués; taille plus faible..... .....Sp. *C. Rothneyi*—Mayr.

10. Tête entièrement sculptée 11

Occiput et vertex lisses, sauf parfois des points épars. Chez quelques variétés du *subnuda* les stries du devant de la tête se prolongent un peu sur le vertex 16

11. Second article du pédicule sans sillon médian. Premier article allongé, plus ou moins elliptiques. L. 3, 5 à 4 mill ....Sp. *C. Modiglianii*—Emery. et var. *annamita*—Em.

Second article du pédicule avec un sillon median. Premier article non elliptique 12

12. Premier article du pédicule en trapèze renversé 13

Premier article du pédicule composé d'une portion antérieure arquée devant et d'une portion postérieure a côtés rectilignes, convergeant en arrière ; ces deux portions très distinctes..... 14

13. Angles antérieurs du premier noeud très nets. Profil du dos du thorax assez horizontal, interrompu seulement par l'échancrure. Tête et thorax régulièrement et grossièrement striés ..... Sp. *C. perelegans*—Forel.

Angles antérieurs du premier noeud fort arrondis. Thorax

fortement étranglé ; mésonotum fort convexe ; face basale du métanotum s'élevant d'avant en arrière et formant avec le mésonotum un angle rentrant. Tête et thorax irrégulièrement ridés, ça et là réticulés...Sp. *C. himalayanus*—Forel.

14. Tête densément et finement striée. Thorax ridé en long .... Sp. *C. Rogenhoferi*—Mayr (avec races et variétés.)

Tête assez grossièrement ridée ou ridée-réticulée. Thorax grossièrement reticulé 15

15. Robuste. D'un rouge-jaunâtre plus vif, avec l'abdomen brun. L. 3, 5 a 6 mill ..... Sp. *C. artifex*—Mayr.

Grêle, élancé. Couleur d'un brun jaunâtre terne. L. 3, 5 à 4·5 mill ..... Sp. *C. Dhorni*—Mayr. et var. *ustus*—Em.

16. Epines métanotales très fortes, épaisses, courbées en dedans en cornes de vaches ..... Sp. *C. Hodgsoni*—Forel.

Epines autrement conformées..... 17

17. Echancrure méso-métanotales très étroite et profonde, en fissure transversale. Mésonotum bidenté ou sub-bidenté derrière..... Sp. *C. Wroughtonii*—Forel.

Autrement conformé..... 18

18. Métanotum inerme ou à peine tuberculé.....Sp. *C. Yappi*—Forel.

Métanotum épineux 19

19. Petites espèces ne dépassant pas 2·5 mill 20

Espèces plus grandes, dépassant en général 3 mill, seules quelques ouvrières minima descendant rarement à 2, 8 ou même 2, 6 mill 22

20. Jaune. Premier noeud du pédicule carré. Second noeud sans sillon .....Sp. *C. Birei*—Mayr. (et variétés.)

Brunâtre. Premier noeud du pédicule comme chez les espèces du No. 14. Second noeud avec un sillon médian 21

21. Massue des antennes de deux articles.....Sp. *C. Millardi*—Forel.

Massue des antennes de trois articles.....Sp. *C. Buddhæ*—Forel.

22. Premier article du pédicule rhombiforme, chaque côté formant au milieu l'un des angles. Très lisse ....Sp. *C. Ransonneti*—Mayr.

Autrement conformé..... 23

23. Epines métanotales très courtes, presque dentiformes, bien plus courtes que la moitié de leur intervalle, dirigées en arrière. Pronotum et mésonotum lisses 24

Epines moyennes ou assez longues, rarement plus courtes et alors dressées 25

24. Yeux très plats. Massue des antennes indistinctement de 2 ou 3 articles. Pronotum sans tubercules. Scapes très courts, n'atteignant pas le bord occipital ..... Sp. *C. Walshi*—Forel.

Yeux plus convexes. Massue distinctement de 3 articles. Le

pronotum à deux tubercules. Le scape attein tle bord occipital ..... Sp. *C. Sagei*—Forel.

25 Thorax lisse. Suture pro-mésonotale obsolète ; épines longues ..... Sp. *C. Ferrarii*—Em.

Thorax presque toujours plus ou moins sculpté. Suture pro-mésonotale assez distincte. Epines très variables .... Sp. *C. subnuda*—Mayr. (avec ses races et variétés.)

Les espèces *Kirbyi*, Sykes, *diffusa*, Jerdon, *anthracina* et *apicalis*, Smith, *apicalis* et *brunescens*, Motschulsky, *deponens*, *forticula*, et *pellens*, Walker, sont indéchiffrables et doivent être, à mon avis, laissées de côté comme espèces douteuses.

LISTE DES ESPÈCES.

1. *Cr.* (*Oxygyne*) *aberrans*, Forel.

Thana (Gleadow) ☿ ♀ ♂.

2. *Cr. Rothneyi*, Mayr.

Calcutta, Madras (Rothney) ; Siwaliks, Dehra Dun (Smythies) ; Travancore (Ferguson) ; Poona (Wroughton), &c., &c.

3. *Cr. Rogenhoferi*, Mayr.

Très commun dans l'Inde entière et à Ceylan, aussi en Birmanie et en Assam S'étend jusqu' à Singapore et Sumatra.

Var. *Cr. flava*, Forel.

Assam (Wood Mason) ; Orissa (Taylor) ; Kanara (Wroughton) ; Travancore (Ferguson).

Var. *Cr. costulata*, Emery.

Birmanie (Fea).

4. *Cr. artifex*, Mayr.

Teinzer, Birmanie (Fea) ; Moulmain, Birmanie (Hodgson) ; Siam, Annam. Très commun à Bangkok.

5. *Cr. Dohrni*, Mayr.

Ceylan (Yerbury et autres).

Var. *Cr. usta*, Emery.

Annam.

6. *Cr. Biroi*, Mayr.

Ceylan (Madarasz).

7. *Cr. subnuda*, Mayr.

Calcutta (Rothney, Walsh) ; Inde septentrionale (Wroughton) ; Madras (Rothney) ; Orissa (Taylor) ; Ceylan (Yerbury), &c., &c. (*Pour les races et variétés voir formes nouvelles*).

8. *Cr. inflata*, Smith.

Birmanie (Fea).

9. *Cr. deformis*, Smith.

Birmanie, Ye Valley (Bingham) ; Moulmain (Hodgson) ; Siam, Bangkok (Sigg).

Race. *Cr. physothorax*, Emery.
Thagata, Tenasserim (Tea).

10. *Cr. Ransonneti*, Mayr.
Ceylan (Ransonnet, Yerbury, &c.)

11. *Cr. Modiglianii*, Emery.
Moulmain, Birmanie (Hodgson).

Var. *Cr. annamita*, Emery.
Ataran Valley et Ye Valley, Birmanie (Bingham).

12. *Cr. Yappi*, Forel.
Gunong, Malay Peninsula (Yapp).

13. *Cr. Ferrarii*, Emery.
Birmanie (Fea).

(*Note.—The following species have been recently described by M. Forel in the "Revue Suisse de Zoologie,"—June* 1902).

14. *Cr.* (*Oxygyne*) *ebenina*, Forel.
L. ☿ 3, 4 à 4 mill. ♀ 7, 4 à 8 mill.
Belgaum, Poona, Kanara, Thana (Wroughton, Gleadow).

Var. *Cr.* (*Oxygyne*) *corax*, Forel.
☿ un peu plus petit.
Moulmain, Birmanie (Hodgson).

15. *Cr.* (*Oxygyne*) *travancorensis*, Forel.
L. 3 à 3, 5 mill.
Travancore (Ingleby).

16. *Cr.* (*Oxygyne*) *soror*, Forel.
L. ☿ 3, 4 à 3, 8 mill. ♀ 4, 3 mill.
Poona (Wroughton) ; Bombay (Rothney, variété à pédicule moins large).

17. *Cr.* (*Oxygyne*) *Dalyi*, Forel.
L. 3, 2 à 3, 5 mill.
Coonoor (Daly).

1. *Cr.* (*Oxygyne*) *aberrans*, Forel.

Var. *Cr.* (*Oxygyne*) *Inglebyi*, Forel.
L. 3, 3 à 3, 8 mill.
Travancore (Ferguson, Ingleby).

18. *Cr. perelegans*, Forel.
L. ☿ 4, 3 à 5, 3 mill. ♀ 11 à 12 mill.
Poona (Wroughton).

19. *Cr. himalayanus*, Forel.
L. 4, 3 à 5, 5 mill.
Dharmsala (Fulton) ; Himalaya, 7,000' (Smythies) ; Mussoorie (Rothney).

2. *Cr. Rothneyi*, Mayr.

Var. *Cr. civa*, Forel.
L. 3 à 4 mill.
Poona (Wroughton).

Cr. Biroi, Mayr.

Var. *Cr. Aitkenii*, Forel.

L. 1,7 à 1, 9 mill.
Kanara (Aitken).

Var. *Cr. Smythiesii*, Forel.

L. 2, 5 mill.
Dehra Dun (Smythies).

20. *Cr. Hodgsoni*, Forel.

L. 3, 4 à 3, 8 mill.
Moulmain, Birmanie (Hodgson).

21. *Cr. Sagei*, Forel.

L. ☿ 2, 8 à 4 mill. ♀ 8 à 8, 3 mill.
Dharmsala (Sage) ; N. W. Himalaya, 5000' (Smythies et Rogers) ; Dehra Dun (Smythies).

Var. *Cr. lævinota*, Forel.

Dharmsala (Fulton) ; Pachmari (Schurr).

22. *Cr. Walshi*, Forel.

L. 2, 8 à 3, 5 mill.
Pooree, Bengale (Walsh).

23. *Cr. Millardi*, Forel.

L. 1, 9 à 2 mill.
Moulmain, Birmanie (Hodgson).

24. *Cr. Buddha*, Forel.

L. 2, 4 mill.
Himalaya, 4,000' (Smythies) ; Calcutta (de Nicéville, un exemplaire).

25. *Cr. Wroughtonii*, Forel.

L. ☿ 3, 4 à 5, 5 mill. ♀ 8 mill.
Poona (Wroughton).

17. *Cr. subnuda*, Mayr.

Var. *Cr. politula*, Forel.

L. 3, 4 à 3, 6 mill.
Assam (Smythies).

Var. *Cr. ruginota*, Forel.

L. 3, 4 à 3, 6 mill.
Pachmari (Schurr) ; Barrackpore (Minchin); Moulmain, Birmanie (Hodgson).

Race. *Cr. rabula*, Forel.

L. 3, 2 à 4 mill.
Poona (Wroughton). Très répandu dans toute l'Inde, tandis que le type *subnuda* se trouve surtout dans le Bengale et vers l'Himalaya.

Var. *Cr. nilgirica*, Forel.

L. 2, 6 à 2, 9 mill.
Ootacamund, Coonoor (Wroughton).

Var. *Cr. Nicévillei*, Forel.

L. 2, 6 à 2, 9 mill.
Calcutta (de Nicéville).

Race. *Cr. contemta*, Mayr.

Toute l'Inde.

Var. *Cr. notabilis*, Forel.

L. ☿ 4 à 4, 5 mill. ♀ 8 à 9 mill.

Poona, Guzerath, Coonoor (Wroughton). Toutes les formes intermédiaires possibles existent entre les races et varietés du *Cr. subnuda*. La forme *contemta*, Mayr, ne peut être maintenue comme espèce Certaines formes du *contemta* voisines de *rabula*, atteignent 4, 5 mill, le type de Mayr en avait 3, 1 mill.

Tous les *Cremastogaster* de l'Inde que je connais ont 11 articles aux antennes.

3 ème Genre MONOMORIUM, Mayr.

TABLEAU DES OUVRIERES.

Antennes de 10 articles. Pas d'yeux L. 1, 7 à 1, 8 mill ... .
.....Sp. *M. decamerum*—Emery.

Antennes de 11 ou 12 articles. Des yeux 1

1. Antennes de 11 articles 2
   Antennes de 12 articles 3

2. L. 1, 5 mill. D'un jaune brunâtre. Tête seulement un peu plus longue que large, à côtés faiblement convexes. Pétiole du premier noeud distinct. Plus robuste .....
..... Sp. *M. orientale*—Mayr.
   L. 1, 2 à 1, 3 mill. D'un jaune clair. Tête en rectangle allongé, d'un bon cinquième plus longue que large. Très grêle. Premier noeud conique, à peine pétiolé ...Sp. *M. atomus*—Forel, et var. *integrius*—Forel.

3. Echancrure méso-métanotale profonde, plutôt étroite, abrupte, étranglant le thorax. Métanotum subcubique, à face basale subplane, rectangulaire 4
   Autrement conformé 5

4. L. 3, 6 à 4 mill. Monomorphe. Métanotum subdenté. Premier noeud extrêmement élevé et subsquamiforme.....
.....Sp. *M. aberrans*—Forel.
   L. 1, 5 à 3 mill. Assez dimorphe. Métanotum sans dents. Premier noeud épais, plutôt bas..... Sp. *M. gracillimum*—Sm.
..... et var *Mayri*—Forel.

5. Noeuds du pédicule très larges, bien plus larges que longs. Thorax à peine échancré. L. 2, 5 à 3, 4 mill .....
..... Sp. *M. latinode*—Mayr.
et var. *brunneum*—Emery.
   Noeuds du pédicule plus étroits..... 6

6. Jaune ou d'un jaune rougeâtre avec l'abdomen noir ou brun et une tache jaune à sa base 7
   Autrement coloré 8

7. Luisant et lisse. L. 1, 8 à 3 mill. Assez dimorphe .....
.....Sp. *M. destructor*—Jerdon.

Tête et thorax mats, d'un jaune rougeâtre. Abdomen luisant, à tache de la base d'un jaune clair. Monomorphe. L. 1, 5 à 2, 5 mill .....Sp. *M. dichroum*—Forel.

8. Assez abondamment poilu et pubescent. Tête et thorax finement striés ; front, vertex, et en partie le thorax plus ou moins lisses. Pro-mesonotum convexe ; échancrure mésométanotale faible .....Sp. *M. Emeryi*—Mayr.
race *lævior*—Mayr.

Pubescence et pilosité éparses. Tête et pro-mésonotum ou bien lisse ou bien entièrement sculptés et mats 9

9. Tête et pro-mésonotum lisses et luisants 10

Tête et pro-mésonotum mats, finement sculptés..... 12

10. Tête, abdomen et massue des antennes brunâtres. Le reste jaune pâle. L. 1, 5 à 1, 7 mill. Très monomorphe. Profil du thorax sur le même plan, peu échancré .....
..... Sp. *M. floricola*—Jerdon

Autrement coloré 11

11. Noir. L. 2 à 2, 3 mill. Tout le corps luisant .....
.....Sp. *M. carbonarium*—Sm.

D'un jaune sale. L. 1, 5 mill. Des fossettes espacées sur la tête ; métanotum subdenté, avec un sillon médian.....
..... Sp. *M. fossulatum*—Em.

L. 2, 2 à 2, 4 mill. D'un jaune clair. Métanotum et côtés du mésonotum mats, réticulés-ponctués. Grêle. Echancrure méso-métanotale assez forte.....Sp. *M. Sagei*—Forel.

12. Tête densément striée en long, pronotum en travers. Métanotum bituberculé. Tête et corps nullement déprimés. L. 2, 2 à 2, 4 mill. Brun. Abdomen lisse...Sp. *M. Schurri*—Forel.

Tête réticulée-ponctuée et en outre striée. Tête et corps un peu déprimés. D'un brun noirâtre. Membres jaunâtres. Mat, sauf les ⅔ postérieurs de l'abdomen. L. 2 à 2, 2 mill
.....Sp. *M. Wroughtonii*—Forel.

Tête et thorax sans stries, seulement réticulés-ponctués. Tête et corps nullement déprimés 13

13. D'un jaune pâle. Abdomen un peu bruni derrière, luisant. L. 2 à 2, 5 mill.....Sp. *M Pharaonis*—L.

Rouges ou bruns. Plus grands..... 14

14. Abdomen lisse. Face basale du métanotum plane, allongée, rectangulaire. Echancrure abrupte. Scape dépassant fortement l'occiput. L. 2, 5 à 2, 7 mill .....Sp. *M. Longi*—Forel.

Abdomen, au moins en partie, réticulé-ponctué et mat. Face basale du métanotum convexe. Echancrure passant par une courbe au métanotum 15

15. Tête fortement échancrée derrière. D'un roux vif, avec l'abdomen noirâtre. L. 2, 5 à 3, 2 mill.....Sp. *M. bicolor*—Emery.

Tête faiblement échancrée derrière ; brun, avec le thorax ferrugineux. L. 2, 5 à 3, 6 mill .....Sp. *M. Salamonis*—L.

Race *indicum*, Forel.

LISTE DES ESPÈCES.

1. *Mon. decamerum*, Emery.

Ceylan (Horn).

2. *Mon. orientale*, Mayr.

Calcutta (Rothney) ; Orissa (Taylor) ; Belgaum Inde septentrionale (Wroughton) ; Himalaya du Nord-ouest (Smythies).

3. *Mon. fossulatum*, Emery.

Rangoon, Birmanie (Fea).

4. *Mon. carbonarium*, Smith.

Trevandrum (Ferguson).

5. *Mon. floricola*, Jerdon.

Repandu dans l'Inde entière.

6. *Mon. Pharaonis*, L.

Cosmopolite. Repandu dans tous les ports, &c.

7. *Mon. destructor*, Jerdon.

=*vastator*. Sm.=*basale*. Sm.).

Répandu dans les maisons de l'Inde entière ; aide, avec les rats à repandre la peste.

8. *Mon. bicolor*, Emery.

Inde (d'après Emery, dans le catalogue Dalla Torre).

9. *Mon. gracillimum*, Smith.

Ye Valley, Birmanie (Bingham) ; Birmanie (Watson).

10. *Mon. latinode*, Mayr.

Assam (Long) ; Bombay, Poona (Wroughton) ; Barrackpore (Rothney) ; Orissa (Taylor) ; Kanara (Wroughton) ; Inde centrale (Betham), &c.

Var *Mon. brunneum*, Emery.

Ceylan (Simon).

11. *Mon. Emeryi*, Mayr.

Race *Mon. lævior*, Mayr.

Ceylan (Madarasz).

(*Note.—The following species have been recently described by M. Forel in the "Revue Suisse de Zoologie"—June* 1902.

12. *Mon. Wroughtonii*, Forel.

Poona, Kanara, &c. (Wroughton).

13. *Mon. aberrans*, Forel.

Pachmari, Inde centrale (Schurr).

14. *Mon. atomus*, Forel.

Orissa (Taylor) ; Assam (Smythies) ; Poona (Wroughton) ; Calcutta (Rothney).

Var. *Mon. integrius*, Forel.

Diffère de la forme typique par son échancrure méso-métanotale plus faible.

L. ☿ 1, 2 mill. ♀. 2, 5 mill.

Nord-ouest de l'Himalaya (Smythies); Poona (Wroughton).

15. *Mon. Sagei*, Forel.

Dharmsala (Sage).

16. *Mon. Longi*, Forel.

Garo Hills, Assam (Long).

17. *Mon. Schurri*, Forel.

L. ☿ 2, 2 à 2, 4 mill. ♀ 3, 7 mill.

Pachmari (Schurr).

18. *Mon. dichroum*, Forel.

L. ☿ 1, 5 à 2, 5 mill. ♀ 4 mill.

Bombay, Belgaum, Poona (Wroughton); Coonoor (Daly).

Mon. Salomonis, L.

Race. *Mon. indicum*, Forel.

L. ☿ 2, 5 à 3, 6 mill. ♀ 7 à 8 mill. ♂ 6 à 6, 5 mill.

Repandu dans l'Inde entière.

4ème Genre. CARDIOCONDYLA, Emery.

TABLEAU DES OUVRIÈRES.

Suture pro-mésonotale fortement imprimée, formant une impression du dos du thorax. Métanotum fort convexe. Epines un peu plus longues que leur intervalle. Entièrement d'un jaune rougeâtre clair, mat. Abdomen noir, luisant. L. 1, 5 à 1, 7 mill ..... Sp. *C. Wroughtonii*—Forel.

Suture pro-mésonotale faible ou nulle. Métanotum peu convexe. Epines plus courtes que leur intervalle, dentiformes. Brunes, ou d'un rouge brun, ou de la couleur de la *Wroughtonii* 1

1. Thorax et pédicule mats, densément sculptés. Brune, avec l'abdomen noirâtre; massue des antennes brune. Premier noeud du pédicule à peine plus élevé que le second. Ce dernier au moins 2½ fois plus large que le premier. L. 1, 8 à 2, 3 mill ..... Sp. *C. nuda*—Mayr.

Pédicule et thorax luisants, le premier lisse, le second à fine sculpture espacée. Premier noeud bien plus élevé que le second. Ce dernier à peine 2 fois plus large que le premier. D'un rouge brunâtre. Abdomen et massue des antennes bruns. L. 2, 1 à 2, 4 mill ..... Sp. *C. parvinoda*—Forel.

Couleur de la *Wroughtonii*. Massue des antennes brune, moins mate. Sculpture et forme plus semblables à celle de la *nuda*. L. 1, 5 à 1, 7 mill ..... Sp. *C. Emeryi*—Forel.

LISTE DES ESPÈCES.

1. *Cardiocondyla Wroughtonii*, Forel.

☿. Assez fortement échancré, l'occiput a un sillon median qui se continue dans le sillon frontal. Second nœud du pédicule deux fois plus large que le premier Assez grossièrement réticulée et finement réticulée-ponctuée en outre. Antennes de 12 articles.

♂. Aptère, ergatomorphe. Antennes de 11 articles. Mandibules très longues, arquées, et pointues. D'un jaune pâle uniforme. Métanotum bidenté. Mésonotum avec une expansion latérale. L. 1, 7 mill.

♀. Ailée. Ailes courtes, hyalines, à nervures atrophiées. Du reste comme l'ouvrière, mais l'abdomen d'un brun plus clair L. 2 mill.

Poona (Wroughton, dans les feuilles d' *Eugenia jambolana*) ; Bhavnagar (Rothney).

2. *Cardiocondyla Emeryi*, Forel.

Poona (Wroughton) ; Coonoor (Daly).

3. *Cardiocondyla nuda*, Mayr.

Poona (Wroughton) ; Orissa (Taylor) ; Barrackpore (Rothney) ; Garo Hills, Assam (Long).

4. *Cardiocondyla parvinoda*, Forel.

L. ☿ 2, 1 à 2, 4 mill. ♀ 4, 5 mill.

Poona (Wroughton).

5ème Genre. SOLENOPSIS, Westwood.

TABLEAU DES OUVRIERES.

L. 2, 5 à 5, 8 mill. Très dimorphe, ☿ maxima à grosse tête. Tête lisse, ponctuée. Une dent tout au bas du mésonotum, devant. D'un roux jaunâtre, poilu.....Sp. *S. geminata*—Fab.
Race *rufa*.—Jerdon.

L. 1, 3 à 1, 4 mill. Monomorphe, Courte, robuste, Tête ridée devant et sur les côtés, avec des aspérités au vertex. Mate ou subopaque, sauf l'abdomen et le second nœud. Yeux nuls, ou d'une seule facette. Palpes maxillaires d'un seul article. Jaunâtre..... Sp. *S. Wroughtonii*—Forel

LISTE DES ESPÈCES.

1. *Solenopsis geminata*, Fab.

Race. *Solenopsis rufa*, Jerdon.

Très commune dans toute l'Inde. Toujours d'un roux jaunâtre ; jamais brune. Se distingue en outre de la forme américaine par la dent inférieure du mésonotum.

2. *Solenopsis, Wroughtonii*, Forel.

Espèce très aberrante.

Orissa (Taylor).

6ème Genre. OLIGOMYRMEX, Mayr.

Note.—Recently described in "Revue Suisse de Zoologie," June 1902.

Toutes les espèces de l'Inde étant nouvelles, et l'ouvrière n'étant connue

que chez l' *asinus*, un tableau synoptiqe est superflu.

LISTE DES ESPÈCES.

1. *Oligomyrmex asinus*, Forel.

L. ☿. maxima 2, 5 à 4 mill. ☿. minima 1 à 1, 1 mill. ♀ 4, 5 mill.
Orissa (Taylor).

2. *Oligomyrmex raja*, Forel.

L. ♀ 5 à 5, 5 mill.
Province du Nord-ouest de l'Inde (Smythies).

3. *Oligomyrmex Leei*, Forel.

L. ♀ 7 à 8 mill.
Mysore (Lee).

4. *Oligomyrmex bengalensis*, Forel.

L. ♀ 5, 5 mill. ♂ 4, 3 mill.
Barrackpore (Rothney).

5. *Oligomyrmex Rothneyi*, Forel.

L. ♀ 3 à 3, 3 mill. ♂ 3 à 3, 4 mill.
Barrackpore (Rothney).

7ème Genre. PHEIDOLOGETON, Mayr.

TABLEAU DES OUVRIERES.

Complètement dimorphe (☿ et ζ). Métanotum inerme. L. ☿ 1, 2 à 1, 5 mill..... Sp. *Ph.* (*Aneleus*) *similis*—Mayr.

Incomplètement dimorphe. Métanotum épineux..... 1

1. Base de l'abdomen densément striée. L. 5 à 8 mill..... Sp. *Ph. silenus*—Sm.

Base de l'abdomen non striée 2

2. L. 2, 5 à 14, 5 mill. Yeux assez gros, convexes, avec de nombreuses facettes chez la ☿ minima. Epines du métanotum longues, plus longues que leur intervalle chez la ☿ minima. Tête de la ☿ maxima carrée, un peu plus large que longue, large de plus de 4 mill. L. ♀ 16 à 17 mill ..... Sp. *Ph. diversus*—Jerdon.

Tête de la ♀ avec des rides transversales, concaves en arrière, à l'occiput L. 14 mill ..... var. *Ph. taprobanæ*—Sm.

Plus petits. Yeux petits, reduits a 2 ou 4 facettes chez la ☿ minima. Tête plus longue que large. Epines métanotales courtes, plus courtes que leur intervalle chez la ☿ minima 3

3 L. 1, 8 à 9 mill. Chez la ☿ minima le pronotum a des angles arrondis, les épines sont dentiformes et le pro-mésonotum est faiblement convexe ..... Sp. *Ph. nanus*—Roger.

L. 2 à 10, 5 mill. Chez la ☿ minima le pronotum est arrondi, non anguleux et les épines sont plus longues que chez le *nanus*; le pro-mésonotum est fortement convexe. Tête

de la ☿ maxima rectangulaire, bien plus longue que large ;
son abdomen a de gros points ..... Sp. *Ph. affinis*—Jerdon.

Note.—L'ouvrière du *Ph. lamellifrons* est inconnue. Sa ♀. L. 4, 5 à 4, 6 mill, se distingue par ses arêtes frontales dilatées en lamelles.

LISTE DES ESPÈCES.

1. *Pheidologeton lamellifrons*, Forel.

Belgaum (Wroughton).

2. *Pheidologeton silenus*, Smith.

Ceylan (d'après Mayr).

3. *Pheidologeton nanus*, Roger.

Ceylan (Roger, Madarasz, Dr. Horn).

4. *Pheidologeton affinis*, Jerdon.

Poona, Kanara (Wroughton) ; Pondichery (André) ; Barrackpore, Travancore (Rothney) ; Calcutta (Coll de Saussure, Wood-Mason, Rothney) ; Assam (Long) ; Ceylan (Yerbury, &c.) ; Hong Kong (Ris) ; Nigri-Sombilant, Malacca (Rev. Martin).

5. *Pheidologeton diversus*, Jerdon.

Belgaum, Poona, S. Konkan (Wroughton) ; Calicut, Barrackpore, Travancore (Rothney) ; Travancore (Ferguson, Ingleby) ; Inde centrale (Betham) ; Birmanie (Bingham, Hodgson, Fea) ; Kanara (Aitken) ; Bombay (Hoogwerf) ; Hong Kong (Ris) ; Himalaya (Smythies).

Var. *Pheidologeton taprobanæ*, Smith.

Ceylan (d'après Smith, Horn).

6. *Pheidologeton* (*Aneleus*) *similis*, Mayr.

Kar Nicobar (Novara Expedition).

8ème Genre. CAREBARA, Westwood.

1. *Carebara lignata*, Westwood.

☿. Jaune pale. Luisante, inerme, avengle. Antennes de 9 articles. L. 2 à 2, 5 mill.

♀. D'un roux brunâtre. Ailes enfumées de même couleur. Luisante inerme. Antennes de 10 articles. L. 20 mill.

♂ Mandibules armées de 6 dents. D'un roux pâle, à la fois jaunâtre et brunâtre. Ailes comme chez la ♀. Finement pubescent. Antennes de 13 articles. L. 12 mill.

Birmanie (Bingham) ; Rangoon, Birmanie (Fea).

Les genres *Oligomyrmex* et *Carebara* sont pour ainsi dire identiques, sauf le nombre des articles des antennes chez la ♀ qui est de 9 chez les *Oligomyrmex* et de 10 chez les *Carebara*.

Chez les genres suivants, très voisins, le nombre des articles des antennes est :—

Æromyrmex	☿ 10, ♀ 11, ♂ 13.
Oligomyrmex	☿ 8 ou 9, ♀ 9, ♂ 13.
Pheidologeton	☿ 11, ♀ 11, ♂ 13.

Solenopsis	☿ 10, ♀ 11, ♂ 12.
Carebara	☿ 9, ♀ 10, ♂ 13.
Diplomorium	☿ 11, ♀ 11.
Rhopalomastix	♀ 11.
Melissotarsus	☿ 6.

Tous ces genres, qui forment le groupe principal aux moeurs lestobiotiques, ont la massue des antennes de 2 articles sauf chez la ♀ des *Diplomorium* et la nervure transverse s'unissant au rameau cubital externe. Cependant les grands *Pheidologeton* et quelques *Solenopsis* ont positivement d'autres moeurs.

9ème Genre. RHOPALOMASTIX, Forel.

Très voisin du genre *Solenopsis*; ce genre s'en distingue surtout par son épistome, l'absence de cellule cubitale, la cellule radiale fermée, et l'épaisseur de tout sont funicule formant une seule massue sauf le premier article. Cuisses renflées, pattes très courtes, crochets des tarses simples.

1. *Rhopalomastix Rothneyi*, Forel.

Epistome convexe, nullement bicaréné, faiblement subtronqué devant au milieu, terminé devant au milieu, par une petite dent avancée, &c., &c.

Barrackpore (Rothney).

10ème Genre. HOLCOMYRMEX, Mayr.

TABLEAUX DES OUVRIÈRES

Epistome sans dents. L. 5 à 6 mill..... Sp. *H. muticus*—Emer
Les carènes de l'épistome terminées devant par deux dents ... 1
1. Tête et thorax mats, densément striés-rugeux.....
..... Sp. *H. scabriceps*—Mayr.
Tête lisse, luisante, plus ou moins ponctuée 2
2. Tête pubescente et poilue, avec une ponctuation abondante et forte. Rougeâtre ; tête et abdomen bruns.....
..... Sp. *H. criniceps*—Mayr.
Noir ; membres roussâtres..... var. *H. niger*—Forel.
Rouge clair ; abdomen brun ..... var. *H. ruber*—Forel.
Tête presque glabre, avec une ponctuation fine et éparse. Noir
..... Sp. *H. glaber*—André.
Rouge clair, membres jaunes, abdomen brun..... var. *H. clarus*—Forel.

LISTE DES ESPÈCES.

1. *Holcomyrmex muticus*, Emery.

Minhla, Birmanie (Comotto).

2. *Holcomyrmex scabriceps*, Mayr.

Très répandu dans tout le continent indien, de Bombay à Calcutta, et du pied de l' Himalaya à la pointe sud de la péninsule.

3. *Holcomyrmex glaber*, André.

Même répartition que le précédent et en outre Ceylan (Yerbury).

Var. *Holcomyrmex clarus*, Forel.

L. 2, 5 mill.

Poona (Wroughton) ; Sivaliks (Smythies) : Wallon (Heim).

4. *Holcomyrmex criniceps*, Mayr

Même répartition que le *glaber*.

Var. *Holcomyrmex ruber*, Forel.

Ceylan (Yerbury).

Var. *Holcomyrmex niger*, Forel.

L. 5,7 mill.

Kanara (Aitken), Poona (Wroughton).

Holcomyrmex glabro-criniceps, Forel.

Variété hybride.

Kanara (Wroughton, Bell) ; Bombay (Rothney).

Holcomyrmex crinicipito-scabriceps, Forel.

Variété du *scabriceps* qui passe au *criniceps*.

Mysore (Rothney) ; Pooree (Walsh).

11ème Genre. STENAMMA, Westwood.

TABLEAU DES OUVRIÈRES.

Ouvrière très dimorphe, la grande ☿ à grosse et large tête. Mandibules épaisses, courtes et fortement courbées. Moeurs gramivores 1

(S. G. MESSOR.)

Ouvrière monomorphe. Mandibules peu courbées, plus longues, non épaisses. Moeurs carnivores 2

1. Entièrement noir. Très rugeux (les noeuds aussi) ; abdomen lisse. Métanotum fortement bidenté. Des soies blanchâtres. Suture pro-mésonotale fortement enfoncées. L. 4,2 à 10 mill .....
..... Sp. *S. barbarum*—L. race. *himalayanum*—Forel.

Tête et thorax rougeâtres, abdomen brun. Tête luisante, faiblement striée, avec de gros points enfoncés à l'occiput. Métanotum avec deux élévations longitudinales en arêtes. Noeuds lisses. L. 4, 2 à 8 mill .....
.....Sp. *S. barbarum*—L var. *punctatum*—Forel.

Tête ferrugineuse ; thorax plus foncé ; abdomen noir. Tête et thorax striés ; noeuds rugeux ; metanotum mutique. L. 6 à 7 mill (d'après Smith) .....
.....Sp. *S. barbarum*—L. var. *instabile*—Sm.

2. Tête rétrécie derrière en forme de cou étranglé 3

(S. G. ISCHNOMYRMEX—Mayr.)

La tête ne forme pas de cou derrière 5

(S. G. APHŒNOGASTER—Mayr.)

3. Joues sans carène. Entièrement lisse. L. 4, 5 mill .....
..... Sp. *S. longipes*—Smith.

Une longue carène oblique partant des joues borde la fossette antennaire en dedans des yeux 4

4. L. 7 à 8 mill. Métanotum ridé en travers. Corps et membres converts de soies brunes ....Sp. *S. Beccarii*—Emery.

L. 5 mill. Métanotum lisse. Poils plus fins, roux-jaunâtre. .....Sp. *S. Fœ*—Emery.

5. Noir luisant. Tête grossièrement striée. Robuste. L. 5 à 5, 8 mill ..... Sp. *S. Sagei*—Forel.

Brun. Tête autrement sculptée. Moins robuste 6

6. Tête non rétrécie derrière les yeux, avec un bord postérieur distinct ; elle est luisante, assez lisse, parfois en partie ridée. Un bourrelet devant le mésonotum. L. 4 à 5, 3 mill. ..... Sp. *S. Smythiesii*—Forel.

Epines dentiformes. Plus petit..... var. *prudens*—Forel.

Tête plus ou moins rétrécie derrière les yeux, sans bord postérieur bien distinct..... 7

7. Tête faiblement rétrécie derrière les yeux formant un bord postérieur indistinct, mais différant du bord articulaire, moins d' $1\frac{1}{3}$ fois plus longue que large. Tête et thorax mats, finement réticulés-ponctués. L. 4 mill. Sp. *S. Schurri*—Forel.

Tête $1\frac{1}{3}$ fois plus longue que large, fortement rétrécie derrière les yeux, le bord articulaire formant seul le bord postérieur 8

8. Une crête transversale devant le mésonotum. L. 5·5 mill. Très grêle. Luisant. Tête faiblement sculptée devant. Pronotum sans tubercules ... . Sp. *S. cristatum*—Forel.

Pas de crête transversale au mésonotum. L. 5,5 à 6,5 mill. Un peu moins grêle. Deux tubercules obtus au pronotum. Tête et thorax subopaques, réticulés--ponctués ..... Sp. *S. Rothneyi*—Forel.

LISTE DES ESPÈCES.

1. *Stenamma* (*Messor*) *barbarum*, L.

Var. *S.* (*Messor*) *instabile*, Smith
(= *Atta instabilis*, Smith.)

Inde septentrionale (d'après Smith. Cat. B. M. 1858).

Var. *S.* (*Messor*) *punctatum*, Forel.

Mussooree (Rothney) ; Bulandshaar, N.-W. P. (Smythies) ; Dehra Dun (Gleadow) ; Pachmari (Schurr) ; Rai Bareilly (Simpson) ; Mt. Abu, Thana (Gleadow).

2. *S.* (*Ischnomyrmex*), *Becarii*, Emery.

Belgaum, Poona, S. Konkan (Wroughton) ; Kanara (Aitken) ; Bombay (Hoogwerf).

3. *S.* (*Ischnomyrmex*) *longipes*, Smith.

Kaw Kareet, Thagata, Tenasserim (Fea) ; Moulmain, Birmanie (Hodgson).

4. *S.* (*Ischnomyrmex*) *Fea*, Emery.

Thagata, Tenasserim (Fea) ; Assam (Smythies).

Note—La *Stenamma didita*, Walker, est indéchiffrable et doit être mise au rebut.

(*The following forms have been recently described in the "Revue Suisse de Zoologie,"* June 1902.)

S. (*Messor*) *barbarum*, L.

Race, *S.* (*Messor*) *himalayanum*, Forel.

L. ☿ 4, 2 à 10 mill. ♀ 12, 5 à 13 mill, ♂ 9 mill. Très répandu dans l' Himalaya, Dharmsala (Sage, Fulton) ; Cachemire (de Lotbinière) ; Mussooree (Rothney) ; Tons Valley, 3500', N.-W. Himalaya (Smythies) ; Panjale, 5000' (Sage).

(A part cette race je nái reçu de l' Inde jusqu'ici que la variété *punctatum*, Forel. Une forme intermédiaire entre elles deux a été recoltée à Pachmari par. M. Schurr. *S. punctato-himalayanum.*)

5. *S.* (*Aphænogaster*) *Sagei*, Forel.

L. ☿ 5 à 5,8 mill. ♀ 6 mill. ♂ 5, 3 mill. Lahoal, frontière de Thibet (Sage).

6. *S.* (*Aphænogaster*) *Smythiesi*, Forel.

L. 4 à 5, 3 mill. ♀ 7 mill. ♂ 4 mill. Himalaya 8,000' à 9,000' (Smythies) ; Mussooree (Rothney) ; Katta Pum, N.-W. Himalaya (Wood Mason) ; Deoban (Smythies,) &c.

7. *S.* (*Aphænogaster*) *Schurri*, Forel.

L. ☿ 4 mill.
Pachmari (Schurr, un seul exemplaire).

8. *S.* (*Aphænogaster*) *Rothneyi*, Forel.

L. 5, 5 à 6, 5 mill.
Mussooree (Rothney) ; Pachmari (Schurr).

9. *S.* (*Aphænogaster*) *cristatus*, Forel.

L. 5, 5. Cette forme n'est peutêtre qu'une race du *Rothneyi*.
Dharmsala (Sage).

12ème Genre LOPHOMYRMEX, Emery.

TABLEAUX DES OUVRIÈRES.

Pronotum inerme, simplement bordé..... Sp. *L. Bedoti*—Emery.
Pronotum armé de deux larges dents, aussi larges que longues
.....Sp. *L. quadrispinosus*—Jerdon.
Plus grêle. Pronotum armé de deux courtes épines, plus longues que larges..... Sp. *L. birmanus*—Emery.

LISTE DES ESPÈCES.

1. *Lophomyrmex Bedoti*, Emery.

Dehra Dun (Smythies).

2. *Lophomyrmex quadrispinosus*, Jerdon.

Siwaliks (Rogers) ; Poona, Bombay, Belgaum, Kanara (Wroughton); Assam (Smythies) ; S. Konkan (Wroughton) ; Barrackpore (Rothney) ; Orissa (Taylor) ; Calcutta (de Nicéville) ; Ceylan (Simon).

3. *Lophomyrmex birmanus*, Emery.

Carin, Cheba, 500 à 1,000 metres (Fea).

13ème Genre. ACANTHOMYRMEX, Emery.

1. *Acanthomyrmex luciolæ*, Emery.

Dimorphisme complet. L'ouvrière a quatre immenses épines au thorax et la tête profondément échancrée derrière. Le ♂ n'a pas d'épines au pronotum et a une tête de *Pheidole*. L ♀, 3, 5 mill, ♂, 4 mill.

Kandy, Celyon (Simon.)

14ème Genre, PRISTOMYRMEX, Mayr.

TABLEAU DES OUVRIÈRES.

L. 2, 6 mill, Brun. Pronotum mutique. Métanotum avec deux longues épines. Dos du thorax sub déprimé. Grossièrement réticulé. Pédicule et abdomen lisse. Pétiole du premier noeud court..... .....Sp. *P. pungens*—Mayr.

L. 3, 5 à 4 mill. D'un roux assez vif. Pronotum et métanotum armés de petites épines recourbées en avant et subégales, celles du pronotum plutôt plus longues. Pétiole du premier noeud bien plus long. Sculpture analogue à celle du *pungens*..... ....Sp. *P. brevispinosus*—Emery.

Race—*sulcatus*—Emery.

LISTE DES ESPÈCES.

1. *Pristomyrmex pungens*, Mayr.

Ceylan, Malacca (d'après, Mayr).

2. *Pristomyrmex brevispinosus*, Emery.

Race—*P. sulcatus*, Emery.

Teinzo, Birmanie, Carin Cheba, 500 à 1,000 metres (Fea).

Le *P. brevispinosus*, est de Sumatra.

15ème Genre. MYRMICA, Latr.

TABLEAU DES OUVRIÈRES.

Noeuds du pédicule bas et allongés, bien plus longs que larges. Epines extrêmement longues, plus longues que le métanotum. Des épines métasternales..... 1

Noeuds du pédicule de forme ordinaire, au moins aussi larges que longs. Epines plus courtes que le métanotum. Pas d'épines métasternales 2

1. Tête régulierement et grossièrement striée-ridée. L. 4, 3 à 6 mill .....Sp. *M. Ritæ*—Emery.

Tête irregulièrement ridée, en partie réticulée. L. 5, 5 mill ....Sp *M. Margaritæ*—Emery.

2. Premier noeud du pédicule longuement pétiolé. Epines longues, sub verticales. Pronotum et mésonotum transversalement ridés. L. 5, 2 mill.....Sp. *M. Inezæ*—Forel.

Premier noeud du pédicule brièvement petiolé. Epines obliques (sauf chez la race *carbonaria*). Thorax réticulé ou ridé en long..... 3

3. Nœuds du pédicule, ou au moins le second, lisses et luisants.. 4
Nœuds du pédicule rugueux 5

4. Epines fortes, comme des épines de rosier, larges à la base, pointues à l'extrémité. Rougeâtre. L. 4, 5 à 5 mill. .....
.....Sp. *M. rubra*, L.
Race. *lævinodis*—Nyl.

Epines courtes et étroites. D'un brun jaunâtre sale. Des poils obliques aux tibias. L. 3, 3 à 4 mill.....Sp. *M. thibetana*—Mayr.

5. Epines fortes, seulement un peu plus courtes que la face basale. Densément rugueuse et assef mate sauf l'abdomen. Une forte pilosité dressée oblique aux tibias et aux scapes. L. 5 à 6 mill.....Sp. *M. rugosa*—Mayr.

Epines un peu plus courtes que leur intervalle. L. 4, 2 a 5 mill.
..... Var. *debilior*—Forel.

Epines plus courtes. Poils des tibias subadjacents. L. 3, 4 à 4, 5 mill..... 6

6. Brun clair, un peu sale. Luisante. Sculpture plus faible. Premier noeud court.....Sp. *M. Smythiesii*—Forel.

Noire. Sculpture plus forte, comme chez la *rugosa*. Premier noeud plus allongé. Epines très courtes.....Var. *rupestris*—Forel.

Noire ; très mate. Plus grêle. Epines grêles, plus longues que leur intervalle, assez dressées (à 45 dégrés). Thorax moins profondément échancré.....Race *carbonaria*—Forel.

LISTE DES ESPECES.

1. *Myrmica rubra*, L.

Race *Myrmica lævinodis*, Nyl.
Cachemire (de Lotbinière).

2. *Myrmica Ritæ*, Emery.
Mt. Mooleyit, 1,000 à 1,900 metres, Tenasserim (Fea).

3. *Myrmica Margaritæ*, Emery.
Mt. Mooleyit, 1,000 à 1,900 mètres, Tenasserim (Fea).

4. *Myrmica rugosa*, Mayr.
N. W. Himalaya. 6,000' (Wood-Mason) ; Darjeeling (Christie) ; Mussooree (Rothney) ; Pachmari (Schurr) ; Deoban, N. W. Himalaya, 8,500 (Smythies).

5. *Myrmica thibetana*, Mayr.
Thibet. (J'ai compris cette espèce dans la faune de l'Inde, lors même qu'elle n'a pas été prise encore dans l'Inde proprement dite, parcequ' elle se trouve sur la frontière et confine à la *Smythiesii*).

(*Note.—The following forms have been recently described in the "Revue Suisse de Zoologie," June* 1902).

6. *Myrmica Inezæ*, Forel.
L. 5, 2 mill.
Pachmari (Schurr, un seul exemplaire).

7. *Myrmica Smythiesii*, Forel.

L. 3, 4 à 4, 5 mill.

Diverses localités de l'Himalaya de 7,000' à 12,000' (Smythies, Gamble).

Var. *Myrmica rupestris*, Forel.

Ekra Peak, 9,500', N. W. Himalaya (Smythies).

Race. *Myrmica carbonaria*, Forel.

L. 4 mill.

Pachmari (Schurr, un seul exemplaire).

4. *Myrmica rugosa*, Mayr.

Var. *Myrmica debilior*, Forel.

Himalaya (Smythies); Darjeeling 3,000' à 8000' (Wroughton); Inde septentrionale (Wroughton); Deota (Smythies); Mysore (Rothney); Kumaon (Schlagintweit).

Les *Myrmica agilis*, *bidentata*, *breviceps*, *cursor humilis*, *luctuosa*, et *rugifrons* de Smith, *cæca* de Jerdon, *consternens* de Walker, *obscurata* et *pallinodes* de Motschulsky sont des espèces indéchiffrables, qui, en grande partie, appartiennent à d'autres genres et doivent être laissées de côté.

16ème Genre. LEPTOTHORAX, Mayr.

Aucune espéce de ce genre n'avait été trouvée en Inde jusqu'ici. Il est inutile de dresser un tableau pour les quatre espèces nouvelles qui suivent, dont l'une (*Taylori*) est le géant du genre et une autre (*inermis*) distincte de toutes par son manque d'épines.

LISTE DES ESPÈCES.

1. *Leptothorax Taylori*, Forel.

L. ♂ 5 mill. ♀ 8 mill.

Orissa (Taylor); Barrackpore (Rothney).

2. *Leptothorax Fultonii*, Forel.

L. 2, 7 à 3, 4 mill—Extrêmement voisin de l'*oraniensis*. Forel.

Dharmsala (Fulton).

3. *Leptothorax inermis*, Forel.

L. 4 mill.

Dharmsala (Sage, un seul exemplaire).

4. *Leptothorax Rothneyi*, Forel.

L. 2, 5 à 2, 8 Extrêmement voisin du *tuberum*.

Mussooree (Rothney, Rogers); Pachmari (Schurr).

Race—*Septothorax Schurri*, Forel.

Pachmari (Schurr.)

17ème Genre. ATOPOMYRMEX, André.

1. *Atopomyrmex ceylonicus*. Emery.

D'un rouge jaunâtre, avec une bande brune sur l'abdomen. Mat, finement réticulé-ponctué, grossièrement ridé. Abdomen lisse strié sur sa base seulement. De courtes soies, un peu claviformes. Métanotum bidenté.

L. 8 mill.

Negombo, Ceylan (Dr. Horn).

18ème Genre. STEREOMYRMEX, Emery.

1. *Stereomyrmex Horni*, Emery.

Antennes de 11 articles, à massue de 3. Articles 3 à 8 extrêmement courts et épais. Thorax large, à dos plat, sans sutures. Epines fortes subhorizontales. Premier noeud squamiforme mais épais ; second noeud en ovale transversal. D'un jaune rougeâtre. Tête et thorax mats. L. 2, 2 à 2, 3 mill. Le ♂ est brun, et a 11 articles aux antennes. L. 3, 2 mill.

Bandarawella, Ceylan (Dr. Horn).

19ème Genre. TRIGONOGASTER, Forel.

1. *Trigonogaster recurvispinosus.* Forel.

Jaune rougeâtre. Finement réticulé ponctué et mat. Pilosité éparse, sétiforme. Yeux en demi lune. Abdomen, vu de profil, trigonal. Epines métanotales fortes, longues, redressées et fortement recourbées en avant. Antennes de 11 articles, massue de 3. L. 2 mill.

Poona (Wroughton).

20ème Genre. TRICHOMYRMEX, Mayr.

1. *Trichomyrmex Rogeri.* Mayr.

♀. Brune. Luisante, avec pubescence couchée. Tête ponctuée, striée en long devant, en travers au vertex, le reste plutôt luisant, en partie lisse. Antennes de 12 articles, sans massue distincte. Métanotum inerme, arrondi. Eperons simples. Une cellule cubitale et une discoïdale, la nervure transverse s'unissant à la nervure cubitale au point de partage. Cellule radiale ouverte.

L. 11, mill.

Ceylan (Roger).

21ème Genre. LIOMYRMEX, Mayr.

1. *Liomyrmex aurianus*, Emery.

Testacée, lisse, presque glabre, très finement ponctuée. Antennes de 11 articles, massue de 3. Aveugle. Absolument inerme. Premier noeud transversal, second cordiforme, avec une épine en dessous. L. 3 à 3, 3 mill.

Mectan, Tenasserim (Fea).

22ème Genre. VOLLENHOVIA, Mayr.

1. *Vollenhovia larvithorax*, Emery.

Brun foncé, poilue, peu pubescente. Tête striée, mate, avec de gros points ; l'occiput est lisse et seulement ponctué. Epistome lisse ainsi que le reste du corps. L. 3, 8 à 4 mill.

Meekalan, Kyeat et Thagata, Tenasserim (Fea).

23ème Genre. MYRMECINA, Curtis.

1. *Myrmecina Striata.* Emery.

Noire ; mandibules, antennes, pattes et extrémité de l'abdomen rousses. Tête et thorax régulièrement et profondément striés, luisants (les

côtes entre les sillons lisses); pédicule plus finement strié. Abdomen lisse. Epistome sans dents. Mésonotum très faiblement bituberculé. Epines métanotales comme chez la *graminicola*.

Mte. Mooleyit. Tenasserim (Fea).

24ème Genre. RHOPTROMYRMEX. Mayr.

1. *Rhoptromyrmex Wroughtonii*, Forel.

L. ♀ 2, 5 à 2, 6 mill ♂. 2, 8 mill.

Kanara (Wroughton).

Race—*Rhoptromyrmex Rothneyi*, Forel.

L. 2, 2 à 2, 3 mill.

Bangalore (Rothney).

Var. *Rhoptromyrmex Longi*, Forel.

Epines plus longues. L. 2, 6 mill.

Garo Hills, Assam (Long).

Les épines métanotales du *Wroughtonii* relient le genre *Rhoptromyrmex* au genre *Tetramorium*. Seule la forme de la tête les separe encore.

25ème Genre. TETRAMORIUM, Mayr.

TABLEAU DES OUVRIERES.

Antennes de 12 articles .....1 (S. G. TETRAMORIUM)—Mayr.

Antennes de 11 articles. .....13 (S. G. XIPHOMYRMEX)—Forel.

1. Epistome bidenté. Noeuds du pédicule aussi larges que le métanotum, bien plus larges que longs, le premier aussi large que le second. Rouge, luisant, rugeux, sauf l'abdomen. Epines longues. L. 2, 5 mill..... ..... Sp. *T. transversarium*—Roger.

Epistome inerme..... 2

2. Luisant et plus ou moins lisse. Tête avec des stries lâches qui divergent en arrière et se courbent vers les côtés. Arêtes frontales très divergentes, faiblement prolongées par une ride divergente. Epines métanotales longues, pas de dents ni d'épines metasternales. Jaune rougeâtre. Poils dressés courts. L. 2, 4 à 2, 5 mill.....Sp. *Fergusoni*—Forel.

Tête et thorax fortement ou densément sculptés, mats ou subopaques, ridés ou réticulés..... 3

3. Arêtes frontales courtes non prolongées par une ride, ni autrement. Pas de scrobe pour le scape. Quatre épines courtes, les métanotales à pointe recourbée en avant. Noeuds lisses. Les scapes dépassent à peine le ¼ posterieur de la tête. D'un roux ferrugineux. L. 2, 4 mill ... Sp. *T. Inglelebyi*—Forel.

Arêtes frontales médiocrement divergentes, prolongées au moins par une ride 4

4. Epines métanotales très longues courbées en dedans. Deux dents métasternales. D'un brun rouge. L. 3, 3 mill ..... Sp. *T. curvispinosum*—Mayr.

Epines métanotales moins longues non courbées en dedans 5

5. Abdomen strié devant. D'un brun obscur. L. 4, 1 mill. ..... Sp. *T. scabrum*—Mayr.

Abdomen entièrement lisse (sauf chez le *pacificum*)..... 6

6. Tête et thorax grossièrement et régulièrement réticulés-ponctués 7

Tête et thorax grossièrement ridés ou rougeux 8

7. Quatre courtes épines. Thorax à dos très convexe, et très arrondi, sans trace de suture ni d'impression. Premier noeud du pédicule très gros, arrondi, à long pétiole courbé Voisin des *Triglyphothrix*. L. 2·5 mill. Sp. *T. coonoorensis*—Forel.

Deux longues épines métanotales seulement. Thorax large ; pronotum subanguleux noeuds du pédicule larges. L. 2 à 2, 5 mill ..... *T. curtulum*—Smith.

8. Pas de dents métasternales ou les angles métasternaux à peine subdentés. L. 2, 3 à 3 mill 9

Quatre épines ou quatre dents. Dans ce dernier cas la longueur n'est que d' 1, 7 à 2 mill..... 10

9. Noir. Thorax allongé, peu convexe. Noeuds lisses. Tête échancrée derrière, scapes atteignent le bord occipitale. L. 2, 8 à 3 mill .... Sp. *T. Christiei*—Forel.

D'un jaune rougeâtre. Abdomen brun. Thorax fort convexe, plutôt court Pedicule rugeux, à sommet des noeuds à peu près lisse L. 2, 3 à 2, 4 mill ....Sp. *T. salvatum*—Forel.

10. Quatre dents. Ferrugineux. L. 1, 7 à 2 mill. Sp. *T. simillimum*—Nyl. (et races).

Quatre épines. Plus de 2, 5 mill 11

11. Dessus des noeuds lisse. Thorax court et convexe. Epines métanotales courbées en dehors. D'un brun rougeâtre ou d'un rouge brunâtre, avec l'abdomen et parfois le dessus de la tête bruns. L. 2, 7 à 3, 1 mill. ....Sp. *T. mixtum*—Forel.

Dessus des noeuds sculpté. Thorax allongé et peu convexe 12

12 Epines métanotales droites. Premier noeud arrondi devant. Base de l'abdomen faiblement striée. Couleur noire ou brun foncé. L. 3, 5 mill .... Sp. *T. pacificum*—Mayr. var. *subscabrum*—Emery.

Epines métanotales courbées en avant. Premier noeud subcubique, anguleux devant. Rougeâtre, abdomen brun. L. 2, 5 à 3, 5 mill ..... Sp. *T. guineense*—Fab.

13. (S. G. *Xiphomyrmex*). Quatre épines 14

Tout au plus des dents métasternales 15

14. Epines métanotales très longues. Dessus des noeuds à peu près lisse. L. 2, 75 mill .... Sp. *T. flavipes*—Emery.

Dessus des noeuds rugeux. Epines moins longues (♀) ..... Sp. *T. belgaense*—Forel.

15. Thorax court, large, subdéprimé. Noeuds lisses. L. 2, 5 à 2, 7 mill ..... Sp. *T. Smithii*—Mayr (et var.)

Thorax allongé, convexe. Long de 3·5 mill et plus 16

16. Sept rides entre les arêtes frontales. Les tibias et les scapes n'ont qu'une pubescence courte, tout à fait adjacente. L. 3 à 3, 5 mill ..... Sp. *T. tortuosum*—Roger (et var.)

Onze rides entre les arêtes frontales. Tibias et scapes avec de longs poils obliques. L. 3, 5 à 4, 2 mill... Sp. *T. pilosum*—Emery (et race).

LISTE DES ESPÈCES.

1. *Tetramorium transversarium*, Roger.

Ceylan (d'aprés Roger).

2. *Tetramorium guineense*, Fab.

Cosmopolite. Kanara (Aitken); Bhamo, Mandalay, Rangoon (Fea).

3. *Tetramorium simillimum*, Nyl.

Cosmopolite. Poona (Wroughton); Ahmednagar (Heim).

4. *Tetramorium pacificum*, Mayr.

var. *Tetramorium subscabrum*, Emery.

Kandy, Colombo (Simon).

5. *Tetramorium scabrum*, Mayr.

Carin Cheba (Fea).

6. *Tetramorium curtulum*, Emery.

Palon (Fea).

7. *Tetramorium curvispinosum*, Mayr.

Kalawewa, Ceylon (Madarasz).

8. *T.* (*Xiphomyrmex*) *Smithii*, Mayr.

Calcutta (Rothney).

9. *T.* (*Xiphomyrmex*) *tortuosum*, Roger.

Ceylan (d'aprés Roger); Kandy (Simon).

10. *T.* (*Xiphomyrmex*) *pilosum*, Emery.

Kandy, Ceylan (Simon); Ceylan (Horn).

11. *T.* (*Xiphomyrmex*) *flavipes*, Emery.

Siam (d'après Emery).

(*Note.—The following forms have been recently described in the "Revue Suisse de Zoologie," June* 1902.)

12. *Tetramorium Christiei*, Forel. L. 2, 8 à 3· mill.

Darjeeling (Christie).

13. *Tetramorium Inglebyi*, Forel. L. 2, 4.

Travancore (Ingleby, un exemplaire).

14. *Tetramorium Fergusoni*, Forel. L. 2, 4 à 2, 5 mill.

Travancore (Ferguson)

3. *Tetramorium simillimum*, Nyl.

Race *Tetramorium lavinode*, Forel.

Epines métanotales plus fortes, dents métasternales plus faibles—Peut-être une espèce distincte.

Calcutta (Rothney).

Race—*Tetramorium denticulatum*, Forel.

Epines métanotales et métasternales réduites à quatre petits denticules subégaux.

Barrackpur (Rothney).

2. *Tetramarium guineense*, Fab.

var. *Tetramorium indicum*, Forel.

Diffère de la forme typique par sa tête plus courte, aussi large que longue, aux angles plus arrondis et par le premier noeud du pédicule dont le sommet est bien moins auguleux assez arrondi devant. La couleur est aussi un peu plus terne. L. 2, 8 à 3 mill.

Calcutta (Walsh).

15. *Tetramorium salvatum*, Forel. L. 2, 3 à 2, 4 mill.

Inde septentrionale (Wroughton); N. W. Himalaya (Smythies).

16. *Tetramorium mixtum*, Forel. L. 2, 7 à 3, 1 mill.

Coonoor, Ootacamund (Wroughton).

17. *Tetramorium coonoorense*, Forel.

Se rapproche du genre *Triglyphothrix*. L. 2, 5 mill.

Coonoor (Wroughton).

18. *T.* (*Xiphomyrmex*) *belgaense*, Forel. L. ♀ 3, 8 mill.

Belgaum (Wroughton).

8. *T.* (*Xiphomyrmex*) *Smithii*, Mayr.

var. *T.* (*Xiphomyrmex*) *kanariense*, Forel.

Les épines métanotales sont plus longues que leur intervalle (plus courte chez le type de l'espèce) et les dents métasternales sont pointues, spiniformes, plus longues que larges (obtus chez le type). La couleur est d'un brun rougeâtre assez foncé et assez uniforme. Le premier noeud est plus allongé que chez le type, distinctement plus long que large. L. 2, 5 à 2, 7 mill.

Kanara (Wroughton).

10. *T.* (*Xiphomyrmex*) *pilosum*, Emery.

Race *T.* (*Xiphomyrmex*) *Yerburyi*, Forel. L. 4 à 4, 2 mill.

Ceylan (Yerbury).

9. *T.* (*Xiphomyrmex*) *tortuosum*, Roger.

var. *T.* (*Xiphomyrmex*) *Bellii*, Forel.

Pas d'épines métasternales. L. 3, 7 mill.

Kanara (Bell).

26ème Genre. TRIGLYPHOTHRIX, Forel.

TABLEAU DES OUVRIÈRES.

Antennes de 10 articles. Métanotum inerme (♀). Sp. *T. decamera*—Forel.

Antennes de 12 articles. Métanotum armé..... 1

1. Abdomen densément strié et mat à la base. Second noeud du pédicule fortement transverse 2

Abdomen non strié. Second noeud peu ou pas plus large que long 3

2. Tête carrée, à peine rétrécie devant. Noir Noeuds moins larges. L. 2 à 2, 1 mill .....Sp. *T. musculus*—Forel.

Tête assez fortement rétrécie devant. Brun ; abdomen d'un brun foncé. Noeuds plus larges. L. 1, 9 à 2, 4 mill. ....Sp. *T. Walshi*—Forel.

3. Poils du corps courts, formant une toison serrée ; épines métanotales moins longues que distantes. D'un roux testacé. L. 2, 2 mill ..... Sp. *T. lanuginosa*—Mayr.

Poils du corps longs et moins nombreux. Epines métanotales plus longues que distantes 4

4. Mandibules lisses sauf à la base. Epines fort longues. L. 2, 5, 5 à 3, 1 mill .... Sp. *T. obesa*—André

Mandibules striées. Epines plus courtes. L. 1, 9 à 2 5 mill. ..... Sp. *T. striatidens*—Emery. (et var.)

LISTE DES ESPÈCES.

1. *Triglyphothrix Walshi*, Forel.

Pooree, Bengale (Walshi); Bombay (Rothney); Poona (Wroughton); Ahmednagar (Heim); Cochin (Rothney); Kanara (Wroughton et Bell); Nawalapitiya, Ceylan (Simon).

2. *Triglyphothrix lanuginosa*, Mayr.

Ceylan (Madarasz d'après Mayr). Je soupçonne cependant que Mayr a confondu cette espèce avec la *Walshi*, car jusqu'ici le *lanuginosa* n'avait été trouvé qu'à Java et Sumatra.

3. *Triglyphothrix obesa*, André.

Calicut, Madras, Travancore (Rothney); Kanara (Wroughton); Travancore (Ferguson); Rangoon (Fea); Gingi (André).

4. *Triglyphothrix striatidens*, Emery.

Bhamo, Birmanie (Fea); Kandy, Ceylan (Simon). Tout le continent de l'Inde. Cette espèce tend à devenir cosmopolite.

(*Note.—The following forms have been recently described in the Revue Suisse de Zoologie,—June* 1902.)

5. *Triglyphothrix musculus*, Forel.

Coonoor (Wroughton).

(4). *Triglyphothrix striatidens*, Emery.

Race—*Triglyphothrix orissana*, Forel. L. 1'9 mill.

Orissa (Taylor).

6. *Triglyphothrix decamera*, Forel.

L. ♀ 3·1 mill. Cette singulière espèce aberrante est facile à reconnaitre à son métanotum inerme et à ses antennes de 10 articles.

Kanara (Aitken).

27ème Genre. MERANOPLUS, Smith.

TABLEAU DES OUVRIÈRES.

Abdomen mat, densément reticulé ponctué. Pro-mésonotum muni de quatre immenses épines plus longues que son côté (du moins les postérieures). Tête et thorax grossièrement réticulés. L. 6 à 7 mill ..... Sp. *M. mucronatus*—Smith.

Abdomen luisant ou subopaque. Plus petits. Pro-mésonotum avec des épines plus faibles ou nulles 1

1. Pro-mésonotum muni d'un large bord lamelleux rectiligne sans dents ni échancrure latérale ni antérieure, avec une large échancrure semicirculaire derrière, ce qui forme deux large dents lamelleuses horizontales, longues et obtuses, dirigées en arrière. Angles pronotaux subdentiformes. Luisant ; ridé et réticulé. Abdomen très finement réticulé, un peu subopaque. L. 22, 5 à 2, 8 mill..... .... Sp. *M. Rothneyi*—Forel.

Plus grand ; au moins 3 mill. Au moins deux épines au métanotum 2

2. Le bord latéral du pro-mésonotum n'a qu'une échancrure entre le mésonotum et le pronotum ; il se termine derrière par deux très longues epines horizontales, subparallèles. L. 3 à 4, 2 mill..... Sp. *M. bicolor*—Guèrin et var. *lucidus*—Forel.

Le bord latéral du mésonotum a de chaque côté deux épines relevées, assez courtes et son bord postérieur n'en a pas. L. 4 à 4, 6 mill..... ..... Sp. *M. Bellii*—Forel.

Le bord latéral du mésonotum a de chaque côté deux courtes épines dentiformes et son bord postérieur une paire d'épines plus longues, minces, médianes et subparallèles L. 3, 4 à 3, 7 mill..... ..... Sp. *M. leviventris*—Emery. et. var *punctulatus*—Forel.

Les espèces *dimicans*. Walker et *villosus* Motschulsky de Ceylan sont indéchiffrables et à mettre au rebut.

LISTE DES ESPÈCES.

1. *Meranoplus mucronatus*, Smith.

Birmanie (Bingham) ; Nigri Sembilant, Malacca (R. Martin).

2. *Meranoplus bicolor*, Guerin.

Ceylan (Yerbury, Biro, Madarasz) et tout l'Hindostan.

3. *Meranoplus leviventris*, Emery.

Kaw Kareet, Mte Mooleyit, Tenasserim (Fea).

Var. *Meranoplus punctulatus*, Emery.

Cette variété se distingue par son abdomen ponctué au lieu d'être lisse.

Carin, Cheba (Fea).

(*Note.—The following forms have been recently described in the Revue Suisse de Zoologie,—June* 1902.)

4. *Meranoplus Bellii*, Forel.

Voisin du *lœviventris*, Emery.

Kanara (Bell, Wroughton).

2. *Meranoplus bicolor*, Guérin.

Var. *Meranoplus lucidus*, Forel.

Un peu plus petite. Tête plutôt ridée et bien moins réticulée que chez le type de l'espèce. Abdomen luisant, faiblement et finement réticulé. Chez la forme typique ordinaire de l'Hindostan l'abdomen est subopaque, parfois presque mat et densément réticulé-ponctué ; la tête a de fortes réticulations. Du reste il existe des variétés intermédiaires.

Birmanie (Watson, Fea) ; Calcutta, Calicut (Rothney).

5. *Meranoplus Rothneyi*, Forel.

Cochin (Rothney).

28ème Genre. CATAULACUS, Smith.

TABLEAU DES OUVRIERES.

Métanotum mutique. Noeuds du pédicule plus longs que larges. L. 5, 6 mill..... .....Sp. *C. muticus*—Emery.

Métanotum armé de deux épines 1

1. Epines métanotales plus longues, ou au moins aussi longues, que leur intervalle, courbées en dedans. Abdomen large. Noeuds plus larges que longs. L. 4 à 5 mill..... ....Sp. *C. taprobanæ*—Smith.

Epines métanotales épaisses, plus courtes que leur intervalle 2

2. Très large et robuste. Abdomen à peine plus long que large. Mat, finement rugeux, à peu près glabre. Entièrement noir. Assez déprimé. L. 4, 6 à 7 mill..... .....Sp. *C. latus*—Forel.

Plus étroit et allongé. Plus grossièrement rugeux. Hérissé de soies jaunâtres très courtes, comme rasées. Noir, tibias et scapes roux. Abdomen assez court, seulement un peu plus long que large. Premier noeud ridé en travers devant. Abdomen ridé devant seulement. Epines fort courtes. L. 3, 8 à 5 mill..... Sp. *C. granulatus*—Latr.

Abdomen étroit et allongé. Très semblable du reste au précédent, mais le premier noeud est seulement ponctué devant et l'abdomen entièrement ridé avec mailles allongées, tuberculé devant. L. 3 à 3, 5 mill..... ..... Sp. *C. Simoni*—Emery.

LISTE DES ESPÈCES.

1. *Cataulacus muticus*, Emery.

Thagata, Mte. Mooleyit, Tenasserim (Fea).

2. *Cataulacus taprobanæ*, Smith.

Ceylan (Yerbury, Simon) ; Kanara (Wroughton, Bell) ; Travancore (Ferguson).

3. *Cataulacus Simoni*, Emery.

Kandy, Colombo (Simon).

4. *Cataulacus latus*, Forel.

Poona (Wroughton) ; Kanara (Bell, Wroughton) ; Orissa (Taylor) ; Pooree, Bengale (Walsh).

5. *Cataulacus granulatus*, Latreille.

Bhamo, Teinzo, Shwegoo en Birmanie ; Thagata en Tenasserim ; Palon en Pegou (Fea) ; Birmanie (Watson) ; Assam, Dehra Dun (Smythies).

29ème Genre. STRUMIGENYS, Smith.

TABLEAU DES OUVRIÈRES.

Mandibules très dilatées, immediatement après leur base plus atténuées vers leur extrémité, dirigées en avant, terminées par deux dents apicales et une préapicale. D'un brun foncé ; mate, sanf l'abdomen qui est luisant. L. 2, 5 mill... ..... Sp. *S. lyræssa*—Roger.

Mandibules étroites et linéaires sur toute leur longueur 1

1. Tête faiblement dilatée derrière, tres étroite. Epistome large, avec une impression médiane. Mandibules fortement courbées en dedans. L. 2, 3 mill.....Sp. *S. Smythesii*—Forel.

Tête cordiforme, fortement dilatée derrière et plus ou moins deprimée 2

2. Mandibules un peu dilatées sur toute la longueur de leur bord interne qui se termine par une trés courte dent préapicale. Deux longues dents apicales. Métanotum avec deux épines et deux arêtes, sans masse spongieuse. L. 2, 5 mill .... Sp. *S. Feæ*—Emery.

Mandibules cylindriques, assez droites, terminées par trois longues dents dont la préapicale aussi longue que les autres. Métanotum à peine denté, avec fortes masses spongieuses. L. 2 mill... ..... Sp. *S. Godeffroyi*—Mayr.

Mandibules courbées en dedans..... ..... Var. *S. Lewisii*—Cameron

De longs poils clavés, dressés, assez abondants sur le corps—Var. *S. indica*.

LISTE DES ESPÈCES.

1. *Strumigenys lyræssa*, Roger.

Ceylan (d'après Roger).

2. *Strumigenys Feæ*. Emery.

Palon, Birmanie (Fea).

3. *Strumigenys Godeffroyi*, Mayr.

Var. *Strumigenys Lewisii*, Cameron.

Ceylan (Madarasz), Shwegu Birmanie (Fea, d'après Emery). Decrite par Cameron sur des exemplaires du Japon.

(*Note.—The following forms have been recently described in the Revue Suisse de Zoologie,—June* 1902).

4. *Strumigenys Smythiesii*, Forel.

L. ♀ 2, 3 mill,—♀ 2, 6 mill.

Assam (Smythies).

(3). *Strumigenys Godeffryi*, Mayr.

Var. *Strumigenys indica*, Forel.

♀ Thana (Wroughton).

30ème Genre. MYRMICARIA, Saunders.

1. *Myrmicaria brunnea*, Saunders (Trans. Ent. Soc., London, 1841)

(=*M. fodiens*. Jerdon, 1851).

Luisante, robuste, ridée. D'un brun de poix. L. 4, 7 à 8 mill. Le ♂ a l'abdomen large, deprimé et cordiforme. Comme cette espèce est la seule du continent de l'Hindostan il n'est pas douteux que *M. fodiens=M. brunnea*. Ce dernier nom étant de 10 ans plus ancien doit avoir la priorité.

Cette espèce est extrêmement commune dans toute l'Inde de l'Himalaya à Ceylan (inclus), de Bombay à Calcutta et dans toute la Birmanie et Tenasserim.

2. *Myrmicaria arachnoides*, Smith.

Race—*Myricaria birmana*, Forel.

L 6 à 6, 3 Beaucoup plus grêle que *l'arachnoides*.

Birmanie (Bingham). *L'arachnöides* est des îles de la Sonde.

31éme Genre. SIMA, Roger.

TABLEAU DES ESPÈCES.

Pronotum à angles antérieurs subdentés. Il est bordé. Rouge avec la tête, le second noeud du pédicule et l'abdomen noirs ou d'un brun foncé. Tête presque aussi large que longue. L. 7, 5 à 10, 5 mill..... .....Sp. *S. rufonigra*—Jerdon.

Pronotum arrondi devant. Corps noir 1

1. Epistome armé de deux fortes dents pointues et longues, très écartées l'une de l'autre (♀) .....Sp. *S. birmana*—Forel.

Epistome autrement conformé 2

2. Grandes espèces (7, 5 à 10, 5 mill) 3

Espèces moyennes (5 à 7, 5 mill). Métanotum élevé, bossu, nullement subbordé 4

Petites espèces (3 à 5 mill) rarement un peu plus mais alors le métanotum est subbordé et subdéprimé 5

3. Tête très allongée, plus large devant que derrière, plus d'1½ fois plus longue que sa largeur antérieure. Epistome en avant-toit, réfléchi, crénelé au bord. Pédicule étroit et allongé. Pubescente, poilue L. 9 à 10, 5 mill .... Sp. *S. Binghamii*—Forel

L. 7, 5 à 8 mill .... Var. *S. Lindgreni*—Forel.

Tête presque carrée Epistome entièrement vertical. Pédicule très étroit et très allongé. L. 7, 5 à 8, 5 mill. Sp. *S. attenuata*—Smith.

Var. *S. thagalensis*—Forel.

4. Luisante, sans pubescence. Pilosité dressée éparse. Thorax profondément échancré. Métanotum élevé, bossu, un peu comprimé. Portion antérieure de l'épistome horizontale, portion postériure verticale. Pronotum seul bordé .....
.....Sp. *S. nigra*—Jerdon (et varietés)

5. Métanotum très comprimé, très élevé, très bossu, à dos presque tranchant. Portion postérieure de l épistome tridentée devant. Les yeux n'occupent pas le tiers des côtés de la tête. L. 3, 2 à 4,7 mill ..... Sp. *S. allaborans*—Walker.
Métanotum non comprimé, subdéprimé en dessus ; épistome inerme 6

6. Dos du thorax entièrement bordé (aussi le métanotum). Les yeux occupent presque la moitié des côtés de la tête. Portion postérieure de l'épistome obsolete. Suture promésonotale profonde, échancrant le dos du thorax. Echancrure méso-métanotale plus faible que chez les suivants. Face basale et déclive ne formant qu'une courbe. L. 3, 7 mill..... Sp. *S. Siggi*—Forel.
Métanotum tout au plus subbordé. Suture pro-mésonotale peu profonde. Yeux un peu moins grands 7

7. Le métanotum ne forme qu'une bosse, sans trace de bord. Premier article du pédicule non convexe dessons. L. 3, 7 mill.....Sp. *S. Aitkeni*—Forel.
Métanotum non subbordé. Tête luisante. L. 3 à 4 mill ...
..... Sp. *S. difficilis*—Emery.
Face basale horizontale, subbordée ; face déclive subverticale. Tête allongée. Premier article du pédicule convexe dessous. L. 4 à 5, 5 mill ....race *longiceps*—Forel.

LISTE DES ESPÈCES.

1. *Sima rufonigra*, Jerdon.

Birmanie, Tenasserim, Assam, Ceylan et toute l'Inde continentale. A Ceylan, une variété de couleur plus foncée (rougeâtre obscur, premier noeud brun), trouvée par M.M. Yerbury et Horn.

2. *Sima nigra*, Jerdon.

(= *atrata*. Sm. = *carbonaria*. Sm. = *petiolata*. Sm). Poona (Wroughton) ; Pooree (Walsh) ; Madras (Rothney) ; Bangalore (Rothney) ; Travancore (Ferguson) ; Assam, Dehra Dun (Smythies) ; Kanara, Belgaum (Wroughton) ; Bombay (Hoogwerf) ; Barrackpore (Minchin) ; Carin, Tenasserim (Fea).

Var. *Sima insularis*, Emery.

Ceylan (Yerbury, Horn).

3. *Sima allaborans*, Walker.

(= *rufipes*. Jerdon. = *subtilis* Emery = *compressa*, Roger).

Poona, Belgaum, Guzerat (Wroughton) ; Orissa (Taylor) ; Moulmain (Hodgson) ; Pooree (Walsh) ; Travancore (Ferguson) ; Barrackpore (Rothney) ;

Bhamo, Palon (Fea); Ceylan (Horn).

4. *Sima difficilis*, Emery.

Deux petites ☿ de Pooree (Walsh) correspondent bien à la description d'Emery, à part leur taille de 3 à 4 mill, seulement. Le type de l'espèce et de Sumatra.

(*Note.—The following forms have been recently described in the Revue Suisse de Zoologie—, June* 1902).

5. *Sima Binghami*, Forel.

L. ☿ 7, 5 à 10, 5 mill. ♀ 13 mill. ♂ 10, 3 à 11, 5 mill. Ye Valley, Birmanie (Bingham); Moulmain, Birmanie (Hodgson); Assam (Smythies, Lind gren); N. Konkan (Wroughton).

6. *Sima birmania*, Forel.

L. ♀ 9 mill.

Birmanie (Bingham, un seul exemplaire).

7. *Sima Aitkenii*, Forel.

8. *Sima Siggi*, Forel.

Bangkok (Sigg).

(4) *Sima difficilis*, Emery.

Race—*Sima longiceps*, Forel.

Travancore (Ferguson).

(2) *Sima nigra*, Jerdon.

Race—*Sima Fergusoni*, Forel.

Travancore (Ferguson, un seul exemplaire).

(1) *Sima rufonigra*, Jerdon.

Var. *Sima Yeensis.*

L. ♀ 9 mill.

Ye Valley, Birmanie (Bingham).

Sima attenuata, Smith.

Var. *Sima thagatensis*, Forel.

L. 8, 5 mill.

Thagata (Fea); Assam (Smythies). *L'attenuata* est de Bornea et ne se trouve pas dans l'Inde.

APPENDICE.

Additions ultérieures à la faune de l'Inde pour les trois premières Sous-familles.

I. CAMPONOTINÆ.

Camponotus (*Colobopsis*) *Longi*, Forel.

Garo Hills, Assam (Long); Cherapoonji (Nissor).

Camponotus auriculatus, Mayr.

L. 4, 7 à 6, 4 mill. ☿ major. Noir, anneaux fémoraux et bas des hanches d'un blanc jaunâtre, ainsi que le bord postérieur des segments abdominauxs Tibias sans poils dressés. Corps, surtout le devant de la tête avec des soies obtuses (courtes et abondantes devant la tête). Finement réticulé ou chagriné. Devant de la tête avec de gros points sétigères. Mandibules à cinq

dents. Tête carrée, de la forme du *fastigiatus*. Epistome rectangulaire, plus long que large, sans carène, avec une impression de chaque côté du milieu, avec un lobe arrondi devant. Le scape atteint le bord occipital. Le bord antérieur de la face basale du métanotum est rélevé et forme de chaque côté un angle à partir duquel une petite arête borde la partie antérieure de la face basale. Forme du thorax du reste comme chez le *C. reticulatus*, mais les sutures plus profondes.

☿ minor. Comme la major sauf la forme et la sculpture de la tête. Les palpes atteignent le trou occipital. Tête ovale-rectangulaire, un peu plus large derrière que devant. Le scape dépasse beaucoup le bord occipital.

Ceylan (Madarasz). Probablement une race du *reticulatus*.

Camponotus Binghamii, Forel.

Moulmain (Hodson).

Camponotus selene, Emery.

(=*Polyrhachis selene*, Emery.)

Assam (Lindgren).

Camponotus crassisquamis, Forel.

Espèce voisine de *maculatus* et *Landolti*.

Assam (Smythies).

Camponotus oblongus, Smith.

Jusqu'ici la ♀ seule était connue. L. 4, 8 à 8 mill.

Pubar Valley, N. W. P., 7000', (Rogers).

Camponotus maculatus.

Race *somnificus*, Forel.

Coonoor (Wroughton).

Camponotus maculatus.

Race *Lotbinieri*, Forel.

Cachemire (de Lotbinière).

Camponotus Siemsseni, Forel.

Tons Valley, N. W. P., 3500' (Smythies).

Camponotus barbatus, Roger, race *Taylori*, Forel.

L'étude des differentes formes de l'ouvrière et surtout du vrai *barbatus* typique, reçu de Coonoor par M. Wroughton et trouvé à Ceylan par le Dr. Horn me prouve que mon *Taylori* est une race imberbe de cette espèce et non du *maculatus*.

Camponotus Gretæ, Forel.

Icaungyin Valley, Birmanie (Bingham, un seul exemplaire).

Polyrhachis Horni, Emery.

☿. Noire. Tête et abdomen luisants, presque glabres, finement et densément ponctué. Thorax recouvert d'une pubescence dense, soyeuse, d'un jaune clair ; de même le sommet de l'écaille ; epines glabres. Pattes à fines pubescence grise. Pilosité presque nulle, sauf sous le corps. Tête très voutée arêtes frontales rapprochées. Bord postérieur de la tête brièvement élevé. Lobe de l'épistome tronqué. Scape cylindrique. Thorax nettement bordé.

Pronotum armé d'épines dirigées en avant et un peu en dedans et en bas. Bords du mésonotum et du devant du métanotum relevés en lobes triangulaires. La face basale passe en courbe à la déclive ; un petit tubercule à leur limite. L'écaille a quatre épines, les latérales plus courtes, dirigées en haut, les médianes plus longues, divergentes et suivant la courbe de l'abdomen, courbées en arrière. L 9 à 9, 5 mill. (♀ 10 à 10, 5 mill.)

Nalanda, Ceylan (Dr. Horn).

Polyrhachis striata, Mayr.

Race *assamensis*, Forel.

Assam (Smythies).

Polyrhachis punctilata.

Roger race *Fergusoni*, Forel.

Travancore (Ferguson).

Polyrhachis clypeata, Mayr.

Race *obtusisquama*, Forel.

N. Konkan (Wroughton).

Polyrhachis furcata, Sm

Var. *tenella*, Forel.

Moulmain (Hodgson).

Polyrhachis Hodgsoni, Forel.

Moulmain (Hodgson).

Formica fusco-rufibarbis, Forel.

N. W. Himalaya (Smythies).

Lasius fuliginosus, Latreille.

N. Konkan (Wroughton).

Prenolepis Naoroji, Forel.

N. W. P. Assam (Smythies).

Prenolepis birmana, Forel.

Moulmain (Hodgson).

Prenolepis birmana, Forel.

Var. *Hodgsoni*, Forel.

Moulmain (Hodgson).

Prenolepis aseta, Forel.

Darjeeling, 3000′ à 8000′ (Wroughton).

Prenolepis Taylori, Forel.

Ceylan (Yerbury) ; Thana (Gleadow).

Prenolepis indica, Forel.

Calcutta (De Nicéville) ; Coonoor (Wroughton).

Madras (Daly) ; Hyderabad (Bularmo).

Plagiolepis Rothneyi, Forel.

Race *Wroughtonii*, Forel.

Ootacamund (Wroughton).

II. DOLICHODERINÆ.

Liometopum Lindgreni, Forel.

Dibrugarh, Assam (Oscar Lindgren).

Technomyrmex Modiglianii, Em.

Race *elatior*, Forel.

Assam (Long).

Iridomyrmex lævigatus, Em.

Moulmain (Hodgson).

III. PONERINÆ.

Ponera confinis, Roger.

Calicut (Rothney).

Leptogenys (*Lobopelta*) *Emilliæ*, Forel.

Guzerath (Wroughton).

Ponera (*Bothroponera*) *insularis*, Emery.

Voisine de *rufipes*, mais plus petite, face déclive du métanotum arrondie en haut, tronquée ou bordée seulement tout en bas. Ecaille avec de grosses côtes longitudinales au sommet.

Ceylan (Yerbury).

CONCLUSION.

Je ne puis conclure cette étude de la faune des Formicides de l'Empire des Indes et de Ceylan sans addresser ici à mon ami M. Rob. Wroughton l'expression de ma plus vive gratitude et de mon admiration pour sa persévérance, son énergie, sa modeste abnégation et ses grandes connaissances. C'est à lui qui est dû le resultat de ce travail, avec la collaboration sans doute de nombreux amis. Mes occupations aussi diverses qu'écrasantes ont mis la patience de M. Wroughton à une rude épreuve de nombreuses années, mais si nous avons tenu firme et sommes au bout c'est à lui qu'en revient l'honneur. Je signale aussi les remarquables envois que m'a fait directement M. Rothney.

Dans l'ensemble de mon travail j'ai compris 635 formes de fourmis de l'Inde et de Ceylan (443 espèces, 71 races, et 121 variétés). Sur ce nombre 166 espèces, 49 races, et 87 variétés étaient nouvelles (quelques unes decrites d'abord dans d'autres mémoires). Les envois de M. Wroughton et de M. Rothney ont amené la découverte de quatre nouveaux genres: *Triglyphothrix*, *Trigonogaster*, *Myrmoteras* et *Rhopalomastix*. Les noms des autres personnes qui ont récolté les diverses espèces de ce travail et me les ont envoyées, soit par M. Wroughton soit directement, sont indiqués pour chaque espèce.

Un fait général ressort de l'étude des fourmis de l'Inde, c'est qu'il y a là de grands noyaux faunistiques qui sont à peu près les suivants:—

1. Faune de l'Hindostan ou Decan proprement dit, à l'exclusion des grandes steppes du Nord-Ouest. Cette faune, de Calcutta à Bombay, et du pied de l'Himalaya à la pointe sud de la péninsule, est en somme fort homogène. Certaines châines de montagnes (je cite Pachmari) ont cependant des formes d'un caractere spécial. Elle est intimement parente de la faune malaisienne, mais bien moins riche, sauf pour le genre *Pheidole*.

2. Faune des steppes du Nord-Ouest. C'est en somme la continuation de la faune Méditerraneenne avec mèlange de quelques espèces de l'Hindostan.

3. Himalaya. Faune alpestre paléarctique, mélangée d'espèces locales propres et d'espèces de l'Hindostan.

4. Faune de Ceylan, renfermant la plus part des espèces de l'Hindostan et en outre de nombreuses formes spéciales et d'autres malaisiennes. Faune tres riche et tres remarquable.

5. Faune d'Assam, Birmanie, Tenasserim et Siam. Extrêmement riche. Mélange d' espèces malaisiennes, espèces de l'Hindostan, et d'une foule de formes tout-à-fait spéciales. Les hautes vallées d'Assam et de la Birmanie offrent les formes les plus curieuses (*Myrmoteras*, *Mystrium*, etc., etc.)

La faune de l'Hindostan forme donc un noyau central d'espèces qui se continuent dans deux noyaux contigus beaucoup plus riches que lui : Ceylan d'un côté et Assam-Birmanie de l'autre. En outre ce noyau central et contigu à l'ouest et au nord à la faune paléarctique, s'entrecroisant avec la région méditerranéenne de cette dernière dans le Punjaub et la Rajputana et avec sa région moyenne et alpestre dans le Cachemire et l'Himalaya. Tels sont les grands traits zoogéographiques que revèle l'étude des fourmis de l'Inde. Il va sans dire que les races et variétés locales trahissent autant les affinités avec la faune de l'espèce mère que les différenciations locales, ainsi par exemple les variétés himalayennes des *Camponotus marginatus* et *dichrous* ou du *Lasius brunneus* de la faune paleartique ou de la *Pheidole indica* du noyau central de l'Hindostan.

Les travaux de M.M. Emery et Mayr. sur les recoltes admirables de M. Fea et sur celles de M. M. Rothney, Simon, Horn, Madarasz, &c., ont ajonté un grand nombre d'espèces remarquables, surtout aux faunes de Birmanie et de Ceylan.

CORRIGENDA.

A

MON TRAVAIL SUR LES FORMICIDES DE L' EMPIRE DES INDES ET DE CEYLAN. PAR AUG. FOREL.

Le tableau des genres des MYRMICINÆ (ouvrières) que j'ai publié le 18 Oct. 1902 dans le Vol. XIV., No. 3., p. 520, contient diverses erreurs dues au surmenage où je me trouvais au moment où j'ai été forcé de le faire en tout hâte, et à ce qu'on ne m'a pas envoyé les epreuves, sur lesquelles je comptais le corriger—Les voici :—

Chiffre 3, ligne 3 : lisez.. ...*Myrmicaria*, Saund.

„ 3, lignes 5 à 8 : supprimez la parenthèse depuis "lorsqu'elles" jusqu'á "d'épines."

„ 8, ligne 3 : ajoutez après " dimorphes " " et chez les ♀, de 13 chez les ♂."

„ 10, ligne 4 : ajoutez après " ♀ ", " de douze chez le ♂."

„ 11, ligne 2 : ajoutez : " antennes grêles."

„ 16, lignes 3 et 4 : au lieu de " forment avec les 4 genres précédents" &c., lisez " forment avec les genres *Triglyphothrix* et *Stron-* " *gylognathus* d'Europe la tribu des des *Tetramorii*."

Chiffre 22, lignes 4, 5 et 6 : Ces lignes sont a supprimer.

„ 25, „ 6 : au lieu de " *Stercomyrmex*" lisez " *Stereomyrmex.*"

„ 27, „ 5 : au lieu du renvoi à " 30" lisez " 31."

A partir du chiffre 29, le tableau est à changer comme suit :—

29. Epistome bidenté ..... *Holcomyrmex* Mayr.
Epistome sans dents ..... 30.

30. Promésonotum en bosse élevée, mé anotum situé plus bas. Pedicule inerme ..... *Stenamma* Westw.

30. Promésonotum peu convexe, pas plus élevé que le métanotum, ou, s'il est plus élevé pédicule épineux ..... *Atopomyrmex* André.

Chiffre " 30 " devient chiffre " 31."

„ " 31 " „ „ " 32."

„ 30, ligne 4 : au lieu de " autre confirmation..... 3 "
lisez " autre confirmation..... 32 "

Enfin l'explication suivante doit suivre le tableau :—

Ce tableau a été construit à l'aide de celui que M. Emery a donné dans les Annales de la Soc : entomologique de Belgique, Tome XL, 1896.

Chez les genres *Trichomyrmex* Mayr et *Rhopalomastix* Forel la ♀ seule est connue. Je n'ai donc pas pu les mettre dans le tableau. Le *Trichomyrmex Rogeri* Mayr, de Ceylan à 12 articles aux antennes, pas d'épinés au métanotum, le premier article du pédicule avec un pétiole triangulaire, les ailes avec une seule cellule cubitale, la nervure transverse s'unissant à la nervure cubitale au point de partage, les éperons simples. Les antennes n'ont pas de massue distincte ; l'aire frontale est très étroite et indistincte.

Le *Rhopalomastix Rothneyi*. Forel appartient à la tribu des *Solenopsidii* et doit être placé à côté de *Pheidologeton* (chiffre 11), dont il se distingue par ses antennes très courtes et très épaisses (de 11 articles), dont les 9 derniers articles forment une seule et large massue.

Nous n'avons pas non plus compris les sous-genres sauf *Xiphomyrmex* dans ce tableau, les ayant réservés aux tableaux des espèces de chaque genre. Considérant le genre *Rhoptromyrmex* Mayr comme sous-genre de *Tetramorium*, dont il ne diffère guère que par sa tête triangulaire-cordiforme, nous ne l'avons non plus compris dans le tableau.

Le S. G. *Oxygyne* diffère des *Cremastogaster* proprement dit par l'absence d'arêtes frontales et la forme aberrante des ♀ avec leurs mandibules arquées et pointues.

Le S. G. *Ceratopheidole* diffère des *Pheidole* proprement dites par la massue de ses antennes qui a 4 articles subégaux.

Dans le genre *Stenamma*, le S. G. *Messor* se distingue par ses mandibules courtes, courbées et usées, adaptées aux moeurs gramivores, ainsi que par sa tête large et le dimorphisme considérable des ♀. Le S. G. *Ischnomyrmex*, au contraire, diffère des *Aphœnogaster* par sa taille très svelte, et son occiput colliforme. En outre ses ailes supérieures n'ont qu'une cellule cubitale au lieu de deux.

NOTES ON CEYLON BUTTERFLIES.

By Major N. Manders, F.Z.S., F.E.S.

These notes on Ceylon butterflies are supplementary to the list of Ceylon butterflies published by De Nicéville and Manders in the *Journal Asiatic Society of Bengal*, Vol. lxviii., Part ii, No. 3 of 1899, pp. 170—234.

Certain corrections in that list are needed, a few new species (one undescribed) to the island have been added, and the list brought up to date. The numbers refer to those in the above list.

5-*a*. Danais (*Limnias*) chrysippus Klugii, Klug.

This insect was described by Marshall and De Nicéville, Butt. Ind., Vol i., p. 52, as *Danais dorippus*, Klug (Karachi and Sind). But Butler, Proc. Zool. Soc. Lond. 1884, p. 478, and Yerbury, Bomb. Nat. Hist. Soc., Vol. vii, p. 209, give valid reasons for believing that *D. dorippus*, Klug, is a form of *D. chrysippus*, which though found on the Arabian coast is more distinctive of Somaliland and Central Africa, whereas *D. Klugii* is an Arabian and Indian form of *D. chrysippus*. The first specimen of this insect in Ceylon was captured by Lieut.-Colonel Yerbury at Trincomalie, April 15, 1891, an event which I had overlooked, or rather was not aware of until lately, when five or six specimens coming to hand called for an investigation of the literature of the species. These specimens were captured by Mr. Pole at Puttalam on the east coast and Hambantotte on the south coast in the dryest and perhaps most arid portion of the island. It is evidently widely distributed in the desert portion of the island and is possibly not uncommon.

The distribution of this insect in India cannot yet be fully known; it is rare in Canara, but is not yet reported from the plains of the Deccan, or Southern India so far as I am aware though it probably exists.

8. Danais (*Chittira*) taprobana, Felder.

This insect has now been frequently bred by Mr. Green, myself and others. The larva feeds on *Tylophora asthmatica*.

23. Ypthima singala, Felder.

The larva feeds on grasses. I have not succeeded in rearing the butterfly but the young larva is bright pink and covered with long white hairs.

65-*a*. Atella ceylonica, n. sp.

Habitat: Nitre Cave district, Ceylon.

Expanse: Male 48-53 M., Female 58 M.

Nearest to *A. alcippe* var. *pallidior*, Staudinger=*A. alcippoides* Moore. From which however it is easily distinguished.

Wings longer and narrower; apex of forewing from just beyond the cell entirely black. Outer margin and submarginal fascia more broadly black leaving the intervening fuscous lunules or rather line, which is interrupted by the black veins, narrow. The outer row of circular black spots (three in number) larger and blacker. Discal markings as in *A. alcippe*.

In the hind wing the arrangement is much the same, the outer margin and

submarginal fascia being much broader and darker, and the other spots and markings also larger and blacker.

Both sexes and more especially the female have a beautiful violet iridescent gloss, more particularly intense towards the bases of the wings.

The under surface of the wings in both sexes is very similar to *A. alcippe* the apex of the forewing being rather darker.

The insect is very constant in colouring, judging from the number of specimens, about twenty, which I have examined (Types in Coll: Mackwood and Manders).

The species is evidently very local, but probably common where it occurs. I am indebted to Mr. Mackwood for my specimens.

The genus *Cirrhochroa* Moore Lep. Ind., reduces the number of Ceylon species to one which he calls *C. lanka*. In South India he gives one species *C. thais*, Fabricius. It was the opinion of De Nicéville that there is probably only one good species in Ceylon and South India which should be called *C. thais*, Fabricius. In Ceylon the insect is highly seasonally dimorphic, but as is so frequently the case in this island with its equable climate, the form *C. lanka*, Moore (dry season) and *C. cognata*, Moore and *C. thais*, Moore (wet season) are frequently to be found on the wing at the same time.

58. HYPOLIMNAS MISIPPUS, *Linnæus*.

In our paper above referred to we expressed surprise that the form of female of this insect *Papilio inaria*, Cramer, should occur at all in Ceylon as its mimic *Danais chrysippus Klugii*, Klug. does not occur "being confined in India to the western litoral (Bombay, Kutch and Sind)." In the light of further knowledge we now know that its mimic does occur though rarely, and it is interesting to note that both *P. inaria* and *D. Klugii* mimicker and mimicked occur more frequently in the hottest and driest part of the island, whereas *P. dioctippus*, Cramer and *D. chrysippus*, Linn. are more common in the moister region of the island.

(62) KALLIMA PHILARCHUS, Westwood.

There appears to be an annual flight of this insect in the Haldumulle district. Ormiston writes "*Kallima* comes to sugar here a little; but the loquot trees are an attraction and almost all I catch are on them. The best tip is searching low on the stems just before dark, or by moonlight when they can be picked off with the fingers." The flights usually take place in November or late in December and in some years number many hundred individuals.

It would be interesting to know whether the closely allied Indian species *K. wardi* and the Andamanese species *K. albofaciata* is given to migrating.

72. LIBYTHEA LEPITA, Moore.

This insect is decidedly local in Ceylon and only a few specimens have been taken. It is probably confined to the same district as *A. ceylonica*.

(105) TARUCUS THEOPHRASTUS, Fabricius.

Confined to the more desert portions of the island where at Fort Frederick, Trincomalie, I had opportunities of observing it at all seasons of the year. It

is decidedly variable, which variability is dependent on the seasons. In the dry season the species is smaller, the markings on the under surface are much reduced and inclined to be reddish ; but I have not in a large series seen any specimens which would deserve the name *T. alteratus*, which is the dry weather form of the insect as found in the Punjab. This no doubt is due to the more equable climate of Ceylon, and I am strongly under the belief that *variation of temperature* has much more to do with seasonal forms than is usually attributed to it. In the Punjab during the cold weather five or six degrees of frost is by no means uncommon, and at midday the sun is extremely hot, and it is this great variation of temperature that produces the extreme forms of *T. theophrastus*.

(*To be continued.*)



J. Green del. et lith.

Mintern Bros. imp. London.

DISTIRA HENDERSONI.

New Sea-snake from Rangoon.

DESCRIPTION OF A NEW SEA-SNAKE FROM RANGOON.

By G. A. Boulenger, F.R.S.

(*With a Plate*).

(*Read before the Bombay Natural History Society on 19th August* 1902).

DISTIRA HENDERSONI.

Head small; body much elongate; neck slender, its diameter about one-third the greatest depth of the body. Rostral much broader than deep; nostril pierced between two nasals and an internasal; the internasals small, separating the posterior nasals and followed by a small azygous shield separating the præfrontals anteriorly; frontal hexagonal, large, nearly three times as long as the anterior nasals, one and a half as long as broad, as long as its distance from the end of the snout; parietals a little longer than the frontal; two præ and two postoculars; two suboculars, on the left side, separate the eye from the labials; two or three superposed anterior temporals; eight upper labials, second largest, fourth, on the right side, entering the eye; two pairs of very short chin-shields, the second pair separated by scales. 32 scales round the neck, 44 round the body; scales feebly imbricate, feebly but very distinctly keeled. Ventrals very feebly enlarged, feebly bicarinate, 317. Olive above, bright yellow on the sides and beneath; 54 regular black rings, about half as wide as the spaces between them, on the body, these rings widening into rhombs on the back; 7 black rings on the tail; a regular pattern of black streaks on the head, one across the occiput connected with the first ring by a median streak and sending forwards two loop-shaped streaks, one on each parietal shield; a curved black streak from the first labial shield to the angle of the mouth, bordering the eye below; a black cross-bar on each side of the throat, behind the occipital bar.

Total length 940 millimetres.

A single specimen, a gravid female from the Coast of Rangoon presented to the British Museum by Dr. T. Beath Henderson, of Glasgow, who received it from a friend. This is a very well-marked new species, in its aberrant upper head-shields connecting *Distira* with *Thalassophis* and recalling *Platurus* in its bright, regular colouration. Its nearest allies appear to be *Thalassophis anomalus*, Schmidt, from Java, which is only known to me from the descriptions and figures, and *Distira lapemidoides*.

THE FERNS OF NORTH-WESTERN INDIA.

Including AFGHANISTAN, the TRANS-INDUS PROTECTED STATES, and KASHMIR: arranged and named on the basis of Hooker and Baker's *Synopsis Filicum*, and other works, with New Species added.

BY C. W. HOPE.

(*Continued from page 480 of this Volume.*)

PART III.—THE GENERAL LIST.—(*continued.*)

Genus 23. NEPHRODIUM, *Rich.*

Subgenus LASTREA, *Presl.*

1. **N. aristatum**, Sw. (under *Aspidium*); *Aspidium* (*Polystichum*) *aristatum*, Sw., Syn. Fil. 255 and 493; Cl. Rev. 511. *Lastrea aristata*, Sw. (under *Aspidium*), Bedd. H. B. 229.

KASHMIR ? *var. affinis*, Wall. Cat. 370, Trotter in List: "collected in two places."

PUNJAB: *Chamba*—Sach Nála 3-3500', McDonell, Bukam Nála 3500', McDonel, 1885, in Herb. Levinge.

N.-W. P.: *Kumaun*—*fide* Hooker on sheet in Herb. Kew, without ticket: no rhizome.

DISTRIB.—*Asia*: N. Ind. (Him.), Nepál, *Winterbottom*; Sikkim and Bhotan 4-10,000'; Assam—Khasi Hills 3-6000', very common. Burma. S. India—very general in forests of Madras Presy. Malay Penins. and Isles. China. Japan. Philippines. Polynesia. Australia. *S. Afr.*: Natal.

I do not recollect seeing Trotter's specimens from Kashmir; but I assume that they are the same as McDonell's specimens from Chamba, which seem to be quite typical *aristatum*, though there is no rhizome. In his Supplement of 1892, Colonel Beddome says of *Lastrea affinis*:—"A very variable species and the caudex is sometimes creeping and sometimes erect;" but I maintain that this is a physical impossibility, and that such a difference of caudex constitutes a specific difference.

Aspidium assamicum (sp.), Kuhn in Linnea, XXXVI, 108, from Sikkim and Assam (*fide* Clarke), seems to be very distinct. On specimens of this in Herb. Kew is found the abnormal growth mentioned under *Pteris quadriaurita*, Retz., as being due to the fungus *Taphrina cornu-cervi*, Giesh.

2. **N. coniifolium**, Wall. Cat. 341 (under *Aspidium*). *Aspidium aristatum*, Sw. var. β *coniifolium*, Wall., Syn. Fil. 255. *Aspidium aristatum*, Sw., C. R. 511. *Lastrea coniifolia*, Wall. (under *Aspidium*,) Bedd. H. B. 230.

N.-W. P.: Kumaun, R. Blinkworth: *fide* Wallich in Cat.

DISTRIB.—*Asia*: N. Ind. (Him.), Bhotan; Assam—Khasi and Garo Hills Burma—Tonghoo, *Parish*. S. Ind.: on the Western Mts. Ceylon. Malaya. China—Yunnan, *Hancock* 1894.

The type sheets in Kew are the only specimens I can find to vouch for the entry of Kumaun as a habitat for this fern. Wallich's entry in the Catalogue is :—" 341 *Aspidium coniifolium*, Wall. in Herb. 1823.

1. Napalia 20.,
2. Kumaun R. B.,
3. I. Neelghiry, Notan 18?6, "

and a cutting from the Catalogue is posted on the sheet, on which also is a note by Sir William Hooker,—" E. I. C.—*Aspidium aristatum*, Sw., Wallich, *var. coniifolia*." And there are several other sheets, agreeing, so marked by Mr. Bentham. These sheets are all the very finely cut decompound fern which is got eastward along the Himalaya, and in Assam and Burma, and in Southern India, and which seems to me a very distinct plant from *N. aristatum*. The softer texture seems a distinctive character. In the *Synopsis Filicum* it is said :—" Dr. Thwaites assigns to β an erect caudex, and regards it as a good species." The late Mr. George Wall, in his Catalogue of Ceylon Ferns, Notes, p. 5, says :—" *Aspidium* (*Polystichum*) *coniifolium*, Wall., having an erect caudex, seems specifically distinct from *A. aristatum*, a smaller plant with a creeping rhizome."

This and the preceding species are among those on the border line between *Polystichum* and *Lastrea*, which Beddome has removed to the last-named genus. Though they are the most compound of the Asiatic *Polystichums*, Colonel Beddome has, therefore, placed them at the head of the list of *Lastreas*, before the simply pinnate species, and made them a separate section—"*Indusium reniform or orbicular, texture more or less coriaceous.*" Under *Aspidium sikkimense*, Baker, = *Nephrodium Sikkimense*, C. B. Clarke, Mr. Baker, in his Summary of New Ferns, of 1891, says :—" Like *A. varium* this stands on the line between *Aspidium* and *Nephrodium*, which I should not in a new book keep up as genera," *i.e.*, I understand, as separate genera. Colonel Beddome, in F. B. I., t. 127, treated this fern as a *Polystichum*, and Mr. Clarke said Mr. Baker preferred Beddome's picture of the involucres to the specimens when he referred the species to *Aspidium*. In his Handbook, Colonel Beddome gave *Lastrea Sikkimense* (Bedd. under *Polystichum*), and said the involucre was reniform.

3. **N. hirtipes**, Hook. ; Syn. Fil. 26 ; C. R. 513. *Lastrea hirtipes*, Bl. (under *Aspidium*), Bedd. H. B. 232 = *Aspidium atratum*, Wall. Cat. 380, in part.

KASHMIR : Ghantamula—Tangdar Forest, 5300', McDonell 1891.

PUNJAB : *Chamba*, McDonell ; *Simla Region*—Raiengarh Forest 65-7000', Gamble 1898.

N.-W. P. : *D. D. Dist.*—Jaunsar, Châchpur 7000', Gamble 1892, Châchpur Valley 6000', Duthie 1898 ; *T. Garh.* 9000' ; *B. Garh.* 6-7000', P. W. Mackinnon 1881.

DISTRIB.—*N. Amer.*: W. Indies—St. Vincent *H. G. Smith*, No. 789 (in Herb. Sahar.). *Asia*: N. Ind. (Him.), Nepál, *Wallich*; Sikkim and Bhotan, common: Assam—Khasia, 4-6000', common, Kohima and Jakpho, 65-7000', *C. B. Clarke*. Manipur—Keyang, 8000', *Dr. G. Watt*. S. Ind.—Nilgiris, &c. Ceylon. Burma. Malaya, China—Yunnan, *Henry* 1898. Polynesia.

McDonell's specimen from Chamba (which I do not possess) has about 21 pairs of distinct pinnæ, cut down ¼—⅛ to the rhachis; pale brown scales on undeveloped fronds and base of stipes of old ones; traces of shed, blackish hair-like, scales on rhachis; mere traces of involucres; pinnæ hardly enlarged at base. Gamble's plant from Jaunsar has about 20 pairs of pinnæ enlarged at base by longer, rounded, lobes on both sides. Other specimens I have had from 20 down to only 10 or 11 pairs of pinnæ besides the suddenly narrowed pinnatified apex. A specimen from Dárjiling, which Mr. Levinge marked as being typical, has stipes 12½ in., frond 15 in. by 10 in., with only 13 pairs of pinnæ which are nearly 1 in. broad. The number of sori on a group of veins (or segment) varies in this specimen from 1 pair, near the apex of a pinna, to 7, or even 9 pairs, about the middle. Five pairs seem about the maximum on the narrower pinnæ of other specimens.

Nephrodium hirtipes, Hook., is *Aspidium hirtipes*, Blume, Enum. Pl. Jav., Fil. 148; and it is said also to be *Aspidium atratum*, Wall., Cat. 380; but I find that of three sheets in the Wallichian collection, in the Linnean Society's Herbarium, one (named *A. atratum* by Wallich himself) is *N. parallelogrammum*, Kze. (*N. patentissimum*, Wall.), and so is another—not named *atratum* by Wallich. The third sheet, named by Wallich "Aspidium atratum, Napalia 1821," is *N. hirtipes*: the specimen is 16 in. broad, but it is incomplete: one-fourth or one-third of the frond is missing; there are 12 pairs of pinnæ—up to 1 in. br., cut down ⅓th, more or less: veins 4-5 pairs in a group; segments with a beak; scales long, narrowing upwards, very dark brown, to black high up. The veinlets in *N. hirtipes* are all simple and stop short of the margin: those in *N. parallelogrammum* are all forked, and they project beyond the margin, forming small teeth; and the segments are not "beaked." In the British Museum Herbarium there are many specimens of *N. hirtipes* named *A. atratum* (by Wallich himself?): none of these are from the westward of Nepál; and none, I think, are *N. Gamblei*, my next species.

4. **N. Gamblei**, n. sp.—Plate VII. (*See* Part II., p. 533.)

5. **N. gracilescens** Hook.; Syn. Fil. 262; C. R. 513; Bedd. H. B. 234.

N.-W. P.: 7. *Garh.*—Phedi, E. of Landour, 4-5000', Duthie 1881.

DISTRIB.—*Asia*: (Him.), Nepál and Sikkim 6-8000', "not common," *C. B. Clarke*; Assam—Griffith? Khasia 4000', plentiful, *C. B. Clarke*. S. Ind.—*fide* Clarke and Beddome, Ceylon, Java, China, Japan.

I have two plants of this from Mr. Duthie, one without a ticket, but both are, I believe, from the Tehri Garhwál locality. Both are sterile. They are tufts, on an apparently erect caudex. The stipes are glabrous; and the veins are distant and simple. Some stipes are longer than the fronds. Clarke makes three varieties besides the type: the Garhwál plant may be his *var. decipiens*, which Beddome, in his Hand-book, thought might be a distinct species, but, in the Supplement to that work, retained as a variety. In their "Supplementary Note on the Ferns of Northern India," read before the Linnean Society 3rd November 1881, (Journ. Linn. Soc. XXV.) will be found descriptions of five varieties or forms, (including the type?) of this species, introduced thus:—

> "Varietates et formæ a C. B. Clarke sub unica specie enumeratæ, ex sententia Beddome 2, vel 3, ex sententia Bakeri 3 vel plures species bonas constituunt: sed species a Baker propositæ cum species Beddomei non conterminæ sunt. Sequitur enumeratio formarum—"

for which I must refer to the paper itself. In his "Summary of New Ferns" of 1891 Mr. Baker does not allude to this joint paper, but merely says that Mr. Clarke in his original paper of 1880 describes three Himalayan varieties. And Beddome, in his Supplement of 1882, refers to Clarke and Baker's joint paper only by implication, gives two varieties besides the type, and separates another as a distinct species. I have not seen this fern, or any of its varieties growing; and as none of these authorities has given a habitat for any of them west of Nepál, I might say no more than that the fern I give here is quite distinct from any other on my list, and that it is new to N.-W. India. In this, as in many other cases, I consider the mode of vernation all important; and—notwithstanding the statement in the *Synopsis Filicum*—I find that in all the specimens named *N. gracilescens*, Hook., and *var. decipiens*, this seems to be the same, namely—rhizome decumbent or horizontal, slow-growing, throwing up fronds in tufts, and dying off behind, probably annually. *A. glanduliferum*, Kze., is undoubtedly a distinct species, for it has a widely creeping and branching, slender, rhizome, which I should think must continue to throw up fronds at intervals (of distance) for a whole growing season at least, and in a moist climate, probably without cessation, though the hinder part must also continually be perishing. Mr. Clarke called this fern *N. repentulum* n. sp., until he found that it had already been named and described.

6. **N. calcaratum**, Hook.; Syn. Fil. 274. *Aspidium calcaratum* Bl. En. Fil. Jav., p. 159.

N.-W. P.: *Brit. Garh.*: Bhainskil, near Parewa, Kotal Range, about 8000', Coll. Ináyat (native collector), June 1902, No. 26043 of Saharanpur Herbarium; *N. Oudh*, Forests, R. Thompson 1870.

DISTRIB.—*N. India* to Ceylon, Burma, Hong Kong, Philippines, Malaccas.

Mr. Thompson's specimen in Kew was named *N. calcaratum*, Hook., by Mr. Baker, but Mr. Clarke afterwards marked it "typical falcilobum," which Mr. Baker gives as a synonym of *calcaratum*. The plant recently found in Garhwál agrees fairly well with the description in the "Synopsis," which is as follows :—

> "*St.* densely tufted, stramineous, villose above ; *fr.* 1 ft. l., 3—6 in. br. ; *pinnæ* spreading, 2-4 in. l., $\frac{3}{8}$—$\frac{3}{4}$ in. br., cut down two-thirds or more to the rhachis into obliqûe, subfalcate, linear-oblong, acute or blunt lobes ; *colour* dark-green ; *rhachis* villose ; *texture* villose or subcoriaceous ; *under side* more or less villose ; *veinlets* 3-6 on each side ; *sori* medial ; *invol.* glabrous, persistent. Hk. Sp. 4, *p.* 98. *N. falcilobum*, Hk. Sp. 4, p. 108.

Mr. Clarke does not give *N. calcaratum* as a species, but instead sets up *N. ciliatum*, C. B. Clarke (Aspidium ciliatum, Wall. Cat. 351) = *N. sericeum*, J. Scott, Syn. Fil. p. 494 ; and he also gives, as a separate species, *N. falcilobum*, Hook., which he says differs from *N.* (*Lastrea*) *calcarata*, Bedd. F. S. I., t. 246, and from Blume's Javan *Asp. calcaratum*, in the auricled stipe, the cutting, the venation, the sori, and the involucres—*i.e.*, in almost every particular, and—it might be added, in the colour, which in *N. falcilobum* seems to be pale green.

> [No fern corresponding to *N. prexilum*, Baker, with erect caudex, tufted stipes, prominent glands at base of pinnæ, and lower pinnæ gradually reduced, is found in N.-W. India, so far as I know. The specimens in herbaria so named as having been found in that region all belong to the next two species, Nos. 7 and 8.]

7. **N. repens**, n. sp.—Hope Plate VIII. (see Part II., Vol. XII., No. 3, p. 535).

Add, under DISTRIB.—Assam—Shillong, *C. B. Clarke* No. 44652, 5—1887. Chain—Yunnan A. Henry 10094, presented to Kew 1900.

8. **N. xylodes**, Kunze in Linnæa, XXIV. 281 (under *Aspidium*) ; *N. prolixum*, Baker, β, *N. tylodes*, Kze. (under *Aspidium*), Syn. Fil. 268 ; *N. prolixum*, Hk. and Bk., C. R. 516. *Lastrea ochthodes*, Kze., var. β *tylodes*. Kze. (under *Aspidium*), Bedd. H. B. 240.

PUNJAB : Mandi State, near Dehlu, 5000', Trotter.

N.-W. P.: *D. D. Dist.*—Ridge west of Mussooree 5000', Mackinnons 1878-79. *T. Garh.*—Mantargádh 6000', Gamble 1898 ; *B. Garh.*, Mrs. Fisher ; *Kumaun*—near Naini Tal, Wigram Money, Hope 1861 ; Almora 5500', Trotter 1891 ; Kot-Ganti Ridge 6500', MacLeod 1893.

DISTRIB.—*Asia* : N. Ind. (Him.) Sikkim, *Levinge* 1871. S. Ind.—Mts., rare Ceylon.

Kunze named his plant *xylodes* ; but in the "Linnæa" two pages further

on, he referred to it as *A. tylodes*, and subsequent authors perpetuated the mistake. Moore, in the unpublished MS. of his *Index Filicum*, noted the mistake—as Mr. Baker has shown me.

Kunze's long description of *Aspidium xylodes* shows clearly that it is the comparatively rare Indian plant, with sori close to the costa. The rhizome was unknown to him, and he had not seen a complete stipes. He calls attention to the "callus" at the base of the pinna, which is much longer than the "gland" in *N. ochthodes*. He says of this callus—"adhuc sæpe neglecto, insignem . . Hinc ultimo proxime affino nostrum differt : fronde firmiore, supra nitida est, excepta costa supra, glabra, basi abrupte contracta ; soris non conjunctis, nec margine approximatis, ad costam productis, indusiis magnis, glabris, venis omnibus apice incrassatis, rhachi subtus stipitisque glabriusculis seu glabris." The gland or callosity is not visible on the upper aspect of the frond, and the pinna appears to be attached to both it and the rhachis of the frond. That the "callus" is remarkable, as Kunze said, is shown by the fact that in some specimens it is all that—below the perhaps single pair of leafy auricles—is left down nearly to the caudex to represent pinnæ. In other specimens there is just the merest trace of lamina besides the "callus." But I am bound to state that a specimen in the Levinge collection, collected by him in Sikkim in 1871, has butterfly auricles on the incomplete stipes. Another small plant got by Mr. Levinge below Dárjiling shows a section of an upright caudex.

This species grows to a very large size, as is shown even by the incomplete specimens I possess and have seen. The breadth of frond in specimens found by the Messrs. Mackinnon to the west of Mussooree is as much as 2¼ feet ; and the stipes is more than 2½ feet in length. The pinnæ are sub patent, the lower few pairs becoming depressed,—the lowest pair very much so, and narrowed at the base, though the medial pinnæ have the lower segments considerably longer than those above : width of pinnæ up to 1¼ inches. Kunze says—"Stipes, quam integrum non vidi, et rhachis basi sæpe pennam anserinum crassitie æquat." The rhachis of one specimen I have is $\frac{5}{16}$ in. br. (where the pinnæ suddenly cease), as flattened by pressing ; and the auricled part below that point—split to facilitate drying in the press—broadens downwards until one-half is ½ in. and the other ⅝ in. wide, and these are not quite flat ; so that the circumference of the rhachis near its base must have been more than 1⅛ in., and the diameter about ·4 in. The size of the stipes I cannot estimate. Mr. Trotter's specimen from the Punjab, in my possession, is very different in size, but yet is unmistakably the same plant ; it is only 2 feet 1 inch in total height, the rhachis auricled (or glanduliferous) almost to the caudex, which is erect, with stipes tufted : the frond only 6-7 in. br., and the pinnæ only about

¼ in. Mr. Trotter said, in his "Ferns of the Punjab," (printed for private circulation), under *Lastrea ochthodes*, Kze.—"The Punjab form is mostly *var. tylodes* (Kze.) Hbk. p. 240, with the basal pinnæ suddenly (not gradually) abortive and reduced to mere auricles." His Kumaun specimen (in my possession) is a frond about 15 in. l. by 7 in. br., with pinnæ up to ⅝ in. br., and there is no apparent stipes, the glands, or representatives of pinnæ, running down close to the caudex, which is erect with tufted stipes.

It is curious that the intervals between the auricles or glands in this species decrease in length near the caudex, in my large specimens at least, instead of increasing as is the normal habit of a fern. The pinnæ are cut down five-sixths of the half width, thus leaving room for only one pair of veins to approach those of the adjoining segments below the sinus, where they merge in a thickened web which strengthens the base of the sinus. There are from 8 to 15 pairs of veins in a segment, according to the size of the frond, all simple, and very conspicuous; and all except the upper one or two pairs are soriferous for half the length of the pinna, the apices of segments and pinnæ gradually becoming bare. The sori are small, closely costal in one row on either side, the lower two or three pairs diverging: they are in large specimens didymochlænoid, or fadyenoid in shape, with the involucres persistent and longo-hippocrepiform like the sori. The whole frond is very stout in texture, glabrous and glossy—only the rhachises being somewhat pilose or downy. The stipes and rhachises of large specimens are sometimes pinkish in colour, which, with the deflexed lower pinnæ, gives a resemblance to *Polypodium erubescens*, Wall.

Beddome, in his Handbook, said of this fern that he believed it quite entitled to rank as a species: he had both it and *N. ochthodes* in cultivation for many years, and said that Mr. Thwaites, who cultivated them in Ceylon, considered them distinct species. But in the Supplement to his Handbook Beddome says, under *L. ochthodes*—"Omit the Ceylon locality, Thwaites' fern being *Nephrodium extensum*." As Colonel Beddome's field of cultivation was, presumably, in the Madras mountains, I consider it proved that both *ochthodes* and *xyledes* have the same habit—"caudex erect, stipes tufted," for he could not have cultivated them for many years without having observed the nature of the caudex or rhizome; and it is clear that he had not got *N. repens*. Another inference from the passage quoted above is that Beddome maintains Ceylon as a habitat for *N. xyledes*, though not for *N. ochthodes*. Mr. G. Wall seems to give only the former as a Ceylon plant, and says it is common in the higher forests of the Central Province. A specimen of *N. xyledes* collected by Levinge in the Pulney Hills, Madras Presidency, has an erect caudex, with tufted stipes, like Trotter's specimens from the Punjáb and Kumaun.

9. **N. Thelypteris**, *Desv.*; Syn. Fil. 271; C. R. 517. *Lastrea Thelypteris*, *Desv.*, Bedd. H. B. 241.

KASHMIR: H. & T. in Herb. Brit. Mus.; Bandipur 5500′, Jacquemont, T. T.; Srinagar—City Lake 5600′, Levinge 1875, Gammie 1891; Ghántamula 5000′, McDonell 1891; "all through the Lolab Vy. 6000′," MacLeod 1891; Punjál, McDonell.

PUNJAB: *Chamba*—Chenab Vy.; Kajiár Lake 6000′, McDonell 1885, Kajiár bog 6500′, Trotter 1887; *Simla Reg.*—Kunáwar T. T.

DISTRIB.—*N. Amer.*: Canada, common! U. S.—as far south as Texas and Florida; Bermuda. *Eur.*: "throughout N. and Centr. Europe; rarer towards south: absent from Spanish Peninsula, and rare in Italy, but found in Corsica. England—widely distributed, but not common; Scotland—infrequent: Ireland—rare and local, though found in many widely-separated localities" (Britten in 'European Ferns'). *Asia*: Palestine. S. India—Nilgiris, in swamp near Ootacamund 7000′. Turkestan, Amurland, and Mandschuria. Japan. Australasia—New Zealand. *Afr.*: Angola; Cape Colony. Natal. Transvaal. E. Matabeli Land. Madagascar.

The wide-creeping rhizome and roots, and young stipes and fronds before they develope are very black, as is also the lower inch or two of the stipes of fully developed fronds. This is in striking contrast with the pale yellowish green of the fronds.

10. **N. Filix-mas**, Rich.; Syn. Fil. 272; C. R. 519. *Lastrea Filix-mas*, Linn. (under *Polypodium*), Bedd. H. B. 248.

TRANS-IND. STATES: *Baraul*—Lowari Pass 9500′, Dr. Harris, 1895.

KASHMIR: *Pir Panjal*—"in excelsioribus, ad torrentis, prope Hirpour," Jacquem. 38 (No. 586), small but typical; Rembiára Vy. 6.5-7000′, Trotter No. 191, 1888; Lidderwat 9000′, Trotter No. 404, 1889; Kitar Daji 6000′, and Sarpat 10,000′, McDonell 1891; Kachal Pass 10,000′ and Dangiára 6500′, McDonell 1894; Ring Nála 8000′, and Kashmir (loc. ?) MacLeod 1891; Kamri Vy.—above Gumin Village 10-11,000′, Duthie, No. 12524, 1892.

PUNJAB: *Chamba*—Ravi Vy., Chatri Forest 9500′, McDonell 1882, Barmaur 9000′, McDonell in Herb. Gamble; *Kullu*—Jalori Pass. 9000′, Trotter 1887; *Simla Region*—Hatu Mt., Bliss 1891; Basahr, Brandis in Herb. Hort. Sahar.

N.-W. P.: *T. Garh.*—Dwantigadh 8000′, Gamble No. 24235, 1893; (loc. ?), Herschell.

DISTRIB.—*Amer.*: from Greenland, westward and southward, along the Rocky Mts. and Andes to Peru (but this includes *N. patentissima*: see No. 10 below). *Eur.*: throughout. *Asia N.*: eastwards to China and Japan. *Afr.*: Abyssinia; Azores and Macaronesia.

Beddome in his Handbook (1883) gave as a synonym for this species *Lastrea odontoloma*, Moore (which he had figured, though but imperfectly, in his F. S. 1, t. 114), remarking that it was typical *Filix-mas*. In the Handbook the reference is to t. 14 of F. S. I., and this misprint is repeated in the Supplement of 1892, in which Moore's plant is given as *Lastrea F.-mas, var. odontoloma*, Moore. Elsewhere in the Supplement Beddome says the name *odontoloma* was given by Moore to Clarke's *var. 2, normalis* of *F.-mas*. Moore, being

familiar with *F.-mas* in all its forms, of course saw at once that Clarke's plant was a distinct species, and named it, as a species, accordingly. Beddome then, in his Supplement, said that the European type of *N. F.-mas* did not occur in India. And, partly misled by the heterogeneous mass of plants named *F.-mas* in herbariums, and because the Kashmir and Punjáb specimens above cited had not (except Jacquemont's, which I had not then seen) then been found, I used to say the same. But there is no longer room for the slightest doubt. Trotter's plant, from the Rembiára Vy. in Kashmir, which he noted as growing "in circular patches, like great shuttlecocks," struck me, and I then saw that his plant from Kullu, gathered previously in 1887, was the same. Shortly afterwards I found in Mr. Gamble's collection two fronds, collected by Mr. McDonell in Chamba in 1882, which Mr. Levinge had correctly named *N. F.-mas*,—one as a variety. And Trotter's discovery in Kashmir was followed by collections made by McDonell, MacLeod, and Duthie in 1894. There is considerable difference, in this material, in the colour of the scales on stipes,—those on some specimens being very dark, and those on others very pale,—and some difference in cutting; but I think all the specimens I have noted above can be matched from among European specimens. I have separated, under the next species, *N. parallelogrammum*, Kunze (under *Aspidium*), not only *Aspidium patentissimum*, Wall., but also Clarke's varieties Nos. 3 and 5, *khasiana* and *fibrillosa*, because I do not think they can be brought under *N. F.-mas*. Other plants, either given as synonyms or unwarrantably degraded to the rank of varieties of *N. F.-mas* in the *Synopsis*, or by Clarke and Beddome, will be found given as distinct species where I think they ought to be put.

I am aware that pteridologists are not agreed that even the European forms of *F.-mas* all belong to the same species, but I will not go into that question. I could sort the above-cited specimens into *N. F.-mas* and *N. pseudo-mas*; but as I have not seen any of these forms growing in India I think it better not to do so, especially in view of my treatment of the so-called varieties I have placed under the next species. Hooker said, in the '*Species Filicum*':—"East India, continental. The normal form is perhaps the least common, and mainly confined to N.-W. India, often at great elevations, Jacquem., Edgeworth, S. & W., Wallich (*Aspidium patentissimum*, Wall. Cat. 340), Sikkim, alt. 8-10,000′, and even 15,000′ (and then small) Hk. Fil. et T. Nilgiris, Wight, Bedd. Nepál *Wall.*, *var.* β is perhaps the next most common."

11. **N. parallelogrammum**, Kunze (under *Aspidium*), in Linnæa xiii. p. 146, *N. Filix-mas*. Rich., *var.* β *parallelogrammum*, Hook. Sp. Fil. iv. 116; "pinnate or rarely subpinnate, their segments oblong-parallelogram, very close and compact."

The following are extracts from Kunze's description :—

"761, b —fronde lanceolata, coriacea, pinnato-profunde pinnatifida, ... pinnis alternis approximatis, horizontalibus, oblongis acuminatis ; acumine inciso-serrato, laciniis imbricatis, oblongis, truncatis subparallelogrammis, marginatis, apice falcato irregulariter argute dentatis ; soris inter costulam et marginem mediis ; costulis costisque subtus laxe ; rhachique stipitique sulcatis utrinque dense fusco-grandi-paleaceis."

"E regno Mexicano miserunt Hegewisch et de a Kawinski (Herb. Leucæ anum).

"Ad Preslii Lastreas § 2. Thelypteris pertinet, et A. filici-mari Sw. prope accedit. Differt vero : fronde coriacea, pinnis approximatis, laciniis imbricatis truncatis apice argute dentatis, soris costulæ minus approximatis, paleis frequentibus, elongatis, indusiisque fuscis. *Aspidium patentissimum* Wallich : fronde coriacea, pinnis approximatis, rhachique paleacea conveniens, differt laciniis majis elongatis, basi latioribus, apice distantibus. Laciniis basris abrupte majoribus, incisisve, et forme laciniarum differunt."

a. Forma khasiana.

N. Filix-mas, Rich., var. ? Khasiana, Clarke in 'Review,' 519, t. 69, fig. 1. "Stipe and main rhachis with many linear blackish scales ; frond oblong-lanceolate, very little narrowed at base ; pinnæ approximate, patent, the lowest equal-sided, cut down to the midrib ; secondary pinnæ narrowly oblong, very close and regular, glabrous beneath, rounded, finely serrulate at the apex ; sori not large."

PUNJAB : *Chamba*—9000', McDonell ; *Simla Region*—ridge east of Simla 8500 Blanford.

N.-W. P. : *D. D. Dist.*—Jaunsár, Mandáli 8000', Gamble 1895 ; *T. Garh.*—Nag Tiba Mt. Mackinnons 1878-79 ; *B. Garh*—Mrs. Fisher above Dhakára, Duthie's collr 1879, Herschel 1879, and Gollan 1880.

DISTRIB.—*Asia* : N. Ind.—Assam : Khasia, alt 4-6000', common, *Clarke* ; Kohima, alt. 6,000', *Clarke*.

Clarke's type specimens of his *var. khasiana* in the Kew Herbarium seem very distinct from *N. patentissimum*, Wall. ; but in the Journ. Linn. Soc., 1889, p. 94, referring to the specimen from Kohima cited above, he says :—"This is very large, and not distinguishable from some of *var. patentissima* (sp. Wall.) from the Central Himalaya. The Khasi examples of *var. patentissima* have a soft, thick stipe with pale yellow-brown scales." One of the Mackinnons' specimens from Tehri Garhwál also is longer than most ; frond 25 in. l., by 9½ in. br near the base ; lowest pair of pinnæ almost 1½ in. br. ; and another is but 16 in. l., by 8¼ in. br. at base. Mr. Gamble's specimen is 19½" × 8½" ; but Mr. Blanford's is only 15 in. l., by 4½" br., and it may not be Mr. Clarke's plant.

In the "Review" Mr. Clarke remarks:—"This is the fern described by Milde, Fil. Europ. 122, lines 3—6 from the bottom of page. It is, as Milde states allied to *var. patentissima* : but, on the other hand, very near *N. elongatum*, Hk. and Gr. Ic. Fil., t. 234 ; *Aspidium elongatum*, Milde, Fil. Europ., 124." But *khasiana*, and *elongatum*, Hk. and Gr., seem to me distinct enough. Though the frond of both is truncate at the base, the scales, both on stipes and frond, differ altogether." *Forma khasiana* seems to have a comparatively long (sometimes nearly as long as the frond) and slender stipes, and more numerous veins in a segment : segments finely toothed and not so squarely ended as those of *f. patentissima*.

b. Forma patentissima.

N. Filix-mas, Rich., *var.* 4 *patentissima*, C. R. 520. *Aspidium patentissimum* (sp.), Wall. Cat. 340. "Stipe shaggy, with linear yellowish pales often ½—¾ in. long ; frond 4—6 feet, narrowly oblong-lanceolate, widest near the middle suddenly narrowed near the base, pinnæ patent, very coriaceous, cut down nearly or quite to the midrib ; segments oblong, obtuse, subentire or minutely serrulate, glabrous beneath, the margin much incurved when dry" .... "*Aspidium paleaceum* Don, Prod. Fl. Nep. 4. *A. Wallichianum* and *Donianum*. Spreng. Syst. IV., 104 and Suppt. 320. Bhotán to Simla, alt. 6-9000′, common. Khasia, alt. 5000′.

N.-W. P. : *D. D. Dist.*—Jaunsar 8-10,000′, Herschel, Gamble ; *T. Garh.* 8-12,000′, Mackinnons, Duthie, Gamble ; *B. Garh.*—Kinolia Vy. 7-8000′, Duthie ; Mrs. Fisher ; *Kumaun*—Griffith ; Kalimundi and near Milám 8-11,500′, S. & W. ; elsewhere—Davidson, Duthie, MacLeod ; summit of Dhankuri Pass 10,500′, Trotter.

DISTRIB.—*Amer.* : W. Ind., Jamaica 7330′, *Dr. D. Morris* ; Mexico, Guatemala, Ecuador, Peru, New Grenada, and Brazil (near summit of Organ Mts.). *Asia*: N. Ind. (Him.), Nepál, Sikkim, and Bhotán, common ; Assam—Khasia 5000′, *Clarke*, *Mann* ; S. Ind.—Nilgiris : common about Ootacamund (*Bedd.*).

This seems to be a larger form of *N. parallelogrammum*, than either *a*, above, or *c*, which follows, and 'shaggy' is not a bad epithet to apply to it. The pinnæ are very patent, becoming deflexed towards the base of the frond. The fronds are sometimes as lanceolate as a frond can be whose pinnæ do not dwindle down to auricles at the base : and I think Clarke meant "suddenly ceasing at the base," instead of "suddenly narrowed near the base," as he puts it. Tehri Garhwál specimens have fronds up to 3¼ feet long, by 1 foot broad, and perhaps longer, tapering gradually downwards to 4½ in. br., below which there are no auricles.

Milde, Fil. Europ., gives *Aspidium parallelogrammum* as a synonym of his *var.* 6 (*of N F.-mas*) *paleaceum*, Moore f. nat. print, and mentions a form from Khasia (*var. khasiana*, *fide* Clarke). His varieties of *F.-mas* are (1) *genuinum* Milde ; (2) *crenatum* Milde ; (3) *deorso-lobatum*, Moore ; (4) *incisum*, Moore ;

(5) *Heleopteris*, Brockhausen; (6) *paleaceum=patentissimum*, Wall.; (7) *Maackii*, Milde; (8) *glandulosum*, Milde; (9) *Duriæi*, Milde. Hooker, in his '*Species Filicum*,' says his *var.* β (*of N. F.-mas*) *parallelogr.* is perhaps the next (sic) most common in the East Indies, and from localities too numerous to be worth recording, generally in mountain and northern districts, yet by no means confined to them." Of the American specimens he says—"All are true *var.* β *parallelogrammum*, Kunze, with long, criniate, paleaceous scales, and quite parallelogrammic close-placed segments and coriaceous fronds. One locality only seems to be recorded in the West Indies for *N. F.-mas*, and that is in Jamaica. Dr. Morris's ticket is: J. P. 228, from Director, Public Gardens and Plantations, Jamaica. This appears to come nearest to *Nephrodium Filix-mas*. In any case it is new to our collection, and so far as I am aware not before collected in Jamaica. Found between the Western and Middle Blue Mountain Peak, 7,330 ft., March 28, 1885, D. Morris, 4-4-85." The specimen of this in Kew is nearer *N. piarallelogr.* than *N. F.-mas*, but the segments are short, rounded and toothed.

c. Forma fibrillosa.

N. Filix-mas, Rich., *var.* 5, *fibrillosa*, Clarke in 'Review,' p. 520, t. 70. "Stipe 1—3 in.; frond 8—30 in., very narrow, tapering at both ends, but not attenuated with auricles into the stipe; stipe and main rhachis densely clothed with lanceolate-linear, chestnut coloured scales; pinnæ patent, cut down to the midrib; segments oblong, obtuse, serrulate at the apex, fibrillose on the surface beneath. North-West Himalaya, alt. 9-12,000', from Kumaun to West Kashmir; very common."

KASHMIR: 5-10,000': common in many places.

PUNJAB: *Chamba*—Ravi Valley 9000'; *Kulu* 6-10,000', Lahaul 12,000', Trotter; *Simla Reg.*—"The Chor," Kamalhari and Hatu Mts. 95-10,000'.

N.-W. P.: *D. D. Dist.*—Jaunsar, Deoban 9000', Herschel; *T. Garh.*—Ganges Vy., Gangotri—11-12,000', Duthie; *Kumaun*—Davidson, Duthie.

Mr. Clarke says:—"One of the most uniform varieties of *N. F.-mas*, and the most worthy consideration for specific rank;" but I find difficulty sometimes in distinguishing it from *forma patentissima*. The smaller size and very dark-coloured scales are perhaps the best characters. The degree of fibrillosity seems to depend on age of specimen. I have seen a good deal of this growing in the Simla Region, and consider it quite distinct from *N. Filix-mas*.

12. **Nephrodium Kingii** n. sp.—Plate IX. (see Part II.; p. 621 of Vol. XII).

13. **N. serrato-dentatum** n. sp.—Plate X. (see Part II.; p. 622 of Vol. XII.).

14. **N. Brunonianum**, Hook; Syn. Fil. 84; C. R. 522, *Lastrea Brunoniana*, Wall., Bedd. H. B. 246.

KASHMIR : 95-12,000', W. S. Atkinson 1872, Levinge 1875, Trotter 1888, McDonell, MacLeod 1891, Duthie 1892-93.

PUNJAB : *Hazara Dist.*—Makra Mt. 11,000', Trotter 1889 ; Chamba—Upper Chenáb and Ravi Valleys 11-12,000', Baden-Powell 1879, McDonell 1882 ; Pángi 12-15,000', Harsukh (Sahar. Herb. Collr.) 1899; Kullu, and Lahaul Trotter (in printed List) ; *Simla Reg.*—Hatu Mt., Trotter (in printed List).

N.-W. P.: *T. Garh.*—under Srikanta Mt., and Kuari Pass 12-14,000', Duthie ; *Kumaun*—Rálam 12,000', S. & W. 1848.

DISTRIB.—*Asia* : N. Ind. (Him.), Sikkim and Bhotán.

The cutting of this fern is certainly, as Beddome says, very like that of *N. serrato-dentatum*, but the shape of the frond is very different, and I see no difficulty in distinguishing between the two species. The fronds of *N. Brunonianum* are oblong-ovate, sometimes diminishing gradually at the base, or oblong and narrow, but always narrowing abruptly at the apex. A Kashmir specimen in my possession has a frond 12 in. l. by 2½ in. br. at the broadest—not four inches from the base : it remains 2¼ in. br. up to within 2½ in. from the apex, being practically parallel-sided for 7½ of the total length. It has about 25 pairs of pinnæ 20—27 pairs of pinnæ seems to be the normal number : 12—14 pairs seems to be the normal of *N. serrato dentatum*, besides a sharp-pointed pinnatified apex ; and the shape of the frond of this latter mentioned species is broadly lanceolate, sometimes almost deltoid. The difference in the clothing is very that of *serrato-dentatum* being comparatively scanty. The scales of *N. Brunonianum* are often bright chesnut coloured, paler than the black stipes and rhachis. The involucre is very fugacious. Beddome in his Supplement of 1892 says Mr. Baker considers this and *N. barbigerum* as varieties of one species,—which species, however, is not said.

15. **N. barbigerum**, Hook. ; Syn. Fil. 274 ; C. R. 252. *Lastrea barbigera*, Hook., Bedd. H. B. 246.

AFGHAN. : Kurram Vy.—95-11,000', Aitch. 1879-80.

KASHMIR : 95-12,500', Levinge, Trotter, McDonell, Gammie, MacLeod—"Common, on north slopes of watershed between Jhelum and Kishenganga Valleys ; " Duthie ; below Gulmarg 6,000'—"almost in the water of a small rivulet," McDonell 1893 ; Sind Valley 10-11,000', Duthie 1892. *Muzafarabad Dist.*—Ináyat (Sahar. Herb. Collr.) 1899.

PUNJAB : *Chamba*—Upper Chenab Valley, 10,000', Baden-Powell ; Cheni Pass; 11-12,000', Gammie ; "Chamba," McDonell 1882-85 ; Pángi, Surál Vy., 12,500', Hursukh (Sahar. Herb. Collr. 1899); Head of Hudán Vy., 14,000', J. Marten 1899.

N.-W. P. : *T. Garh.*—Kidar Kanta Mt. 9000', Herschel ; Bandarpunch 13-14,000', and Bamsor Pass 11-12,000', Duthie ; *B. Garh.*—Joshi Mat 12,000', P. W. Mackinnon Kumaun—near Rálam 12,500', S. & W. ; Duthie 11-13,000', three stations ; near Pindari Glacier 10-11,000', Trotter ; Lessar Pass 16,800', MacLeod, "a solitary plant under a rock in the snows."

DISTRIB.—*Asia* : N. Ind. (Him.), Sikkim.

McDonell's gathering at about 6000′, in Kashmir, which he sent to me for confirmation at the time, and MacLeod's as high as 16,800′, in Kumaun, make a considerable vertical extension of distribution. Herschel's specimen from T. Garhwál is remarkable for its comparative nakedness, and the narrowness and distance apart of its segments. Mackinnon's specimen from B. Garhwál has dark-brown scales.

The '*Synopsis*' says this and the preceding species are closely allied to one another, but not likely to be confused with anything else. Beddome doubts their distinctness. Clarke points out that the position of the sori differs. I find the shapes of the two fronds to be constantly different : *barbigerum* is broad for its length, and ovate : *Brunonianum*—narrow, and generally oblong. The stipes and rhachis of *Brunonianum* are black—blacker than the scales ; those of *barbigerum* are pale-brown—paler than the scales.

16. **N. pandum**, n. sp. (see p. 623 of Vol. XII.).

Add—PUNJAB : *Chamba State*—J. Marten, 1898. N.-W. P. : *B. Garh.*—, Mrs. Fisher.

17. **N. Schimperianum**, Hochst. (under *Aspidium*). *N. Filix-mas*, Rich., Syn. Fil. 272. *N. F.-mas, var. c, Schimperiana* (sp.), Hochst., C. R. 520. *Lastrea Filix-mas, var. γ elongata*, Hk. and Gr., Bedd. H. B. 250 ; *Lastrea Filix-mas, var. Schimperiana*, Bedd. Suppt. H. B., p. 58.

KASHMIR : Rattan Pir 8000′, Trotter 1888.

PUNJAB : *Kullu*—Jalori Pass N. 9-10,000′, Trotter 1887 ; *Simla Reg.* 55-8000′, and perhaps higher : very common in Simla.

N.-W. P. : *D. D. Dist.*—Mussooree 6500′, Hope 1890 (1 plant) ; Landour and to the eastward, above 7,000′, abundant ; *T. Garh.*—Kidar Kánta Mt. 6000′ Herschel ; Jumna Vy., near Kharsoli 9-10,000′, Duthie ; *B. Garh.*, Duthie, Mrs. Fisher ; *Kumaun* 5-9000′, several collectors ; Gori Ganga Vy. near Buin 3400′, and above Rilkot 10,000′, MacLeod 1893.

DISTRIB.—*Asia* : N. Ind. (Him.), Sikkim and Bhotán, Assam—Khasia 5-6500′ "very common," *Clarke*, *Mann* ; Naga Hills—Kegwima Edge 7000′, Clarke 1885.

Beddome says, in his Supplement of 1892, "The typical form of this is well marked, ... it is intermediate between *cochleata* and *odontoloma*, Moore. There are two forms in N. India, a large and a small variety. I have only seen the latter (*L. intermedia*, Bedd. F. S. 1, t. 311) in Southern India." The figure here referred to does not suggest *N. Schimperianum* to me. I think this well-marked fern can afford to stand alone without the support of *N. cochleatum* and *N. odontoloma*, to which latter species at least it has no sort of resemblance or affinity.

N.-W. Indian specimens seem to run much larger than those from Sikkim, Assam and Madras, but some of them are as small as any from elsewhere. One of Trotter's plants from Rattan Pir in Kashmir has five fronds, none of which are over 7 in. l., including stipes : three of them are fertile. The cutting of this

species varies a good deal, but not with the size of the frond. One frond I collected in Simla in 1871, about 25 in. l. by 8½ in. br., is only bipinnatifid, and the segments are not lobed—only slightly toothed. Another I got at Mashobra (Simla Region) in 1886—matched by a frond of Strachey and Winterbottom's from Kumaun—may be said to be bipinnate, *i.e.*, there is hardly any wing to the secondary rhachis in the greater part of the frond, though the pinnules are sessile with a decurrent base. The bipinnateness decreases in the lower part of this frond, and is quite lost in the lower two or three pairs of pinnæ, as it is towards the tips of all. This frond is 28 in. l. by 10 in. br., and has a stipe 13 in. l. The segments are distinctly lobed, and the 8—10 lobes are toothed. The veins are distant, one to each lobe, and pinnate in the lobes. The sori of this specimen are uncharacteristically small,—one at the base of each vein close to the midrib, except in the tips of the pinnules.

The scales of *N. Schimperianum* (the Indian plant) at base of stipes are long, linear, in a dense mass; higher up there are both large, broad, scales, with fibrillose twisted tips, and very narrow ones. All are always pale-brown, transparent. The caudex is decumbent, and stipes tufted, but not densely so, and spreading. The fern generally grows on steep ground, and is often rooted in the clefts of rocks; and the fronds droop more or less.

I have seen quantities of *N. Schimperianum*, *N. marginatum*, Wall., and *N. odontoloma*, Moore, growing together, near Landour, but never the slightest passage from one to the other.

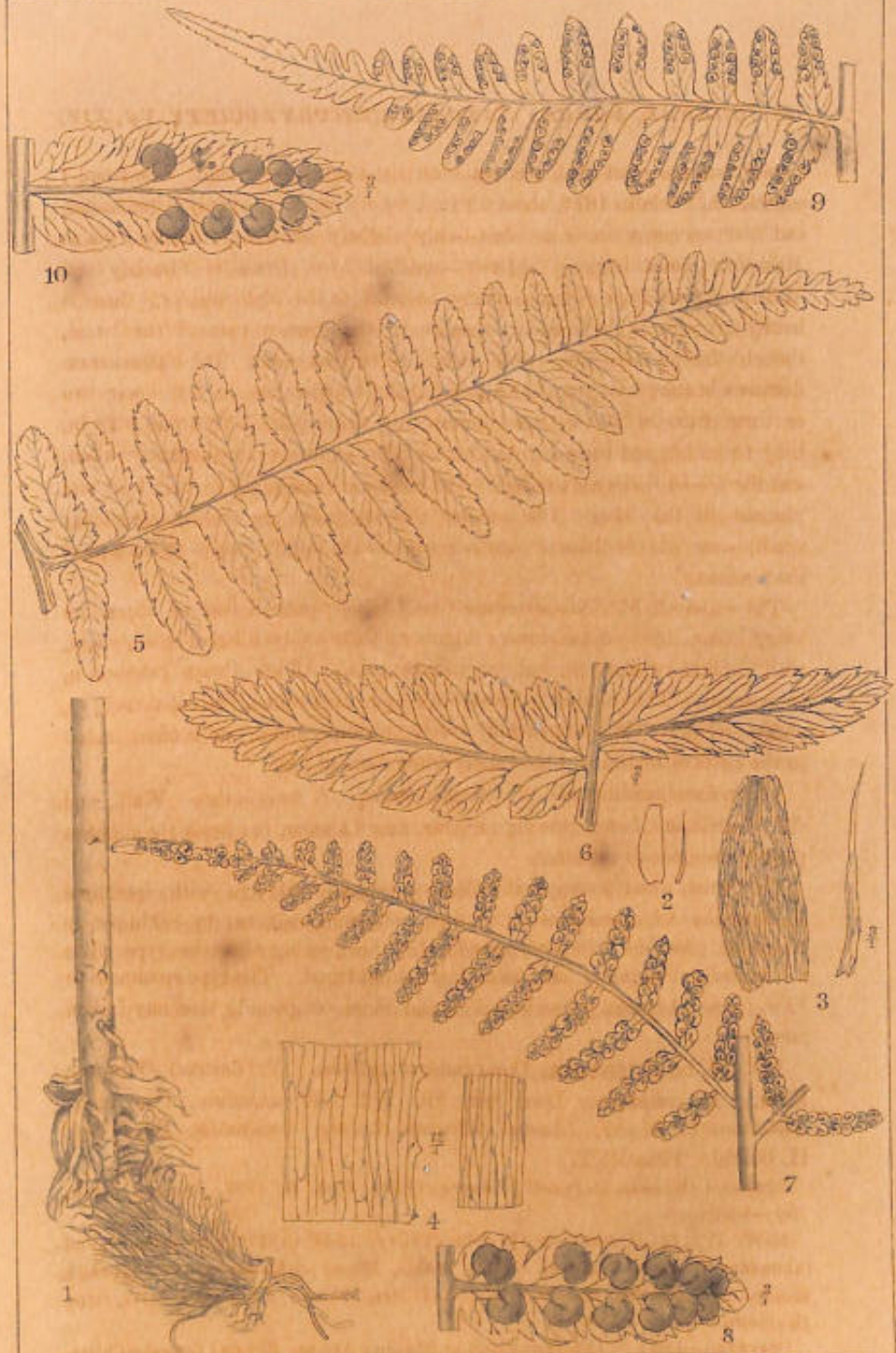
Dr. Christ, who has compared Indian specimens of this fern with specimens of *Aspidium Schimperianum* in his own herbarium, collected by Schimper in Abyssinia, considers it imprudent to identify them, seeing that the type plant is markedly bipinnate, and has a large deltoid frond. The type specimens in Kew, from Abyssinia, are wider below, and more compound, than any Indian ones.

18. **N. cochleatum**, Don (under *Aspidium*). *N.* (*Lastrea*) *Filix-mas*, Rich., *N. cochleatum*, Don, Syn. Fil. 272. *N. cochleatum*, Don (under *Aspidium*), C. R. 521. *Lastrea Filix-mas*, L., *var.* ? *cochleatum*, Don, Bedd. H. B. 250. Plate XXX.

PUNJAB: *Chamba*—McDonell; *Kangra Valley Dist.* E 4000', Trotter; *Simla*, *Reg*—Simla.

N.-W. P.: *D. D. Dist.*—in the Dún (Valley) 1,550' to 3150', very common, and (abundant in places; *T. Gark.* 4-5000', Duthie, Hope; *Sahdranpur Dist.*—Siwalik Range, on south side, MacLeod; *B. Gark.* Mrs. Fisher; *Kumaun*, S. & W., Hope Davidson, Duthie, 25-6000'.

DISTRIB.—*Asia*: N. Ind. from Oudh to Bhotán; Assam—Khasia; Bengal—Chittagong, and Parasnáth Mt., up to 4000', very common. Burma—Ava. Malay Penins. (*Clarke* in Rev.). S. Ind.—Western Mts., 2-4000' (*Bedd.* in H. B.).



J. N. Fitch del. Chitra Silpi Cº Lith.

NEPHRODIUM COCHLEATUM Don.

1. Base of stipes, nat. size.
2. Scales from ,, ,,
3. ,, ,, ,, × 3 diam.
4. Portion of do. × 12 diam.
5. Pinna of sterile frond, nat. size.
6. Pinnules from sterile frond × 2 diam.
7. Pinna of fertile frond, nat. size.
8. Pinnule of ,, enlarged 3 diam.
9. Pinna of semi-contracted frond nat. size.
10. Pinnule of ,, enlarged 3 diam.

Wallich thought this fern so distinct from any other that he made a new genus for it—*Arthrobotrys*, meaning, I presume, that the sorus or bunch of sporangia was attached to the frond by a joint,—and he gave it the specific name *macrocarpa*. The involucre completely envelopes the sorus, and the whole bunch on a stalk can be detached, even in old dried specimens, from the segment, the involucre being like a thin shell. Sometimes it separates from the frond and turns upwards, but it is always persistent. The "*Synopsis*" gives the generic synonym, and, also, DIPTOPTERIS, Schott. And Clarke gives *Arthobotrys macrocarpa*, Wall., Cat. 395, and *A. avana*, Wall., Cat. 1034, as synonyms. Beddome also mentions those, and says that *A. avana* is from Ava, with the fertile segments so contracted as to be quite beadlike. All the descriptions state that the sterile and fertile fronds are different, though Mr. Clarke says that barren fronds partially fruit-bearing are not rare, and Colonel Beddome that the fronds are generally dimorphic. This is a very common fern in the Dehra Dun, and I should say that a partially-contracted frond is a very rare occurrence. I can see in this fern no resemblance to *N. F.-mas*, or connection with that or any other *Lastrea*. The general aspect of the plant, which sometimes grows in a thick bed or large patch, is—a number of broad leafy sterile fronds bending backwards, and one or more fertile fronds standing stiff and erect in the middle, and much higher than the rest, the stipes being very long, round, and stout. The fertile fronds are often found to have been eaten off by cattle or deer, I presume. The plant loves a clay or rich loamy soil, moisture and shade, or ravine or hilly ground, under trees or among bushes.

N. cochleatum is never truly bipinnate, even in the fertile fronds, the segments being cordate on the superior side and decurrent to a winged rhachis on the inferior,—the wing being traceable throughout. The veins, sometimes very obscure, are pinnate in the lobes; veinlets few and long. The caudex is decumbent like that of *N. marginatum*, Wall.: stipes tufted. A section of the caudex shows black striæ in the woody structure, which are wanting in *N. marginatum*. Beddome says of *Lastrea cochleata*—"A very distinct-looking plant at low elevations, but running into *elongata*" (i.e., *N. marginatum*) "at higher elevations (*vide* forms of my collecting on the Nilgiris and Brunmagherries in the British Museum)." He also, in a letter, referred me to that suite; but I found only about two specimens in it which I could not at once sort according to my lights. Mr. Clarke says *N. cochleatum* has been confused with *vars. intermedia*, Bedd., and *Schimperiana*, Hochst., of *F.-mas*, and that it resembles them in having large involucres. "Its especial character is its strong dimorphism; it is worthy, perhaps, of generic rank." He further says there are no forms intermediate between *N. cochleatum* and *N. elongatum* at Kew, nor has he ever met with such in India. "There are examples of *N. cochleatum*

marked as collected at 7000′ alt., even in Kumaun ; but the fern is confused with *N. Filix-mas*, var. *Schimperiana*, and I very strongly expect that collectors have mixed the two before distribution : I altogether doubt high-level localities assigned to *N. cochleatum*." I quite concur.

[*N. rigidum*, Desv., was given by Mr. Clarke at p. 523 of his ' Review ' as an Indian fern, and I do not think he gave it up in his later papers. I know the European fern, and I can say that I have seen nothing very like it from the Himalaya. I do not think *N. pallidum*, Bory, is very near *N. rigidum*, though I think it is probably identifiable with the Himalayan *N. odontoloma* (Moore), Bedd. Beddome also had *Lastrea rigida* as an Indian species in his Handbook. He said it was very near *L. Filix-mas elongata*, and he did not know any distinguishing character. Since then he must have seen the European *N. rigidum*, for in his Supplement of 1892 he says, under *Lastrea rigida*,—" All the specimens I formerly referred here I now refer to *Filix-mas elongata*. I much doubt if this species is represented in Northern India, at least as distinct from *remota*." He then proceeds to treat of *Lastrea spinulosa*, var. *remota*, as an Indian fern.]

[*N. remotum*, Hook., Brit. Ferns t. 22 ; *N. spinulosum* Desv., *remotum* (A. Br. sub *aspidium*), Bedd. H. B., p. 252 ; *A. remotum*, A. Br.

This plant is included by Clarke in his ' Review ' as an Indian fern, and by Beddome as mentioned above. As I have never seen Indian specimens which agree with European specimens, and have, moreover, reasons for agreeing with Milde that *N. remotum* is a hybrid between *N. F.-mas* and *N. spinulosum*, I do not admit this as an Indian species, and have instead given *N. Blanfordii* n. sp. No. 18, below.]

[*N.* (*Lastrea*) *spinulosum*, Desv., is stated in the ' *Synopsis* ' to be found in the Western Himalaya ; but neither Clarke nor Beddome corroborates the statement, and I have never seen Indian specimens. It is said to have been collected in the Gilgit District of (Trans-Indus) Kashmir by Colonel Tanner in 1880, at an elevation of 8000′ ; but the specimens are only two barren fronds without rhizome. I have my doubts.]

19. **N. Blanfordii** n. sp.—Plate XI. (see p. 624 of Vol. XII.)

Add :—KASHMIR : Kishenganga Valley, 7-8000′, Duthie 1892 ; Baltistan, 12-13,000′, Duthie 1892 ; " Kashmir," McDonell 1894.

PUNJAB :—*Hazara Dist.*—Kagan Valley, Duthie's Collr. 1899 ; *Chamba*—J. Marten 1897-98 ; Pangi 8500′, Harsukh 1899.

20. **N. odontoloma**, Moore (under *Lastrea*), Index Filicum, MS.; Bedd. F.S.I., 39, t. 114 ; *Lastrea Filix-mas, var. odontoloma*, Moore, Bedd. Suppt. H. B. 55. *N. Filix-mas*, Rich., var. 2, *normalis*, C. R. 519, t. 68, fig. 2.—



J. N. Fitch del. Cintra Silpi C° Lith.

NEPHRODIUM ODONTOLOMA. Moor.

1. Basal pinnae of a large frond.
2. Segments of a pinnule × 2 diam.
3. Portion of upper part of same frond.
4. Portion of a pinna from do. × 2.
5. Pinnae from a small specimen, nat. size.
6. Base of stipes of frond N°1.
7. Scale from do × 3 diam.
8. Portion of do enlarged 30 diam.
9. Rhizome and stipes of a small frond ½
10. Scale from N° 9, enlarged 2 diam.
11. Portion of N° 10, enlarged 25 diam.

Plate XXXI. *Plants* isolated. *Caud.* decumbent, slow-growing, throwing up a few fronds from the apex annually, and perishing behind, densely clothed with large, broad, acuminate scales. *Stipes* curving upwards to the vertical, densely clothed at base with linear, subulate, concolor, light-chestnut-coloured scales, ¾ in. l., higher up with larger and broader scales up to 1 in. l., very acuminate, dark-chestnut-coloured, still higher up shortening to ⅓ in., with pale edges, and becoming scattered and deciduous ; stiff but not thick ; from 6 in. in small to 23 in. l. in large plants;—average of 25 large fronds 14 in. *Fronds* from 8 to 23 in. l., by 4 to 13 in. br., ovate-acuminate : sometimes the lowest pair, or the two lowest, sometimes the third and fourth pairs from base, sometimes the middle pairs, the longest : bipinnate. *Pinnæ* oblong-acuminate, generally broadest at base, occasionally at middle, pinnate to a slightly winged rhachis, distant, pinnules generally set well apart. *Pinnules* generally sessile, but lowest often petiolate, broadest at base, slightly falcate and tapering to a rounded apex, cut down more or less into distinct, blunt or truncate, sharply-toothed lobes, 4-6 in number according to length of pinnule, the toothed margin thin in texture, almost hyaline, with a tooth to each veinlet. *Veins* distinctly visible, pinnate in the lobes : veinlets curved, in lower lobes often forked in the inferior half, running into the teeth but stopping short of the margin, clubbed at the ends. *Sori* in a single row on either sider of costa of pinnule, one in each lobe, but often two in each of the lowest pair ; lowest 3—5 pairs of pinnæ sterile. *Texture* herbaceous ; colour of stipes and rhachises pale-straw-coloured, or light brown : of lamina pale, dull, green.

AFGHAN.—Griffith ; Kurram Valley—Aitch. Nos. 384 and 455, 1879.

TRANS-IND. STATES : Chakdára, Duthie's Collr. 1895 ; *Barawl* and *Swát*—with the Chitrál Relief Expedition, 6 stations, 63-10,000′, Harris 1895 ; Mirga 8000′, Sir W. Gatacre 1895.

KASHMIR :—"Kashmir and W. Thibet, J. E. Winterbottom 1847, No.—, Habitat Birik in Gilgit (Balti or Lower Thibet), elevn. 10,000 ft." ; Rutton Pir 8000′, C. B. Clarke, No. 28310, 1876 ; Srinagar, Bamahama, and And'rbug 5-7000′, "common" MacLeod 1891 ; Jhelam Valley, 3000′, Gammie 1891.

PUNJAB : *Dehra Ismail Khan*—Pingul, Rev. J. Williams 1888 ; *Hazara Dist.*—Black Mt., Akhund Bába Peak, and Kahim Gali 8-9000′, Panj-Gali 6-7000′, Duthie Nos. 7623-23, 1883 ; Kagan Valley. 5-8500′, Inayat (Sahar. Herb. Collr.) 1896-97-99. Abbotabad to Murree 7-9000′, Trotter 1889 ; Murree 5-7000′, Hope 1882 ; *Chamba State* McDonell, Trotter, J. Marten 1893-99, Harsukh (Sahar. Herb. Collr.) 1899; *Kangra Vy. Dist.*—Dharmsala 8000′, Trotter 1887; Simla Reg. 5-10,000′, Hope, Gamble, Blanford, Duthie, Bliss.

N.-W. P. : *D. D. Dist.*—Jaunsar 45-8000′, C. G. Rogers, Gamble ; Mussooree 6-7000′ : the common *Lastrea* of Mussooree ; *T. Garh.*—King, Duthie, Gamble ; *B. Garh.*—Mrs. Fisher ; *Kumaun*—Hope, Davidson, Trotter, Duthie.

DISTRIB.—*Asia—Centr.* : N. Ind. (Him.) Sikkim, Bhotan ; Assam—Khasia Hills, *Clarke*, *Mann* ; "not very common" (*Clarke* in 'Rev.') ; Kohima 4500′, *Clarke* S. Ind.—Nilgiri and Annamalay Mts., above 5000′, *Beddome*, *Lovinge*, *Gambel*.

The above description has been written by me from a large series of specimens. I first gathered this fern at Naini Tál in 1861, and again at Simla in 1871. I was very familiar with it at Mussooree from 1880 to 1896, where it is one of the commonest ferns in and near forest, on the north side of the ridge. On dry ground it is small and poor, and like Clarke's type of *N. F.-mas, var.* 2. *normalis ;* but in rich moist soil, in open shade, it developes into a large handsome plant, with a number of fronds growing up simultaneously from the apex of a suberect or decumbent stout caudex, but not shuttlecock-wise from an erect caudex, like the fronds of *N. F.-mas.* Generally the four, always three, lowest pairs of pinnæ are barren, and not uncommonly five pairs. This may be taken as a character of the species. The sori are small, but the involucres when young are twice as large as the sori, shrivelling up when they ripen. The pinnæ are all distant, increasingly so downwards to 3—3½ in. apart in large fronds. The stipes is generally long. Before I saw this fully-developed state of the plant I thought the Mussooree fern must be Clarke's *normalis.* I objected to the species being put under *F.-mas,* and when, later, I received Assam specimens from Mr. Clarke, I identified them with the small form of the Mussooree fern. When I went to England in 1888, and studied at Kew, I noted—"No specimen that I have, or have seen, marked *var. normalis* by Mr. Clarke is at all like *N. Filix-mas,* either in stipe, shape of frond, cutting, or sori." I classified on paper all the specimens like *normalis,* or like the Mussooree larger fern, into groups :—I. Old specimens, identical with Clarke's own, found freely scattered through bundles marked as containing not only *N. F.-mas,* and varieties of it, but *N. rigidum,* Desv., and these Mr. Clarke had apparently not identified as his *normalis.* The earliest collected of these is, I think, a frond collected by Jacquemont at Mussooree, No. 592, and it had been marked *N. remotum* by Mr. Clarke. Another, from Afghanistan, Griffith, Mr. Clarke had marked *N. rigidum,* Desv. Two or three sheets, of Dr. Bacon's collecting, have tickets—"Mussooree, abundant," and—"N.-West India, Mr. Edgeworth." There are about a dozen sheets of these old specimens, collected from Kashmir to Kumaun, but all unmistakably *N. odontoloma,* Moore.

Group II. comprises seven sheets of Mr. Clarke's own collecting in Kashmir and at Dalhousie in the Chamba State, marked *rigidum* or *remotum.* A wrapper marked by him '*Ind. Or. rigidum,*' contained either *N. marginatum,* Wall., or very large and compound specimens of the Mussooree *normalis,* collected by Jacquemont, Strachey and Winterbottom, Hook. fil. et Thoms, and Edgeworth. None of these seemed to me in the least like the European *rigidum* or *remotum.* Some loose sheets had mostly been referred to *rigidum,* though they were not in a *rigidum* wrapper. I thought them not even like that species. Many were named *pallidum* by the collectors, which name well indicates their

tint of green. There is a great resemblance between *N. odontoloma*, Moore, and *N. pallidum*, Bory; and some specimens of Dr. Aitchison's from Afghanistan, which I at first referred to *odontoloma*, may be *pallidum*, if these are distinct species. There is a whole plant of his, No. 455, "Shand Toi ravine, Aspidium Filix-mas, 31-5-79," which is exactly Clarke's Assam *normalis*, small and simple in cutting, but very pallid. Mr. Baker has marked this—"doubtful—between *rigidum* and *Filix-mas*." Under *rigidum*, which he seems to have erroneously introduced into the Flora of India, Mr. Clarke says—"Some of the Indian examples exhibit the whitened appearance of *N. pallidum*, Bory; and Sir W. J. Hooker has written that name on one of them. Some forms included by me under *N. Filix-mas, var.* 2, *normalis* above, become 2-pinnate, and I can draw no line between them (Khasi examples) and *N. rigidum*." From this it would appear that the large N.-West Himalayan form of *N. odontoloma* grows also in Assam; but Mr. Clarke gives no dimensions, and his figure is of the small form.

Later on, after a discussion, Mr. Baker allowed me to pick out of all these wrappers the specimens I reduced to *normalis*, alias *N. odontoloma*, Moore, and Mr. Clarke pinned additional tickets on them, bearing that name, on my responsibility. Colonel Beddome, in his Supplement, under *Lastrea F.-mas*, var. *odontoloma*, Moore, makes no mention of this re-sorting done at Kew; but under *Lastrea spinulosa* var. *remota*, he seems to refer to specimens of *N. odontoloma* I contributed to Kew when he says—"Mr. Hope has also sent specimens to Kew, gathered at the base of the Himalayas, in which the pinnules are much less cut than in the type, which have been referred to *rigida*, var. *pallida*." The specimens I sent, which are admitted by Clarke to be his var. *normalis*, well developed, were not gathered at the base of the Himalaya, but over the outer ridge of the range at an elevation of about 6,300 feet, and no specimen of this plant has ever been got at the base of the Himalayas.

Large specimens of *N. odontoloma*, Moore, and also of *Aspidium marginatum*, Wall., are quite bipinnate in the lower half: *N. F.-mas* is never bipinnate. *Nephrodium elongatum* (Sw.), Hook. & Grev., is somewhat like *N. odontoloma*, and very unlike *F.-mas*. It is not bipinnate, and the lowest two pairs of pinnæ, which are not much shorter than those above them, are less bipinnate than the third and fourth pairs are.

21. **N. ramosum**, Hope, in Journ. Bot., March 1896, p. 126.—"*Rhizome* procumbent" (plants isolated), "ligneous, densely clothed, as are the bases of the stipes, with large, broad, suddenly-acuminate hair-pointed pale-brown self-coloured scales. *Stipes* 6-17 in. l., stout, pale-brown or straw-coloured, sometimes mottled. *Frond* 10-24 in. long by 8-13 in. br., bipinnate in lower part; *rhachises* slightly winged in upper pinnæ; lowest pinnæ as long as or longer than the next above, and the lowest four or five pairs but

little diminished in length, diminution thence gradual to apex; *rhachises* straw-coloured, or pale-brown, or pale-green, more or less clothed with pale-coloured linear scales and fibrils, but sometimes glabrous; frond plumose in appearance. *Pinnæ* ascendant, 16-30 pairs besides the deeply-pinnatified apex, distant near base of frond, lowest 5-9½ in. l. by 2-4¼ in. br. *Pinnules* 12-20 pairs, on the lower pinnæ much longest on the lower side, longest towards the middle and then up to 2½ in. l., none ½ in. br., and all distant, falcate; oblong for two-thirds of their length, and then acuminate, cut down to a winged rhachis into 10-15 segments; segments in large fronds lobed on both sides, and lobes toothed. *Texture* herbaceous. *Colour* pale-green, but drying sometimes pale-brown. *Veins* pinnate in segments, and forked in larger lobes. Sori generally absent in lowest two or three pairs of pinnæ, but extending sometimes almost to the apices of fronds and pinnæ, up to six in lowest lobes, medial. *Involucres* thick moderate-sized, persistent, brown; sporangia pale-green when young."—Plate XXXII.

Afghan.: *Peiwar Kotal* 8000′, the late Sir Henry Collett 1879; *Aitch.* 9000, No. 266, 1880 (named *N. rigidum, var. pallida*).

TRANS-IND. STATES: with the Chitral Relief Expedition—72-10,000′, Dr. Harris, Sir Wm. Gatacre.

KASHMIR, W.—4-10,000′, Trotter 1888, MacLeod 1891, McDonell 1891 and 1894, Duthie 1892-93.

PUNJAB: *Hazara Dist.*—"The Gallies," Mrs. Queripel 1882; Kagán Valley Inayat (Sahar. Herb. Collr.) 1896-7-9; between Abbotabád and Murree 7-8500′, frequent, Trotter 1888-89 and 1892; *Simla Reg.*—8-9000′, Blanf. 1882-84, Hope 1886, Bliss 1891.

N.-W. P.: *D. D. Dist.*—Jaunsar 8000′, Gamble 1892-95-98; *T. Garh.* 8-9000′, Duthie 1883.

The characteristic features of this fern are—the broad frond, hardly ever reduced at the base: the very long, broad and distant pinnæ: the very long and narrow pinnules: the pale-green colour of the frond, and the almost invariably pale colour of the scales. The distribution seems to be confined to the Western Himalaya and the mountains immediately to the westward of British India. In colour it is similar to the much less compound *N. pallidum* of Bory, a native of South-Eastern Europe and Western Asia. Some specimens of *N. ramosum* approach *N. odontoloma*, and others *N. marginatum*, Wall., which varies a good deal. But *N. odontoloma* never is broadest at base as *N. ramosum* is almost invariably. Perhaps the nearest congener of this species is *N. Blanfordii*, Hope, No. 18 above described, a fern with a more limited range; but that species is never so compound in cutting, and it always has a short stipes, and dark-coloured scales.

22. **N. marginatum**, Wall. (under *Aspidium*), Cat. 391, mainly, but not the type sheet; C. R. 521, t. 71; *Aspidium marginatum* (not clearly separable from) ", *N. elongatum*, Hk. & Grev., Syn. Fil. 272. *Lastrea Filix-*



J. N. Fitch del. Chitra Sdpt. Cy Lith.

NEPHRODIUM RAMOSUM Hope.

1. Section of rhizome, nat. size.
2. Portion of frond, nat. size.
3. Pair of pinnules, enlarged 2 diams.
4. Sorus, enlarged 20 diams.
5. Scale from base of stipes, × 7 diam.
6. Portion of same scale, × 30 diams.



J.N. Fitch del. Chutea Calpi Co. Lith.

NEPHRODIUM MARGINATUM Wall., (Sub Aspidium)

1. Rhizome natural size.
2. Pinnules from a basal pinna: nat. size.
3. Upper ½rds. of a pinna. nat size from same frond. 6..... do. : enlarged 5 diam.
4. Pinnule of N°3. enlarged 2½ diam.
5. Scales from base of stipes: nat. size.
7. Portion of scale: enlarged 20 diam.

mas, var. γ, elongata, Hk. & Grev., Bedd. H. B. 250, and Suppt. 56. Plate XXXIII.

Mr. Clarke's description is :—"Frond large, oblong or ovate-lanceolate, not narrowed at the base, 2-3 pinnate ; lowest pinnæ often 12 in. l., falcate ; main and partial rhachises nearly free from scales ; tertiary pinnæ oblong, obtuse, serrate or pinnatifid sometimes nearly to the midrib ; texture, venation, and sori nearly as *Filix-mas*.—Himalaya, alt. 6-9000′, from Bhotan to Kumaun, common in Sikkim ; Khasia, alt. 5000′ ; Kohima 6000′."

Mr. Clarke observes :—"This form is called var. *elongatum* (*of N. F.-mas*) in the Kew bundles, and also by Indian collectors ; but I do not see that it is much like *N. elongatum*, Hk. & Gr., Ic. Fil. t. 234 (*Aspidium*, Milde, Fil. Eur. 124), which is founded on a Macaronesian fern that seems to me much more like var. *Khasiana*." In this I quite concur, but I cannot do so in what follows the above. *N. marginatum*, Wall., is quite common as far westward as Simla, and even in Western Kashmir, according to Col. MacLeod ; and I have a specimen from the Hazára District collected by Mr. Trotter. I give the habitats I have notes of—as follow:—

KASHMIR : On the range between Jhelam and Kishenganga Valleys—"common from 6 to 11,000′," MacLeod in MS., 1893.

PUNJAB : *Hazara Dist.*—near Dungagali 7000′, Trotter No. 546, 1890 ; *Chamba*—below Dalhousie 5000′, Blanford 1886 ; McDonell ; *Kangra Vy. Dist.*—Dharmsála 6500′, Trotter ; *Simla Region*—Simla 5500′-6000′, Hope, Blanford, Bliss.

N.-W. P. : *D. D. Dist.*—Musscoree and neighbourhood, from 5000 to 6950′, common in forest. *T. Gark.*—Aglár Valley, Duthie ; *Kumaun* 47-6000.

DISTRIB.—*Asia* : N. Ind. (Him.), Sikkim (common), Bhotan ; Assam—Khasia 5000′, Kohima 6000′ *Clarke*. S. Ind., on the Western Mts., 4-6000′, *Beddome*. Ceylon (Beddome H. B.). Malay Peninsula—Perak (Beddome Suppt. H. B.).

The description of *N. elongatum*, Hk. & Gr., given in the '*Synopsis*' under *N. Filix-mas* Rich., is :—"*fr.* sometimes 3-4 ft. l., 2 ft. br., subdeltoid, quadripinnatifid ; lower pinnæ 1 ft. or more l., 4-6 in. br., pinnl. close, lanceolate, cut down nearly to the rhachis into oblong crenated lobes ; *involl.* ⅛—½ lin. br. ;" and the concluding remark, under *N. F.-mas*, in which is included *N. elongatum*, as var. γ is—"The extremes as described differ widely, but we cannot draw any clear line between them. *A. Schimperianum*, *canariense*, *Ludovicianum*, and *marginatum*, none of them seem clearly separable from γ which might be looked for in group 7." Group 7, when we come to it ten pages further on in the '*Synopsis*,' contains 28 species with fronds ample, more than 1½—2 ft. l., 1. ft. br., decompound.

Had the description of *N. elongatum* given in the '*Synopsis*' been simply of the Macaronesian plant, as figured in Hooker and Greville's *Icones Filicum*, the suggestion that the fern might be looked for in group 7 of *nephrodium* could hardly have been made. The figure is of the Madeira fern, as gathered

there, at Ribeiro d'Amestade, and the description in the *Icones* is said to have been made from the frond figured ; but it goes beyond that, and seems to have been intended to cover also *N. canariense*, A. Br., which Milde considered to be a distinct species. So also does the description in the '*Synopsis*' seems to have been designedly made comprehensive ; and afterwards it was thought sufficiently so to cover also *N. Schimperianum*, Hochst., and *N. marginatum*, Wall. And, next, the habitats were extended eastwards from the Macaronesian Islands, over nearly all Africa, and the East Indies, and westwards to the South United States. I cannot find any specimen of *N. elongatum*, as figured by Hooker and Greville, marked as having been collected in the Canary Islands ; nor does it seem to have been got on the Continent of Africa. Nor can I find any specimen of the more compound (or decompound ?) plant, *N. canariense*, marked as having been got either on Madeira or on the African Continent. But I must point out, in spite of Milde's opinion that it is a distinct species, that *N. canariense* appears to be closely connected with *N. elongatum*, for it shares with it two characters which I cannot find in *N. Filix-mas*, or in any African or Indian plant named *N. elongatum*. These are (1), as stated in Hooker and Greville's description,—"the underside (of the frond) is minutely dotted with crystalline glands, and the involucre, which is very convex, is also studded with glands, some crystalline, some opaque (sic)" ; and (2)—which I cannot see anywhere noted—the secondary rhachises, and in a less degree the costæ of the pinnules, or the tertiary rhachises, bear peculiar small, rounded, pointed scales. These scales I cannot find on any form of *N. Filix-mas*, or on any other so-called variety of it, or on *N. marginatum*, Wall., or on any continental African species or form.

The difference in cutting between even the largest specimens of *N. canariense* and the smallest and least compound (or decompound) specimens of *N. marginatum*, Wall., is very marked ; and the very patent and closely-set pinnæ and pinnules of *N. elongatum*, Hk. & Gr., and *N. canariense*, A. Br., are in marked contrast with the ascendant and widely separated corresponding parts of *N. marginatum*, Wall. The texture and colour of the two species are very different ; and the scales at base of stipes are utterly dissimilar from each other as well as from those of *N. Filix-mas*.

Nephrodium elongatum, Hk. & Gr., is, as these authors say, *Aspidium elongatum*, of Swartz, Syn. Fil. p. 55, Willd. Sp. Pl. v. 5, 269, 1779, which again is the *Polypodium elongatum*, of Aiton, in Hort. Kew. Ed. 1, v. 3, p. 465, and Ed. 2nd, Vol. V., 1813. The type of *Polypodium elongatum* is in Herb. Hort. Kew.—ticket—"*Polypodium elongatum*, Solander, n. sp, 1781," Herb. late Bishop Goodenough, presented by the Corporation of Carlisle, June 1880. This has the characteristic scales, described above, on the secondary rhachises and

costæ : the stipes are incomplete, and there is no rhizome. *Tectaria elongata*, Cav., is quoted in the Icones as a synonym. The following remarks are made, after the technical description :—

"This fern appears to be very little known to botanists, and we are much indebted to the Rev. R. T. Lowe for sending us five specimens gathered in Madeira, at Ribeiro d'Amestade, at an elevation of 3,000 feet above the level of the sea, and from which our figure and description have been made. These, too, we have had an opportunity of comparing with an authentic specimen of Mr. Masson's, and thus determining it to be the *Polypodium* of the *Hortus Kewensis*." None of the authors, Aiton, Swartz, and Hooker and Greville, give any habitat for the plant, except the islands of the Macaronesian group ; and as there is plenty of specimens in the Kew Herbarium, from Lowe and other collectors, named *N. elongatum*, there can be no dispute as to what the type plant is. As the plant was in cultivation in the Royal Gardens, Kew, in Aiton's time, and as it has a place in the Hand-List of Ferns and Fern Allies cultivated in the Royal Gardens, and it would be interesting to compare the fronds now growing with the old Herbarium specimens, and others more recently collected in Madeira, I have tried to find the plant referred to in the List, but without success. No one in the Gardens seems to know of the existence of the plant, or to be able to find it. The Growing ferns are not arranged according to any system of classification, and they are therefore not so available for study as they might be. But I am safe in challenging any one to show any connection between *N. elongatum* and *N. marginatum*, Wall.

23. **N. sparsum**, Don (under *Aspidium*); Syn. Fil. 276 ; C. R. 523. *Lastrea sparsa*, Don, Bedd. H. B. 252.

PUNJAB : *Chamba State*—Ravi Valley-Langera 6500', McDonell 1882.

N.-W. P. : *T. Garh.*—Duthie 1877, Herschel 1878-79; Phaidi, E. of Landour 5-6000', Duthie 1881 ; *Kumaun*—near Askot 4-5000', Duthie 1884.

DISTRIB.—*Asia* : N. Ind. (Him.), Sikkim and Bhotan ; Assam—"very common eastward." C. Prov.—Pachmarhi, *Duthie*. S. Ind.—Mahableshwar ; "abundant on all the western Mts., and on the hills on eastern side" (*Beddome*). Ceylon. Thibet *H. E. Hobson*, Burma, Malay Isles. N. China Yunnan—*Henry*. Formosa. Java—*Raciborski*. Borneo.

Mr. McDonell's fern from Chamba seems very different from the Garhwál plant. It is very elegant in cutting, and, though small, is all but tripinnate ; stipes and rhachis reddish in colour ; it is perhaps a distinct species. The Garhwál plant is hardly bipinnate.

24. **N. crenatum**, Baker, Fl. Mauritius 497. *Polypodium crenatum*, Forsk. *N. odoratum*, Baker, Syn. Fil. 280. *N. crenatum*, C. B. Clarke, C. R. 524. *Lastrea crenata*, Forsk. (under *Polypodium*), Bedd. H. B. 258.

PUNJAB : *Hazára Dist.*—near Kalapani 6000', Trotter 1890 ;—*Chamba State*, McDonell ; 6-7000' Trotter ; Mandi State 5-6000', Trotter ; *Simla Reg.*—Simla to Kamalhori Mt., and Sutlaj Valley, 3-8500' or higher, Gamble, Hope, Bliss.

N.-W. P.: *D. D. Dist.*—Jaunsar: Khalsi; Gammie, Shaora 5500', C. G. Rogers in the Dún, common in ravines, at foot of Himalaya, and up to Mussooree, 25-7000'. *T. Garh.*—Ganges Valley 5-6000', Duthie; *B. Garh.*—Mrs. Fisher; *Kumaun*—Naini Tál 7500', Hope 1861; Davidson; Gola Valley, above Ranibagh 2-2500', Hope 1890; "very common in all valleys, 2-5000'," MacLeod.

DISTRIB.—*Asia*: N. Ind. (Him.) Sikkim and Bhotan; Assam—Khasia 2-4500', frequent; Bengal—Chutia-Nágpur 2-3000'. Ceylon—Malay Peninsula. S. China. *Afr.*; *Trop.*; Mauritius.

Mr. Clarke says—very partial to limestone; but I find it grows also on sandstone and shale. It flourishes on dry cliffs, in the clefts of which it buries its procumbent rhizome, which has a beautiful covering of long golden-chestnut scales. The sori are rarely nephrodioid, generally looped, or hippocrepiform: towards tips linear. The plant might almost be put in *Allhyrium*.

25. **N. Boryanum**, Baker, non Hook.; Syn. Fil. 284; C. R. 527. *Lastrea Boryana*, Willd. (under *Aspidium*), Bedd. H. B. 266.

PUNJAB: *Chamba*—McDonell (in List of Chamba Ferns identified at Kew; *Kangra Vy. Dist.*—Dharmsála, C. B. Clarke 1874; *Simla Reg.*—Simla, Col. Bates, Dr. Cattell, 10th Hussars, 1876; Simla waterfalls, Gamble; Simla—"the Glen" 6000', Blanford: "not uncommon in well-shaded ravines below 6000'"; Simla, below Petersfield 5500', in the open, Hope 1886.

N.-W. P.: *D. D. Dist.*—Mussooree? Duthie, Herschel; *T. Garh.*—Bhatauli 4-5000', Mackinnons, Hope; *Kumaun*—Sarju Valley 3-4000', Duthie; Trotter.

DISTRIB.—*Asia*: N. Ind. (Him.), Sikkim *Hook. fil., C. B. Clarke*; Bhotan *Griffith, C. B. Clarke, Levinge*; Assam *Wallich*, Khasia; Burma—Tonghoo. S. Ind.—Anamallay Hills, *Beddome*. Malaya. China—Yunnan *Henry*. Japan. *Afr.*: Ruwenzori Mt., Scott Elliot; Johanna, Mauritius, Bourbon.

26. **N. setigerum**, Baker; Syn. Fil. 284. *N. tenericaule*, Hook., C. R. 528. *Lastrea tenericaulis*, Wall., under *Polypodium*, Bedd. H. B. 266.

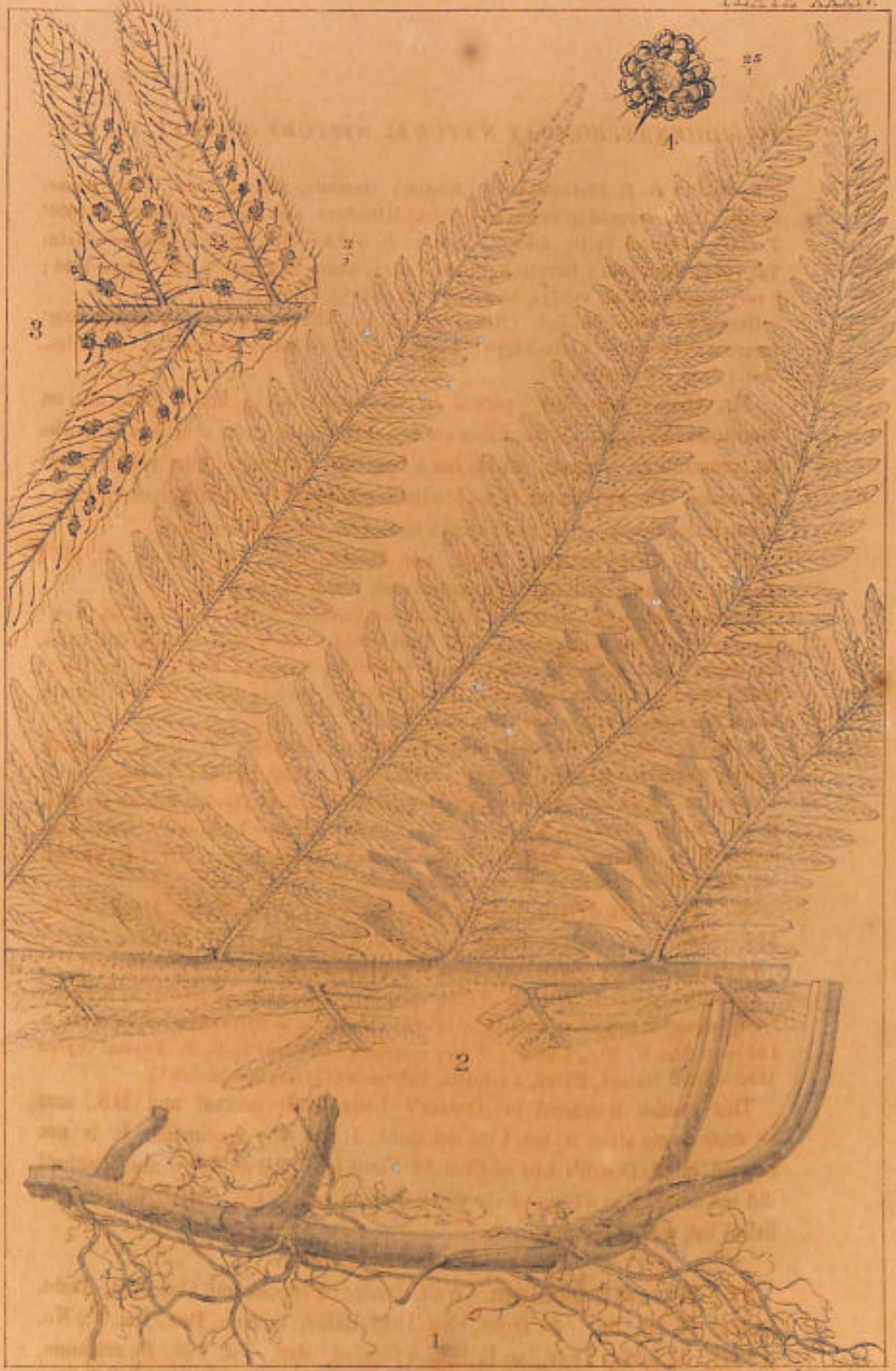
PUNJAB: *Chamba State*—Dr. George Watt, *fide* Trotter.

DISTRIB.—*Asia*: N. (Him.), Nepál, Sikkim; Assam—up to 4000': E. Bengal—"very common, extending some way into the plains, as to Sylhet Station," *Clarke*. S. Ind.—on the W. Mts., 2-3000': "very common," *Beddome* in H. B. Burma. Ceylon 1500'—3000'. Malaya, China, Australia, Polynesia (Clarke, in 'Review'.)

This species is entered in Trotter's Lists, both printed and MS., and he wrote to me about it, but I do not think I saw the specimen. It is not entered in McDonell's List of Chamba Ferns identified at Kew; and Blanford did not admit it as a fern of the Simla Region, where Dr. Cattell, in his published list, said it had been got.

Subgenus EUNEPHRODIUM.

27. **N. molliusculum**, Wall. (under *Polypodium*), Cat. 332, Bedd. Suppt. H. B. 68. *N. Hopei*, No. 165* Baker, in Ann. Bot., Vol. V., No. XVIII. *N. molle*, Desv., an E. Indian form of, Syn. Fil. 293. *N. extensum*, *vars. microsora* and *late-repens*, C. R. 529, 530. *N. microsorum*, Clarke, Bedd. H. B. 270.—Plate XXXIV.



J. N. Fitch del. Chromo. Silber & Lith.

NEPHRODIUM MOLLIUSCULUM Wall. (Order Aspidium)

1. Rhizoma: natural size.
2. Portion of frond: natural size.
3. Portion of a pinna: enlarged 3 diam.
4. Sorus: enlarged 25 diam.

N.-W. P. : *D. D. Dist.*—Dehra Dun E., Song R., above Lachiwála 18-1900′, Hope 1886 : seen also eastward down to 1150′ alt. ; Nála Páni, near Dohra, "23-9-70," in Herb. Hort. Calc. ; *Garhwal*—G. King, 1868 ; *Kumaun*—R. B. 1827 ; A. O. Hume, in Herb. Hort. Calc.; Kali Valley, 2-3000′, Duthie 1884 ; Sarju Valley near Bageswar. 3-3500′, Trotter 1891.

DISTRIB.—*Asia* : N. Ind. (Him.), Sikkim 500′-4000′, common ; in the Terai universal (Clarke in 'Review'); Assam-Kohima 5000′, Clarke—as *N. extensum*, in Linn. Journ. XXV, 94. China, *Henry*, No. 13079 : presented to Kew Herb. in 1900 and named there *N. molle*.

Colonel Beddome has given up his *N. microsorum*, and in his Supplement of 1892 has in its stead set up *N. molliusculum*, Wall. Both Baker and Clarke say that Wallich's *N. molliusculum* is N. *molle*, *alias N. parasiticum* ; but on turning up Wallich's specimen in the Linnean Society's Herbarium, I find that Col. Beddome's new view is correct. Mr. Baker had, of course, been obliged to rename the plant, because there was already a *Nephrodium* (*Lastrea*) *microsorum*, Hook., No. 69 in the '*Synopsis*.' This re-christening has promoted research.

N. molliusculum, though very rare in N.-W. India, seems—if Beddome's reduction of Clarke's varieties of *N. extensum* be correct—to be very abundant in Sikkim and the '*Tarai*' below it. Clarke says his *var. microsora* is common in Sikkim, and that his var. *late-repens* is universal in the '*Tarai*.' [As this vernacular word had not, I think, appeared in this paper before it may be explained that it means the second belt or zone of land below the Himalaya Range,—the first, just at its feet, being the '*Bhabar*' or steepish stratum of boulders and gravel into which the off flow of the mountains sinks—to reappear in the flatter '*Tarai*,' at a lower level.] Mr. Clarke says :—"This fern creeps in the sand near streams where they debouch from the hills, covering acres, I might say square miles, of country, as round Siliguri." Again, under *N. procurrens*, he says—"There are ferns, like *N. extensum, var. late-repens*, where a single rhizome will cover a quarter of an acre." In the Dehra Dún, the station where I first saw *N. molliusculum* was below the high bank of a river, in swampy ground caused by water trickling out of the bank ; this was in forest, and canes (*Calamus* sp.) were growing in the swamp, which prevented the rhizomes being traced to any great extent. It was evidently a wrong time of year for collecting the fern, and there were large beds of young sterile fronds, among which were found a few larger and more developed fertile fronds of the previous season. I think in July and August good fertile specimens would be got ; but where a fern perpetuates itself so well from its rhizome it has small need for producing sporangia. *Asplenium multicaudatum*, Wall., is another case in point. Dr. King's plant from Garhwál, noted above, seems this ; but the pinnæ dwindle to nothing at the base of the frond. In the Calcutta Herbarium there is a remarkably fringed sport, from Assam, *Simons*.

28. **N. aridum**, Baker; Syn. Fil. 291; C. R. 531. *Nephrodium aridum*, Don (under *Aspidium*), Bedd. H. B. 272. *Aspidium venulosum*, Wall. Cat. 352. *A. scabridum*, Wall. Cat. 302.

PUNJAB: *Chamba*—McDonell; *Kullu*—Upper Beas Valley 5-6000', Trotter 1887; *Simla Reg.*—Bashahr, Lace.

N.-W. P.: *D. D. Dist.*—Khurrak, Edgew.—Very common in the Dún, in ditches and by sides of streams, 1500'—3000'; *Kumaun*—Sarju Valley 3500', S. & W., Davidson; near Askot 4-5000', Duthie; Takula 4500', MacLeod. *Oudh*—Philibhit, Keri and Baraitch Dists., Duthie 1898.

DISTRIB.—*Asia*: N. India—"Throughout the Bengal Plain, abundant; from the Soonderbun (Sundriban) to Assam and the Dehra Dún, ascending the hills to 3000'. Throughout India and Ceylon." (*Clarke's* Rev.). Bhotán, *Nuttall*, Manipur 1500', *Clarke* 1885. Not in S. India or Ceylon (*Bedd.* in H. B.). Malay Peninsula, Perak and Singapur. N. Australia (*Clarke* in Rev.)

This is one of the commonest ferns in the Dehra Dún, where there is water; it is quite a hedgerow plant, if there is a wet ditch adjoining. Its name must have been given to it on account of the dry appearance and texture of the fronds when mature; while growing they are succulent. The rhizome is creeping. I would amend Beddome's description thus:—

> "*Rhizome* creeping; *stipes* 1 ft. or less long, erect, slightly pubescent; fronds 2-12 ft. l., 12-15 in. br.; *pinnæ* increasingly distant until below they are 4-6 in. apart, and rapidly diminishing to mere auricles, 6-9 in. l., ¾-1 in. br., cut about ⅓rd of the way down into subtriangular sharp-pointed lobes, in the barren fronds, at least, auricled at base above; the lowest lobes of the pinnæ sometimes much the smallest, sometimes much the largest, in which latter case the veinlets may be found forked, and anastomosing in the lobe; *texture* coriaceous, glandular below; *rhachis* and lower surface hairy; veinlets 8-10 on a side, 5-6 pairs joined with those of the adjacent pinnules; *veins* in green frond transparent, in dry frond opaque; *sori* in rows, 1 or 1 pair at junction of lowest pair of veins,—the rest nearly medial."

Colonel Beddome's new species, *N. papyraceum*, Suppt. H. B., p. 69, is, I feel sure, non-existent, so far at least as N.-W. India is concerned. His locality—"Kullu, Upper Biso Valley, Trotter"—must be a misprint for "Upper Biás (or Beás) Valley. I have a young sterile frond from Trotter collected in Kullu—Upper Biás Valley 5-6000', noted above, and it is *N. aridum*, pure and simple. It has no such venation in the lowest segments of the pinnæ as Beddome speaks of; but on looking at other specimens I find that is a character of *N. aridum*, as long ago I observed it is of *N. mole*. I now understand that Col. Beddome gives up the Kullu station for *N. papyraceum*, admitting that his specimen is *N. aridum*.

29. **N. molle**, Desv.; Syn. Fil. 293; Bedd. H. B. 277. *N. parasiti-*

cum, C B. Clarke, C. R. 533 (Linn. under *Polypodium*; Sunw. der *Aspidium*).

TRANS-IND. STATES: *Swát*—below Láram Pass, 4000', Gatacre 1895.

PUNJAB: *Hazára Dist.*—Trotter in Lists; Siran Vy., Inayat, collr. for Sahar. Herb. 1896. *Chamba State*—McDonell in List and J. Marten; *Kangra Vy. Dist. W.*, 25-3000', Trotter; *Hoshiarpur Dist.*—Aitch.; *Jalandhar*, Aitch.; *Simla Reg.*—Simla and vicinity—"not met with above 5000', but common in the deep valleys at 4500' and below": Blanford in List.

N.-W. P.: *D. D. Dist.*—Jaunsar 3000' and lower, common in the Dehra Dún 1-3000'; *T. Garh.* near Bhatauli 4500', Hope; *B. Garh.* Mrs. Fisher. *Kumaun*—Almora 4600', Hope; "Kumaun," Davidson 1875; Gola Vy. 35-4000', Hope; *Gorakhpur Dist.*—Nichaul (in a well), A. Campbell.

DISTRIB.—*Amer.*:—Cuba and Mexico to Peru and Brazil. *Asia*: Himalaya and S. India; China—Hong Kong. *Australasia*: N. S. Wales and N. Zealand. *Afr.*: Macaronesia, Guinea Coast, Cape Colony, Mascaren Isles.

Mr. Clarke says this species is very little variable, considering its extensive range. There is, or was, close to Dehra a remarkable sport, which besides forking, sometimes several times, has a tendency to become distinctly bipinnate, and when so is often soriferous. Such fronds were found on plants producing also normal fronds; and the sporting seemed to be luxuriance produced by moist rich soil in a ditch, used also as an irrigation channel, with dense shade overhead. I have seen plants with similar tendency on the slope of a canal cutting near Dehra. I gathered many plants and fronds of this from the first-mentioned station, but never got a frond wholly bipinnate. Had I found a plant with only bipinnate fronds, I might have been tempted to propose a new genus or subgenus—there being no bipinnate *Eunephrodium* that I know of. In the Calcutta Herbarium there is a specimen of a similar sport from Sikkim, 1873.

30. **N. papilio**, n. sp.—Plate XII. (see Part II., Vol. XII., p. 625).

Add, to localities:—*T. Garh.*, Mantargadh 4500', Gamble, 27413, 10-'98; *B. Garh.*, Mrs. Fisher.

31. **N. occultum**, n. sp.—Plate XIII. (see Vol. XII., p. 627).

Subgenus SAGENIA, *Presl.*

32. **N. cicutarium**, Baker; Syn. Fil. 299; C. R. 539. *Aspidium cicutarium*, Sw., Bedd. H. B. 220.

PUNJAB: *Chamba State*—McDonell, in List; *Kangra Vy. Dist. W.*—3000', Trotter; *Mandi State*, Trotter 1887; *Simla Reg.*—below the tonga road, 8 miles from Simla, Bliss 1892: new to the Region; not in Blanford's List.

N.-W. P.: *D. D. Dist.*—The Dehra Dún and South slope of Himalaya, 15-5100', common; *T. Garh.*—Ganges Vy. 3-4000', Duthie; *B. Garh*, Mrs. Fisher. *Kumaun*—Valley of the Sarju 4,000', R. Blink., in Herb. Wallich, 3500', S. & W.; Naini Tál, Hope 1861; Davidson 1875; Káli Vy. 3-4000', Duthie 1884; Gola Vy. 2500' Hope 1890.

DISTRIB.—*Amer.*; Cuba and Mexico, southward to Brazil and Peru. *Asia*: N., Ind. (Him.), Sikkim and Bhotán; Assam; Bengal—Chittagong, Chutia-Nágpur

1-4000', common. S. India—"the more hairy variety, known as *coadunata*, only is found" (*Bedd.* H. B.); Burma. Ceylon. *Afr.*: Guinea Coast, Angola, Zambesi Land, Mascaren Islands.

No mention is made in the Synopsis of Clarke's *var. coadunata*, Wall. Cat. 377, partly :—"Frond thick, hairy on the rhachises, and often on the frond beneath," which he says is as widely spread in North India as the typical *N. cicutarium*, and still more plentiful. I have seen no such hairy Sagenia from N. India, or indeed from elsewhere. Clarke goes on to say that *N. coadunatum* is a stout, firm, thick, hairy frond on a short stipe, but that Wallich's type sheet of *Aspidium coadunatum* is very glabrous, and is unfortunately exactly that variety which has been known in India as not *var. coadunata!*

I have a specimen of this fern from Simla, a portion of a thin, light-green, membranous frond, with small sori confined to the long, pointed lobes, and scarcely a trace of involucre; and involucres are hardly visible in a large specimen from below Mussooree. On the other hand, in one specimen received from the Messrs. Mackinnon, collected near Mussooree, the involucres are persistent, but only $\frac{1}{16}$th in. diam.; while in another, from the same source, they are $\frac{1}{8}$th in. diam., and so crowded all over the frond as often to overlap one another: their diameter is thrice that of the sovas, and they are all nephrodioid. A specimen I collected at 5100' alt., below Mussooree, is mounted on five 18½ in. sheets: the second lowest pinnæ are 22 in. l., giving a breadth of frond of 44 in., and the lowest pinnæ are 24" × 12", and 26½" × 13", respectively. Some American specimens are comparatively small, and not broad below.

Genus 24. NEPHROLEPIS, *Schott.*

1. **N. cordifolia**, Presl.; Syn. Fil. 300; C. R. 540; *N. cordifolia*, Linn. under *Polypodium*, Bedd. H. B. 282.

N.-W. P.: *T. Garh.*—below Laluri 3-4000', Duthie 1881; *B. Garh.*—3-4000', P. W. Mackinnon 1881; Kinoli Vy.—4-5000', Duthie 1885. *Kumaun*—Sarju Vy., near Bagesar 3-3500', S. & W. 1848, Trotter 1891; Sarju—Ganga Vy. 3500', MacLeod 1893.

DISTRIB.—*Amer.*: Cuba and Mexico to Brazil and Peru. *Asia*: N. Ind. (Him.), Bhotán, up to 5000'; Bengal—Chittagong, as well as on the hills to the south of Hindostán. S. India. Ceylon. Burma. Malaya. Japan. Australia and N. Zealand. *Afr.*: Guinea Coast, Zambesi Land and Mascaren Islands.

2. **N. volubilis** (J. Smith), Clarke in 'Review' 541, t. 78; Bedd. 284. *N. exaltata*, Schott, Syn. Fil. 301: "a straggling, flexuose form." Mr. Clarke's description is :—

> "Rhizome climbing 25—30 ft. high over trees, with adpressed chestnut scales in the short lateral distant spurs, whence spring clusters of stipes; pinnæ obtuse or not very acute; venation and sori much as in *N. exaltata*. *Aspidium exaltatum*, Wall. Cat. 1031, partly marked *vix exaltatum* by Wallich. *Lindsaya lanuginosa*, Wall. Cat. 154.

N.-W. P.: *Kumaun*—Naini Tál, Hope 1861; once seen.

DISTRIB.—*Asia* : N. Ind. (Him.), Bhotán *Griffith* ; Assam—Sylhet Station (alt. 300'), *Hook. fl.* and *T. T.*, and *C. B. Clarke*, Manipur ; Bengal—Chittagong, *Hk fil.* and *T. T.*, and *C. B. Clarke*. Malacca. Malay Archipelago. N. Borneo.

Mr. Clarke says in his 'Review,' "Considered a variety of *N. exaltata* in Hk. and Baker. Syn. Fil. 301 ; but with the arrival of more material Mr. Baker inclines to admit it as a good species. They both grow together plentifully in Sylhet Station, but are there easily distinguished."

N. exaltata does not appear to climb at all, whereas *N. volubilis* climbs 25—30 feet (Beddome says 50 feet) to the tops of trees. (Perhaps the specific name *exaltata* is thought sufficient to cover this notable difference of habit : if a fern named *exaltata* does not climb 30 or 50 feet high, it certainly ought to do so.) My specimen from Naini Tál, in Kumaun, consists of eight inches of glabrous, wiry, rhizome, with two spurs, three inches apart, from which spring not only clusters (pairs) of stipes as in Mr. Clarke's figure, but also clusters of very long roots, which have hardly been indicated by Mr. Clarke's artist. I gathered it by the side of the path (or road) which then (1861) led up Chinar Mountain, through the jungle at the north end of the Naini Tál Glen. The plant was growing on the ground, and I gathered only the portion above described. I showed this to Mr. Clarke and Mr. W. S. Atkinson in Calcutta in 1872, and they agreed in naming it *N. ramosa*, Moore,—in error, as I afterwards saw. The specimen was mounted, with the rest of my collection, when I was at home later in 1892, and the sheet has ever since been in my possession.

Genus 25. OLEANDRA, *Cav.*

1. **O. Wallichii,** Hook. ; Syn. Fil. 302 ; *O. Wallichii*, Presl., C. R. 542 ; Bedd. H. B. 287.

PUNJAB : *Simla Reg.*—Simla 5-6000', Edgeworth, Bates, Gamble, Blanf., Trotter, Bliss. "Not common, but locally abundant : growing on perpendicular rock faces between 5500' and 6000'," Blanford in List.

N.-W. P. : *D. D. Dist.*—Mussooree, in Herb. Dalzel, 1860 ; "The Park" 63-6500', on trees, Mackinnons 1879, Hope 1887, 1895 ; *T. Garh.*—Jumna Vy., Duthie 1883 ; "Garhwál," 5-6000', Dr. J. L. Stewart, *B. Garh.*—above Banshagar 4-5000' and 6-7000', Duthie 1885 ; *Kumaun*—Mohargiri 6500', S. & W. 1848 ; near Naini Tál, Hope 1861, on wet rocks ; Gori Valley 5-8000', Duthie 1884, 8-9000', Duthie 1886 ; Dhankuni Pass 8500', Trotter 1891 ; Kála Muni Ridge 9000', MacLeod 1893 ; "grows chiefly on rocks, occasionally on trees."

DISTRIB.—*Asia* : N. Ind. (Him.), Nepál, *Wallich*, Sikkim and Bhotán ; Assam—Khasia, Kohima and N. Manipur 5500'. Burma, Malay Penins.

The fronds of this fern grow larger than is stated in the books : I have Mussooree specimens over 18 in. l. The creeping rhizome is generally free, only clinging to the trunks of trees and to rocks by its long wiry roots : it winds round and up the trunks, branching in all directions—frequently at right angles. The fronds droop, and form a beautiful clothing to the tree trunks.

THE ORIENTAL REGION AND ITS POSITION IN ZOOLOGICAL GEOGRAPHY.

By E. Comber, F.Z.S.

(*Read before the Bombay Natural History Society on the 27th November*, 1902.)

Prior to the adoption of the general theory of evolution, when species were regarded as "special creations," it never occurred to any one that there was any direct advantage in studying the comparative faunas of different countries or the exact areas occupied by various species or groups of animals. But when Darwin's great revelations taught us to realise the relationships of different animals, it was at once seen that distribution was a most important study in helping to unravel the mysteries of the book of Nature, in addition to the study of the habits, structure and affinities of animals. The subject of geographical distribution, however, entails the study of much more than would at first appear probable; for, in addition to the mere mapping out of the areas over which any species or group ranges it involves the interesting and complex questions of why it should be confined to that region, which may even consist of two or more discontinuous areas, and how it came to be present there, perhaps away from all its near relations. We are thus led into the whole past history of the world, organic and inorganic, throughout a large portion of geological time, of the true affinities of animals, including their extinct forms and of past migrations which may be accounted for by the submergence or upheaval of certain areas of the earth's surface, causing connections or separations of existing land areas, or by alterations of geological climates, such, for instance, as the well-known glacial epoch of Northern Europe.

It is a subject to which there has been little or no direct reference in the published records of this Society, although boundless information of a scattered nature is of course to be discovered in the thirteen volumes of our Journal by those who come to analyse, tabulate and draw conclusions from the many lists of local faunas—mostly of course treating of some one group or class—that have appeared in its pages.

A short summary of the position and characteristics of the general fauna of the Oriental—or as some authorities have preferred to designate it, the Indian or Indo-Malayan—region at the present time will therefore, I believe, interest and I hope, to some extent, assist

those who have not studied the question in its more scientific sense; although I do not in any way lay claim to anything original of scientific importance in this paper.

As a local Society we have never definitely adopted any exact limits to the region to which our investigations shall be confined, but, although we have constantly published papers dealing with subjects or collections from places outside the boundaries of the Oriental region—such, for instance, as Aden, Somaliland or the Persian Gulf—it is with this region that we are more particularly concerned.

It will be as well, I think, to first of all glance over the several zoological regions into which naturalists have divided the terrestrial surface of the globe, for we shall then be able to better understand the position of the Oriental region in the scheme when we come to consider it in detail.

It is needless, I fancy, to remark that it was long ago recognised that the great geographical or political divisions of the globe in common use do not correspond to its zoological divisions; but it was not until after the middle of last century that a more or less practical scheme was published by Mr. P. L. Sclater, the present Secretary of the Zoological Society of London, followed up and developed by the great work of Mr. A. R. Wallace, which, with some modifications, has since been generally adopted. This division of the world into zoological regions was originally based by Mr. Sclater on the distribution of representative orders, families and genera of birds, and that he was in the main correct is proved by the fact that the six regions that he established have met with very general acceptance at the hands of those who specially study other groups of animals. At the same time it must be borne in mind that a division, which is suitable for one class of animals, is not by any means necessarily applicable to other groups. And still less so for plants, for such configurations of the earth's surface, in the way of oceans, mountain ranges, deserts, &c., which may, for instance, be insuperable barriers to mammals, may not be so to birds, reptiles, fishes, molluscs or insects. But the fact that we find in each of the recognised regions the whole fauna more or less typical of that particular region, is sufficient justification for adopting them as a means of assisting our investigations of the zoology of the globe.

The six regions may be briefly described as follows :—

(1) PALÆARCTIC.—The whole of Europe and of Asia north of the

boundaries of the Oriental region, which we shall define presently, and including that portion of Africa that is north of the Sahara desert.

(2) NEARCTIC.—The whole of North America, excluding Mexico, but including Greenland.

These two regions have, by several eminent authorities, been lately combined under the designation HOLARCTIC, the former titles being retained as sub-regions of the same.

(3) ETHIOPIAN.—The whole of Africa from the northern limits of the Sahara desert, with Arabia and the islands of Madagascar, Mauritius and Seychelles.

(4) ORIENTAL.—That portion of Asia south of the boundaries of the Palæarctic region, and including the islands of the Malay archipelago till it meets the Australian region.

(5) AUSTRALIAN.—Australia, New Zealand and Tasmania with the islands of New Guinea and Celebes, though it is probable that eventually New Zealand may come to be separated into a region of its own.

(6) NEOTROPICAL.—South and Central America, including Mexico.

I have not attempted in the foregoing summary to define the boundaries between the Oriental region and the Palæarctic or Australian regions, for they cannot be described in a few words and can best be considered in detail, to which we will now proceed.

The Oriental region, it will be noticed, is conterminous with the Ethiopian region on the west and with the Palæarctic and Australian regions on its northern and south-eastern boundaries, respectively ; but except in the latter case, owing to the nature of the country and the present limits of our knowledge, the exact line of demarcation cannot be laid down with the accuracy that we can determine the boundaries of other regions. Let us, however, trace them as nearly as we can.

The whole of the peninsular of Arabia, south of a line drawn from the upper end of the Persian Gulf to Suez, belongs to the Ethiopian region, and all Persia, Afghanistan and the greater part, if not the whole, of Baluchistan belongs to the Palæarctic region. It is when we come to Sind that we first find the fauna partaking of the character of the Oriental region, and the line of demarcation follows the Indus valley to Attock till we come to the western ranges of the Himalayas. Continuing along their southern slopes at about 9,000 to 11,000 feet, according to soil, aspect and shelter, above which the forest belt is

mainly composed of coniferous trees, it passes to the southward of Kashmir and then tends northward into Eastern Tibet, across the desert of Gobi, so as to include the whole valley of the Yang-tse-kiang and probably also that of the Hoang-ho, till it strikes the coast of China somewhere about Shanghai. Our present knowledge of the zoology of China is, however, so limited that it is not as yet possible to say where the change in the character of the fauna actually occurs.

Formosa and the Philippine Islands are included in the region, whence the line passes between Borneo and Celebes and then between the two small islands of Bali and Lombok, just at the eastern end of Java, passing away into the Indian Ocean south of the latter island.

Now this clearly marked division between the islands of Bali and Lombok is one of the most extraordinary instances in zoological geography, showing how little mere geographical considerations, judged from the situation and configuration of islands or continents, has to do with its phenomena. They are, judging from the map, two insignificant little islands about the size of Corsica, separated by a narrow strait no more than fifteen miles across at its narrowest part; of considerable depth it certainly is—over 1,000 fathoms—but who would ever have imagined that we should here find the ancient boundary line of geological times between the continents of Asia and Australia? How inapplicable does the very name Australasian, so often applied to this part of the world, become? Regarding these two islands I cannot do better than quote what Mr. Wallace, who discovered this remarkable boundary line, wrote:—

"These islands differ far more from each other in their birds and "quadrupeds than do England and Japan. The birds of the one are "extremely *unlike* those of the other, the difference being such as to "strike even the most ordinary observer. Bali has red and green "woodpeckers, barbets, weaver-birds and black and white magpie "robins, none of which are found in Lombok, where, however, we "find screaming cockatoos and friar-birds, and the strange mound-build-"ing megapodes, which are equally unknown in Bali. Many of the "kingfishers, crow-shrikes and other birds, though of the same general "form, are of very distinct species; and though a considerable number "of birds are the same in both islands, the difference is none the less "remarkable—as proving that mere distance is one of the least

"important of the causes which have determined the likeness or unlike-
"ness in the animals of different countries."

Having now sketched out the limits of our region, let us turn our attention to some of the more characteristic groups of animals which serve to distinguish it from its neighbours.

Starting with the highest forms, we have the family *Simiidæ* or Anthropoid Apes represented by the Orang-outang of Sumatra and Borneo, and the Gibbons—the whole family being confined to the Oriental region, except in the case of the Gorilla and Chimpanzee of Africa. Of other apes, monkeys and baboons there are many peculiar forms, but the Langúr group, distinguished by their possessing no cheek-pouches, of the genus *Semnopithecus*, is specially characteristic. Of Lemurs there are two kinds, both being peculiar to the region, *viz.*, *Nycticebus tardigradus*, the slow Loris, found throughout the countries east of the Bay of Bengal, and *Loris gracilis*, the slender Loris, confined to Southern India and Ceylon. They both afford one of the most remarkable and interesting examples of geographical distribution known, their nearest allies being two genera found only in West Africa.

In the Cats we are strongly represented with 16 species of the genus *Felis* in British India and the well-known Hunting Leopard or Chita. The Tiger is of course the truly typical species, its range extending to all parts of the region except Ceylon and Borneo, though it is also found in parts of Central Asia. Of the *Viverridæ*, comprising the Civets, Mungooses, &c., there are a number of peculiar genera, of which I may specially mention *Arctictis* with its one species known as the Binturong or Bear-cat, and the curious aquatic *Cynogale* of the Malay Peninsular, Sumatra and Borneo. The genus *Cyon* among the *Canidæ*, containing the two species of Wild Dogs, is worthy of note, being found throughout the region; outside its limits its range is peculiar, as it is found in Central Asia as far north as the Altai, the Amurland and Sagalian, but not, so far as is known, in Northern China or Japan. No true Badgers are found in the region, though three allied and peculiar genera occur, as well as four species of Otters. Of Bears—a family that is spread throughout the Palæarctic, Oriental and Nearctic regions, but are not known to inhabit Australia or Africa south of the Atlas—there are various species.

Coming to the order *Insectivora*, we must note the peculiar family *Tupaiidæ* or Tree-Shrews, which have a remarkable similarity to

Squirrels in general appearance and habits. They differ from all other members of the order in being not only arboreal but diurnal in their habits. The two curious species of *Gymnura* are worthy of mention—shrew-like animals closely allied to the Hedgehogs, though they possess fur and not bristles—and only known from the countries east of the Bay of Bengal. Several species of Moles just cross our boundaries from the Palæarctic region, but the family is otherwise missing. At the end of the insectivorous section we come to a most remarkable animal about whose position and affinities there has been much doubt, *viz.*, *Galeopithecus*, for which no better popular name has been found than the Flying-Lemur. Like the so-called Flying-Squirrels, its limbs are united by a membrane or parachute extending to the toes. Two species only are known; the one inhabiting the Malay Peninsula, Siam, Sumatra, Java and Borneo, the other the Philippine Islands. It is even suggested to create a special 'order' for their reception.

Of the Bats and Rodents there is nothing special to note, both being represented by numerous species, though of the latter the Flying-Squirrels (*Pteromys*) here reach their highest development.

Our next order is the *Ungulata* or hoofed quadrupeds, and first in it we must mention the Elephant, found in all suitable localities throughout the region, and which, so far as living species are concerned, is, like the genus *Rhinoceros*, confined to the Ethiopian and Oriental regions. When we come to the Tapir, however, we find a more unique instance of geographical distribution, for besides the Malayan species, the only other surviving forms inhabit Central and South America. The large section of the Goats and Sheep is only represented in the region by the Wild Goat of the Nilgiris and Southern India, though of course a number of species are found in the higher ranges of the Himalayas close to our boundary line. The Indian Antelope or Black Buck is separated in a genus (*Antilope*) of its own, being of course confined to the Peninsular of India, and the Chevrotians or Mouse Deer (*Tragulus*) belong to a group peculiar to the region, of which the only near ally is a single West African species. Allied to *Tragulus* is the genus *Hydropotes* with its one species of so-called Water-Deer found only in the swamps of the Yang-tse-Kiang.

Representing the lowest order of Mammalia—the *Edentata*—we have several species of the genus *Manis*, whose bodies are covered with an armour of horny epidermic plates, arranged like the tiles of a roof

and apparently consisting of agglutinated hairs. Other members of the genus are found in Africa.

In the case of Birds, it is not, I think, necessary to go at great length into the very numerous genera and species that are peculiar to the region, for it will be sufficient, for the purposes of this paper, to indicate the more remarkable and characteristic groups.

To start with, the Crow family is very fully represented, the genus *Cissa*, with its birds of beautiful plumage, being perhaps the most conspicuously characteristic, while the Tree-pies (*Dendrocitta* and allied genera) include many interesting species peculiar to the region. The Crow-tits (*Paradoxornis*, *Suthora*, &c.) form an isolated and peculiar group, being restricted to the mountains of Northern and Eastern India and some of the mountain ranges of China. The heterogeneous collection of passerine birds included by Mr. Oates in his family of *Crateropodidæ* is very rich in the number of its forms, amounting to over 250 recognised species in British India alone. Amongst the most noteworthy genera in this group may be mentioned the Laughing-Thrushes (*Garrulax*, &c.), the Tit-Babblers, or as they were formerly designated Hill-tits, the Shrike-tits (*Pteruthius*), and the green Bulbuls (*Chloropsis*), and it is within our region that the true Bulbuls (*Brachypodinæ*) attain their greatest development.

Of other passerine birds, I will only mention the quite peculiar group of Warblers known as Tailor-birds, the beautiful Minivets (*Pericrocotus*) and the bright-coloured Pittas, which reach their maximum of beauty and variety in Borneo and Sumatra. The family *Fringillidæ* (Finches and Buntings) is poorly represented, though many varieties are to be found just across the border in the Palæarctic region.

We must next note a quite peculiar order comprising the Broad-bills, of which the genus *Eurylæmus* is the type, that are entirely confined to the Oriental region; and following them we find a wonderful variety of Woodpeckers, which group does not extend to the Australian region at all. The Barbets and Kingfishers are strongly represented, though it is in Australia that the latter attain their highest development of peculiar forms. The Hornbills, however, though extending to both the Ethiopian and Australian regions, are richest in variety within our area, and one genus only is common to any two of the said regions. The Cuckoos provide a number of

highly specialized forms; while of the Accipitrine birds, I will only draw attention to the Vultures, whose range stops short at our south-eastern boundary, though it is strange that birds possessing the powers of flight that they do should not be found to inhabit the apparently well-suited country of tropical and sub-tropical Australia.

Finally, we must not forget to note that it is in the Oriental region that the Pheasants are found in their greatest glory with the Peafowl and the splendid Argus Pheasant at their head, not to mention such remarkable groups as the Peacock-Pheasants (*Polyplectrum*), the Koklas, the *Gennæus* group, including the Silver Pheasant, the Monals, the Tragopans and the Blood-Pheasants (*Ithagenes*), while closely allied to them we have the Jungle-fowls (*Gallus*), which are entirely confined to the region.

When we come to the Reptiles, we find them in great abundance, but they do not present any well-known groups which can be considered as specially characteristic, and I think I have said enough to justify the position of the Oriental region as a well-defined and distinct section in zoological geography without deducing further instances from the great class of insects, regarding which, however, Mr. Wallace wrote: "On the whole, the insects of this region "probably surpass those of any other part of the world, except South "America in size, variety and beauty."

ROUGH NOTES ON THE MAMMALIA OF CHITRAL.

By Captain H. Fulton.

I have compiled these few notes on the Mammalia of Chitral from such observations as I have been able to make during my stay in Chitral (October 1901—October 1902) and from "Notes on the Fauna of Chitral" by Capt. A. H. McMahon, C.S.I., C.I.E., F.Z.S., which was printed in the Journal, Asiatic Society of Bengal, Vol. LXX, Part II., No. 1 of 1901.

(3). *Macacus rhesus.*—The Bengal Monkey.

This is the only animal representative of this order. They appear to be very plentiful at the lower end of the Chitral Valley in summer on the right bank of the river.

They come up as far as the Utzun Valley so far as I was able to find out and go about in troops. I only saw two captive specimens, and as far as I could place them, I believe them to be *rhesus*. Major McMahon has some doubts as to the identification. This will, however, be shortly decided, as Capt. Gurdon sent down a specimen to him to forward to England.

They are found at about 5,000 feet, and probably come over the Pass into Utzun from the Kafiristan valleys.

(30) *Felis pardus.*—The Leopard or Panther.

Common in all the wooded nallahs of Lower Chitral up to elevations of 10,000 feet.

(31) *Felis uncia.*—The Ounce or Snow Leopard.

Fairly common in the upper parts of the Chitral Valley.

(43) *Felis lynx.*—The Lynx.

Not observed. Is mentioned by Major McMahon as occurring.

(66) *Hyæna striata.*—The Striped Hyæna.

Not observed; said to exist.

(67) *Canis lupus.*—The Wolf.

Common in lower valleys of Chitral. A pack of about ten frequented the Kasgol nallah opposite and about a mile from Drosh. One specimen was shot in May 1902. Was in the usual mangy condition. A litter of five cubs was taken the same month from under a large rock at the bottom of the nallah. They were about two weeks old.

They follow the herds of goats every morning when going out to graze, and following them up in the evening, when returning to the folds, pounce on any stragglers. Their presence so near Drosh was probably due to the large herds of Commissariat goats and sheep which were grazed in the nallah.

(69) *Canis aureus.*—The Jackal.

Common in the lower valleys of Chitral. None noticed more than ten miles above Drosh.

* Note.—Nomenclature and numbers according to Blanford's Mammalia. Fauna of British India.

(75) *Vulpes alopex.*—The Common Fox.

Exceedingly common. Probably over the greater portion of the country

(77) *Mustela flavigula.*—The Indian Marten.

One specimen was obtained. Probably common in the wooded valleys.

(78) *Mustela foina.*—The Beech Marten.

One male specimen killed at an elevation of 4,000 feet while trying to carry off a fowl from an officer's shooting camp. Probably common in the wooded valleys.

Lutra (?) sp.

I am uncertain whether there are two species of the otter or only one, as I had no opportunity of examining uncured skins. I am inclined to believe that both *L. vulgaris* and *aureobrunnea* are to be found.

(97) *Ursus arctus.*—The brown Bear.

Fairly common at the head of the Turikho and Yarkun valleys. Noticed in June at elevations of 10,000 to 13,000 feet.

(98) *Ursus torquatus.*—The Himalayan black Bear.

Common in the wooded side valleys of Lower Chitral.

(226) *Eupetaurus cinereus.*—The woolly Flying-Squirrel.

One skin of this rare species, in poor condition, was obtained in the bazaar. As a specimen was got in Gilgit it is probable that this flying-squirrel occurs in Chitral also, but I have been unable to obtain any fresh specimens.

(228) *Pteromys inornatus.*—The large red Flying-Squirrel.

Fairly common in the deodar forests of Lower Chitral up to elevations of 10,000 feet.

Two specimens were obtained, one from Ayon nallah and one from the Asreth nallah. Also observed in the Pattison nallah.

(233) *Sciuropterus fimbriatus.*—The smaller Kashmir Flying-Squirrel.

One specimen was obtained in the Ayon nallah.

(234) *Sciuropterus alboniger.*—The parti-coloured Flying-Squirrel.

One specimen was obtained in the Ayon nallah.

Arctomys (?) sp.

One, perhaps two species, of the marmots occur—one at the head of the Ayon nallah and one at the head of the Yarkun and Baroghil nallahs. I was unable to obtain specimens for identification.

(272) *Mus rattus.*—The Common Indian Rat.

Common.

(282) *Mus musculus.*—The Common House-Mouse.

Common.

(287) *Mus buduga.* The Common Indian Field-Mouse.

Common.

Nesocia (?) sp.

Not identified. Very common in all the fields of Lower Chitral Valley, and doing an immense amount of damage.

(315) *Hystrix leucura.*—The Indian Porcupine.

No specimens were obtained. Quills, however, were fairly common in the wooded side nallahs of Lower Chitral. I also picked up a quill at Dir.

(323) *Lepus tibetanus.*—The Afghan Hare.

I am not quite certain of the identification, as, although they are fairly common at all elevations from 4,000 to 11,000 feet, I obtained no fresh specimens to view, and the only skin I saw was in very bad condition.

(345) *Ovis vignei.*—The Urial or Shá.

The Shapu variety is common in the Lower Chitral valleys, coming down in winter as low as 5,000 feet.

(348) *Capra sibirica.*—The Himalayan Ibex.

Common in the valleys of Upper Chitral at elevations of 7,000 to 18,000 according to season.

(349) *Capra falconeri.*—The Markhor.

Abound in all the wooded valleys of Lower Chitral. Cabul and Pir Panjal varieties, varieties between these two shapes and some of the Cabul varieties tending slightly towards the Sulimán variety.

(370) *Moschus moschiferus.*—The Musk-Deer.

Evidently fairly common in the lower wooded valleys. Specimens were obtained in the Shishi Koh, Ashreth, and Utzun nallahs. Is probably very common in Kafiristan and Dir.

(374) *Sus cristatus.*—The Indian wild Boar.

The rootings of this pig are very noticeable in the Shishi Koh and the valleys below Drosh. Specimens were seen in the Shishi Koh, Utzun, Pattison, and Chuchukheni nallahs.

A CATALOGUE OF THE *HETEROCERA* OF SIKHIM AND BHUTAN.

By G. C. Dudgeon, F.E.S.,

With Notes by H. J. Elwes, F.R.S., &c.,

AND

Additions by Sir George Hampson, Bart., B.A., F.E.S., &c.

Part XIV.

(*Continued from Vol. XIV, page 553.*)

The following genera which were originally included in the Family ARCTIADÆ have been transferred to the Family HYPSIDÆ in Sir George Hampson's latest revision, and should therefore follow Macrobrochis gigas, Wlk, referred to at the commencement of Part XI of this Catalogue in Vol. XIV, No. 1, at page 6 of this Journal.

Family HYPSIDÆ—*continued.*

Genus Argina, Hübn.

1273. *A. argus*, Koll.

Sikhim and Bhutan, 2,500—4,000 feet. Not uncommon during May, July, August and September, occurring also in November.

1274. *A. syringa*, Cram.

Sikhim? This is recorded from throughout India in the Moths of India, but I think it doubtful that it has been taken within these limits.

1275. *A. cribraria*, Clerck.

Sikhim and Bhutan, 1,000 feet. Rather scarce, found only at the foot of the hills in July and August.

Genus Sebastia, Kirby.

1246. *S. argus*, Wlk.

Sikhim. I have not taken this. The generic name of Moorea given by Sir George Hampson gives place to Sebastia of Kirby and is so noted in the Appendix to the Moths of India.

Genus Calpenia, Moore.

1248. *C. saundersi*, Moore.

Sikhim. I have not seen this. (I have a fine female of this rare species from Mr. Knyvett's collection which was probably taken near Jalpaiguri. *H. J. E.*)

Genus Callimorpha, Latr.

1249. *C. principalis*, Koll.

Sikhim, 6,800 feet. The only specimen of this which I have from this locality differs from a Kangra Valley one in having the spots on the forewing orange and the same colour as the ground colour of the

hindwing, which latter is also heavily marked with black. The Kangra Valley specimen referred to has the spots on the forewing nearly pure white and the ground colour of the hindwing less obscured by the dark streaks on nervures. My Sikhim specimen was taken at Darjeeling in June. (My only Sikhim specimen was taken at light on the road to Tonglo at about 7,000 feet. It has the spots on forewing pale creamy-yellowish and smaller than in Kashmir or Chinese specimens. The markings of the hindwing are yellow and less in size and number. *H.J.E.*)

1250. *C. similis*, Moore.

Sikhim. I have not taken this. (This is a very distinct species which occurs on Tonglo at 9-10,000 feet. I took one myself and got another from Dewan Roy, a forest official, who collected for me with much success. I have a third from Knyvett's collection. They vary in the tint and extent of the markings. *H. J. E.*)

1251. *C. plagiata*, Wlk.

Sikhim and Bhutan, 4,500 up. Common at Tukvar in March, May, July and October. It is variable in the extent of the white markings on the forewing.

1252. *C. equitalis*, Koll.

Sikhim and Bhutan, 5,000—7,000 feet. Not so common as the last, but it is attracted to light in June besides being found flying in the dark misty forests below Pasheteng during the day. (Taken on Sinchul near Darjeeling at 7–8,000 feet where in some seasons it is fairly common. *H. J. E.*)

1253. *C. nyctemerata*, Moore.

Sikhim and Bhutan, 5,000—7,000 feet. Rarer than *C. equitalis*, Koll. Occurs in April and May. It is smaller than *C. equitalis*, Koll., and has the abdomen yellow instead of crimson besides having more and larger white patches near the base of the forewing.

Family AGARISTIDÆ.

Genus EUSEMIA, Dalm.

1562 (part). *E. nipalensis*, Butl.

Sikhim and Bhutan, 5,000—7,000 feet. Found flying by day round the tops of flowering trees in May and August. (This was described as *E. maculatrix*, Westw., in the Moths of India, but the species just described by Westwood is the same as *E. irenea*, Boisd the species afterwards described and signified by him under the same name being that now referred to. *G. F. H.*)

1561. *E. adulatrix*, Koll.

Sikhim and Bhutan, 2,000—5,000 feet. Probably the commonest species of the Family, having the same habits as the last, but found flying nearer the ground. I have taken it in April, May, July, August and September. Kangra Valley specimens have the postmedial spots reduced in size.

Genus EXSULA, Jord.

1558. *E. dentatrix*, Westw.

Sikhim. I have not seen a specimen. (I took one near Darjeeling in August and have five others from Möller's collection, one of which, a very small one, is dated March 6. *H. J. E.*)

1556. *E. victrix*, Westw.

Sikhim and Bhutan. Rare. I have only one specimen in my collection without date. (I have two taken by Gammie near Mongpoo in May and two others from Möller's collection which agree with others from the Khasia and Naga hills. *H. J. E.*)

Genus SCROBIGERA, Jord.

1552. *S. amatrix*.

Sikhim and Bhutan. Rather scarce in May and July. (Also occurs in September, but I never took it myself and do not know at what elevation it occurs. *H. J. E.*)

Genus ÆGOCERA, Latr.

1579. *Æ. bimacula*, Wlk.

Sikhim and Bhutan, 1,800—3,000 feet. A common species flying low among ground plants in April and May.

Genus MIMEUSEMIA, Butl.

1582. *M. peshva*, Moore.

Sikhim and Bhutan, 2,000 feet. Rather scarce. I have only taken it in April at light.

1581. *M. basalis*, Wlk. (Plate II, Fig. 16.)

Sikhim, 1,800 feet. I took four specimens in June, attracted to light at Punkabaree, two of which were without the orange patch on the hindwing. One of these is figured in the plate mentioned above.

Genus OPHTHALMIS, Hübn.

1568. *O. funebris*, Moore.

Sikhim. I have never seen this species. (I also have never seen this species, which must be extremely rare if it really occurs in Sikhim. *H. J. E.*)

THE BIRDS OF THE MADHUBANI SUB-DIVISION OF THE DARBHANGA DISTRICT, TIRHUT, WITH NOTES ON SPECIES NOTICED ELSEWHERE IN THE DISTRICT.

By C. M. Inglis.

Part V.

(*Continued from page* 563 *of this Volume.*)

Order—GRALLÆ.

Sub-order Fulicariæ.

Family *Rallidæ*.

(205) Rallus indicus.—The Indian Water-Rail.

Blanford, No. 1387; *Hume*, No. 914.

Mr. G. Dalgliesh writes in the Zoologist that he thinks he saw a bird of this species on a small pond near Bunhar.Fty., in February 1899. It was fired at, but only wounded and escaped.

(206) R. aquaticus.—The Water-Rail.

Blanford, No. 1388; *Hume*, No. 914 *bis*.

An exceedingly rare bird. A single specimen was shot by Mr. G. Dalgliesh at Hatauri as already recorded in this Journal. The only other places recorded for this species by Blanford are Gilgit (*Scully*); Kulu (*Hay*); Dehra Dun (*Hume*). In Hodgson's collection is a skin labelled Nepal, and Mr. R. George states that he got a specimen near Shikarpur. Mr. Wm. Jesse also got one at Lucknow.

(207) Porzana pusilla.—The Eastern Baillon's Crake.

Blanford, No. 1393; *Hume*, No. 910.

I have got several of these little crakes. They are called *Jhilli* by the natives. They undoubtedly breed here as I have seen them during the breeding season. I have however been unsuccessful in finding the nest.

(208) P. maruetta.—The Spotted Crake.

Blanford, No. 1394; *Hume*, No. 909.

A solitary female was snared at the Koraihia Chaur by a *mir-shikar* on the 22nd December 1901. It was brought to me. I have never seen another. Native name also *Jhilli*.

(209) Amaurornis phœnicurus.—The White-breasted Water-Hen.

Blanford, No. 1401; *Hume*, No. 907.

Abundant. They breed during June, July and August. I have never seen more than six eggs in any nest. They build on trees or bushes near the water. Snakes or magpies destroy a good number of eggs of this species. Native names *Dauk* and *Bon múrghi*.

(210) Gallinula chloropus.—The Moorhen.

Blanford, No. 1402; *Hume*, No. 905.

Common. It breeds in August, but I have seldom seen its nest. Native name *Bódor*.

(211) Gallicrex cinerea.—The Kora or Water-Cock.

Blanford, No. 1403; *Hume*, No. 904.

This species is scarce. It is seldom seen but is occasionally heard. I have

only received three males, all of which were snared by *mir-shikars*. They were all in summer plumage. Native names *Toobka* and *Kora*.

(212) PORPHYRIO POLIOCEPHALUS.—The Purple Moorhen.

Blanford, No. 1404; *Hume*, No. 902.

I found them scarce near Jainagar and Narhar, but numbers are to be found at the Minti Chaur, and Scroope shot some in a tank at Madhubani. At Baghownie they are abundant and commit great havoc in the paddy fields by cutting the plant and piling it up to form their nests. They breed from July to September. Native names *Karim* and *Korma*.

(213) FULICA ATRA.—The Coot.

Blanford, No. 1405; *Hume*, No. 903.

Very common in the cold weather and a few remain and breed. Native names *Kesrar* and *Serar*.

Sub-order GRUES.

Family *Gruidæ*.

(214) GRUS COMMUNIS.—The Common Crane.

Blanford, No. 1407; *Hume*, No. 865.

Mr. G. Dalgliesh saw this species once near Hatauri Fty., in December 1897. I have never seen this species, but a few are snared on the banks of the Kamla near Jainagar but in Nepal. I have not succeeded in getting the skin. Native name *Kulang*.

(215) G. LEUCOGERANUS.—The Great White or Siberian Crane.

Blanford, No. 1408; *Hume*, No. 864.

I saw some white cranes during the cold weather of 1898 in a chaur near Beerpur Fty., not far from Jainagar. I stalked them very carefully, but they were too wary and I failed to get a shot. The *mir-shikars* know the bird and call it *Burmuch*.

(216) G. ANTIGONE.—The Sarus.

Blanford, No. 1409; *Hume*, No. 863.

The late Mr. Grahame and I stalked a sarus near Allumpore Fty., but did not get a shot, although one of us had a rook rifle. I believe a pair used to come to Minti during the cold weather. Two young birds in the down were brought to me by a *mir-shikar* on the 15th October, 1901. Another pair were brought in December 1902, but as they were very small I did not keep them. The smallest one had a deformed bill, one mandible crossing the other. It had to be fed by hand. The man wanted Rs. 20 for the pair, but I managed to get them for Rs. 14. The one with the deformed bill only lived five weeks, but the other one lived till the 7th December, it was then killed by a blow from the bill of a lesser adjutant. It grew very tame and was just getting rid of all its down. They came from a chaur near Allumpore and were probably the offspring of the bird we stalked. Native name *Sáras*.

(217) ANTHROPOIDES VIRGO.—The Demoiselle Crane.

Blanford, No. 1411; *Hume*, No. 866.

Many are seen flying to their feeding ground, but few seem to settle in the sub-division. They arrive about the beginning of October. Some are snared

on the banks of the Kamla in Nepal every year. At Burreroa in Nepal my man counted 16 nets. They were stretched across the dry sand banks in the middle of the river and were about 50 yards apart. The nets were 45 yards long and 8 yards high. The men who snared the cranes were of the *Bin* caste. The birds sold for Rs. 1-4-0 per pair. The netters said that they also sold the legs for medicine at an anna each. One of my men shot one out of a flock of about twenty which were feeding near a paddy field not far from the Kamla. He said he could have got more had not some cowherds frightened them away. The bird shot had its stomach full of paddy. They are excellent eating. One flock noticed was flying in extended line slightly arched in the centre, a second in V shape, and another had not any formation at all. Native name *Kurra*.

Sub-order OTIDES.

Family *Otididæ*.

(218) SYPHEOTIS BENGALENSIS.—The Bengal Florican.

Blanford, No. 1417; *Hume*, No. 838.

I flushed a Bengal Florican twice in grass some four miles from Baghownie on the following dates—27th April, 1901, and on the 29th May, 1902. Mr. Millar and I also flushed one in some indigo at Hatauri. It flew into some sugarcane *koonties*. There was only one bird, either a female or a male, in undress plumage. The same bird was again flushed near the same place on the 3rd of June.

ORDER—LIMICOLÆ.

Family *Œdicnemidæ*.

(219) ŒDICNEMUS SCOLOPAX.—The Stone Curlew.

Blanford, No. 1418; *Hume*, No. 850.

Very common. It breeds from March to June. They are often found in bamboo and mango groves and on dry plains. When seen they crouch on the ground and then gradually, one after the other, raise their heads and scuttle off with bodies close to the ground for some yards, after which they either take to flight or lie down again. Description of nestling in down—Forehead crown, back and wings light brown speckled with black; centre of crown with two longitudinal black bars; a broad band from back of eye and round nape black; cheeks, sides of head, chin and breast white, a black patch on the upper portion of the latter and a black line from base of wings to tail. *Bill* and *legs* dusky pink; *iris* dark brown. Native name *Karwanak*.

(220) ESACUS RECURVIROSTRIS.—The Great Stone-Plover.

Blanford, No. 1419; *Hume*, No. 858.

Rather scarce. A pair or so are now and then to be seen on the banks of the Kamla from the end of July and through the cold weather. I have secured few specimens. Native name *Burra Karwanak*.

Family *Glareolidæ*.

Sub-family *Cursorinæ*.

(221) CURSORIUS COROMANDELICUS.—The Indian Courser.

Blanford, No. 1422; *Hume*, No. 840.

A few flocks seen from September to end of April. They keep to waste lands or prepared fields seldom going into the crops.

Sub-family *Glareolinæ*.

(222) GLAREOLA LACTEA.—The Small Indian Pratincole.

Blanford, No. 1427; *Hume*, No. 843.

Fairly common on the banks of the Kamla during the cold weather. I have not got their eggs from this side of the Nepal Frontier, but a short distance on the other side my man found some nests and eggs in April. I daresay they do lay with us.

Family *Parridæ*.

(223) METOPIDIUS INDICUS.—The Bronze-winged Jacana.

Blanford, No. 1428. *Hume*, No. 900.

Abundant. It breeds in tanks and chaurs during June, July and August. All nests found were the same, simply a floating mass of water plants. I have never found more than five eggs in a nest. One egg I got measured 1·7″ by 1″, which is very long for this species. The earliest nest was taken on the 20th June and the latest on the 26th August, the latter containing two very highly incubated eggs. A female shot on the 4th October had lost all its primaries and rectrices; new ones were just appearing. Native names *Pipi* and *Kundai*.

(224) HYDROPHASIANUS CHIRURGUS.—The Pheasant-tailed Jacana.

Blanford, No. 1429; *Hume*, No. 901.

Not so common in this sub-division as the former species. Near Baghownie I think it is, if anything, commoner than *M. indicus*. They breed in July, August and September, never I think in tanks, but always either in jheels or weedy river beds. One nest, formed of straw, was situated on a broad spiky leaf, and one of the spikes had drilled a neat hole on one side of one of the eggs. They appear to be commoner during the rains, and I think migrate locally in the cold weather. They lay from three to four eggs, usually three. Native name *Piho*.

Family *Charadriidæ*.

Sub-family *Charadriinæ*.

(225) SARCOGRAMMUS INDICUS.—The Red-wattled Lapwing.

Blanford, No. 1431; *Hume*, No. 855.

Very common. It breeds from March to May, usually in a hollow in the ground in some paddy field and generally near water. A fine male measured in the flesh:—*Length*, 14·1″; *wing*, 9·25″; *tail*, 4·9″; *tarsus*, 3·2″; *bill at front*, 1·31″; *bill at gape*, 1·4″; *expanse*, 30·25″. The colours of the soft parts of a young bird which had just left the nest were as follows:—*Base of bill, lappet and edge of eyelids* dusky red; remainder of *bill* black; *iris* dark-brown; *legs* and *feet* dusky yellow. This is known to most Europeans in India as the *Did-he-do-it*. Native names *Titi* and *Titiri*.

(226) SARCIOPHORUS MALABARICUS.—The Yellow-wattled Lapwing.

Blanford, No. 1433; *Hume*, No. 856.

This species is scarce. I saw a pair on two occasions not far from Jainagar in April and July 1899. The only specimen in my collection was shot at Belahi Fty., in the Mozufferpur District on the 1st May, 1896.

(227) HOPLOPTERUS VENTRALIS.—The Indian Spur-winged Plover.

Blanford, No. 1435; *Hume*, No. 857.

Common on the banks of all rivers. It breeds from March to May and lays its eggs in a depression in the sand. I have seen this species near a tank a long way from any river. They are generally seen in pairs, but I have seen as many as twenty together. They are usually wary, keeping well out of gun shot. The first pair I stalked gave me a lot of trouble. They flew out of range and settled near the edge of the water, running up and down and now and then squatting, vociferating vigorously the whole time. I was for several hours after them, but failed to get a shot.

(228) CHETTUSIA LEUCURA.—The White-tailed Lapwing.

Blanford, No. 1438; *Hume*, No. 853.

I never came across this species in the sub-division, but not far from Baghownie they are fairly common near the chaurs during the cold weather.

(229) CHARADRIUS FULVUS.—The Eastern Golden Plover.

Blanford, No. 1439; *Hume*, No. 845.

Fairly common. I have seen flocks from the end of August up to the beginning of May. The earliest arrival was noted on the 26th August and the last were seen on the 1st May. Those seen in that month were in breeding plumage.

(230) ÆGIALITIS MONGOLICA.—The Lesser Sand Plover.

Blanford, No. 1443; *Hume*, No. 847.

This species is fairly common during the cold weather. My specimens were got in January and April, but they arrive earlier than this. They keep to the cultivated fields and seem to have a preference for light soil.

(231) Æ. ALEXANDRINA.—The Kentish Plover.

Blanford, No. 1446; *Hume*, No. 848.

Commoner than the preceding species. I have seen them from October to April. Few are seen in March and April, and they are usually in breeding plumage. I got a nest and three eggs near Jainagar in April on the bank of the Kamla, and several nests and eggs were got in Nepal, also on the bank of the same river. They were laid on a little grass in a depression in the sand. Unfortunately, most of the eggs were useless, being on the point of hatching.

(232) Æ. DUBIA.—The Little Ringed Plover.

Blanford, No. 1447; *Hume*, No. 849.

Common, especially during the cold weather. A few remain and breed, as a couple of clutches of two eggs each were taken on the banks of the Keray on the 8th May, 1901. Two of the eggs were fresh and two incubated. Native name *Rooni chaha*.

Sub-family *Hæmatopodinæ*.

(233) HIMANTOPUS CANDIDUS.—The Black-winged Stilt.

Blanford, No. 1451; *Hume*, No. 898.

A common cold weather visitant, especially near the large chaurs where

vast flocks are to be found. I have never got a fully adult bird with pure white head and neck. They arrive about September and remain all through the cold weather. I shot one however on the 28th June, but it had a broken leg, the bone of the tibia protruding at the joint. The ovaries were small though one would have expected to have found them enlarged at that season.

(234) RECURVIROSTRA AVOCETTA.—The Avocet.

Blanford, No. 1452; *Hume*, No. 899.

Scroope found a small flock feeding on a mud flat about a mile from Benipati. Not uncommon during some cold seasons near Baghownie where they usually keep in small parties. I have shot them from November to the end of March.

(235) NUMENIUS ARQUATA.—The Curlew.

Blanford, No. 1454; *Hume*, No. 877.

Scroope saw five Curlews near Madhubani in June 1899. They are scarce birds. Gordon Dalgleish shot a pair in February 1900, and I have secured six or seven specimens in the neighbourhood of Baghownie. In the stomach of a female which I dissected were some shells. They are exceedingly wary. Native names *Gooniar* and *Goonjer*.

(236) N. PHÆOPUS.—The Whimbrel.

Blanford, No. 1455; *Hume*, No. 878.

A single female was snared with bird lime by a *mir-shikar* in the Maiser chaur some miles distant from Baghownie on the 15th July. The country was in flood at the time, and it was with the greatest trouble that he managed to get the bird. There were no others nor have I ever heard of any others being got in these parts. Native name *Chota gooniar*.

(237) LIMOSA BELGICA.—The Black-tailed Godwit.

Blanford, No. 1456; *Hume*, No. 875.

Vast flocks are found near the Minti chaur in the cold weather according to Scroope, and one of my men saw a lot in the Sumnah jheel about two miles south-east of Minti. They are abundant in the Ootidee chaur near Baghownie during the same period. They are excellent eating. I got one on the 3rd May which was in breeding plumage.

(238) TOTANUS HYPOLEUCUS.—The Common Sandpiper.

Blanford, No. 1460; *Hume*, No. 893.

Fairly common, but rarer than the next species. They arrive about the third week in August.

(239) T. GLAREOLA.—The Wood Sandpiper.

Blanford, No. 1461; *Hume*, No. 891.

Very common. They arrive in the beginning of August and stay till March.

(240) T. OCHROPUS.—The Green Sandpiper.

Blanford, No. 1462; *Hume*, No. 892.

This is the commonest Sandpiper we have. They usually arrive in August, but I once got one on the 6th July. Sandpipers are generally known to Europeans in India as *Snippets*.

(241) T. STAGNATALIS.—The Little Greenshank.

Blanford, No. 1463; *Hume*, No. 895.

I have found this species scarce in the sub-division, but in the vicinity of Baghownie near the jheels they are fairly common. I have no notes on any procured before November. They remain till March.

(242) T. CALIDRIS.—The Redshank.

Blanford, No. 1464; *Hume*, No. 897.

Scroope once wrote me the following:—"I think *T. calidris* occurs. Its cry is unmistakeable." I have never come across it.

(243) T. FUSCUS.—The Spotted Redshank.

Blanford, No. 1465; *Hume*, No. 896.

Very common cold weather visitant. The earliest arrival was noticed on the 21st September and they remain till April. Those got in the latter month were in full or partial breeding plumage. One bird had its gullet full of small fish.

(244) T. GLOTTIS.—The Greenshank.

Blanford, No. 1466; *Hume*, No. 894.

Exceedingly common during the cold weather. I have seen solitary birds on the 17th July, 1899, the 22nd August, 1899, and on the 28th June, 1901, but they generally arrive about September and leave in March. A bird shot in August had still some of the dark-brown spots of the summer plumage. They usually go about in flocks and are commoner near the rivers than the jheels.

(245) PAVONCELLA PUGNAX.—The Ruff and Reeve.

Blanford, No. 1468; *Hume*, No. 880.

Common round about Narhar and also near Baghownie. They arrive about the middle of September. A few birds show traces of the breeding plumage of the male. In this species the palate is very rough with blunt spikes on it leaning backwards.

(246) TRINGA MINUTA.—The Little Stint.

Blanford, No. 1471; *Hume*, No. 884.

Very common near the jheels in the cold weather. They go about in flocks.

(247) T. TEMMINCKI.—Temminck's Stint.

Blanford, No. 1474; *Hume*, No. 875.

Also a common cold weather visitant.

(248) T. ALPINA.—The Dunlin.

Blanford, No. 1478; *Hume*, No. 883.

Mr. G. Dalgleish shot a male out of a small flock seen at Hatauri on the 12th February, 1898. He very kindly let me have the skin. On the 14th January, 1901, one of my men saw some birds which I think were this species. They were on the edge of the Ootidee chaur near a large flock of godwits.

Sub-family *Scolopacinae*.

(249) SCOLOPAX RUSTICULA.—The Woodcock.

Blanford, No. 1482; *Hume*, No. 867.

No occurrence known in the sub-division. A woodcock was shot at Tewarrah in this district by the late Mr. Ikey Barton.

(250) GALLINAGO CŒLESTIS.—The Common Snipe.

Blanford, No. 1484 ; *Hume*, No. 871.

This is the common species. They are to be had from September to April. One however was flushed by me near Baghownie on the 15th July. Native name *Chaha*.

(251) G. STENURA.—The Pintail Snipe.

Blanford, No. 1485 ; *Hume*, No. 870.

Not so common as the above. I have handled too few skins to be able to state correctly in what proportion the two species occur. They arrive in the middle of August and remain till the end of April.

(252) G. GALLINULA.—The Jack Snipe.

Blanford, No. 1487 ; *Hume*, No. 872.

Rather scarce. Gordon Dalgleish shot several in January and February, and I have had them brought to me by *mir-shikars* on a few occasions during those months.

(253) ROSTRATULA CAPENSIS.—The Painted Snipe.

Blanford, No. 1488 ; *Hume*, No. 873.

Rare. I got several specimens in March and April 1898 and 1899 at Narhar, but have since then got no others.

(To be continued.)

FAMINE FOODS.

DIOSCOREA PENTAPHYLLA.

AN IMPORTANT EDIBLE WILD YAM OF THE THANA DISTRICT, BOMBAY PRESIDENCY.

By G. M. Ryan, I. F. S., F. L. S.

It was in 1897 that I was struck with the great importance, as articles of food, which the various wild tubers of the Thana forests were to the forest tribes. That year happened to be one in which the district was stricken with famine to some extent, and probably the wild tribes indented more largely than usual on the various yams in consequence, but since then it has come to my knowledge by coming constantly in contact—as a Forest Officer in Thana perforce must—with these poor creatures, that many of the wild yams form the main standby of the forest tribes in ordinary seasons, and that but for the presence of the various tubers in the forests the majority of the wild tribes would probably cease to exist. Finding that no chemical analysis existed of the various yams, I was induced to send one (tuber of *Dioscorea bulbifera*) to Calcutta, for such analysis, and through the courtesy of Dr. Prain the analysis was carried out by Mr. Hooper. It showed that the nutrient ratio of the yam was about equal to that of the potato. Other tubers were sent from time to time subsequently for analysis, but owing to pressure of work apparently no analysis could then be made.

Recently, however, through the courtesy of Mr. Burkill, Reporter on Economic Products to the Government of India, an analysis was carried out of another important wild yam, and as its nutrient ratio is even greater than that of *Dioscorea bulbifera*, it occurs to me that perhaps a short note on the plant is worthy of record and may not prove uninteresting.

The tubers of this plant, known among the wild tribes as "Londi," are one of the most important yams of the Thana District. The plant has a climbing habit, and is found growing usually at the base of trees and shrubs. It possesses a slender twining stem covered near the base with irregularly distributed prickles, with the aid of which it climbs its host.

The flowers which appear in the monsoon (usually August) are yellowish green and are small and inconspicuous, but flowering does not take place annually in the case of artificially planted tubers.

The description given in the *Flora of British India* of the plant is as follows:—

"Leaves obovate, acuminate or cuspidate, *Male panicles* and flowers glabrous hispidly pubescent or villous, spikes lax or dense-fid; flowers sessile or pedicelled $\frac{1}{16}$—$\frac{1}{12}$ in. diameter, fragrant; filaments and staminodes very short. *Capsule*—$\frac{3}{4}$—1 in. rounded at both ends or base cordate and tip apiculate glabrous or pubescent. *Seeds*—$\frac{1}{4}$—$\frac{1}{2}$ in., wing broader than the nucleus."

Distribution.

In the *Flora of British India* it is said the plant is found "throughout tropical India from Kumaon in the N.-W. Himalaya, eastward to Burmah,

and southward to Ceylon and Malacca. Distributed Malay hills, Afr. trop."

In the Thana District it exists in all the forests. In many areas it is now scarce, owing to the great demand during recent famine years for the tubers.

Description of Tubers.

The plant bears oblong, dark brown tubers, which are covered with root hairs, and which are about 6" to 8" in length. They are inserted perpendicularly in the soil, two or three tubers being found clustered together round a common axis, and imbedded in the earth like potatoes.

After 5 or 6 months growth, when all the starchy substances have been used up for the needs of the growing stem and seeds, the tubers shrivel up and die as does also the stem, and new tubers are formed, which remain imbedded in the earth till the approach of the following monsoon, when they again sprout. During May, when the heat is extreme, tubers, if stored together in wooden cases, sprout freely, their stems rising up to seek the light.

Rate of Growth.

The tubers may be planted at any time in the soil, and they sprout usually after the rains set in. The best period for planting is just before the rains. In a week the stem attains a length of about 2 to 3 feet and in six weeks it is almost full grown. After 2½ to 3 months it bears flowers, and after about 5 it seeds and dies.

By whom eaten.

The three important wild tribes in Thana are the Thakoors, Warlis and Kathodis, of whom the latter alone are the chief consumers of these tubers. The Thakoors and Warlis indulge in various other kinds of yams as food, of which there are several in the Thana District.

The Kathodis, however, who are darker and slimmer than other forest tribes, are the most hard-working of the three, and this may probably account for their selecting the Londee as an article of diet, since it is found by analysis as shown below to be probably the most nutritious of all the edible tubers in Thana. So far only three * of the different yams growing in the District have been chemically analysed. It is hoped that gradually all of them will be so treated.

The Kathodis, who allege they are descended from monkeys, are the wood-cutters of the Thana District, and they are almost in a position of servitude with their masters. The wage they earn for a family, including husband and wife and two or three children, is from Rs. 2 to Rs. 3 per mensem.

In some instances their emoluments are paid to them in grain. The *Soukars* who employ them for various kinds of labour give them advances of money and grain in the monsoon, which sums are repaid by work done in the fair season.

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* The other two, besides *Dioscorea pentaphylla*, are *Dioscorea bulbifera* and *Dioscorea daemona*.

Very often the advances are not cleared by work done and some of the defaulters decamp to other parts of the District, where for a time they exist in the forests on scarcely anything else but these tubers and rats, if they can find them. In a famine year the demand for tubers of all kinds is enormous, not only in the District but also outside. While going through a forest, during the famine of 1896-97, I met large bodies of women and children grubbing up these and other tubers from beneath bushes and trees, and in the famine of 1899 cart-loads of Londee and Karva Kánd (*Dioscorea bulbifera*) were exported to the Deccan for sale there, from Central Thana and Mokhada.

Mode of preparation for food.

The tubers are first cleaned of their root hairs, then washed in cold water, afterwards peeled like potatoes, boiled, cut into slices, and eaten usually with salt. It is said that an adult can be maintained on 3 to 4 lbs. per diem of the tubers.

Chemical Analysis.

The fresh tubers submitted to chemical analysis afforded the following constituents :—

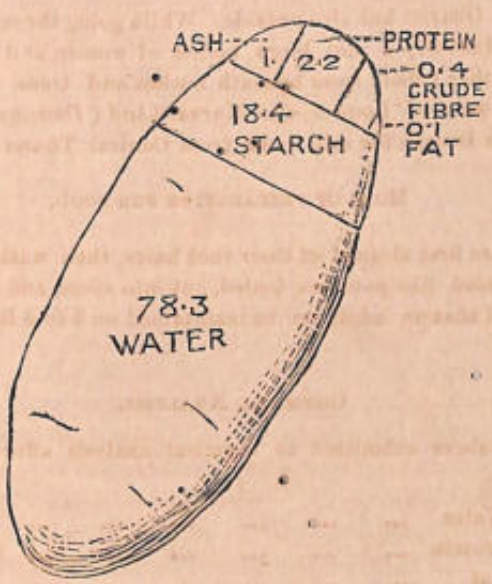
Water	5·55
Protein	20·75
Fat	0·77
Starch	61·77
Fibre	6·23
Ash	4·93
	100·

For the sake of comparing the dietetic value of these tubers with that of the potato, the following results of the analysis of this well-known food is reproduced from the *Journal of the Department of Agriculture, Western Australia* :—

Water	78·3	
Protein	2·2	Nitrogenous matter.
Fat	0·1	
Carbohydrates	18·4	Principally starch.
Mineral matter	1·0	
	100·	

The above figures, like others for composition of food-materials, represent general averages, from which there are wide variations in individual specimens.

The following diagram from the *Gardeners Chronicle* shows in graphic form the quantitative composition of the potato :—



The nutrient ratio of *Dioscorea pentaphylla*, it will be seen, is considerable, and it becomes a question whether its cultivation should not be encouraged for the benefit of the poorer classes.

Pro. Goff, in that extremely interesting work of his, entitled "Principles of Plant Culture," page 11, says, "In culture the intelligence and energy of man produce a more favourable environment for the species he desires to rear ; hence domestic plants and animals attain higher development in certain directions than their wild parents. The cultivated potato, for example, grows larger, is more productive and is higher in food value than the wild potato."

I would therefore invite the attention of the Director of Agriculture and Collectors of Districts to the dietetic value of this yam, and suggest that its cultivation be encouraged as far as possible in the Bombay Presidency. The introduction of this and other tubers into the Panch Mahals especially, for example, would probably be followed by favourable results in the event of another famine should one unfortunately occur there.

NOTES ON SOME OF THE PLANTS INTRODUCED INTO THE VICTORIA GARDENS, BOMBAY, DURING THE PAST 8 YEARS.

By Cavasji D. Mahaluxmivala.

Part III.

(*Read before the Bombay Natural History Society on 23rd September*, 1902.)

32. Tradescantia virginiana, *L.* (Commelinaceæ).* Flower of a Day; Common Spider-wort; or Virginian Spider-wort. It is a perennial herb of North America from 1 to 2 feet high, and is considered the best of all the tradescantias grown in gardens. While the two plants commonly grown in our gardens under the name of T. discolor and T. zebrina are grown for their foliage, their flowers being insignificant, this one is remarkable for its very showy flowers. There are said to be several varieties of it with violet, purplish, whitish and rose-coloured flowers, but all the plants now in the garden have only purple flowers. They are about 2 inches in diameter closely packed in terminal cymes in two opposite, long, leafy bracts, opening one after the other, with 3 light purple petals, the filaments and style being of the same colour, the former densely bearded, and the ovary and stigma being white. It has begun flowering from July and is still flowering. The leaves are long linear, $20'' \times \frac{3}{4}''$. The plants were raised from seeds purchased from Mr. Ernst Benary, Germany, under the name of T. Virginica, in 1896, but the seeds germinated very badly, and a few plants that came up died afterwards. Seeds were again obtained this year from the same place which germinated freely, and the plants are doing very well up to now. It can be propagated by division, and is suitable for growingi n borders or on rockeries

33. Zephyranthes citrina, *Baker* (Amaryllideæ).† Yellow Zephyr Flower. A bulbous plant from Tropical America, similar to the white and rose-coloured species (Z. candida and rosea) commonly grown in our gardens, except that the flowers are of a bright yellow colour. This species also, like the others, flowers several times during the rains. It was purchased from the Agri-Horticultural Society of India, Calcutta, in 1898. A similar plant was received in exchange from the Agri-Horticultural Society of Madras under the name of Z. sulphurea, in 1901.

34. Zephyranthes carinata, *Herb.* (Amaryllideæ).‡ This species from the West Indies has flowers of a pink colour, much larger than those of the other species mentioned above. Bulbs were presented by Maj. A Hildebrand of Calcutta in December 1900.

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* The genus is named after John Tradescant, gardener to Charles I., and the specific name after its native habitat.

† The generic name from *Zephyros*, the west wind, and *Anthe*, a flower, a fanciful name given by Herbert, and the specific name from the citron yellow colour of the flowers.

‡ The specific name means "keeled" from the leaves being channelled and keeled.

35. PANDANUS UTILIS, *Bory* (PANDANEÆ).* This species of the Screw-pine is native of Madagascar, where it is said to grow to a height of 60 feet. It has large, glaucous, erect leaves armed with sharp red spines, and from its bold and striking habit is suitable for a large vase on a terrace wall or lawn, or as a single specimen on a lawn. It is said to be a very common wild plant in Mauritius, where it is called *Vacua* or *Bacua*, and is there cultivated for its leaves, which are used together with those of other species in the manufacture of the sacks in which sugar is exported. The materials of these sugar-sacks are said to be afterwards reused in making the flat square fish-bags commonly used in English Markets. The plants were raised from seeds obtained from Messrs. Vilmorin Andrieux & Co., Paris, in 1897, and thrive well in the open.

36. PANDANUS PACIFICUS, *Veitch* (PANDANEÆ).† This species of pandanus is a native of the Pacific Islands. The leaves are broad, shining green, having the margins furnished with fine spines, and the tips narrowed abruptly to a long, tail-like point. It was presented by the Superintendent of the State Gardens, Baroda, and is suitable, like the other species, for growing in conservatories, in vases or on lawns, but cannot bear direct exposure to sun and must be grown in a shady place.

37. PIPER ORNATUM, *N. E. Br.* (PIPERACEÆ).‡ An ornamental climbing plant from Celebes in Malay Archipelago, suitable for growing on pillars in conservatories on account of its beautifully-marked leaves, which are about 4 inches by 5 inches, cordate, roundly ovate and bright green, marked with pink spots. The plant was purchased from the Government Agri-Horticultural Gardens, Lucknow, in 1900, and is doing well, but has not flowered yet. It has been propagated by layering.

38. ILEX PARAGUAYENSIS, *St. Hilaire* (ILICINEÆ).§ Maté or Paraguay Tea. It is a small evergreen tree, native of Paraguay, with opposite, smooth, serrate, shining green, obovate leaves, four or five inches long. The flowers are said to be white, copiously produced in much branched racemes. The leaves of this plant are extensively used in South America for the same purpose as tea is used in the rest of the world. They contain the same active principle as tea and coffee, *viz.*, theine, and the infusion of the leaves is gently stimulating and refreshing, especially after fatiguing journeys. The leaves are prepared for the infusion by the branches being first roasted over a wood fire, after which the leaves are knocked off and powdered. The powdered leaves are then placed in a calabash called a *maté* and boiling water poured over them. The infusion, which is also called *maté*, and which has a somewhat

* The generic name from the Malayan name *Pandang*, and the specific name meaning useful.

† The specific name is after its native habitat.

‡ The generic name from the old Latin name akin to the Greek *peperi* and Sanskrit *pippala*, and the specific name meaning ornamental.

§ The genus from the Latin name given by Virgil to Quercus Ilex, and the specific name after its native habitat.

agreeable aromatic odour and slightly bitter taste is then sucked through a tube or *bombilla*. The plant was purchased from the Agri-Horticultural Society of India, Calcutta, in December 1897, and seems to do well here, though it has not yet grown to any height on account of its being utilized for propagation by layering, and has not yet flowered.

39. SOLANUM TRILOBATUM, *Linn.* (SOLANACEÆ).*—*Mothi Ringni.* A scandent, spiny undershrub, 6 to 12 feet high, native of East Indies, common in hedges in the Bombay Presidency. The leaves are 3 inches by 1½ inch, smooth, shining, prickly, irregularly obtusely sinuate or lobed. The flowers are purple, about 1 inch in diameter, and the berry red, of the size of a currant. The plant was sent in exchange from the Agri-Horticultural Society of Madras, in October 1901, and thrives well here. It has commenced flowering since August last.

40. MELALEUCA LEUCADENDRON, *Linn.* (MYRTACEÆ).† Cajuput Tree. A large tree, native of the Malay Islands and Australia. There are two varieties of this tree, the cajuput oil of commerce being obtained from the variety called minor. The trunk of the tree is covered with a thick, spongy, light-brown and white bark, peeling off in layers every year. This bark is said to protect the tree against conflagrations, and is used by the Australian aborigines for tinder, for making shields and canoes, for covering huts, and for inscribing their sacred writings upon. It is also said to be a good material for fruit packing. The wood is said to be fissile, hard, close-grained, resisting the attacks of white ants, and almost imperishable under ground. The leaves are 3 inches long, alternate, vertical, lanceolate, oblique or somewhat falcate, three-nerved, and contain an aromatic oil reputed to be antiseptic, and on that account the tree is considered very suitable for planting in malarial swamps in tropical countries, especially at low elevations, where many of the Eucalypti do not thrive. The flowers are white of the bottle-brush kind, arranged in spikes 2 or 3 together interruptedly at short distances apart. The plants were raised from seeds purchased from the Director, Botanical Gardens, Sydney, in April 1900, and from the Curator, Southern California Acclimatising Association, in August 1901. Those raised from the former have flowered this year in July to September, but have not seeded yet.

41. LOBELIA CARDINALIS, . . . (CAMPANULACEÆ).‡ Cardinal flower. A handsome herbaceous perennial from 1 to 2 feet high, native of North America, where it is said to be growing in boggy ground. The leaves are smooth, narrow, lanceolate, toothed and tinged with red or bronze. The flowers are two-lipped of a vivid scarlet colour, in one-sided terminal racemes, and

* The generic name is the old Latin one used by Pliny, and the specific name means three-lobed, probably in reference to the leaves which are, however, five-lobed.

† The generic name from Greek, *melas*, black, and *leukos*, white, in reference to the trunk being black and the branches white, in one of the species, and the specific name from *leukos*, white, and *dendron*, a tree, on account of its whitish bark.

‡ The genus is named after Matthias de L'Obel, a Flemish botanist and physician to James I., and the specific name from the colour of the flowers which are cardinal red.

are very telling in effect. Plants were raised from seeds purchased from Mr. Ernst Benary, Germany, in November 1900, and grown in an open border, where they died after flowering, apparently from the effect of direct sun in the hot weather. Seeds purchased from Messrs. Nimmo and Blair, New Zealand, in October 1901, failed to germinate. They were, however, again raised from seed obtained in January 1902, from Mr. Ernst Benary, Germany, and are now (September) in flower in a shady bed under a tree. As the plant does not seem to bear direct sunshine, especially in the hot weather, it is suitable for growing in borders under shade or in conservatories.

42. LOBELIA ANCEPS (CAMPANULACEÆ).* This species is a dwarf herbaceous perennial from the Cape of Good Hope. The leaves are large 5 inches by 2 inches, obovate, toothed, hairy, and thickly set on the stem. The flowers are in dense spikes, blue with a white or yellowish throat. A few plants of this species came up among those raised from seeds of L. cardinalis purchased from Mr. Ernst Benary, Germany, in 1900, and have been again raised from true seeds purchased from the same seedsman, in 1902. Some of the older plants are still alive, and have again flowered in July last. The new plants have not flowered yet. This species also like the last is suitable for growing in conservatories or shady borders.

43. ANGELONIA GRANDIFLORA *ALBA (SCROPHULARINEÆ). † A small herbaceous perennial, about 2 feet high. It appears to be simply a garden variety of the blue flowered A. salicariæfolia, *H. and B.*, of South America, commonly grown in gardens under the name of A. grandiflora, and which it resembles in all respects except that the flowers are white. Plants were raised from seeds purchased from Mr. Ernst Benary, Germany, in May 1901, and are easily propagated by cuttings.

44. BOCCONIA CORDATA, *Willd* (PAPAVERACEÆ).‡ Plume Poppy. It is a very handsome, herbaceous foliage plant said to be from 5 to 8 feet high, with a stately habit, native of China and Japan. The leaves are alternate, large, 12 inches by 6 inches, long-stalked, deeply veined, recurved, ovate-cordate, margins lobed and sinuate, of a light yellowish colour, reticulated with dark green veins. The flowers are said to be buff-coloured, numerous in very large terminal panicles, and though not individually showy are together in inflorescence striking, and give a fine effect to the plant. Plants were raised from seeds purchased from Messrs. Nimmo and Blair, New Zealand, in October 1901, and are doing well, though they have not flowered yet. It is suitable for growing in conservatories, or as an individual specimen on the lawn or in borders, in a shady place. It has been propagated by cuttings.

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* The specific name means two-edged or flattened.

† The generic name is derived from Angelon, the local name of A. salicariæfolia, in South America, and the specific name meaning large, white-flowered.

‡ The genus is named after Paolo Bacconi, M.D., a Sicilian botanist, and the specific name means heart-shaped from the form of its leaves.

45. PERISTROPHE ANGUSTIFOLIA AUREO-VARIEGATA (ACANTHACEÆ).* An elegant little dense-spreading herbaceous plant, seldom exceeding 6 or 9 inches in height, native of the Java mountains. The leaves are small, ovate-lanceolate, bright orange in the centre, margined with dark green. The flowers which begin to appear in the rains are two-lipped and rosy purple. The plant was presented by Mr. G. H. Krumbiegel, Superintendent of the State Gardens, Baroda, in December 1896, and thrives well here, being easily propagated by cuttings. It is very suitable as an edging on the slopes of borders, but requires partial shade. It is also very suitable for growing in conservatories on rock work or in baskets. In the monsoon the leaves are green, but become variegated with orange during the cold weather.

46. COMMELINA NUDIFLORA, *Linn.* (COMMELINACEÆ).† A compact growing, evergreen, herbaceous trailing plant, found throughout the hotter parts of India. The leaves are about 4 inches long, narrow, lanceolate. The flowers are cobalt blue (and in another variety, rosea, rose-coloured) enclosed in a complicate, cucullate (hood-shaped) spathe. They are very showy, opening in the morning and closing at noon. The plants were raised from seeds sent in exchange by Messrs. Herb and Wulle, Naples, in January, 1900, under the name of C. sellowiana rosea. They are doing very well here, flowering almost throughout the year, and are very suitable for growing on a sloping bank. It is easily propagated by means of cuttings.

47. MANETTIA CORDIFOLIA, *Mart.* (RUBIACEÆ). ‡ A pretty climbing plant of slender habit, native of Brazil. The leaves are about 1 inch long, opposite, ovate, cordate, pubescent. The flowers are tubular, about one inch and a half long, pendulous and scarlet, somewhat resembling those of Russelia juncea. The rind of the root is said to possess emetic properties, and is used by the Brazilians in dropsy and dysentery. The plant was presented by Mr. G. H. Krumbiegel, Superintendent of the State Gardens, Baroda, in December 1896, under the name of M. bicolar which is a different species, and thrives well here, flowering during the rainy season. It has been propagated by cuttings.

48. MAURANDIA BARCLAYANA, *Lindl.* (SCROPHULARINEÆ).§ A beautiful climber of slender habit, native of Mexico. The leaves are small, cordate, lobed and somewhat hastate. The plant climbs its support by means of the twisting petioles of the leaf. The flowers are about 2 inches long, curved, the tube greenish white, and the lobes of a violet purple colour. Plants were

* The generic name is derived from *peristrophe*, turning round, in reference to the corolla, which is twisted so as to be upside down, and the specific name means narrow-leaved with golden variegation.

† The genus is named after Kaspar and Johann Commelin, Dutch botanists, and the specific name means "naked-flowered."

‡ The genus is named after Xavier Manetti, Prefect of the Botanic Gardens at Florence in the middle of the eighteenth century, and the specific name means heart-shaped in reference to the leaves.

§ The genus is named after Dr. Maurandy, once Professor of Botany at Carthagena, and the specific name after Barclay.

raised from seeds purchased from Mr. Ernst Benary, Germany, in May 1901. They have commenced flowering this year since the commencement of the monsoons.

49. VICTORIA REGIA, *Lindl.*,(NYMPHÆACEÆ). * Queen Victoria's Water Lily or Royal Water Lily. This well-known and magnificent water plant, remarkable alike for its beautiful large flowers and its gigantic leaves, is a native of Guiana in South America. The leaves are circular, large, said to grow up to about 12 feet in diameter. The largest leaf of the plants grown in the garden, however, has not exceeded 7 feet, but could no doubt grow much larger in a tank more suited to its requirements. The edges of the leaves are turned upwards 2 or 3 inches, which gives the leaves an appearance of a huge native "thàlà" or tray with upturned edges. The colour of the leaf is green above and purple beneath, and the petiole, lower side of the leaf and the calyx are covered with large spines. The whole leaf is so well supported by the girder-like projecting veins and ribs underneath that it is said to bear the weight of a man easily. On experimenting I found that one of the floating leaves of the plant in the Garden, which was about 7 feet in diameter, could bear a weight of about 45 lbs., and to demonstrate it graphically I had a basket put on the leaf with a six-year old child in it, and had a photograph of it taken in 1895 which is exhibited here. The flowers are large, when fully expanded quite a foot in diameter, white at first, turning gradually to pink, diffusing a sweet scent, and coming up in constant succession during the rains and occasionally afterwards. Plants were raised from seeds purchased from the Superintendent, Sajjan Newas Gardens, Udaipur, in March 1898, but with difficulty at first, as the tender-seedlings were several times destroyed by fishes, which are plentiful in the ponds in the Garden, and the plants were further damaged by the great rush of water in the ponds during the monsoon. It is now grown in a small pond made by emptying and excavating one of the old manure pits in the Garden, but it is not large and deep enough for this gigantic plant, and the leaves are often damaged by being shaken and overturned by strong wind during the rains. Though it is a perennial, it seems to deteriorate here in the size of leaves and flowers year by year, and has to be grown afresh every year from seed. The seeds are eatable after being roasted.

50. PITCAIRNIA LATIFOLIA, *Soland* (BROMELIACEÆ).† An herbaceous perennial, native of West Indies and Brazil. The leaves are long, linear, about 3 feet by 1 inch, acuminate, white furfuraceous at back, margin irregularly prickled, arranged in a rosette. The flowers are in a compound raceme, rising on a long stalk about 7 feet high from the centre of the plant, the individual flowers being about 3 inches long, bright red. Plants were purchased from the Agri-Horticultural Society of India, Calcutta, in October 1897, and thrive well in Bombay in conservatories, or under partial shade outside.

* The genus is named after Her Majesty Queen Victoria, and the generic name means royal.

† The genus is named after W. Pitcairn, a physician of London, and the specific name means broad-leaved.

DESCRIPTIONS OF NEW SPECIES OF MAMMALS FROM THE ANDAMAN AND NICOBAR ISLANDS.

The following descriptions of new species of Mammals are extracted from a paper by Mr. Gerrit S. Miller, Jnr., published in the Proceedings of the United States National Museum (Vol. XXIV, pp. 751—795), on the collection made by Dr. W. L. Abbott and Mr. C. B. Kloss, who visited the islands during the months of January, February and March 1901.

SUS NICOBARICUS, new species.

Type.—Young adult male (skin and skull), No. 111794, U.S.N.M. Collected on Great Nicobar Island, Nicobars, March 13, 1901, by Dr. W. L. Abbott. Original number, 930.

Characters.—Like *Sus andamanensis*, but slightly larger, and with much larger teeth. Colour entirely black. Tail covered with a sparse, nearly uniform growth of long black hairs.

Fur.—The fur throughout consists of bristles with no admixture of softer hairs. In texture it resembles that of *Sus andamanensis*, and is much less harsh than that of *Sus cristatus*. The diameter of the individual bristles of both back and mane is scarcely more than half that of hairs from corresponding regions in the mainland animal, and is apparently a little less than in the Andaman pig. Mane and dorsal crest well developed, though less so than in *Sus cristatus*. At middle of back the bristles of the crest are about 70 mm. in length, while those bordering it barely reach a length of 50 mm. The crest, however, owes its distinctness to the greater crowding of the bristles of which it is composed, as compared with those of the surrounding parts. As in *Sus andamanensis*, the skin is plainly visible through its scant covering of hair everywhere except in the region occupied by the mane and crest. The cheeks are more hairy than in *Sus andamanensis*. The tail is hairy throughout except at tip. At base the hairs, which are much softer than the bristles of the back, are rather inconspicuous, but near middle they increase in number and in length, and form a straggling brush, the longest hairs of which are 150 mm. long.

Colour.—The colour is black throughout, with a faint brownish wash on dorsal crest. Hoofs rather dark horn colour. In the type the hind feet are albinistic between hoof and hock, the light colour involving the hoofs as well as the hair.

Skull.—The skull of *Sus nicobaricus*, though distinctly larger than that of *S. andamanensis*, shows no approach to the dimensions of that of *S. cristatus*. In form it differs from the skull of *Sus andamanensis* chiefly in the greater angle formed by the surface of the forehead with that of the rostrum, and in the larger, more inflated audital bullæ. The zygomatic arch as a whole is more heavily built than in *Sus andamanensis*, and its horizontal surface is broader posteriorly.

As compared with the skull of *Sus cristatus* from Tenasserim, that of *S. nicobaricus* shows numerous differences in form. Most conspicuous among

these are the relatively shorter rostrum and the very distinct angle in the facial profile at posterior extremity of nasals. This angle is difficult to measure, but it is approximately 8° in *Sus cristatus* and 18° in *S. nicobaricus*. The audital bullæ appear to be relatively larger than in the average of *Sus cristatus*, but this character is probably not constant.

Teeth.—The teeth are slightly larger in proportion to the size of the skull than in *Sus andamanensis*, but otherwise I can detect no differences. They also agree in all essential characters with those of *Sus cristatus*.

Measurements.—External measurements of type : Total length, 1,190 mm.; head and body, 1,000; tail, 190; height at shoulder, 520; hind foot (hoof included), 185

Cranial measurements of adult male considerably older than type (No.112011 U.S.N.M.): Occipito-nasal length, 280 mm.; basal length 255; basilar length, 245; length of nasals, 133; width of both nasals together posteriorly, 40; median length of bony palate, 175; width of bony palate at middle of second molar, 31; distance between tips of postorbital processes, 92; least interorbital breadth, 71; zygomatic breadth, 130; occipital breadth, 57; occipital depth, 105; least depth of rostrum between canine and incisor, 35; mandible, 220; depth of mandible through coronoid process, 105; depth of ramus at front of first molar, 32; maxillary toothrow to front of canine (alveoli), 118; mandibular toothrow to front of canine (alveoli), 132; crown of first upper molar, 12 by 14; crown of second upper molar, 17 by 17; crown of third upper molar, 26 by 18; crown of first lower molar,—; crown of second lower molar, 16 by 14; crown of third lower molar, 30 by 15.

Remarks.—This species is readily distinguishable from the Andaman pig by its larger teeth. The uniform black colour of the type and the peculiar hairing of the tail may be mere individual characters.

The occurence of a diminutive wild pig on the Nicobar Islands was noted as long ago as 1863 by Blyth[1]; but until the present time there has been no opportunity to compare the animal with *Sus andamanensis*. That it proves to be distinct from the Andaman swine is not in the least surprising, though such a possibility appears not to have occurred to Blyth. He says :

> The small Andamanese wild pig appears, at first, to be as isolated in its range as new to science; but I have been assured of the existence of a diminutive wild pig in the Nicobars, additional to the huge tame swine of undoubtedly exotic origin, which are bred by the Nicobarians of the coasts; and I have also considerable reason to suspect that it exists likewise in Sumatra.

The differences between the wild and domesticated pigs of the Andamans alluded to by Blyth were noted in considerable detail by Dr. Abbott.[2]

> Pigs, both tame and wild [he writes], were plentiful in the Nicobars. Those in Kar Nicobars, and many of the tame ones everywhere, are descendents of European and Chinese stock, and splendid big porkers some of them are. But the wild pig of which I send you one skin and two skulls from Great Nicobar does not seem the same. It is small, about the

[1] Appendix to Mouat's Adventures and Researches among the Andaman Islanders, p. 349.

[2] Letter dated April 23, 1901.

same size as that of Bunguran Island [*Sus natunensis*], the males weighing about 90 pounds. I am almost sure that it has been introduced long ago into the Nicobars, and that it was originally *Sus cristatus* of the mainland, degenerating as the result of insularity and inbreeding. The Danes and others have had settlements on the Nicobars in the last century, and an extensive trade with India and with Chinese junks from Hainan. This trade has been going on for generations, and the modern big pig is the result of the new introductions mixed more or less with the small form. In Great and Little Nicobar many of the tame pigs are precisely like the skin of the wild one which I send, and although the tame animals are usually larger they never equal the size of the huge European pigs of Kar Nicobar and the islands of the central group.

Whatever may have been the history of the animal, there can be little doubt that it is now a distinct species. I am inclined to believe that it was introduced by human agency, but at a time far anterior to the establishment of European trade.

Genus MUS LINNÆUS.

Three species of *Mus* have been recorded from the Andaman Islands, *Mus musculus* and *Mus andamanensis* by Blyth, and *Mus bowersi* by Blanford. Only the second of these was certainly obtained by Dr. Abbott, though it is probable that the animal here described as *Mus taciturnus* is the *Mus bowersi* of Blanford. From the Nicobars the only rat hitherto known is the *Mus palmarum* of Zelebor. This was regarded by Blanford as identical with *Mus rattus*. Dr. Abbott did not meet with it. On the other hand he secured six species in the Andamans and five in the Nicobars, raising the total number known from the islands to twelve.

MUS STOICUS, new species.

Type.—Adult male (skin and skull) No. 111834, U. S. N. M. Collected on Henry Lawrence Island, Andamans, January 9, 1901, by Dr. W. L. Abbott. Orginal number, 820.

Characters.—A large, heavily built rat, bearing a general likeness to *Mus validus* and *Mus palmarum*. Tail considerably shorter than head and body, unicolor. Fur of back moderately spinous. Under parts bluish gray. Mammæ apparently ten. Skull as long as that of *Mus validus*, but very slender. Teeth with normal enamel pattern, the length of upper molar series (alveoli) in adults less than half diastema.

Fur.—Under fur rather scant, much less dense than in *Mus validus* or *Mus norvegicus*, but not peculiar in quality; it is most abundant on flanks and lumbar region. Main body of fur composed of two elements, soft terete hairs and stiff grooved bristles. On middle of back these are about 15 mm. in length, but the hairs usually a little exceed the bristles. Width of bristles on back about 33 mm. On under parts they become much more slender and are scarcely to be distinguished from the terete hairs. The bristles are numerous on middle of back and on sides, but are practically absent from rump and from region in front of shoulders. The back is rather plentifully sprinkled with coarse, terete hairs about 50 mm. in length, but these are not sufficiently numerous to influence the general appearance of the fur. Whiskers coarse, the longest 70 mm. in length. Supraorbital bristle about 10 mm. less.

Colour.—Back a coarse grizzle of black and dull ochraceous buff (distinctly darker than Ridgway's Pl. v, fig. 10), the latter element in excess. The effect is similar to the general color of *Mus validus*, but considerably more yellow. The longer hairs are strongly lustrous, so that in certain lights the fur has a noticeable steely gloss. This sheen is very conspicuous at sides of shoulders when the skin is viewed from in front. Sides like back but with buff even more predominant. Under parts and inner surface of limbs nearly uniform mouse gray (paler than that of Ridgway). This colour is due to the combined effect of the drab under fur and whitish hair tips. It extends entirely around upper lip and spreads over cheeks, where, however, it becomes mixed with ochraceous buff. Eye surrounded by a very faintly indicated dark ring. Whiskers black. Ears and tail uniform dull dark brown throughout. Feet sprinkled with fine whitish hairs, these nowhere abundant enough to conceal the light brown skin.

Tail.—The tail is rather inconspicuously annulated—that is, the boundaries of the scales are less sharply defined than in most rats of the same size. At middle there are about ten rings to the centimetre. At first sight the tail appears to be naked, but on close inspection it is seen to be beset with fine appressed hairs 1 to 2 mm. in length, two or three of which spring from the base of each scale.

Mammæ.—In the single adult female collected one pectoral and three inguinal mammæ are plainly visible on each side. The skin is in bad condition in the region which the anterior pair of pectoral mammæ would occupy if present. On the label Dr. Abbott has written "mammæ apparently ten."

Feet.—The feet show no peculiarities of form or structure. Soles naked, with six well-developed tubercles.

Ears.—The ears are moderately large, their height from crown exactly equal to distance between eye and tip of muzzle. In form they are not peculiar. Both surfaces are naked, except for a fine, close pubescence.

Skull.—The skull of *Mus stoicus* differs conspicuously from that of *Mus validus*, *Mus vociferans*, or *Mus bowersi* in its much lighter structure and more slender form. Viewed from above it does not differ widely from the skull of *Mus vociferans*, except that it is more narrow throughout, a difference more noticeable in rostrum and braincase than in the zygomatic region. Supraorbital ridges about as in *Mus vociferans*. The plate of the maxillary forming outer wall of antorbital foramen is as broad as in *Mus validus*, but the foramen is widely open below, as in *Mus vociferans*. These characters are very apparent in this view of the skull. Viewed from the side the skull closely resembles that of *Mus vociferans*, except for the peculiarities already mentioned Zygomata much more slender than in the allied species. Viewed from beneath the skull shows its most striking characters. The floor of the braincase is essentially like that of *Mus vociferans*, though the audital bullæ are distinctly larger than in the mainland animal. In form the bullæ do not differ very materially from those of *Mus vociferans*, though they are somewhat more

inflated anteriorly. Palate and rostrum very unlike those of any of the allied species, the differences due to the combined reduction in size of the teeth and elongation of the rostrum. The length of toothrow is contained fully twice in length of diastema, instead of about once and a half, as in *Mus vociferans* and *Mus validus*. The incisive foramina share in the elongation of the rostrum to such an extent that they are much longer than the toothrow instead of distinctly shorter. Except that it shares in the general slender form of the skull, the mandible shows no characters of importance.

Teeth.—The teeth differ from those of *Mus vociferans* in size only, as the enamel pattern of the two species is similar throughout.

Measurements.—External measurements of type: Total length, 442 mm.; head and body, 249; tail, 193; hind foot, 47; ear from meatus, 24; ear from crown, 20; width of ear, 16. Average of ten adults from the type locality: Total length, 437; head and body, 241; tail, 198; hind foot, 48; hind foot without claws, 46.

Cranial measurements of largest specimen: Greatest length, 55·4 mm.; basal length, 50; basilar length, 47; palatal length, 28; least width of palate between anterior molars, 6; diastema, 18; length of incisive foramen, 10·6; combined breadth of incisive foramina, 3·8; length of nasals, 22; combined breadth of nasals, 5·4; zygomatic breadth, 25; interorbital breadth, 9; breadth of braincase above roots of zygomata, 18; mastoid breadth, 19; occipital depth at front of basioccipital, 14·6; fronto-palatal depth at posterior extremity of nasals, 13; least depth of rostrum immediately behind incisors, 9·8; mandible, 31; maxillary toothrow (alveoli), 8·2; width of front upper molar, 2·4; mandibular toothrow (alveoli), 8·4.

Specimens examined.—Eighteen, all from the type locality.

Remarks.—In general appearance *Mus stoicus* resembles *Mus validus*, but the skull is much more slender. It is, however, in no way distantly related to the large rats of the Malay Peninsula.

Dr. Abbott writes as follows of the rats of Henry Lawrence Island (*Mus stoicus* and *Mus flebilis*):—

> Trapped in the dense jungle with which the island is covered. Note that in this lot there are two distinct species: one large with tail shorter than head and body [*M. stoicus*], and one smaller with tail longer than head and body [*M. flebilis*]. The tail is more hairy in the smaller species. Both were caught in the same places, on the west side of the island on Kwantung Straits, at two localities about two miles apart. The smaller one squeals piteously when caught in a trap, but the larger is silent.

MUS TACITURNUS, new species.

Type.—Adult male (skin and skull), No. 111828, U. S. N. M. Collected on South Andaman Island, Andamans, January 16, 1901, by Dr. W. L. Abbott. Original number, 854.

Characters.—Slightly larger than *Mus stoicus*, and colour both above and below more tinged with yellow.

Colour.—Back and sides a coarse grizzle of black and bright ochraceous buff (distinctly more yellow than Ridgway's, Pl. v, fig. 10), the latter very conspicuously in excess. Under parts paler than in *Mus stoicus*, though the elements of the colour are essentially the same, the difference due to the more extensive whitish hair tips, and faintly lighter under fur. Colour otherwise as in *Mus stoicus*.

Measurements.—External measurements of type: Total length, 494 mm.; head and body, 266; tail, 228; hind foot, 53; ear from meatus, 24; ear from crown, 21; width of ear, 16·4. An adult female measures: Total length, 446; head and body, 237; tail, 209; hind foot, 48.

Specimens examined.—Seven, all from the type locality.

Remarks.—This species is very closely allied to *Mus stoicus*, but is nevertheless easily distinguishable on comparison. It is probably the rat recorded by Blanford as "a variety of *Mus bowersi*, or a closely allied form."[1] *Mus bowersi* differs, however, from all of the rats known to occur on the Andamans by its distinctly bicoloured tail.

MUS PLEBILIS, new species.

Type.—Adult female (skin and skull), No. 111841, U. S. N. M. Collected on Henry Lawrence Island, Andamans, January 10, 1901, by Dr. W. L. Abbott. Original number, 827.

Characters.—A large member of the *Mus rattus* group. Size about as in *Mus pannosus* of the Butang Island, but tail always considerably longer than head and body. Fur thickly sprinkled with weak spines, its colour paler and more yellow than in *Mus pannosus* and closely resembling that of *Mus stoicus*. Skull much like that of *Mus pannosus*, but with larger audital bullæ, more prominent supraorbital ridges, and smaller teeth.

Fur.—The fur is like that of *Mus stoicus*, except that the bristles are a little less stiff and the under fur is somewhat more woolly. The long terete hairs on the back are less noticeable than in the larger animal. In abundance and distribution the bristles are essentially the same in the two species.

Colour.—Back and sides essentially as in *Mus stoicus*, except that the light element of the grizzle is paler, almost exactly matching the ochraceous buff of Ridgway, and a little more noticeably in excess of the dark. The fur is nearly destitute of the lustrous sheen so noticeable in the larger animal. Muzzle and outer surface of front legs washed with broccoli-brown. Under parts and inner surface of limbs cream buff. Under fur light drab. Ears and tail dull brown throughout. The colour of the under parts completely encircles the mouth, but scarcely spreads upward on cheeks. Feet more thickly haired than in *Mus stoicus*, cream buff heavily clouded with drab. Whiskers black. A faintly indicated dark eye-ring.

Tail.—The annulation of the tail is similar to that in *Mus stoicus*, except that the rings and scales are more sharply defined. At middle there are ten rings to the centimetre. The hairs, though not conspicuous, are longer and more abundant than in the larger animal.

[1] The Fauna of British India, Mamm., 1891, p. 410.

Mammæ.—There are 10 mammæ, 2 pectoral and 3 inguinal on each side.

Feet.—The feet are in no way peculiar. Soles naked, with 6 well-developed tubercles.

Ears.—The ears are essentially as in *Mus stoicus*.

Skull.—The skull of *Mus flebilis* resembles that of the larger members of the *Mus rattus* group, but is readily distinguishable by its larger audital bullæ and more strongly developed supraorbital ridges. In the latter character it suggests *Mus surifer* and its allies. As compared with the skull of *Mus pannosus* that of *Mus flebilis* differs, aside from the characters just mentioned, in slightly smaller size, relatively shorter, more robust rostrum, narrower outer wall of antorbital foramen, more abruptly flaring zygomata, and longer incisive foramina. The mandible is essentially the same in both species. Its much greater size (greatest length about 45 mm. instead of about 40) immediately distinguishes the skull of *Mus flebilis* from that of *Mus rattus* and *Mus alexandrinus*.

Teeth.—The teeth exactly resemble those of *Mus alexandrinus* and *Mus rattus* in form and in pattern of enamel folding, but are conspicuously larger. In the latter character they are slightly surpassed by those of *Mus pannosus*.

Measurements.—External measurements of type: Total length, 452 mm.; head and body, 210; tail, 242; hind foot, 41·4; ear from meatus, 21; ear from crown, 16; width of ear, 15. Average of six adults from the type locality; Total length, 441 (417—460); head and body, 203; tail, 238 (222—240); hind foot, 41·8 (41—44); hind foot without claws, 40 (39—42).

Cranial measurements of type: Greatest length, 45 mm.; basal length, 40; basilar length, 37; palatal length, 21·4; least width of palate between anterior molars, 5; diastema, 13; length of incisive foramen, 8·8; combined breadth of incisive foramina, 3; length of nasals, 18; combined breadth of nasals, 4·8; zygomatic breadth, 19·8; interorbital breadth, 6; mastoid breadth, 18; breadth of braincase above roots of zygomata, 16; depth of braincase at anterior border of basioccipital, 11·4; fronto-palatal depth at posterior extremity of nasals, 11; least depth of rostrum immediately behind incisors, 8·6; mandible, 26; maxillary toothrow (alveoli), 7·4; width of front upper molar, 2·2; mandibular toothrow (alveoli), 7·4.

Specimens examined.—Seven, all from the type locality.

Remarks.—These rats were trapped, together with the specimens of *Mus stoicus*, in the dense jungle with which Henry Lawrence Island is covered. The types of both species were taken on the south side of the island on the shore of Kwantung Straits. Other specimens were secured at a point about 2 miles farther north. The names which I have used for the two species were suggested by Dr. Abbott's note that the smaller animal squeals piteously when caught, while the larger is silent.

MUS PULLIVENTER, new species.

Type.—Adult male (skin and skull), No. 111790, U. S. N. M. Collected on Great Nicobar Island, Nicobars, March 12, 1901, by Dr. W. L. Abbott. Original number, 927.

Characters.—A rat of somewhat less bulk than *Mus flebilis*, but with smaller hind foot and shorter tail, the length of latter considerably less than that of head and body. Fur densely spinous, but the bristles even more slender than in *Mus flebilis*. Colour brown throughout, the belly not distinctly paler than sides, skull slender, with dorsal profile nearly straight from middle of braincase to tip of nasals. Teeth small, normal. Mammæ 8.

Fur.—The fur is fine and close in texture, but on examination it is seen to be densely beset with very slender spines. These spines are rather more numerous than in *Mus flebilis*, but their width is distinctly less than in the Andaman species. The fur of the back is sprinkled with a few long terete hairs, but these are only evident on close inspection. On the belly the bristles are reduced to mere rudiments scarcely to be distinguished from the oridinary hairs.

Colour.—Back and sides a fine grizzle of black and russet, the two colours in about equal parts on the back, the russet in excess on the sides and outer surface of legs, where it is faintly washed with wood brown. Belly and inner side of legs drab, a little tinged with russet. Chin, middle of throat, axillary region and area surrounding nipples white; this colour perhaps abnormal. Cheeks and muzzle like belly, but slightly more washed with russet. Top of head dark, grizzled hair brown. Feet scantily sprinkled with brownish and whitish hairs. Ears and tail uniform dark brown.

Tail.—The annulation of the tail is indistinct and somewhat irregular. At middle there are eleven or twelve rings to the centimetre. From the base of each scale spring two or three stiff hairs, the length of which scarcely exceeds the width of the rings. The hairs are very inconspicuous, and more apparent to the touch than to sight. At extreme tip the skin of the tail is whitish, but this character may readily be abnormal.

Mammæ.—There are 8 mammæ, 1 pectoral pair and 3 inguinal pairs.

Feet.—Relatively to the size of the animal, the feet are unusually small and weak. Soles with the six pads rather indistinct in the dry specimen.

Ears.—The ears are in no way peculiar. In length they are about equal to distance between eye and muzzle. They are naked, except for a fine, almost microscopic pubescence.

Skull.—The skull of *Mus pulliventer* differs conspicuously from that of the other Andaman and Nicobar rats in its flat dorsal outline. When viewed from the side the profile is nearly straight from front of nasals to middle of braincase. The palatal profile shares the same peculiarity but to a less degree. Except for its flatness the skull closely resembles that of *Mus rattus*. The rostrum is, however, more elongate, and the audital bullæ are smaller. When viewed from above, the plate forming outer wall of antorbital foramen scarcely extends in front of line of outer curve of zygomatic arch, while in *Mus rattus* it projects conspicuously in front of this line. Viewed from the side this plate is narrower and less concave than in *Mus rattus*, and its front edge is nearly straight.

Teeth.—The teeth of the type are somewhat worn, but they appear to be in every way similar to those of *Mus rattus*.

Measurements.—External measurements of type: Total length, 387 mm.; head and body, 202; tail, 185; hind foot, 35; ear from meatus, 19; ear from crown, 14; width of ear, 15.

Cranial measurements of type: Greatest length, 44 mm.; basal length, 40; basilar length, 38; palatal length, 22·6; least width of palate between anterior molars, 4·6; diastema, 12·6; length of incisive foramen, 7·8; combined breadth of incisive foramina, 4; length of nasals, 16; combined breadth of nasals, 4·6; zygomatic breadth, 21·8; interorbital breadth, 6·4; breadth of braincase above roots of zygomata, 16·2; mastoid breadth, 16·8; occipital depth at front of basioccipital, 13; fronto-palatal depth at posterior extremity of nasals, 9·6; least depth of rostrum immediately behind incisors, 7·6; mandible, 25; maxillary toothrow (alveoli), 7·8; width of front upper molar, 2; mandibular toothrow (alveoli), 6·8.

Specimens examined.—One, the type.

Remarks.—*Mus pulliventer* differs so conspicuously from its allies of the *Mus rattus* group that it needs no special comparison with any of them. The flattened skull and dark colour of the under parts are sharply diagnostic.

MUS ATRATUS, new species.

Type.—Adult female (skin and skull), U.S.N.M. No. 111868. Collected on Barren Island, Andamans, 7th January 1901, by Dr. W. L. Abbott. Original number, 818.

Characters.—Size and proportions as in *Mus andamanensis*, but fur spineless. Colour of under parts yellowish brown, back strongly suffused with black (often entirely black). Skull shorter, broader, and more robust than that of *Mus andamanensis*, the audital bullæ smaller. Teeth as in *Mus andamanensis* and *Mus rattus*, but much larger.

Fur.—The fur consists of the usual elements. The spines, however, are so reduced in diameter as to appear like ordinary hairs unless examined with a lens.

Colour.—Upper parts almost exactly as in *Mus flebilis* and *Mus andamanensis* except that the fur is strongly suffused with a slaty black like that of *Mus rattus*. In two of the eight specimens the brown remains in excess of the black, but in the other (including the type) the latter predominates, nearly or quite to the exclusion of the brown. Belly yellowish brown (rather paler and less yellow than the ochraceous buff of Ridgway) in the brown-backed specimens, slaty in the others. Only one skin, however, lacks a distinct brownish wash over the slaty under parts. Feet sprinkled with whitish or slaty hairs. Ears and tail uniform dark brown.

Tail.—The tail is distinctly annulated. At middle there are about ten rings to the centimetre. The boundaries of the scales are sharply defined, much more so than in *Mus stoicus* and *Mus flebilis*. From the base of each scale grow three hairs which in length are equal to the width of two rings. Though better developed than in the larger Andaman rats, these hairs do not conceal the annulation of the tail.

Feet.—The feet are in no way peculiar. Soles naked, 6-tuberculate.

Ears.—The ears are of moderate length, about equal to distance between eye and nostril. They are naked except for a fine, inconspicuous pubescence.

Skull.—The skull is much like that of *Mus rattus*, except that the frontal profile is more strongly concave, the audital bullæ are smaller, and the region between and including anterior zygomatic roots is broader and more heavily built. The incisive foramina extend back nearly to level of middle of first molar.

Teeth.—The teeth are similar to those of *Mus rattus*, but very much larger.

Measurements.—External measurements of type: Total length, 342 mm.; head and body, 160; tail, 182; hind foot, 36; ear from meatus, 18; ear from crown, 14; width of ear, 13. Average of seven adults from the type locality: Total length, 353 (342—372); head and body, 175 (160—195); tail 181 (173—190); hind foot, 39·7 (39—41·6); hind foot without claws, 37·3 (36—39).

Specimens examined.—Eight, all from the type locality.

Remarks.—In the appendix to Mouat's Adventures and Researches among the Andaman Islanders, Blyth remarks that—

lately the Rev. C. S. P. Parish, the able botanist and chaplain of Moulmein, observed on Barren Island the half-devoured remains of some rat, which it is not likely had been carried by a bird of prey from the nearest land, 66 miles distant. As the carcase was much mutilated, Mr. Parish did not think it worth while to preserve it in spirits, though had he done so, the identification of the species, with the peculiar spiny-coated *Mus andamanensis*, would probably have been easy.

This is the only published allusion to the Barren Island rat that I have seen.

Dr. Abbott found the animal excessively abundant in favourable localities among the patches of grass and scrubby jungle with which the volcanic ash and scoria of Barren Island are covered. He noted nothing peculiar in its habits.

MUS BURRUS, new species.

Type.—Adult female (skin and skull), No. 111811, U. S. N. M. Collected on Trinkut Island, Nicobars, February 5, 1901, by Dr. W. L. Abbott. Original number, 881.

Characters.—Size and general appearance much as in *Mus pulliventer*, but tail shorter, back less distinctly grizzled, and belly light buff. Fur spineless. Mammæ 10. Skull much like that of *Mus norvegicus*.

Fur.—The fur is like that of *Mus atratus*, that is, the spines are so reduced in diameter that on casual examination they do not appear different from the surrounding hairs. They are, however, slightly larger than in *Mus atratus*.

Colour.—Back and sides a fine grizzle of black and russet, the colours nearly as in *Mus pulliventer*, but grizzle less distinct. The two elements are in about equal parts on back, but on sides the russet is considerably in excess of the black, and at the same time slightly obscured by the drab gray of the under fur. Under parts and inner side of legs cream-buff to base of hairs. Crown and forehead like back, but a little tinged with gray; cheeks washed with drab. Feet scantily clothed with whitish and brownish hairs. Ears and tail uniform dark brown.

Tail.—The tail is coarsely and distinctly annulated. At middle there are about eight rings to the centimetre. To each scale there are from one to three stiff hairs varying in length from 1 to 1½ millimetres.

Mammæ.—There are 10 mammæ, 4 pectoral and 6 inguinal.

Feet.—The feet are in no way peculiar. Soles naked, with the usual six tubercles.

Ears.—Ears as in the related species.

Skull.—In a general way the skull of *Mus burrus* rather closely resembles that of *Mus norvegicus*. It is slightly smaller than that of the house rat, however, the dorsal profile is less convex, the rostrum shorter and broader, the interorbital region less constricted, the zygomatic arches less flaring, the braincase broader and less elevated, the interpterygoid space wider, and the audital bullæ slightly different in form and more resembling those of *Mus rattus*. Nasal bones gradually narrowed from front to back, their outer margins nearly straight except for the usual slight downward curve. Posterior portion of mandible somewhat deeper than in *Mus norvegicus*.

Teeth.—The teeth are relatively somewhat larger than in the house rat, but the enamel pattern shows no peculiarities.

Measurements.—External measurements of type: Total length, 430 mm.; head and body, 215; tail, 215; hind foot, 43; ear from meatus, 24; ear from crown, 18; width of ear, 17. Average of ten specimens from the type locality: Total length, 407 (385—430); head and body, 205 (195—225); tail vertebræ, 202 (193—215); hind foot, 42·5 (42—43); hind foot, without claws, 40·6 (40—41·4).

Cranial measurements of type: Greatest length, 47·6 mm.; basal length, 43; basilar length, 40; palatal length, 23·4; least width of palate between anterior molars, 5·4; diastema, 14; length of incisive foramen, 8·4; combined breadth of incisive foramina, 2·8; length of nasals, 17·4; combined breadth of nasals, 5; zygomatic breadth, 22; interorbital breadth, 8; mastoid breadth, 17·4; breadth of braincase above roots of zygomata, 17; depth of braincase at anterior border of basioccipital, 12·2; fronto-palatal depth at posterior extremity of nasals, 11·8; least depth of rostrum immediately behind incisors, 9; mandible, 28; maxillary toothrow (alveoli), 7·6; mandibular toothrow (alveoli) 7·4.

Specimens examined.—Twelve, all from Trinkut Island, Nicobars.

Remarks.—In external characters, the series of 12 skins show practically no variation. The younger specimens are less clear buff beneath, but with this exception, the colour is perfectly constant. The skulls are likewise very uniform. Here the variation is confined to the slight differences in size usually correlated with greater or less age. The nearly straight lateral outline of the nasal is an unvarying characteristic of the entire series of skulls.

Whether *Mus burrus* is a direct descendant of the house rat cannot be decided, but its relationship with this wandering species is not remote. The dark colour and less spreading zygomata are alone sufficient to distinguish the Nicobarian animal, however, from any of the very numerous specimens of *Mus norvegicus* that have come under my observation.

MUS BURRULUS, new species.

Type.—Adult male (skin and skull), No. 111817, U. S. N. M. Collected on Car Nicobar, January 25, 1901, by Dr. W. L. Abbott. Original number, 865.

Characters.—Similar to *Mus burrus*, but much smaller; hind foot, 38; greatest length of skull, 41.

Colour.—The colour and other external characters so closely resemble those of *Mus burrus* as to need no detailed description.

Skull.—The skull though differing from that of *Mus burrus* chiefly in its smaller size is also distinguishable by its much more slender rostrum, a character which is in no way due to differences of age. The outer margin of the nasal is straight, as in the larger animal.

Teeth.—The teeth are similar to those of *Mus burrus*, though perceptibly smaller throughout.

Measurements.—External measurements of type: Total length, 357 mm.; head and body, 174; tail, 183; hind foot, 38; ear from meatus, 19; ear from crown, 15; width of ear, 15.

Cranial measurements of type: Greatest length, 41 mm.; basal length, 37·4; basilar length, 34·8; length of nasals, 15; combined breadth of nasals, 4; zygomatic breadth, 19·8; interorbital constriction, 6·8; maxillary toothrow (alveoli), 7.

Specimens examined.—One, the type.

Remarks.—Although represented by only one specimen, the rat of isolated Car Nicobar is evidently distinct from those of the larger southern islands. That its small size is not due to immaturity is shown by the fact that the type is fully adult, with distinctly worn teeth, a much older individual than several of the specimens of *Mus burrus*.

MUS BURRESCENS, new species.

Type.—Adult female (skin and skull), No. 111789, U.S.N.M. Collection on Great Nicobar Island, March 12, 1901, by Dr. W. L. Abbott. Original number, 926.

Characters.—Externally similar to *Mus burrus*, but red of upper parts a little more intense. Skull distinguishable from that of the related species by the form of the nasal bones, which are strongly contracted a little in front of middle.

Colour.—The upper parts are slightly more red than in *Mus burrus*, and the grizzle produced by the black hair-tips is less coarse, differences easily appreciable on comparison. Otherwise the two animals are entirely similar so far as external characters are concerned.

Skull.—The skull is like that of *Mus burrus*, except in the form of the nasal bones. The outer margin of each nasal, straight or nearly so in *Mus burrus* is here abruptly concave at middle. The result is a spatulate outline of the two nasals together, quite different from the regular cuneate form characteristic of *Mus burrus* and *Mus burrulus*.

Teeth.—Teeth as in *Mus burrus*.

Measurements.—External measurements of type: Total length, 408 mm.; head and body, 206; tail, 202; hind foot, 40; ear from meatus, 21; ear from crown 16; width of ear, 15.

Cranial measurements of type: Greatest length, 44·6 mm.; basal length, 40; basilar length, 38; length of nasals, 16; combined breadth of nasals, 56; zygomatic breadth, 21·8; interorbital constriction, 6·8; maxillary tooth-row (alveoli), 7·4.

Specimens examined.—Two, both from Great Nicobar Island. A specimen from Little Nicobar may represent this species, but it is too young for positive determination.

Remarks.—The cranial character by which the species is distinguished from its allies though trivial is apparently of perfect constancy. In none of the 12 skulls of *Mus burrus* is there any approach to the spatulate form of nasals.

Genus TUPAIA RAFFLES.

TUPAIA NICOBARICA SURDA, new sub-species.

Type.—Adult male (skin and skull), No. 111757, U.S.N.M. Collected on Little Nicobar Island, March 1, 1901, by Dr. W. L. Abbott. Original number, 899.

Characters.—Similar to *Tupaia nicobarica nicobarica*, but light areas of pelage much less yellow and less contrasted with dark areas.

Colour.—Type: Entire under parts, front and hind legs, head, neck, shoulder and anterior half of back wood brown, tinged with drab posteriorly and on upper parts, with buff elsewhere. An indefinite dark shade on forehead and another on nape, the latter sending back a faint median streak and two still more indistinct lateral shades. On under parts and inner surface of legs the hairs are dull and lustreless and the colour clear, but on upper parts and outer surface of legs the glossy texture of the hairs, together with a very fine annulation (particularly in mantle), imparts a faintly grizzled aspect. Posterior half of back very dark brown, almost black, with here and there a hair which shows a trace of wood brown annulation. Tail deep burnt umber throughout, except at extreme base, where it shades abruptly to black above and to the drab wood brown of belly below.

In other specimens the dark dorsal area is lightened to prouts brown (of a shade considerably darker than Ridgway's Pl. III, fig. 11), and the tail to a pale burnt umber glossed with russet. In most cases, however, the colour is like that of the type, or nearly so.

Skull and Teeth.—I cannot find that the skull and teeth differ from those of *Tupaia nicobarica nicobarica*.

Measurements.—External measurements of type: Total length, 410 mm.; head and body, 190; tail vertebræ, 220; hind foot, 48; ear from meatus, 16; ear from crown, 7; width of ear, 13·4. Average of 10 specimens from the type locality: Total length, 388 (370—410); head and body, 176 (170—190) tail, 212 (200—220); hind foot, 47·5 (47—49); hind foot without claws, 44·4 (43·4—45).

Cranial measurements of type: Greatest length, 54 mm.; basal length, 47; basilar length, 46; median palatal length, 28; length of nasals (about), 18; distance from lachrymal notch to tip of premaxillary, 21·8; diastema, 5; width of palate between anterior molars, 9·6; lachrymal breadth, 18·4; breadth of rostrum at middle of diastema, 7; least interorbital breadth, 17·4; zygomatic breadth, 28; least distance from inion to rim of orbit, 26; occipital depth, 12·4; depth from middle of parietal to lower surface of audital bulla, 18; depth of rostrum at base of nasals, 8; depth of rostrum at middle of diastema, 5·8; mandible, 37; maxillary toothrow behind diastema, 19; mandibular toothrow (behind diastema), 17.

Specimens examined.—Seventeen, all from Little Nicobar Island.

Remarks.—Typical individuals representing the majority of specimens are instantly recognizable, as compared with similar material from Great Nicobar by the dull, relatively lustreless, and ill-contrasted colour of the mantle and thighs, as well as by the less yellow under parts. The mantle is less often outlined by a dark shade at the side than in the typical form. Occasionally a specimen may be found which cannot be certainly referred to either race, but taking the series as a whole the characters are readily appreciable.

Genus CROCIDURA WAGLER.

CROCIDURA NICOBARICA, new species.

Type.—Adult female (in alcohol), No. 111788, U.S.N.M. Collected on Great Nicobar Island, March 15, 1901, by Dr. W. L. Abbott. Original number, 931.

Characters.—Largest known oriental member of the sub-genus *Crocidura*; total length, about 210 mm. General colour, sooty brown.

Fur.—The fur is dense and velvety, the hairs on middle of back about 4 mm. in length, with a few longer ones interspersed.

Colour.—Dorsal surface prouts brown (slightly darker than Ridgway's Pl. III, fig. 11), somewhat grizzled in certain lights by the silvery gray reflections from the hairs. Sides, under parts, and both surfaces of legs broccoli brown, slightly washed with wood brown. On middle of chest there is an elongate patch of gray, very nearly Ridgway's gray No. 8, but faintly washed with broccoli brown. Ears, tail, and feet an indefinite fleshy brownish, the thin sprinkling of minute hairs not affecting the colour.

Tail.—The tail is so minutely and indistinctly annulated that, at first sight, its surface appears to be smooth. On close inspection the rings become visible, about thirty to the centimetre at middle. Numerous dark hairs with silvery reflections spring from the border of each ring. In length they slightly exceed the width of the rings. These hairs are invisible without the aid of a lens, except when seen in profile against a white surface, or when certain lights cause them to appear as a silvery pubescent sheen. With the short hairs are sparsely intermingled cilia, 10 mm. in length.

Mammæ.—Apparently there are two inguinal mammæ on each side, but the specimen is sufficiently mutilated to make the count uncertain.

Feet.—Both soles and palms are naked and 6-tuberculate. The surface between the tubercles is finely reticulated.

Skull.—The skull exactly resembles that of Kashmir specimens of *Crocidura* (*Pachyura*) "*murina*," except that the size is a trifle less. So far as can be determined from a single specimen, the skull of the fully-developed adult Nicobar shrew is less angular than that of *C.* "*murina*" of the same age.

Teeth.—The teeth resemble those of *Crocidura* "*murina*." The first unicuspid is, however, distinctly smaller than in the Kashmir animal, and the two succeeding teeth are faintly larger. As a result there is less contrast in the size of the unicuspids, though the relative proportions remain the same—that is, the first is much larger than the third, which in turn exceeds the second. Of the fourth unicuspid, well developed in *C.* "*murina*," there is no trace.

Measurements.—External measurements of type: Total length, 210 mm.; head and body, 120; tail, 90; 1 hind foot, 24[1]; ear from meatus, 11; ear from crown, 5; width of ear, 11.

Cranial measurements of type: Greatest length (exclusive of incisors), 27 mm.; basal length, 26; basilar length, 24; palatal length, 11·8; width of palate between middle molars, 3·6; mastoid breadth, 11·6; lachrymal breadth, 6·2; mandible (without incisor), 15; maxillary toothrow, 12·8; mandibular toothrow, 12.

Specimens examined.—One, the type.

Remarks.—This species is readily distinguishable among the hitherto known oriental members of the sub-genus *Crocidura* by its very large size, a character in which it is approached by its representative in the Andaman Islands only. Some of the larger African species are, however, of about the same measurements.

CROCIDURA ANDAMANENSIS, new species.

Type.—Adult male (skin and skull), No. 111825, U.S.N.M. Collected at MacPherson Strait, South Andaman Island, January 16, 1901, by Dr. W. L. Abbott. Original number, 851.

Characters.—In size nearly equal to *Crocidura nicobarica*; general colour, bluish gray.

Fur.—The fur is somewhat longer and less dense than in the type of *C. nicobarica*, that on middle of back about 8 mm. in length. This character is probably individual.

Colour.—Entire body and head gray (very nearly Ridgway's No. 8), everywhere washed with broccoli brown. This wash is most noticeable on dorsal surface, where the effect of the two colours is drab gray. On under parts the brown is distinctly visible in some lights, scarcely so in others. Feet, yellowish brown; tail and ears, dark brown.

Skull.—The skull is in every way similar to that of *Crocidura nicobarica*, except that it is somewhat smaller.

Teeth.—In general the teeth of *Crocidura andamanensis* closely resemble those of *C. nicobarica*. The unicuspids are, however, actually as well as

[1] Slightly damaged.

relatively larger, and the contrast in size between the second and the other two is more marked.

Measurements.—External measurements of type: Total length, 200 mm.; head and body, 114; tail, 86; hind foot, 26.

Cranial measurements of type: Greatest length (exclusive of incisors), 25·6 mm.; basal length, 24·8; basilar length, 22; palatal length, 11; width of palate between middle molars, 3·2; mastoid breadth, 11; lachrymal breadth, 6; mandible (without incisor), 15; maxillary toothrow, 12; mandibular toothrow, 11.

Specimens examined.—One, the type.

Remarks.—This species, though closely related to *Crocidura nicobarica*, appears to be well characterized by its smaller size, larger unicuspid teeth, and distinctly gray colour.

Genus PIPISTRELLUS KAUP.

PIPISTRELLUS CAMORTÆ, new species.

1861. ? *Vesperugo nicobaricus* FITZINGER, Sitzungsber. Math.-Naturwissensch. Cl. Kais. Akad. Wissensch., Wien, XLII (1860), p. 390 (*nomen nudum*).

1869. ? *Vesperugo tenuis* ZELEBOR, Reise der österreichischen Fregatte Novara, Zool., I (Wribelthiere), 1, Mamm., p. 16 (Nicobars).

1876. ? *Vesperugo abramus* DOBSON, Monogr. Asiat. Chiropt., p. 212 (Nicobars).

Type.—Adult male (in alcohol) No. 111897, U.S.N.M. Collected on Kamorta Island, Nicobar Islands, February 12, 1901, by Dr. W. L. Abbott.

Characters.—Externally much like Javan specimens of *Pipistrellus abramus*, but slightly smaller, the ears shorter and broader, and penis considerably shorter than tibia. Skull with broader rostrum and smaller audital bullæ. Teeth as in *P. abramus*, the inner upper incisor bifid.

Ears.—The ear is moderately long; laid forward it extends about to nostril. Anterior border nearly straight from base to broadly rounded-off tip. Posterior border straight from just below tip to about middle, then strongly convex to notch isolating low but well-developed antitragus. Tragus short and broad, its greatest width nearly equal to length of anterior border. Posterior outline evenly convex except where interrupted by a small but very distinct lobe near base. Anterior-border slightly concave.

Feet.—The foot is smaller than in *Pipistrellus abramus*. Calcar fading insensibly into uropatagium, but provided with a very distinct keel, considerably larger than that of *P. abramus*.

Membranes.—The membranes are thin and delicate, but do not show any peculiarities of importance. They are naked except close to body. Wing from base of outer toe.

Penis.—The penis, though much larger than in *Pipistrellus pipistrellus* and *P. kuhli*, lacks the enormous development characteristic of *P. abramus*. Its length equals about two-thirds that of tibia.

Colour.—After several months' immersion in alcohol the colour is a uniform dark brown above (the exact shade intermediate between the bistre and burnt umber of Ridgway), and a lighter brown (between wood brown and cinnamon) beneath. Fur everywhere blackish at base, ears and membranes blackish brown, the wing faintly edged with white.

Skull and Teeth.—The skull resembles that of *Pipistrellus abramus* in general size and form, but the rostral portion is very noticeably broader and shorter. Audital bullæ smaller than in *P. abramus*, but not different in form.

Teeth as in *Pipistrellus abramus*, but more robust.

Measurements.—External measurement of type: Total length, 78 mm. (80);[1] head and body, 48 (48); tail, 30 (32); tibia, 12 (11·6); foot, 6·8 (6·6); penis, 9; forearm, 31·6 (32); thumb, 5 (5·4); second digit, 31 (30); third digit, 52 (55); fourth digit, 47 (51); fifth digit, 40 (42); ear from meatus, 11·4 (12); ear from crown, 9 (9); width of ear, 10·6 (10·6); tragus (anterior border), 3 (4).

Cranial measurements of type: Greatest length, 12·6 mm.; basal length, 12; basilar length, 9; zygomatic breadth, 9; least interorbital breadth, 3·6; greatest length of braincase, 7·8; greatest breadth of braincase above roots of zygomata, 7; mandible, 10; maxillary toothrow (exclusive of incisors), 5; mandibular toothrow (exclusive of incisors), 5.

Specimens examined.—Two (in alcohol), both from the type locality.

Remarks.—*Pipistrellus camortæ* appears to be a well-marked species related more closely to *P. abramus* than to any other. It is undoubtedly the bat which Dobson recorded from the Nicobars in the list of specimens of *Vesperugo abramus* in the collection of the East Indian Museum. Probably it is also the species named *Vesperugo nicobaricus* by Fitzinger, but afterwards regarded by Zelebor as *V. tenuis*.

Genus HIPPOSIDEROS Leach.

Hipposideros nicobarulæ, new species.

1876. *Phyllorhina bicolor* Dobson, Monogr. Asiat. Chiropt., p. 70 (Nicobars).

Type.—Adult male (in alcohol), No. 111874, U.S.N.M. Collected on Little Nicobar Island, March 2, 1901, by Dr. W. L. Abbott.

Characters.—Closely related to *Hipposideros bicolor* and *H. fulvus*, with which it agrees in all general external features. Size much less than that of *H. fulva* and slightly greater than in *H. bicolor*. Terminal erect portion of noseleaf broader than in *H. bicolor*; skull more inflated in front of orbits and with broader palate and interpterygoid region.

Noseleaf.—The noseleaf is slightly larger than that of *Hipposideros bicolor*, but not essentially different in form. The posterior erect portion is slightly broader, but the difference may be in part sexual, as the only specimen of *H. bicolor* at hand is a female.

Colour.—Two distinct colour phases occur. In the dark phase, represented by the type, the hairs of the back are seal brown through terminal third, light

[1] Measurements in parenthesis are those of an adult female from the type locality.

smoke gray basally in strong contrast. On under parts the fur is broccoli brown throughout, the hairs slightly darker at tip. In the light phase the whole body is mars brown, the hairs everywhere light gray at base, but this feature most noticeable on back. Ears and membranes blackish. This description is based on specimens that have been immersed in alcohol for about six months.

Skull and Teeth.—The skull is so much smaller than that of *Hipposideros fulvus* that it needs no special comparison. From the skull of *H. bicolor* it differs in slightly larger size and in several details of structure. The width of the constricted portion of the palate is considerably greater than in the allied species, and the interpterygoid space is wider in proportion to its length. Antorbital region more inflated than in either of the allied species.

The teeth show no peculiarities of form. They are intermediate in size between those of *Hipposideros bicolor* and *H. fulvus*.

Measurements.—For external measurements see table below.

Cranial measurements of type: Greatest length, 16·4 mm.; basal length, 14; basilar length, 12·8; zygomatic breadth, 8·4; least interorbital breadth, 2·2; mastoid breadth, 9·4; greatest length of braincase, 10; greatest breadth of braincase above roots of zygomata, 7; fronto-palatal depth (at middle of molar series), 3; depth of braincase, 5·8; maxillary toothrow (exclusive of incisor), 5·6; mandible, 10; mandibular toothrow (exclusive of incisors), 6.

Specimens examined.—Twenty-five, all from the type locality.

Remarks.—Though in some respects intermediate between *Hipposideros bicolor* and *H. fulvus*, this species is so readily distinguishable as to need no special comparison.

Table of measurements of Hipposideros nicobarulæ.

Number.	Sex.	Total length.	Tail.	Tibia.	Foot.	Calcar.	Forearm.	Thumb.	Second finger.	Third finger.	Fourth finger.	Fifth finger.	Ear from meatus.	Ear from crown.	Width of ear
		Mm	*Mm*	*Mm*	*Mm*	*Mm*	*Mm*	*Mm*	*Mm*	*Mm*	*Mm*	*Mm*	*Mm*	*Mm*	*Mm*
111871.....	Male.....	78	30	17	7	9	40	5·6	34	64	50	53	18	15·4	17
111872.....	Do.	81	33	17	6·4	10	40	5·4	32	61	51	54	17·4	15	18
111874[1]	Do.	77	31	16	7	9·4	39	5·6	32	63	49	52	19	14·6	17·6
111876	Do.	75	29	16	7	9	39	6	32	66	52	55	18	14	17
111885.....	Do.	75	29	18	6·8	10	40	6	32	65	51	54	19	14	17·4
111895.....	Do.	78	31	17	7	9	39	5·6	33	65	50	54	19	15	17
111875.....	Female.....	83	32	18	6·6	10	41	5·6	33	65	53	55	20	14	18·4
111877.....	Do.	76	27	16	7	9	40	5	32	63	49	53	18·6	15	16
111887.....	Do.	85	34	18	6·8	10	40	6	32	65	52	56	20	15·6	17·4
111888.....	Do.	81	33	18	7	11	41	6·6	35	68	54	56	19	15	18
111894.....	Do.	83	34	18·4	6·6	10	42	6	33	65	52	55	19	15	17·6

Type.

Genus PTEROPUS Brisson.

Pteropus faunulus, new species.

Type.—Adult male (skin and skull), No. 111730, U.S.N.M. Collected on Car Nicobar, January 23, 1901, by Dr. W. L. Abbott. Original number, 864.

[1] Vol. V, Pt. 52. October, 1825. Named in table, Vol. VII, p. 2, 1842.

Characters.—A member of the sub-genus *Spectrum* as defined by Matschie. Size very small (forearm 110 mm.); ears triangular-pointed; colour tawny; the face and back strongly tinged with hair brown; skull and teeth essentially as in *Pteropus lepidus*, but much smaller.

Fur.—The fur of the back is silky in texture and closely appressed, the individual hairs 10—12 mm. in length. On rump, thighs, and interfemoral region it becomes distinctly woolly in texture, though less so than on other parts of the body. It extends on leg to knee, below which there is a sparse sprinkling of hairs along inner surface of tibia. Fur of shoulders, head, neck, and underside of body loose and woolly in texture, therefore appearing much longer than that of back, though the length of the individual hairs is everywhere about the same. On under surface the fur extends about to knee and elbow. Beyond the latter point it is continued as a sparse sprinkling of fine hairs to middle of forearm.

Membranes.—The membranes show few peculiarities worthy of note. The uropatagium is reduced to a mere rim, except along legs, where it is about 12 mm. in width. Between knee and body it is entirely concealed by the fur above, but only partially below. Propatagium naked above, sprinkled with fine hairs below. Wing membranes entirely naked above except for an inconspicuous sprinkling of fine hairs close to body and along forearm. Below they are scantily furred to line joining elbow and knee, also along forearm.

Ears.—The ears are of moderate size, proportionally about as in *Pteropus lepidus*, *P. hypomelanus* or *P. nicobaricus* and smaller than in *P. meduis* from Tenasserim and Lower Siam. In form they are quite distinct from those of any of the related species. Anterior border nearly straight from base to about middle, then after a faint convexity again nearly straight to tip. Extremity very narrowly rounded—less than 1 mm. in width. Posterior border nearly straight from tip to a little above middle, then abruptly convex for a distance of a few millimetres; beyond this, nearly straight to slightly above small but distinct antitragal lobe. At tip the anterior and posterior borders form an angle of about 80°. The convexity of the posterior border is so abrupt as to be almost angular.

Colour.—Back hair brown, considerably darker than Ridgway's Pl. III, Fig. 12, everywhere intermixed with ochraceous buff. Anteriorly the brown is in excess of the buff, but posteriorly the buff becomes more conspicuous until on rump it practically excludes the darker colour. The entire back is sprinkled with silvery whitish hairs which are most conspicuous anteriorly. Mantle, head and entire under parts ochraceous buff, brighter than that of back and strongly tinged with tawny on chest, sides of neck, and middle of breast and belly. Face, cheeks, and chin grizzled hair brown. Ears and membranes blackish.

Skull and Teeth.—The skull and teeth show a remarkable likeness to those of *Pteropus lepidus*, though immediately distinguishable by their much smaller size. The interorbital region is, however, actually broader than in the larger species, and the postorbital processes are more robust. Pterygoids

distinctly convergent posteriorly, imparting to outline of interpterygoid space a distinctly lyrate form. The teeth both above and below agree almost exactly with those of *Pteropus lepidus*, except that the cusps are not as high and the crown is relatively wider between the cusps.

Measurements.—External measurements of type (from well-made skin). Head and body, 170 mm.; tibia, 38; foot, 34; calcar, 13·6; forearm, 110; thumb, 49; second digit, 82; third digit, 220; fourth digit, 168; fifth digit, 153; ear from meatus, 22; ear from crown, 19; width of ear, 14.

Cranial measurements of type: Greatest length, 54 mm.; basal length, 48·6; basilar length, 46; median palatal length, 28; palatal breadth (between anterior molars), 9; zygomatic breadth, 28; least interorbital breadth in front of postorbital processes, 7; least interorbital breadth behind postorbital processes, 7·6; breadth between tips of postorbital processes, 19; greatest breadth of braincase above roots of zygomata, 20·2; greatest depth of braincase, 17·6; occipital depth, 11·6; depth of rostrum at middle of diastema, 7·8; mandible, 40 (50); maxillary toothrow (exclusive of incisors), 19; mandibular toothrow (exclusive of incisors), 22; crown of first upper molar, 3·4 by 2·6; crown of first lower molar, 3·6 by 2.

Specimens examined.—One, the type.

Remarks.—*Pteropus faunulus* is a very strongly marked species, easily recognized by its small size and pointed ears. The single specimen was shot in dark forest. It was apparently not very common. *Pteropus nicobaricus*, originally described from a Car Nicobar specimen, was not found on the island by Dr. Abbott.

Genus MACACUS LACÉPÉDE.

MACACUS UMBROSUS, new species.

1846. *Macacus cynomolgus* BLYTH, Journ. Asiat. Soc. Bengal, XV, p. 367. (Nicobar Islands.)

1869. [*Innus cynomolgus*] var. a, *Cercocebus carbonarius* ZELEBOR, Reise der österreichischen Fregatte Novara, Zool., I (Wirbelthiere), 1, Mamm., p. 7. (Great Nicobar Island.)

Type.—Adult male (skin and skull), No. 111795, U.S.N.M. Collected on Little Nicobar Island, Nicobars, February 25, 1901, by Dr. W. L. Abbott. Original number, 888.

Characters.—Similar to the *Macacus 'cynomolgus'* of the Malay Peninsula but much darker and less yellowish in colour. General hue of upper parts hair-brown, the hairs with faint pale annulations, but with no trace of tawny.

Colour.—Upper parts and outer surface of limbs nearly uniform hair brown, with a faint tinge of drab, the latter becoming more pronounced on sides. About 3 mm. below the tip of each hair is a dull cream buff annulation 3 mm. to 4 mm. in width. These light rings, together with the glossy texture of the hairs, give the fur a changing aspect as viewed in different lights. They are slightly more numerous on crown, nape, buttocks, and posterior surface of thighs than elsewhere. On the crown and nape they are

very sharply defined, but on buttocks and thighs they lose their distinctness, at the same time increasing in length. Tail dark drab above, almost black on proximal half, pale drab below. Under parts and inner surface of limbs scantily clothed with pale drab hairs of very silky texture, those bordering mouth distinctly darker than elsewhere.

Skull and Teeth.—The skull and teeth so closely resemble those of *Macacus "cynomolgus"* that I can detect no tangible differences.

Measurements.—For external measurements see table below.

Cranial measurements of type: Greatest length (exclusive of incisors), 134 mm.; basal length, 102; basilar length, 96; least palatal length, 57; palatal breadth (between front molars), 25; zygomatic breadth, 90; mastoid breadth, 71; greatest breadth of braincase above roots of zygomata, 61; least breadth of braincase immediately behind orbits, 39; orbital breadth, 67; least distance from orbit to alveolus of inner incisor, 49; greatest depth of braincase (exclusive of sagittal crest), 50; mandible, 97; greatest depth of ramus, 19·6; maxillary toothrow (exclusive of incisors), 44 6; mandibular toothrow (exclusive of incisors), 50; crown of middle upper molar, 8·8 by 9; crown of middle lower molar, 8·2 by 7·4.

Specimens examined.—Eight, from the following islands of the Nicobar group: Great Nicobar, 4; Little Nicobar, 2; Katchal, 2.

Remarks.—The series of eight specimens includes individuals of all ages from half-grown young to aged adults. Throughout the colour is very constant, and no approach is shown to the tawny of *Macacus "cynomolgus."*

This monkey was supposed by Zelebor to be the same as *Macacus carbonarius*, an animal from Sumatra, described by F. Cuvier in the Histoire Naturelle des Mammifères.[1] That such is not the case is clearly proved by Cuvier's description and figure, both of which refer to an individual of the tawny '*cynomolgus*' type.

Macacus umbrosus has long been known as an inhabitant of the Nicobar Islands. It was recorded by Blyth as long ago as 1846. Blanford suggested that it might have been introduced,[2] but the reasons for this supposition are not given.

Measurements of eight specimens of Macacus umbrosus.

Number.	Sex.	Total length.	Head and body.	Tail	Foot.
		Mm.	*Mm.*	*Mm.*	*Mm.*
111792	Male ad.	1,040	510	530	135
111795[1]	Do.	1,085	505	580	145
111796	Male	915	470	445	135
111797	Do.	1,025	475	550	155
111801	Male ad.	1,130	525	605	150
111802	Male	796	360	430	120
111792	Female	830	395	435	120
111799	Female ad.	960	460	500	133

[1] Type. Weight, 8 kg.

[1] Fauna of British India, I, Mamm., p. 22, 1888.

SUMMARY.

The mammal fauna of the Andaman and Nicobar islands is now known to consist of 35 positively identified species and 4 others whose status is still in doubt.

On comparing this fauna with that of other islands in the Malay region, two remarkable features are at once noticeable, the prevalence of bats and rats and the absence of practically all of the charateristic Malayan types such as ungulates, squirrels, carnivores, and flying lemurs, which abound on other islands at an equal distance from the mainland. This paucity of mammalian life cannot be regarded as due to unfavourable surroundings, since all the natural conditions on both Andamans and Nicobars are perfectly suited to the support of a rich and varied fauna. In only one feature do the Andamans and Nicobars differ from such islands as Sumatra, Java, Borneo, the Natunas, Anambas, and Tambelans; they are surrounded by water of relatively great depth, while the others lie within the 50-fathom line. Doubtless this greater depth of water indicates separation from the mainland during a much longer period of time; and it appears safe to assume, therefore, that the Andamans and Nicobars, contrary to the case with the shallow-water islands, were isolated at a time when the mammals, now characteristic of the Malay region, did not exist there. As yet no species are known whose origin may be referred to the remote period of this land connection, but that such exist in the unexplored interior of the larger islands, particularly of the Andaman group, is not beyond the limit of possibility. Such mammals as are now known are evidently of very recent origin, as in scarcely an instance has their differentiation progressed further than in the case of members of the same genera found on islands lying in shallow water. The question at once arises, therefore, as to the means by which they have arrived where they now are. Flight from the mainland would readily account for the distribution of the bats; but the presence of the other mammals seems impossible to explain otherwise than through the agency of man. With the single exception of *Tupaia nicobarica*[1] all are types well known to be closely associated with man throughout the Malayan region. Moreover, the period of time necessary to the development of the peculiarities of the native Andamanese would, undoubtedly, be ample to allow the formation of any of the species known from either group of islands, since in a biologic sense it has been vastly longer to the smaller, more rapidly breeding animals than to man. The introduction, intentional or otherwise, of a pig, a monkey, a palmcivet, two or three species of rats, a shrew and perhaps also a treeshrew, at about the time when the various islands were peopled by their present human inhabitants, would amply account for the existence of the present mammal fauna with its striking peculiarities.

[1] It is worthy of note that this animal differs more conspicuously from its congeners than is the case with any of the other mammals.

THE LATE Mr. R. A. STERNDALE.

The death of His Excellency Mr. R. A. Sterndale, late Governor of St. Helena, which was recently announced, removes one of the oldest and most honoured names from our roll. Mr. Sterndale came to Bombay soon after the Bombay Natural History Society was founded and at once joined it, and worked for it with characteristic enthusiasm. That it rose so rapidly from the littleness and obscurity of its origin must be attributed, in a great measure, to its good fortune in having among its members a naturalist of Mr. Sterndale's distinction and one so exceptionally qualified by his versatile gifts to popularise its work. The list of contributions from his pen, which will be found in the Index to our Journals, gives no idea of the extent to which the Society was indebted to him. The idea of starting a Journal originated with him and proved practicable only because of the way in which his ready pen and pencil solved all difficulties. He continued to edit the Journal till he left Bombay in 1887. Mr. Sterndale's presence at the monthly meetings also added much to their interest. He was not a museum naturalist, but a lover of animals, and he imparted a living interest to every creature about which he discoursed. As Governor of St. Helena he was too busy and too far removed from us to help us much, but he retained his interest in the Society to the last. While recording its sense of the great debt it owes him, the Society desires also to express its sympathy with his widow and daughters in their sorrow.

THE LATE Mr. CHARLES MARIES, V.M.H.

In the death of Mr. Charles Maries, the Superintendent of the Gwalior State Gardens, the Natural History Society has also lost a member who had for many years contributed valuable specimens to the Society's collection. Mr. Maries, in addition to being one of the leading gardeners in India, had, amongst many other accomplishments, the art of successful taxidermy, and by studying the birds and animals whilst alive, was able to mount them as specimens in the most life-like attitudes. The three cases of Wild Ducks and Wading-birds in the Museum, which are so much admired by members and visitors, were mounted and presented by Mr. Maries, and there are also many other specimens which he had from time to time contributed.

MISCELLANEOUS NOTES.

No. I.—THE IDENTIFICATION OF ACCIPITRINE BIRDS.

(*Concluded from page* 594 *of this Volume.*)

Having dealt with *Spizaëtus* in the last number of this Journal, we now come on to the so-called Eagles, which have their tarsus or shank bone naked of feathers, or only partially covered, as in some of the Fish Eagles, and following the order in the *Fauna of British India, Birds*, Vol. III, page 355, we find the genus *Circaëtus* and next to it *Spilornis*, two closely allied genera. *Circaëtus* has but one species *C. gallicus*, the Short-toed Eagle, whereas, in the genus *Spilornis* there are three species, *viz.*, *S. cheela*, the Crested Serpent-Eagle; *S. minimus*, the Little Nicobar Serpent-Eagle, and *S. elgini*, the Andaman Serpent-Eagle. *Circaëtus*, however, can be easily distinguished from *Spilornis*, in not having any crest, whereas in *Spilornis*, the feathers on the sides of the neck and nape are lengthened, to form a rounded and conspicuous crest. Before, however, showing the differences in the three species of *Spilornis*, it will be as well to discuss the characteristics of *Circaëtus* more fully, for though it can so easily be distinguished from *Spilornis*, in the latter having a crest, the casual observer might easily get confused between the genera *Circaëtus*, *Butastur* and *Buteo*, unless he has something more substantial to go upon, than simply the mention of the name and the fact that it has no crest. *C. gallicus*, the Short-toed Eagle, the only Indian species of the genus *Circaëtus*, is a bird about 26 inches long (male), tail 11·5″; wing 21″; the female being a little larger, length 28″. Irides bright orange-yellow and the only species in the whole family *Falconinæ* with a *white or whitish cere*. It resembles *Butastur* not a little, but is much larger, neither of the three species of *Butastur* measuring more than 17″ or 18″ from bill to tail.

The species of the genus *Buteo* which resemble, in point of size, *Circaëtus gallicus*, can be distinguished, however, by having the *front* part of the tarsus partially (for about $\frac{1}{3}$ of its length) covered with feathers, whereas in *C. gallicus* the tarsus is naked, and also in having their toes very unequal in length.

Now to return to SPILORNIS.

Key to the Species.

a. Pale wing-bar near tips of quills broader than adjoining dark interspace.

a' Dark brown on back, with metallic gloss; wing 15″ to 21″.....*S. cheela*.
(The Crested Serpent-Eagle).

b' Earthy brown on back, little or no gloss; wing 11″ to 12″ .....*S. minimus*.
(The Little Nicobar Serpent-Eagle).

b Last pale wing-bar narrower than dark interspace in front of it .....*S. elgini*.
(The Andaman Serpent-Eagle).

So far as Anglo-Indians are concerned however, it is quite sufficient to remember that they have only the first two species to think of, and the first which is about 29" long is much larger than the second which is about 19". The last (*S. elgini*) is a species found only in the Andamans, one specimen only having been taken from the Nicobars. Its length was about 22" ; tail 9·5" ; wing 14" ; and tarsus 3·5".

BUTASTUR—The Buzzard-Eagles—three species.

Key to the Species.

a. Tail more or less rufous, with or without narrow dark cross-bars.

a' Quills chiefly brown above..... *B. teesa.*
(The White-Eyed Buzzard-Eagle).

b' Quills chiefly rufous above..... *B. liventer.*
(The Rufous-winged Buzzard-Eagle).

b. Tail *not* tinged with rufous, and with broad dark cross-bands broader than the interspaces in adults..... *B. indicus.*
(The Grey-faced Buzzard-Eagle).

The Buzzard-Eagles are all small, not much bigger than a crow and *B. teesa*, the White-eyed Buzzard-Eagle, is always to be found sitting on telegraph wires looking out for rats, worms, &c., and is familiar to us all.

The Fish-Eagles which next attract our attention are divided into two genera—*Haliaëtus* (3 species) and *Polioaëtus* (2 species). These are all birds of large size, the smallest (*P. humilis*), measuring over 24 inches in length and can be distinguished from the rest of the family by their feet, which are white or whitish in all the species except *H. albicilla*, the White-tailed Sea-Eagle, and are nearly always to be found over rivers or jheels.

In the genus *Haliaëtus* the claws are grooved beneath and in the genus *Polioaëtus* the claws are rounded beneath, the outer toe being partially reversible.

HALIAETUS—*Key to the Species.*

a. Wing less than 24 inches long.

a' A well-marked ruff of lanceolate feathers ; tail slightly rounded ; a white band across middle of tail in adults ..... *H. leucoryphus.*
(Pallas's Fishing-Eagle).

b' No distinct ruff ; outer tail-feathers at least 1 inch shorter than middle pair ; head, lower parts, and end of tail white in adults..... *H. leucogaster.*
(The White-bellied Sea-Eagle).

b. Wing 24-26 inches ; tail wedge-shaped, white in adults. *H. albicilla.*
(The White-tailed Sea-Eagle).

POLIOAËTUS—*Key to the Species.*

a. Basal three-fourths of all tail feathers white in adults, mottled in young ..... *P. ichthyaëtus.*
(The Large Grey-headed Fishing-Eagle).

b. Middle tail-feathers brown throughout ..... *P. humilis.*
(Hodgson's Fishing-Eagle).

P. ichthyaëtus is also very much larger (length 29") than *P. humilis*, which is about 24" or 25".

Between the Sea-Eagles and the Kites comes the genus *Haliastur* which has but one representative in India, *H. indus*, the Brahminy or Maroon-backed Kite, too well known with its white head and under parts and maroon back, to need description.

The genus *Milvus* which comprises the true Kites is divided into 3 species, the tail being forked in all three and the size moderate, the largest 27" and smallest 23".

MILVUS—*Key to the Species.*

a. Head tawny or rufous with black streaks in adults.

a' Wing ♂ (in male) 16·75" to 18·5"; ♀ (in female) 17" to 19·5" ..... *M. govinda.*
(The Common Pariah Kite).

b' Wing ♂ 19" to 20·5"; ♀ 19·25" to 21·5" ..... *M. melanotis.*
(The Large Indian Kite).

b. Head whitish with black streaks in adults ..... *M. migrans.*
(The Black Kite).

Elanus cæruleus, the Black-winged Kite, is the only Indian species of the genus *Elanus* and in size and habits too, to some extent, resembles the Buzzard-Eagles (*Butastur*) rather than the Kites. This is a small bird not much more than 12 to 14 inches in length and frequently to be seen flying over grass jungles and sometimes hovering like a Kestrel. When flying it has an appearance of being pure white beneath and dark-grey or brown on the back and wings. Bill black; cere and gape pale-yellow; irides crimson in adults and yellow in the young; legs and feet deep-yellow; claws black.

CIRCUS.

"The Harriers are a well-defined group of Hawks, easily recognized by "their flight and appearance."

"General form slender. Bill moderate or weak, compressed, the culmen "curving from the margin of the cere to the hooked tip; the margin of the "upper mandible slightly festooned; nostril large, oval, in the anterior part of "the cere, overhung and partly concealed by the bristles of the lores . . . ". . . . . Wings long and pointed; tail long, even at the tip or "rounded. Tarsi long and slender, feathered at the base only, with transverse "shields in front and smaller polygonal scales behind; toes moderate; claws "much curved and sharp." (*Fauna of British India, Birds*, Vol. III, page 380.)

CIRCUS—*Key to the Species*—(six species).

a. Outer web of 2nd, 3rd and 4th quills, but not of 5th, notched.

a' Tarsus more than 2·5" long ..... *C. macrurus.*
(The Pale Harrier.)

b' Tarsus less than 2·5" long..... ..... *C. cineraceus.*
(Montagu's Harrier.)

b. Outer web of 5th quill notched.,

c' Straight from end of cere on culmen to tip of bill measures less than 0·75".

a" Upper parts ashy..... *C. cyaneus* (1).
(The Hen-Harrier) *Adult.*

b" Upper parts to rump black*.....*C. melanoleucus*(2).
(The Pied Harrier) *Adult.*

c" Upper parts brown, more or less edged with buff or rufous.

a³ Upper tail-coverts pure white ..... *C. cyaneus* (1).
Adult.

b³ Upper tail-coverts not entirely white.

a⁴ Coverts along forearm white or buff .....*C. melanoleucus*(2)
Adult.

b⁴ Coverts along forearm brown.

a⁵ Abdomen buff, with darker shaft-stripes..... .....*C. cyaneus* (1)
Young.

b⁵ Abdomen rufous-brown .....*C. melanoleucus*(2)
Young.

d' From cere on culmen to tip of bill is *more* than 0·75"

d" Abdomen white unstriped or buff with dark shaft-stripes ..... *C. spilonotus.*
(The Eastern Marsh-Harrier.)

e" Abdomen dark or rufous-brown, or rufous with dark stripes..... *C. æruginosus.*
(The Marsh-Harrier.)

The next two genera *Buteo* and *Archibuteo*, comprise 4 species of the birds known as the Buzzards (proper), and are closely allied to the Eagles and from which, as Blanford says, "they chiefly differ structurally by their less powerful bills and claws."

Key to the Genera.

Bill from gape more than half tarsus.
Lower part of tarsus naked all round .....BUTEO.
Tarsus feathered in front to base of toes, naked and scutellate behind .... ARCHIBUTEO.

BUTEO—*Key to the Species.*

a. Wing more than 16 inches.

a' Tarsus half-feathered, naked part in front scutellate..... *B. ferox.*
(The Long-legged Buzzard.)

b' Tarsus two-thirds feathered, naked part in front reticulated ..... *B. leucocephalus.*
(The Upland Buzzard.)

b. Wing less than 16 inches... ..... *B. desertorum.*
(The Common Buzzard.)

The only representative in India of *Archibuteo* is *A. hemiptilopus*, the Himalayan Rough-legged Buzzard, and it is by no means a common bird.

The Buzzards are, for the most part, heavy sluggish birds, fonder of sitting on trees and looking out for frogs and lizards than soaring like the Eagles.

The colouration of the Buzzard is very variable ; different specimens of the same species being very unlike each other, and it does not in the least follow, that, if a bird has the dark plumage, it is a young bird, as it would do in the generality of accipitrine birds, for there appears to be no distinctive young plumage in the Buzzards.

Before dealing with the typical hawks and falcons used for falconry, I shall take up the two genera *Pernis* and *Baza*.

"*Pernis cristatus*, the Crested Honey-Buzzard, can easily be distinguished "from all other accipitrine birds, by having the lores and sides of the head, "like the forehead and chin, covered with small scale-like feathers, without "any bristles or bristly ends. This dense covering probably serves as a "protection against the stings of bees and wasps, the combs and young of "which form the principal food of this genus." There is but the one species of this genus in India.

The only Indian species of the genus *Machærhamphus*, *M. alcinus*, the Slender-billed Pern, which is similar to *P. cristatus* in that it has its lores densely feathered, might easily be distinguished as follows :—

P. cristatus: Loral feathers scale-like ; bill not much compressed. Size large, 25 to 27 inches.

M. alcinus: Loral feathers not scale-like ; bill excessively compressed, culmen sharp. Size small, 18 inches.

Genus BAZA.

This genus comprises 3 species but they are not likely to be confused with any other of the *Falconidæ* as the long nuchal crest separates them at once.

In my last paper, on page 593, I showed the differences between *Spizaëtus*, the Crested Hawk-Eagles, and Baza.

BAZA—*Key to the Species.*

a. Upper plumage chiefly black ; 3rd quill longest..... *B. lophotes.*
(The Black-crested Baza).

b. Upper plumage brown ; 4th quill longest.

a'. Sides of throat rufous in adults ; wing 13' .....*B. jerdoni*
(Blyth's Baza).

b'. Sides of throat grey in adults ; wing 12" .....*B. ceylonensis.* (Legge's Baza).

We now come to the typical Hawks and Falcons which, to my mind, form the most interesting group of the whole family, and are the birds most resorted to for falconry. The Hawks, Blanford says, can easily be distinguished from Falcons, Eagles, Buzzards, Kites and Harriers "by having proportionately shorter and more rounded wings, and from "all, except the Harriers, by having the tibia and tarsus nearly equal in length."

The Hawks and Falcons are all well known to native falconers, but strange to say, to falconers alone. Of course there are a few natives who can tell a Goshawk from a Shikra, or a Laggar Falcon from a Peregrine, but it will always be found to be misleading to ask a native, however good a *shikari* he may be, if he is not a falconer by trade, what a certain bird is. If he gives the right name, it is ten chances to one by a fluke ; but as a rule, he will name something quite different. Of course, there are exceptions but very few and far between, so it is really never safe, if you wish to find out what kind of a hawk it is that has just carried off your wounded duck, to ask your *shikari*. In all probability he will answer promptly 'laggar' as that is the word that seems to come easiest to them, and the bird, ten to one, is a Peregrine or a Shaheen. A regular falconer, however, will never be deceived, and some of them, I daresay, know more about the different points for identification between Hawks and Falcons than our greatest naturalists, and are exceptionally sharp at recognizing birds on the wing and a long way off. For instance, it is uncommonly hard work to distinguish between a female Shikra (*Astur badius*) and a male Sparrow-Hawk or "bashin" (*Accipiter nisus*) when flying, some distance off, but a falconer will tell you at a single glance. To resume, however.

The next 3 genera comprise 6 species of the typical hawks and they are—*Astur*, *Lophospizias* and *Accipiter*.

Key to the Genera.

a. Size moderate or small ; tarsus scutellated behind.

a' Bill from gape $\frac{2}{3}$ to $\frac{3}{4}$ length of mid-toe without claw.

a² No crest ..... ASTUR.

b² A small occipital crest..... LOPHOSPIZIAS.

b' Bill from gape about half mid-toe without claw. ACCIPITER.

The genus *Accipiter* also has much longer and slenderer tarsi and toes, the middle toe being very long and projecting far beyond the others.

The only difference between *Astur* and *Lophospizias*, of which there is but one Indian species, is in the latter having a small crest and rather different marking on the breast.

ASTUR—*Key to the Species*—(three species).

a. Fourth quill longest.

a' Size large, wing 12″ to 15″ ..... *A. palumbarius.*
(The Goshawk.)

b' Size small, wing 7″ to 9″ ..... *A. badius.*
(The Shikra.)

b. Third quill longest, wing about 7·5″ ..... *A. soloensis.*
(Horsfield's Short-toed Hawk.)

LOPHOSPIZIAS—(one species).

Small occipital crest. Himalayan female, length 18″
S. Indian female, length 16″ ..... *L. trivirgatus.*
(The Crested Goshawk.)

With reference to *L. trivirgatus*, there seems to be some slight error in the measurements, for Blanford says, on page 401, Vol. III, that "birds from Southern India and Ceylon are much smaller—length of "female about 16″; "tail 7″; wing 8·5″; tarsus 2·3″; ..... of "males, length 14·5″; wing 8″;" and I caught an adult female down here (Madras Presidency) and that I presume is included in S. India, which measures length 18·25″; wing 10″; and tail 8·75″. I have seen two here within the last fortnight, but was unable to capture the second one.

ACCIPITER—*Key to the Species*—(two species).

a. No gular stripe; 5 or 6 dark bars, one terminal, on 4th quill in adults..... ...*A. nisus.*
(The Sparrow-Hawk.)

b. Generally a dark gular stripe; 7 or 8 dark bars on 4th quill in adults .....*A. virgatus.*
(The Besra Sparrow-Hawk.)

FALCO.—Typical Falcons.—*Key to the Species*—(eight species).

a. Larger Falcons with long toes; mid-toe without claw over 1·75″.

a' 1st primary longer than 3rd; upper parts ashy grey in adults.

a″ Cheek-stripe broader than eye; no nuchal collar.

a³ Crown dark grey, breast very slightly rufous .....*F. peregrinus.*
(The Peregrine Falcon.)

b³ Crown blackish, breast generally deep rufous .....*F. peregrinator.*
(The Shaheen Falcon.)

b″ Cheek-stripe narrow, a buff nuchal collar; head ashy grey or rufous ... .*F. barbarus.*
(The Barbary Falcon.)

b' 1st primary sub equal to 3rd or shorter ; upper parts not ashy grey.

c'' Adults not banded above.

c³ A distinct narrow cheek-stripe ; middle tail-feathers entirely brown in adults .....*F. jugger.*
(The Laggar Falcon.)

d³ No cheek-stripe ; middle tail-feathers usually brown, with white spots on both webs .....*F. cherrug.*
(The Saker Falcon.)

d'' Adults banded with rufous on back, wings, and tail ..... *F. milvipes.*
(The Shanghar Falcon.)

b. Small Falcons with shorter toes ; mid-toe without claw not over 1·5″.

c' Breast white or buff with brown streaks .....*F. subbuteo.*
(The Hobby.)

d' Breast deep rufous, unspotted in adults .....*F. severus.*
(The Indian Hobby).

In the Falcons the plumage undergoes a considerable change from the young to the adult stage, so recognition from descriptions is not easy, especially if the bird be not in its complete new plumage, and has few feathers remaining from the previous year. These feathers, however, will always have a faded appearance, and a young bird can nearly always be distinguished by having its feet of a bluish tinge, instead of the bright yellow of an adult bird. *F. peregrinator* (The Shaheen) however is an exception.

It seems to be undecided as to whether the Hobbies breed in India as the nest has apparently never been taken. I am, however, quite sure that one of the two species does breed in India, as I took a nest with 4 young birds in Tehri Gurhwal, near the source of the Ganges River, in July 1896, and then again 2 young birds were brought to me in Kashmir in September 1899. I unfortunately failed to make certain at the time, as to whether they were *F. subbuteo* or *F. severus*, but I can distinctly remember the parent bird, in the first case, to have had a very white and spotted breast, so am inclined to think those I took in Gurhwal were the young of *F. subbuteo*, and probably the same in Kashmir. Last year, however, I shot a Hobby in Kashmir and not very far from the place where the young were brought to me, which proved to be *F. severus*. Of course it might have had no connection with the young ones.

Besides the true Falcons, the 2 species of the genus *Æsalon*, *Æ. regulus*, the Merlin, and *Æ. chicquera*, the Red-headed Merlin, are also much used in falconry and afford uncommonly good sport when trained to larks, hoopooes, rollers, &c. They are both small birds but exceptionally fast on the wing.

Key to the Species.

a. Crown grey or brown dark-shafted..... *Æ. regulus.*

b. Crown chestnut ..... *Æ. chicquera.*

There now remain but 4 genera comprising in all 7 species of the *Falconidæ*, viz., *Erythropus*, 1 species; *Tinnunculus*, 2 species; *Microhierax*, 3 species; and *Poliohierax*, 1 species.

Key to the Genera.

a. Sexes dissimilar (unlike Falcons); foot small, mid-toe about ½ inch ..... ERYTHROPUS.

a' Tail graduated, middle tail-feathers exceeding outer by an inch or more; upper parts largely brick-red ..... TINNUNCULUS.

a'' Size very small, wing under 5" ..... MICROHIERAX.

b' Tail nearly as long as wing ..... POLIOHIERAX.

The sexes are dissimilar in all except *Microhierax* in which they are the same.

TINNUNCULUS—Kestrels—*Key to the Species.*

a. Claws black..... *T. alaudarius.*
(The Kestrel.)

b. Claws whitish or pale horny ..... *T. cenchris.*
(The Lesser Kestrel.)

MICROHIERAX—Falconets—*Key to the Species.*

a. A broad white nuchal collar; thigh-coverts ferruginous ..... *M. cutolmus.*
(The Red-legged Falconet.)

b. No white collar.

a' Thigh-coverts and lower surface throughout white ..... *M. melanoleucus.*
(The White-legged Falconet.)

b' Thigh-coverts black..... *M. fringillarius.*
(The Black-legged Falconet.)

Poliohierax insignis (Fielden's Hawk) is the only species of the genus. Length of a female 11"; wing 6". Found in Burma, Northern Tennaserim and Western Siam.

VIZAGAPATAM DISTRICT, C. H. DONALD.
MADRAS.
December, 1902.

No. II.—THE BANDED CRAKE (*RALLINA SUPERCILIARIS*).

In a Miscellaneous Note No. XXIX of No. 1, Vol. XIV of our Journal, I recorded the occurrence of the above bird at Khandalla and also that I had every reason for supposing it bred there. Mr. Bell, in the next number of the Magazine, more or less confirmed my letter by stating that he had found the bird breeding all round Karwar. Though I have not actually taken the bird on the nest, I think I can pretty well claim to have established the fact that

this bird does breed at Khandalla in the monsoon and what is more seems to be very common, as my man has sent me many clutches. I went down to Khandalla on the 16th August and was shewn a nest which had been marked down. It was about 3 feet from the ground, in a dense tangle, by the side of a mountain stream and was built on interlaced stems. The nest was a rough structure of twigs lined with damp leaves. I beat for the bird, but unfortunately she broke out away from me. The nest contained four fresh eggs of a creamy white colour and with rather an oily or greasy surface. I returned to the nest late in the afternoon to take the eggs, which I had left in the hopes that the bird might have returned, but was disappointed. I told my man he must get me a bird with a nest. Accordingly, on the 19th August, he came in with a live bird and five partially incubated eggs of the same type. He told me he had shot the bird with an arrow, while she was seated on the nest and that when they are incubating they sit very close and allow themselves to be almost taken with the hand. I should have liked to have kept the bird alive, but as her thigh was broken, I thought it cruel, so destroyed her and sent her to the Museum with the eggs. The eggs obtained last year and this year are of the same type. As both the birds brought in were Banded Crakes, and as Mr. Bell states the eggs he took are of the same type as those obtained at Khandalla, I think the breeding of the bird can be taken as established at that place. Khandalla is not the place to live in during the monsoon, owing to the excessive rainfall, probably that is how its breeding has never been previously discovered.

R. M. BETHAM, MAJOR,
8th Bombay Infantry.

POONA, *3rd October*, 1902.

No. III.—THE EGGS OF THE LONG-BILLED BABBLER (*RIMATOR MALACOPTILUS*).

Whilst discussing egg matters with Mr. Eugene Oates in the British Museum, I referred to the uncertainty we felt as to the eggs of *Rimator malacoptilus*. Mr. Oates informed me that there were in the Museum three eggs of this bird, procured by Mr. Gammie of Darjeeling, and these he turned out and showed to me. Their description tallies in every single detail with that given by me in my "Birds of Cachar," and I think places beyond all doubt authenticity of my specimens.

The nidification of *Rimator*, *Corythocichla* and *Turdinulus* bears out the very close connection between these birds as shewn in their general structure and peculiar lax, squamated plumage. It is indeed possible that the differences in bill and in length of tail are insufficient to constitute genera, and all three will have to be joined together.

E. C. STUART BAKER, F.Z.S., &c.

KINGS LYNN, NORFOLK.
23rd September, 1902.

No. IV.—CURIOUS SITE FOR NESTING CHOSEN BY THE MALABAR WHISTLING-THRUSH (*MYIOPHONEUS HORSFIELDI*).

I happened to sit down on the path just above the Roman Catholic Church at Khandalla on the 16th August of this year, to partake of light refreshment, when two "whistling schoolboys" flew into a tree hard by, from there they went on and disappeared under the roof of the Church. I turned to my men and said that there must be a nest there, they replied that there was and that it was inside the Church. I could hardly believe this. On going down, one of the men pushed his head through a broken pane and said he could see the bird on the nest. I followed his lead and was surprised to see the nest on the window sill with madam at home. I got hold of the keys and a long ladder to investigate. On going up I found three eggs. The female sat very tight and only left by compulsion. The men told me the birds built there regularly every year. This certainly appeared to be the case, as the nest was about a foot high, if not more, and one could easily see the remains of the old nests, which had been used as foundations year by year.

R. M. BETHAM, MAJOR,
8th Bombay Infantry.

POONA, *3rd October*, 1902.

No. V.— NOTES ON THE NIDIFICATION OF SOME BIRDS, THE NESTS AND EGGS OF WHICH HAVE NOT BEEN PREVIOUSLY DESCRIBED.

1. *Trochalopterum affine.* The Black-faced Laughing Thrush.—This species is fairly common at elevations of from 9 to 10,000 feet in the Rhododendron and fir forests of the Singalila ridge which separates the Darjeeling district and Sikkim from Nepal, where it takes the place of *Trochalopterum variegatum*, the "Alpine" Laughing Thrush of the N.-W. Himalaya. I found three nests of this bird on the 31st May 1902 in Rhododendron and Viburnum bushes, 5 to 8 feet from the ground, at an elevation of about 11,500 feet. The nests were rather massive, but neat cups, about 8 inches in external diameter and were composed of moss, thin twigs and dry grass stems, lined copiously with the black rhizomorph of a fungus (resembling thin black roots) mixed with some Birch-bark "paper". Two of the nests contained two slightly set eggs each and the third two freshly hatched young.

The eggs are oval, with a slight gloss, of a fairly dark blue with a few dark purplish (nearly black) spots and specks chiefly in a zone towards the larger end, not unlike those of the English Song Thrush.

The average of four eggs gave the following measurements:—

Length	...	...	...	...	1·15″
Breadth	...	...	...	...	0·82″

2. *Acanthopneuste viridanus*. The Greenish Willow-Warbler.—I found a single nest of this species containing 2 partly-set eggs at an elevation of 11,000 feet on the 31st May, 1902.

The nest was domed with rather a large opening, twice as broad as high towards the top and was placed on the ground on a fairly steep hillside near a bush. It was composed externally of moss and dry grass, and roofed internally with fine grass stalks, the egg-cavity being densely lined with a thick felting of hair. The eggs were pure white, rather broad ovals with little gloss. One of the two eggs[s] (the other unfortunately got smashed) measures 0·64″×0·50″.

The parent bird was shot off the nest and identified by me as the above, my identification being subsequently confirmed in the Indian Museum, Calcutta.

3. *Horeites brunneifrons*. The Rufous-capped Bush-Warbler.—This bird is common at from 10 to 11,000 feet on the Singalila ridge. It frequents the low scrub consisting of dwarf bamboo (grazed down), berberis, &c., in the more open portions of the Silver fir and Rhododendron forest. It is a busy, noisy little bird with a strange unmistakeable call which it constantly repeats and which consists of a few ordinary chirping notes followed by a curious grating mouse-like sound, twice repeated, and of a ventriloquistic nature.

I found four nests of this species containing 4, 3, 3, and 2 eggs, respectively, all in the first week in June, built in low scrub about a foot from the ground at an elevation of about 10,000 feet.

The nest is domed and rather oval in shape 6 or 7 inches high and 4 inches thick, with a circular opening near the top about 1½ inches in diameter. It is composed externally of moss, dry grass and dry bamboo leaves and lined rather scantily with fine grass and lastly with feathers.

The eggs are slightly glossy ovals. In colour they are peculiar, the ground being terra-cotta with darker markings of the same colour chiefly at the big end.

The average of 12 eggs gives the following:—

Length	...	...	0·72″
Breadth	...	...	0·49″

The above description, it will be observed, does not tally at all with that given either in the *Fauna of British India* or in *Hume's Nests and Eggs*. As, however, these latter appear to refer to eggs brought from Native Sikkim by native collectors, they are probably unreliable and belong to some other birds.

4. *Æthopyga nepalensis*. The Nepal Yellow-backed Sun-Bird.—The accounts of the nesting of this species, given by Hodgson and Jerdon, are somewhat conflicting. I give the following note on a nest found by me on the 14th May, 1902, at Rungirum, elevation 6,200 feet, near Darjeeling. The nest is oval in shape, measuring externally 5½″×2½″. It was suspended from the ends of a small *Cryptomeria* branchlet, overhanging a steep bank at a

height of about 3 feet from the ground, and is composed of bright green moss with a little white vegetable down woven in, and is lined with the latter material.

The aperture, which is 1 inch in diameter, is near the top. There is no "projecting roof" over the entrance.

The eggs, three in number, are white, sparingly spotted and mottled with very dark brown.

The average of the 3 eggs gives the following measurements :—

Length	...	... 0·58″
Breadth	...	... 0·41″

B. B. OSMASTON, I. F. S.

DARJEELING, *October*, 1902.

No. VI.—BIPEDAL LOCOMOTION OF A CEYLONESE LIZARD.

I have frequently observed with interest the erect attitude assumed by the small Agamid lizard (*Otocryptis bivittata*, Wiegm.) when running rapidly, and have long suspected that the short front legs were not used at such times. But the rapidity with which the animal runs, and the nature of the ground which it usually frequents, have prevented very close observation. I have, however, recently fully satisfied myself that its action is truly bipedal. The lizard happens to be common in the Botanic Gardens here, and on several occasions one of them has crossed a smooth sanded road immediately in front of me. I have thus been able to see clearly that the anterior limbs are carried quite free from the ground, progress being effected solely by the long hind limbs.

It seems possible that the closely allied and similarly built lizard *Sitana ponticerina*, Cuv., may have the same habit. Does the Indian species of *Otocryptis* (*O. beddomii*) progress in the same fashion?

At present the habit has been recorded only of one or more Australian lizards, notably the "frilled lizard" (*Chlamydosaurus kingi*), which has been very cleverly photographed in the erect attitude by Mr. Saville Kent.

E. ERNEST GREEN.

PERADENIYA, CEYLON, *August*, 1902.

(Published in "Nature," Vol. 66, No. 1716, Sept. 18th, 1902.)

No. VII.—THE NIDIFICATION OF THE BRONZE-WINGED JACANA (*METOPIDIUS INDICUS*).

Nowhere do I find it recorded that this Jacana has two broods a year, yet I have seen a pair sucessfully raise two families, between the months of February and July. As they were the only pair of birds upon a jheel which surrounded the house I lived in, in Dum-Dum, there can be no mistake. When I first saw them in February there were three birds, either

the parents and one young one, or a young brood of three. They were all alike. Shortly after my arrival, two of the birds became very quarrelsome with number three, and after a week's hard fighting, No. 3 betook himself to pastures new, leaving the pair in undisturbed possession of the jheel. I little suspected they were about to breed, as I do not find it recorded that this bird breeds before the beginning of the monsoon, and I was therefore surprised on approaching the spot most frequented by them one day early in April, to find that they were very much disturbed at my approach, both birds going off a short distance in different directions, with a shrill harsh cry and as if severely wounded. Having my glasses with me, I immediately took cover, expecting that they would shortly return and reveal, as I thought, their nest. As I could see no signs of the nest myself, I thought it just possible that they were about to begin. Imagine my surprise when in about ten minutes one of the birds came creeping back across the lotus leaves, twittering gently, and when I first noticed her, followed by one chick not more than a day or two old. Another almost immediately rose from somewhere, and then another. One of these chicks must have come to an untimely end, as by the time they grew up there were only two. The jheel, I may mention, was an artificial affair, being really a moat cut round the compound, and being about 500 yards long on the longer sides and 400 on the shorter one, and about 50 feet broad, terminating in two tanks which curved inwards, each being about 250 feet in circumference, the whole overgrown with weeds, lotus and grass. It was at one of the corners that these birds bred. They soon shifted up for a couple of months into the circular end, and then it became more difficult to watch them. Almost immediately on the outburst of the monsoon, they betook themselves to the corner, leaving the now full grown young ones to shift for themselves, and woe betide them if they came within a hundred yards of that corner. Here they eventually built a second nest among the long grass. I saw the eggs, three in number, on the 2nd July, and in about a fortnight they had their second brood of that year to look after, and before I left in September these three were nearly, if not full, grown.

ERNEST E. TOOTH.

POONA, 13*th November*, 1902.

No. VIII.—THE HIMALAYAN NUTCRACKER (*NUCIFRAGA HEMISPILA*).

With reference to a note by General Osborn on the Himalayan Nutcracker (*Nucifraga hemispila*), which appeared on page 628 of Vol. XIV., of the Society's Journal, I should like to make a few remarks.

It is stated in the above that the Nutcracker perforates the shell of the wild walnut and feeds upon the contents. This, I maintain, is a mistake.

The wild walnut of the Himalayas has an intensely hard shell which it would be quite impossible for any bird to perforate. Even the black bear

finds it too tough a nut for his powerful jaws to crack, though he feeds largely on the cultivated variety with a thinner shell. The only animal, as far as I know, which can circumvent the excessively thick and hard shell of the wild walnut is a species of rat (probably *Mus niveiventer*). When stationed for some years in the North-West Himalayas (Chakrata) I constantly came across wild walnuts with the round holes described by Genl. Osborn, bored in a systematic manner in either side of the nut, but the holes showed evident marks of the teeth of a small rodent, and, though I never actually saw the rat at work, I think there can be little doubt but that he is the culprit.

The chief food of *N. hemispila* is the seed of the Blue pine (*Pinus excelsa*) in forests of which they do considerable damage by extracting the seed from the ripening cones.

They also feed on the seed of the Spruce fir (*Picea morinda*).

They are not migratory in the N.-W. Himalayan region between Chakrata and Simla, but are found, according to season, at elevations of from 3,000 to 10,000 feet.

I never saw the Larger Spotted Nutcracker (*N. multipunctata*) in the N.-W. Himalayas, but here in Sikkim it appears to be the only species found. It frequents chiefly the fir forests at high elevations 10 to 12,000 feet.

The only specimen of *N. caryocatactes* I ever shot was in Germany, and its crop contained six uncracked hazel nuts. I doubt if the Nutcracker is much given to cracking nuts, and certainly his bill seems ill-adapted for the purpose.

B. B. OSMASTON.

DARJEELING, *6th December*, 1902.

[In view of the above suggestion regarding the cause of the perforations in the walnuts, the specimens sent by Genl. W. Osborn have been carefully examined, and it would certainly appear that the holes in the sides of the nuts bear the marks of rodents' teeth.

E. COMBER,
Hony. Secy., Bird Dept.,
Bombay Natural History Society.]

No. IX.—THE CHESTNUT-HEADED SHORT-WING (*OLIGURA CASTANEICORONATA*).

I see Mr. Whymper has noted at page 607 of Vol. XIV. of the Journal the occurrence of the Chestnut-headed Short-wing (*Oligura castaneicoronata*) in Kumaon, whereas the distribution of this bird is given in Oates as extending from Nepal eastwards.

I found this bird not uncommon in the hills of Tehri-Garhwal (north-west of Chakrata). In the winter it is to be found in the low valleys at 3,000 to 4,000 feet elevation, but in June I found it common on Kedar Kanta

at 11,000 feet. I tried hard to find its nest, but without success. I think possibly they breed in July.

Another bird, the distribution of which has been incorrectly entered in Oates, is Mandelli's Spotted Babbler (*Pellorneum mandelli*). Oates says it is found in the lower hills of Nepal and Sikhim; the Bhutan and Buxa doars, &c.

I found this bird throughout the lower hills and valleys up to about 2,500 feet elevation as far west as the Jumna; it is quite common in Dehra Dun.

B. B. OSMASTON.

DARJEELING, *6th December*, 1902.

No. X.—SOME OBSERVATIONS ON *EUMENES DIMIDIATIPENNIS*.

The following observations were made at Shaikh Budin, a small Hill Station in the Derajat District of the Punjab. The hill is bare and rocky, 4,500 feet high, and stands by itself in the midst of a sandy wilderness. The only water in the place is rain water collected in tanks. The month of May had been dry, and not a flower nor a blade of grass was to be seen. Animals of all kinds were scarce, save *Eumenes dimidiatipennis*, which was plentiful. I only saw one *Palistes hebraeus* and one *Vespa orientalis*.

Eumenes dimidiatipennis is a Solitary Wasp which occurs in India, spreading thence into Arabia and Africa. It is reddish-brown, with the hind half of the abdomen black. The jaws are long and strong. It has a slender and very long waist. The propodeal area is grooved lengthwise. The two fore-legs are much smaller than the others, and are much used for working, somewhat like hands; they are tucked up under the breast when standing. The female is 25 mm. long, with a stout abdomen; when she has newly emerged the clypeus is brown, and it remains brown afterwards; the mesonotum is at first black, but seems to become brown afterwards; the tips of the antennæ are hooked. The male is 23 mm. long, smaller and slighter than the female; on fresh specimens the clypeus is white and the mesonotum black; I did not see any males after they left the nest, and cannot say whether they changed colour afterwards.

Some rain had fallen in June; at the beginning of July the Acacia trees were covered with leaves; a great many caterpillars were on the trees; scores of *Eumenes* came into my house, and began nesting. The female only works. The nests are of mud, and are built on walls, rafters, boxes, doors; but always on a vertical surface. Each nest is made up of several cells. The first cell is vase-like, the others are not so regular. Grains of sand are worked into the walls. Dry earth is made use of, and is chewed with saliva; the mud sets as hard as mortar. Whilst flying to and fro a drop of saliva can often be seen hanging from the mouth, and it sometimes falls on the floor; it is of a light honey colour. When the ground is wet after a shower of rain, they stop work; and begin again after it has got dry. A pellet of

mud is brought between the jaws, the perimeter of the cell is laid out, the substratum forming the flat side. The pellet is first kneaded by the jaws into the rough shape of the wall; then, the head being inside and the fore-legs outside, the wall is squeezed between the two, and thinned. A cell takes half-an-hour to build, about 8 pellets being used. When the hole is of the size of her head, she catches hold of the edge with her jaws, and twists herself round and round, thereby giving a pouting border to the mouth of the cell, somewhat like that of a gurrah. She then stands over the cell and puts her abdomen through the opening to lay. Her head and abdomen are of the same size across; as her head was inside the opening when she finished it off, her abdomen just goes in. She spins a gossamer thread from behind, attaching one end to the upperside of the cell, lays one egg, and hangs it to the other end of the thread. The egg-laying takes less than 2 minutes. She then goes out for caterpillars. About a quarter of an hour is taken to bring a caterpillar; and each cell is stored with about half a dozen. I saw the way the caterpillars are dealt with. They were feeding on Acacia trees, and mimicked dead twigs by their colour and attitude. But the wasp spotted them at once. They knew their foe; as soon as they heard the buzz of a wasp, they stopped feeding and stood stock still. She seized a caterpillar by the scruff of the neck with her jaws, and held the body by her legs; she then brought her abdomen forwards between her legs, and stung the head and thoracic segments through the neck, this made the caterpillar wriggle; it was then stung amidships to numb the prolegs, and a third sting was given near the hind end to numb the hindmost prolegs, which held on to the last like suckers. The caterpillar now let go and became quiet; she hugged it below her breast, her jaws holding the neck and her legs the body; and then flew to her nest. There is a special mechanism for stinging. The long petiole or waist has a joint fore and aft; there is a lengthward groove behind the chest; the petiole is raised and fits into the groove; the abdomen is then bent under the petiole and afterwards thrust forwards between the legs close to the breast, if the petiole were not first lifted high, the abdomen could not be bent down, because the caterpillar would be in the way; and if the abdomen could not be bent down, the sting could not be brought forwards to the head of the caterpillar, which is under the head of the wasp.

Having reached the cell, she stuffs the caterpillar in, putting the head first in, then thrusting the body in, working the while with her jaws and fore-legs. She presses down the caterpillars with such force, that they indent the soft wall of the cell. Each caterpillar was slightly curled, as they were longer than the cell. The caterpillars were scotched, but not killed. When the cell was ¾ full, with the egg lying on the topmost caterpillars, she plugged the hole with a wad of mud, and at once set to building another. A cell was built and stored in two hours, about 5 being built in a day. A nest is made up of from one dozen to two dozen cells. The nest is finished

off by filling in all the hollows, and laying on a layer of mud, until the nest looks like a half-orange. Streaks of mud ran out from the edges of the nest, as if a daub of mud had been chucked against the wall. One wasp took 6 days to build a nest of 12 cells, 3 days being spent over the cells, 3 days over the finishing off. Another wasp took 10 days to build her nest of 20 cells, 5 days being spent over the cells, and 5 days over the finishing off. In 3 instances, after having closed the first cell, the wasps left the spot, and built somewhere else. They buzz whilst on the wing, but make no noise when working. They worked from sunrise to sunset. At night they slept by hanging on to twigs or twine catching hold of it by means of the jaws and clutching it with the forelegs. The eggs are big, and after laying one or two dozen eggs, the abdomen became thin, the wasp was weak and would sometimes fall down whilst flying. She came back now and then to look at her nest. If she found any hole she would plug it. After the young had come out some of the holes were stopped. On one occasion a mother wasp plugged a hole that her young was making to come out; the young wasp had to drill anew. The caterpillars were those of a small grey moth. July had witnessed a new birth of nature, the Acacia trees were in leaf, the caterpillars had hatched underground. They made tracks for the Acacia trees, creeping rather fast, a loop occurring between the thoracic legs and abdominal prolegs. Each was 1½ inch long, over one line thick; eyes olive-coloured; neck olive, above, black sideways; back black, with 3 olive patches; 5 olive dots and one olive stripe on each side; tail olive, belly greenish below, with 7 black dots; 3 pairs of thoracic legs; 2 pairs of biggish, 2 pairs of dwarfed abdominal prolegs; aft one pair of sucker-like tail-prolegs.

The egg is ½ cm. long, 1 mm. thick, sausage-shaped, big, tough, white and clear. It hangs by a thread and lies on the top layer of caterpillars. The grub hatches on the 2nd day, and has a light greenish tint. It remains inside the egg shell. It is a headless, legless maggot, and sucks the top layer of caterpillars from its coign of vantage. The egg skin then splits screw-wise and lengthens, allowing the maggot to feed on the middle layer of caterpillars from its swing. When half grown it gets down amongst the lowest caterpillars and sucks them dry. When full grown it is about ½ inch long, fat, cream coloured, 12-ringed. At first the gut ends blindly. But when the maggot is full-fed, the gut opens at the anus and it gets rid of its frass. It then spins a web with which it lines its cell, shutting off the frass and the dried caterpillars in one corner. The pupa is about the same size as the wasp; it is at first white, but afterwards becomes brown. It is naked, being merely wrapped in a thin caul; the wings, legs and antennæ being in sheaths of their own. It takes about 6 weeks from egg to imago. Each imago cuts its way out. It moistens the hard clay with its saliva and rasps away with its strong jaws. One can hear the rasping when standing near.

There are two broods in the year. The females of the year before, which have wintered during the cold and dry weathers, begin nesting at the begin-

ning of July, when the caterpillars are on the green Acacia trees. The winged wasps of the first brood come out about six weeks later, in the middle of August. The females of this first brood begin nesting at the end of August; and the winged wasps of the second brood appear about six weeks afterwards. I did not notice minutely the appearance of the first brood. In the second brood all the males came out first, and were twice as many as the females. On coming out of the nest the males of the second brood had a white clypeus, and the females a brown one; both had a black mesonotum; but the females that laid the eggs, had a brown mesonotum; I did not see any males after they left the nest.

As soon as the nest was done, scores of little black ants began eating the saliva-moistened clay; they ate their way into the last-built cell and ate the grub; the caterpillars pupated and became moths.

Stilbum splendidum, one of the Chrysididæ, is parasitic on *Eumenes dimidiatipennis*. It is a big species with a stout abdomen; the chest is hump-backed. It is glossy green, with the last two segments cobalt-blue; according to the light it may glow like an emerald, a sapphire, a ruby or gold. The skin is very hard, coarsely pitted and highly burnished. The eggs are dark in the shade, but straw-coloured in the sunlight. The wings are smoky dark with a purple gloss. The fore wings have one cubital thinly closed, one closed discoidal, and one open radial cell. The abdomen is made up of five segments, of which the second is the biggest; when standing only four segments are seen, but when the body is rolled up, another segment comes into view behind and beneath the second segment. The second segment is so big, because it has to hide the third segment. The hidden third segment is like the last two segments in colour and hardness; its use is to save the necessity of exposing any soft inter-segmental skin, when the body is rolled up like a Wood-louse, and hence helps to protect the chrysid against the sting of the solitary Wasp. The last segment is the smallest and bears four hard teeth aft, with ten tiny pits in front of them. The abdomen is rounded above and flat below, the sides overhanging and the tip bent down; the skin underneath is softer. There is a tubular ovipositor, which is withdrawn like a telescope inside the body; it is made up of three distinct segments, and of a fourth indistinct one. Inside this is a small sting in a sheath. It flies with the antennæ sticking straight out in front, and makes a slight buzz. It sleeps on the flat lying on its forehead and tail like an arch.

I saw it several times on the nest of *Eumenes*, but although a cell was open it never went in. The reason is that its larva is not parasitic on the larva of the host, but on the pupa; hence it must allow the maggot of the host to grow into a pupa before laying its egg. Mother *Eumenes* knew her foe and always went for the Cuckoo; but the latter rolled itself up into a pill, and as its skin is sting-proof no harm was done. After the nest was done I saw *Stilbum* at work. She feels for the hardest part of the nest, and therefore for an early cell which holds a pupa. She first digs a tiny pit with her jaws, then

whisks round and squirts a drop of white watery secretion from her anus into the pit; this softens the clay; she broadens the pit with her jaws until her ovipositor can get in; she deepens the pit by swaying her abdomen from side to side, the while dropping in some of the watery stuff. When the pit becomes too narrow for the abdomen the sides of the pit are bitten off. In digging, the diameter of the pit is increased by means of the jaws, and the depth through the teeth on the last segment of the abdomen. When the hollow of the cell is reached, very likely the web lining is pierced by the sting and the tubular ovipositor put through the hole, so as to reach the pupa on which the egg is laid. The *Eumenes* drove off the Cuckoo, and plugged the hole it had made. The grub of *Stilbum* nips the pupa of *Eumenes* and sucks it without giving rise to any wound. The pupa of the host remains soft and moist, and is crumpled up into a round heap in one corner, the abdomen being telescoped into the chest. The softness is due to the fact that the web lining makes the cell proof to evaporation. From the telescoping of the pupa the Cuckoo grub seems to nip the apex and to thrust it headward as it gets empty. The crumpled pupa can be easily pulled straight again.

The grub of the *Stilbum* is white and ringed. There is no distinct head; but it has three soft segments at the fore end; the first is peristomial and bears the mouth and two black eye specks; then come two soft indistinct segments which can be telescoped into the prothoracic segment. The prothoracic segment is tough, narrow, stops at the sides and does not bear any pimple. Behind it come seven tough, alabaster-white, bigger rings; they go right round, and each bears a fleshy pimple (papilla) on each side underneath, which may be breathing openings (stigmata). The tail end is soft, and is made up of three distinct and one indistinct segments, it becomes the ovipositor. The pupa is enclosed in a brown cocoon, which is silky outside; but smooth, shiny and chocolate-coloured inside. It has two biggish black eyes; four visible abdominal horny segments; it is at first alabaster-white and is pitted; later on it becomes green.

Each *Eumenes* nest harboured one *Stilbum* young.

In captivity the watery white secretion was seen to drop from the hind end; it came from the vent; I could not tell what the use of the ten pits on the last segment were for.

I also saw a species of *Chrysis*, of the same colours as *Stilbum*, but smaller and with the hind body more slender and more conical. The sub-marginal cell was quite open at one point. I did not see any bore through the nest of *Eumenes*.

Odynerus punctum makes use of the empty cells of *Eumenes dimidiatipennis* for its young. It cleans the cell, clearing away the frass and rubbish. It stores the common fly and jumping spiders (*Salticus*) for its young, and closes the cell.

EUG. CRETIN, Lt.-Col., F.R.C.S., I.M.S.

Dera Ismail Khan,
November, 1902.

PROCEEDINGS

OF THE MEETING HELD ON 27TH NOVEMBER, 1902.

A meeting of the members was held at the Society's Rooms on Thursday, the 27th November, Mr. E. M. Slater presiding.

NEW MEMBERS.

The election of the following new members was announced :—

Mr. N. Marryat (Bombay); Captain L. T. R. Hutchinson, I.M.S. (Bombay); Miss L. Jewett (Darjeeling); Lieutenant A. S. B. Robert (Myitkyina, Upper Burma); Mr. F. A. Ingle (Bombay); Mr. H. W. P. Scroope, I.C.S. (Tippera, Bengal); Mr. A. B. Hawkins (Purulia); Captain H. M. Moore, I.M.S. (Aden); Lieutenant R. Metge (Subathu); Mr. J. C. Winterscale (Penang); Captain W. R. Battye, I.M.S. (Multan); Captain F. E. Edlmann (Abbottabad); Mr. A. McL. Marshall (Edinburgh); and Mr. J. McL. Marshall (Edinburgh).

CONTRIBUTIONS.

Mr. W. S. Millard, the Honorary Secretary, acknowledged receipt of the following contributions since the last meeting :—

CONTRIBUTIONS TO THE MUSEUM.

Contributions.	Description.	Contributor.
1 Snake (alive)	*Tropidonotus punctuatus*	Mr. T. J. Spooner, C.E.
1 Krait (alive)	*Bungarus cæruleus*	Mr. Paul Gerhardt.
1 Cobra (alive)	*Naia tripudians*	Do.
1 Green Pit Viper (alive)	*Trimeresurus gramineus*	Do.
1 Pair of Panther Cubs (alive). *	*Felis pardus*	Capt. D. O. Morris.
2 Lammergeyers	*Gypaetus barbatus*	Capt. H. T. Fulton.
1 Common Heron	*Ardea cinerea*	Do.
1 Indian Pigmy Shrew	*Crocidura perrotteti*	Major F. Wyville Thomson, I.M.S.
1 Chinkara skull	*Gazella bennetti*	Mr. A. H. A. Simcox, I.C.S.
1 Cobra (alive)	*Naia tripudians*	Major W. E. Jennings, I.M.S.
1 Sea Snake	*Pelamis bicolor*	Mr. F. W. Townsend.
2 Phoorsas	*Echis carinata*	
1 Snake	*Zamenis diadema*	
A quantity of squillidæ, Fishes and Scorpions, &c., from the Persian Gulf.	.....	
A quantity of Butterflies from Chitral.	.....	Capt. J. S. M. Harcourt.
1 Snake	*Dipsas forstenii*	Mr. Chas. Gray, forwarded through the Madras Museum.
2 Crimson-horned Pheasants	*Tragopan satyra*	Col. C. W. Ravenshaw.
1 Rib faced or Barking Deer	*Cervulus muntjac*	Do.
1 Sambhur skull	*Cervus unicolor*	Mr. A. G. Edie.
1 Indian Pitta	*Pitta brachyura*	Miss Atkinson.
1 Phoorsa (alive)	*Echis carinata*	Mr. P. Gerhardt.
3 Chameleons (alive)	*Chamæleon calcaratus*	Mr. A. M. Masani.
1 Skin of Yellow-throated Bulbul.	*Pycnonotus xantholæmus*	Mr. D. G. Hatchell.

* Forwarded to the Victoria Gardens.

Contributions.	Description.	Contributor.
1 Cobra, juv (Keautiah variety).	*Naia tripudians*	Capt. N. S. H. Sitwell, R.A.
1 Snake	*Coluber helena*	Col. R. H. Light.
1 Indian Grackle (alive) ...	*Eulabes intermedia*	Mr. A. M. Tod.

MINOR CONTRIBUTIONS.

From Mr. C. Hudson, I.C.S., Lieutenant H. D. McLaughlin, Mrs. A. M. Alexander, Mr. J. R. Greaves, Mr. H. E. John, Mr. A. Smith, Mr. A. Leslie, and Mr. F. Flewker.

CONTRIBUTIONS TO THE LIBRARY.

Memoirs of the Geological Survey of India, Vol. XXXII, Part III. ...	Presented in exchange.
Do. do. Vol. XXXIV, Part II. ...	
Do. do. Vol. XXXV, Part I. ...	
The Trees, Shrubs and Woody Climbers of the Bombay Presidency by W. A. Talbot, F.L.S., I.F.S. ..	By the author.
Transactions and Proceedings of the New Zealand Institute for 1901	... ..
An Account of the Indian Triaxonia collected by R.I.M.S. "Investigator"	In exchange.
Departmental Notes on Insects that affect Forestry by E. P. Stebbing, F.L.S., F.E.S.	By the author.
The Hope Reports, Vol. II., 1897-1900, by Edward B. Poulton	Do.

OBITUARY NOTICES.

The Honorary Secretary read obituary notices on the late Mr. R. A. Sterndale and the late Mr. Chas. Maries, V. M. H., in which mention was made of the great loss the Society had suffered from the deaths of these members.

LIVE SNAKES REQUIRED.

The Honorary Secretary appealed to members and their friends in all parts of India to send to the Society's Museum live specimens of snakes. Captain Wall, I.M.S., having undertaken to write a series of papers for the Journal describing the "Indian Snakes," it is desirous to illustrate the same with coloured plates. The only way that these can be successfully done is from live specimens, and therefore it is hoped that members will endeavour to send in all the snakes that can be obtained. Arrangements have been made for the sketches to be done here.

The Honorary Secretary said it was hardly necessary for him to touch on the importance of such a series—both from a popular and educational point of view. There was practically no illustrated work on the snakes of this country with the exception of Nicholson's, which was very old, and Fayrer's 'Thanatophidia,' which was confined to the venomous snakes and was very expensive, so that a work of this kind would supply a much-felt want.

PAPERS READ.

Mr. E. Comber read a paper on "The Oriental region and its position in Zoological Geography"—which he illustrated with typical specimens of mammals and birds from the Society's Collection. A carefully prepared map also helped materially to demonstrate the region referred to.

A note by Major R. M. Betham on a "Curious site for nesting chosen by the Malabar Whistling-Thrush" was also read.

A vote of thanks was accorded to the authors of the papers and the meeting then terminated.

PROCEEDINGS

OF THE MEETING HELD ON 8TH JANUARY, 1903.

A meeting of the members was held at the Society's rooms on Thursday last, the 8th January 1903, Mr. J. D. Inverarity presiding.

NEW MEMBERS.

The election of the following new members was announced:—

Lieutenant W. Robertson, R.E. (Bangalore); Mr. F. A. Leete, F.C.H. (Naini Tal, U. P.); Mr. Y. D. Thanevala, M.A. (Bombay); Mr. Henry Phipps (Beauly, Invernesshire); Captain J. D. Alexander, R.A.M.C. (Bombay); Mr. C. B. Moggridge (Gangaw, Upper Burma); Lieutenant G. A. Perreau (Drosh, Chitral); Le Comte de Kergarion (Kashmir); Colonel O. E. P. Lloyd, V.C., R.A.M.C. (Ootacamund); Mr. E. Hannyngton, I.C.S. (Ootacamund); Mr. J. B. Russell (Hanbalu, Hassan District, Mysore); Dr. J. M. Falkiner (Panitola, Dibrugarh District, Upper Assam); Mr. A. W. Forbes (Secunderabad); Lieutenant V. F. Currey (Colaba Depôt); Dr. H. Cogill, M.R.C.S., L.R.C.P. (Karwar), and Mr. L. V. Bagshawe (Gangaw, Upper Burma).

CONTRIBUTIONS.

The Honorary Secretary acknowledged receipt of the following contributions since the last meeting:—

CONTRIBUTIONS TO THE MUSEUM.

Contributions.	Description.	Contributors.
1 Skin of the Avocet.....	*Recurvirostra avocetta*	The Estate of the late Major F. T. Williams.
2 Skins of the Golden eye...	*Clangula glaucion*	
4 Skins of the Crested or Falcated Teal.	*Eunetta falcata*	
1 Skin of the Spotted-billed Duck.	*Anas conorhyncha*	
1 Skin of the Lapwing or Peewit.	*Vanellus vulgaris*	
3 Skins of the Baikal Teal or Clucking Teal.	*Nettium formosum*	
1 Skin of the Eastern or Chinese Francolin.	*Francolinus chinensis*.....	
1 Skin of the Blue-breasted Banded Rail.	*Hypotænidia striata*	
1 Skin of the small Indian Pratincole or Swallow Plover.	*Glareola lactea*	

Contributions.	Description.	Contributors.
1 Skin of the Eastern Little Stint.	*Tringa ruficollis*	The Estate of the late Major F. T. Williams.
2 Skins of the Large Indian Pratincole or Swallow Plover.	*Glareola orientalis*	
2 Skins of the Curlew Stint or Pigmy Curlew.	*Tringa subarquata*	
3 Skins of the Turnstone...	*Strepsilas interpres*.....	
1 Skin of the Marsh Sandpiper or Little Greenshank.	*Totanus stagnatilis*	
1 Skin of the Goosander...	*Mergus castor*	
2 Skins of the Andaman Teal.	*Nettium albigulare*.....	
2 Skins of the Burmese Button-Quail.	*Turnix blanferdi*	
1 Skin of the Asiatic Pectoral Sandpiper.	*Tringa acuminata*	
2 Skins of the Common Ruby Throat.	*Calliope camtschatkensis* ...	
43 Skins of various other birds	.....	
1 Skin of the White-headed or Stiff-tailed Duck.	*Erismatura leucocephala* ...	Mr. W. H. Lucas, I.C.S.
1 Skin of the Seesee Partridge.	*Ammoperdix bonhami*.....	Major T. Jermyn.
1 Eastern Baya (alive) ...	*Ploceus megarynchus*... ...	Mr. E. W. Harper, F.Z.S.
1 Dhaman (alive)	*Zamenis mucosus*	Mrs. Sanders Slater.
2 Skins of McClelland's Laughing Thrush.	*Garrulax gularis*.....	Dr. H. N. Coltart.
2 Skins of Ogle's Laughing Thrush.	*Dryonastes nuchalis*..	
1 clutch of eggs of Austen's Babbler.	*Drymocataphus assamensis.*	
1 clutch of eggs of the Red-throated Tit-Babbler.	*Schoniparus rufigularis*.....	
1 Snake (alive)	.....	Mr. T. J. Spooner, C.E.

MINOR CONTRIBUTIONS.

From Mrs. M. Edmiston, Mr. Flewker, Mr. C. P. George, Mr. F. Dundas Whiffin, Major Jermyn, Mrs. A. W. Thomson, Mr. H. Bulkley, Mr. C. Glover Wright, Mr. J. Ribeiro, Mr. R. H. Harter, and Mr. R. Whately.

PAPERS READ.

The following papers were then read and discussed :—1. Some observations on the Solitary Wasp (*Eumenes dimidiatipennis*), by Lieutenant-Colonel E. Cretin, I.M.S., F.R.C.S. 2. The incubation of a Cuckoo's egg, by Lieutenant A. H. Mosse. 3. Famine Foods: *Dioscorea pentaphylla*, an important edible yam of the Thana District, by Mr. G. M. Ryan, I.F.S., F.L.S.

A vote of thanks was passed to the authors of the papers.