PROCEEDINGS

OF THE

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SCIENTIFIC MEETINGS

OF THE

ZOOLOGICAL SOCIETY

OF LONDON

FOR THE YEAR

1888.

PRI
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OF THE

COUNCIL AND OFFICERS

OF THE

ZOOLOGICAL SOCIETY OF LONDON.

1888.

ZOOLOGICAL GARDEN
Regent's Park

Acc. no. - 879
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(*Elected April* 30, 1888.)

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ERRATA.

Page 123, 8th line from top, *for* "also" *read* "alone."
„ 251, 2nd line from top, *for* "from a Specimen" *read* "from Specimens.
„ 266, 14th line from bottom, and page 267, 18th line from bottom, *for* "E. E. Cotes" *read* "E. C. Cotes."

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(PLATES.)

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January 17, 1888.

Dr. A. Günther, F.R.S., Vice-President, in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of December 1887 :—

The total number of registered additions to the Society's Menagerie during the month of December was 35, of which 17 were by presentation, 2 by birth, 2 by purchase, 2 by exchange, and 12 were received on deposit. The total number of departures during the same period, by death and removals, was 117.

Amongst these I may call attention to a small Fox from Afghanistan, presented by Lieut.-Col. Sir Oliver B. C. St. John, K.C.S.I., F.Z.S., which should probably be referred to the species shortly noticed by Blyth (Journal As. Soc. Bengal, vol. xxiii. p. 730, 1884) as *Vulpes griffithi*. It is, however, as Mr. Blanford informs me, somewhat doubtful whether the species is really distinct from *Vulpes leucopus* (Blyth), the small Desert-Fox of Western India.

This specimen has been lodged in the New Wolves' and Foxes' Dens lately finished, to which I wish to call special attention, as this is the first occasion on which our specimens of the genus *Canis* have been arranged in a connected series. I add a list of the specimens now living in the collection :—

List of Specimens of the Genus Canis *now living in the Society's Gardens.*

1, 2. *Canis lupus*, ♂ ♀. Received in exchange, Dec. 5, 1887.

3. *Canis lupus*, ♂. Presented by C. S. Hardy, Esq., Dec. 14, 1887. This is a large animal of unknown origin, and may possibly be referable to *Canis occidentalis* of North America.

4. *Canis niger*, ♂. Received in exchange from the Zool. Gardens, Calcutta, May 5, 1883, to which institution it was presented by Major Fred. Clowes.
5. *Canis vulpes*. Presented by Mr. Thos. Legg, July 30, 1884.
6. *Canis vulpes*. Presented by Lady Brassey, F.Z.S., Feb. 21, 1885.
7. *Canis vulpes*. Presented by A. B. Priestley, Esq., July 3, 1886.
8. *Canis vulpes*. Presented by C. Heseltine, Esq., July 8, 1885.
9, 10, 11. *Canis lagopus*. Presented by T. Nordenfelt, Esq., C.E., Sept. 27, 1887.
12. *Canis javanicus*, ♂. Purchased, Sept. 29, 1887.
13. *Canis aureus*. Presented by J. Smith, Esq., Aug. 22, 1878.
14. *Canis aureus*, ♀. Presented by Capt. W. Geake, Sept. 23, 1887.
15. *Canis griffithi*. From Afghanistan. Presented by Lt.-Col. Sir O. B. C. St. John, Dec. 29, 1887.
16. *Canis anthus*, ♂. Presented by Capt. W. F. Wardroper, Dec. 4, 1882.
17. *Canis anthus*, ♀. Presented by A. T. Marsh, Esq., Sept. 14, 1886.
18, 19. *Canis mesomelas*, ♂ ♀. Presented by F. Mosenthal, Esq., May 12, 1886.
20, 21. *Canis lateralis*, ♂ ♀. Purchased, May 28, 1886.
22. *Canis pallidus*. Presented by Capt. J. S. Talbot, Nov. 24, 1885.
23. *Canis chama*. Purchased, June 26, 1886.
*24. *Canis latrans*. Presented by R. Payne, Esq., July 8, 1884.
25. *Canis latrans*, ♂. Presented by Prof. C. M. Vincent, Aug. 21, 1887.
26. *Canis latrans*, ♀. Presented by Baron Ferdinand de Rothschild, F.Z.S., Dec. 5, 1885.
27. *Canis fulvus*. Deposited, Nov. 10, 1876.
28. *Canis fulvus*. Presented by Messrs Ensor, Weber & Co., July 23, 1886.
29. *Canis fulvus*. Presented by Miss Cameron, Sept. 24, 1887.
30. *Canis velox*. Received in exchange, Jan. 17, 1885.
31. *Canis virginianus*. Received in exchange, Oct. 23, 1886.
32. *Canis azaræ*. Purchased, June 16, 1885.
33. *Canis rudis*, ♂. Presented by Capt. J. Smith, Sept. 30, 1886.
34. *Canis rudis*. Purchased, Dec. 2, 1886.
35. *Canis fulvipes* (Tierra del Fuego). Presented by Miss M. M. Wroughton, Sept. 26, 1887.
36. *Canis dingo*, ♀. Deposited, July 4, 1887.

* It is doubtful whether the animal presented by Mr. R. Payne as captured in Epping Forest is really of this species. It seems in some respects to be more like the North-African *Canis anthus*.

J. Smit. del. et lith.

Mintern, Bros. imp.

ANOMALURUS PUSILLUS.

J. Smit. del. et lith.

Mintern Bros. imp.

DENDROHYRAX EMINI.

Mr. F. Day, F.Z.S., exhibited a specimen of the Spanish Loach, *Cobitis tænia*, captured the previous week at Hungerford.

Mr. Day also exhibited two specimens of hybrid Salmonidæ from Howietoun, both of which had been removed from the ponds on Dec. 1st, 1887. The first was of the *leopard breed*, 13·2 inches long, and one of the progeny from 8000 eggs of an American Char (*Salmo fontinalis*), taken on November 15th, 1882, milted from a Loch-Leven Trout. Although 4 years and 10 months of age, this was the first season that they had been observed to be fertile; the specimen was a female full of nearly ripe eggs. The second fish was one of the *zebra breed*, 18 inches long, 3 lb. in weight, and one of those raised from 3000 ova of the Loch-Leven Trout taken on November 29th, 1883, and milted from an American Char. This fish, 3 years and 10 months old, was also a fertile female. The external colours in these two forms were very similar, and coloured drawings of the hues exhibited by the fish when first captured were likewise shown. These fishes were covered with reticulations or vermiculated lines on a grey or silvery ground, and differed in appearance from either of their parents. But the most remarkable feature was the dentition of the vomer, for in the Char teeth are only found along the hind edge of the head of that bone, not along its shaft, where they are, however, present in Trout. In these hybrids the hind edge of the head of the vomer was toothed as in a Char, and also for a short distance along the shaft of that bone, where three or four teeth were to be seen. Thus a fertile form could be produced, differing in external colours from Trout or Char, and having neither the dentition of *S. salvelinus* nor of true *S. fario*, but a compound between the two. If such a form had been captured wild, and it is now so found in Cardiganshire, doubtless it would have been referred to a new species.

The following papers were read :—

1. On a Collection of Mammals obtained by Emin Pasha in Equatorial Africa, and presented by him to the Natural History Museum. By Oldfield Thomas.

[Received December 14, 1887.]

(Plates I. & II.)

The Mammals recently received by the Natural History Museum from Dr. Emin Pasha number 115, belonging to 39 species—a collection which is of the utmost value as a contribution to our knowledge of the Central-African fauna, and one which reflects the highest credit on the energy and scientific spirit of the man by whom it was formed. When the cares and anxieties of a person in the position of responsible governor of a large and turbulent African province are considered, it seems wonderful that Emin should have been able to make any collections at all, and still more should have

made such a collection as the present, nearly every specimen of which has been carefully labelled in his own handwriting, with the date, sex, and exact locality—particulars which add enormously to its scientific value.

The great mass of the collection was not obtained at Dr. Emin's headquarters, on the Upper Nile, but in a district called Monbuttu (lat. 2° 30′ N., long. 27° 50′ E.), just within the Congo basin[1], and separated by the Congo-Nile watershed from the Wadelai region. There, practically, all the interesting forms were collected; and, considering their number, and especially their strongly marked geographical character, the general affinities of the mammal-fauna of this district may now be looked upon as settled; their affinities are discussed at the end of the present paper.

Of the more recent papers on the Central-African mammal-fauna the three following are the most important:—

1. Pagenstecher, Dr., "Die von Dr. G. A. Fischer, auf der im Auftrage der geographischen Gesellschaft in Hamburg unternommenen Reise in das Massai-Land gesammelten Säugethiere"[2].

2. Noack, H., "Beiträge zur Kenntniss der Säugethier-Fauna von Ost- und Central-Afrika"[3].

3. Leche, W., "Ueber einige von Emin Pascha gesammelte afrikanische Säugethiere"[4].

The first of these contains notes on 31 species of mammals, but the region explored by Dr. Fischer has so different a fauna from Monbuttu, that only some three or four species, and those very widely spread, are common to both collections[5].

Dr. Noack's paper also, based on the mammals collected by Dr. Böhm in the Marungu country, on the south-west coast of Lake Tanganyika, refers to a fauna very different to that of Monbuttu, although several species, and those some of the most interesting (e. g. *Sciurus boehmi* and *Mus kaiseri*), are found in both districts.

Finally, Dr. Leche's paper is founded, like the present one, upon specimens collected by Emin Pasha. Fifteen species are enumerated, but these come chiefly from the Upper Nile district, only three of them occurring also in the Monbuttu collection. The localities given are so widely scattered that the paper, although important for the histories of the individual species, gives but little definite faunistic information.

There is also a list of 71 species observed in Niam-niam-land, given at the end of Dr. Schweinfurth's 'Im Herzen von Afrika,' but

[1] On the assumption that the Uelle is really an affluent of the Congo, and does not run, as has been suggested, north-westwards to Lake Chad or into the Niger basin.

[2] JB. Mus. Hamburg, 1884, pp. 32–46 (1885).

[3] Zool. Jahrb. ii. pp. 193–302, pls. viii.–x. (1887).

[4] Zool. Jahrb. iii. pp. 115–126, pls. iii. and iv. (1887).

[5] Dr. Pagenstecher (pp. 40 and 41) places *Gazella thomsoni* and *Alcelaphus cokei* as synonyms of *G. granti* and *A. lichtensteini* respectively, observing that they are "figured but not described" in Thomson's 'Masai-Land,' 1885. He seems, therefore, to be unaware that these species were originally described by Dr. Günther (Ann. & Mag. N. H. [5] xiv. p. 426, 1884).

the list is a merely nominal one, except that the different native names of the animals are all carefully recorded. Two of Dr. Emin's West-African animals, the Chimpanzee and *Galago demidoffi*, occur in the list.

The 39 species in the present collection consist of 3 Primates, 8 Carnivora, 1 Insectivore, 3 Bats, 1 Ungulate, 1 Edentate, and no less than 22 Rodents, Dr. Emin having wisely paid most attention to the latter group, in which our knowledge of the smaller forms is still so exceedingly incomplete.

1. ANTHROPOPITHECUS TROGLODYTES (Gm.).

a. Skeleton, ♂ (incomplete). Bellima, Monbuttu.
b, *c*. Skulls, old ♂ and imm. Monbuttu.

Without further material, and a much fuller examination than is now possible of the whole genus, it is impossible to determine to which of the races of Chimpanzee these specimens should be assigned, and I therefore place them provisionally under the name of the common West-African species. Chimpanzees from this region have received the names of *Troglodytes schweinfurthi*[1], and *T. niger*, var. *marungensis*[2], but the evidence in favour of this distinction seems to be as yet exceedingly meagre. Some notes on an acrocephalous skull of a Chimpanzee, also obtained by Dr. Emin, were contributed to this Society by Prof. Flower in 1882 (P.Z.S. 1882, p. 634).

2. COLOBUS GUEREZA, Rüpp.

a. Immature. On the Nambiri[3], Sandeh (=Niam-niam) land, 20/7/83.

This species is also mentioned by Schweinfurth as occurring in Niam-niam.

3. GALAGO DEMIDOFFI, Fisch.

a. ♂. Stat. Gadda, Monbuttu, 18/3/84.
b. ♂. Stat. Gadda, Monbuttu, 3/5/84.
"Iride flavo-umbrina. Monbuttu name 'Nensi.'"—E.[4]

This species, like the last, was observed by Schweinfurth in Niam-niam, but has otherwise only been recorded from West Africa.

4. FELIS SERVALINA, Ogilb.

a. Immature.

As this specimen is immature, having its milk-teeth still in place, it does not afford any additional information as to the vexed question of the relation of *F. servalina* to the true *F. serval*, except

[1] Giglioli, Ann. Mus. Genov. iii. p. 56 *et seqq.* (1872). See also Peters, SB. Nat. Freunde, 1869, p. 25; Issel, Ann. Mus. Genov. i. p. 56 *et seqq.* (1870); Hartmann, Arch. Anat. Phys. 1872, p. 474 *et seqq.*; and Schweinfurth, 'Im Herzen von Afrika,' i. p. 558 (1874).

[2] Noack, *l. c.* p. 291 (1887).

[3] The exact position of this locality I am quite unable to find in any of the maps at my disposal.

[4] The particulars marked "E." are those noted on the labels by Emin Pasha.

in so far as it shows the constancy at different ages of the peculiar coloration to which the name of *F. servalina* has been applied. The specimen has lost its label, but is no doubt one of the Monbuttu series.

5. Felis caligata, Temm.

a. ♂. Tingasi, Monbuttu, 16/10/83.
b. ♂. Stat. Gadda, 14/5/84.
c. Juv.

"Iride fulva. Lives in the woods. Monbuttu name 'Nango' or 'Kao.'"—E.

[Felis caligata domesticata.

a. Lado. 12/83.

"Bastard between *F. caligata* ♂ and *F. domestica* ♀."—E.]

6. Genetta tigrina, Schr.

a, *b*. ♀ and juv. Lado, 5/12/83.

"Caught with three young in its nest. A severe biter, and a great enemy to poultry. Ejected a fetid fluid on capture."—E.

I only use the above name provisionally, until the species of Genets are properly worked out, which will probably result in the union of nearly all the so-called different species.

7. Poiana richardsoni, Thomps.

a. Juv.

An immature individual of this exceedingly rare and interesting species quite agrees with the typical specimen in the Museum collection. It is unfortunate that its label has been torn off, so that its exact locality is unknown; but as the species is a strictly West-African one, having only hitherto been recorded from Fernando Po and Sierra Leone, it was, no doubt, obtained in the Monbuttu district, where the whole of the purely West-African species were collected.

8. Crossarchus zebra, Rüpp.[1]

a. ♂. Tingasi, 1/7/83.
b. ♂. Stat. Gadda, 18/1/84.
c. ♂. Stat. Gadda, 20/1/84.

"Iride fusco-flava. 'Ndoto' (Monbuttu)."—E.

Notes on the habits in Marungu of the closely allied *C. fasciatus*, Desm., have been recorded by Dr. Noack[2], from the note-books left by Dr. Böhm.

Of the species labelled as occurring in Monbuttu, this is absolutely the only one of a distinctly Abyssinian character. It is, however, a

[1] In connection with this species, I may take the opportunity of correcting an unfortunate misprint in my paper on the African Mungooses (P. Z. S. 1882, p. 87), where, in the synopsis of species (lines 22 and 24), the lengths of the fourth premolar in *C. zebra* and *C. fasciatus* have been transposed, as an examination of the detailed descriptions would show. It is *C. fasciatus* that has its premolar "more than 8 millim." and *C. zebra* "less than 7 millim."

[2] *T. c.* p. 253.

most strongly marked example, the present being by far the most distant point from Abyssinia from which it has been recorded.

Bearing in mind the semi-domesticated state of many of the Mungooses, and the otherwise strictly West-African character of the Monbuttu fauna, one is almost tempted to believe that this species has been artificially transported across the watershed from the Lado district, where Dr. Emin has himself previously obtained it.

9. Crossarchus obscurus, F. Cuv.?

a. ♀ imm.

"Lives in pairs; very harmful to poultry."—E.

An extraordinary short-haired specimen, of the determination of which I am somewhat doubtful. It is wholly without the long fur on the body, none of the hairs exceeding about 14 or 15 millim. in length, and the general tone of colour is a peculiar whitish grey, exactly similar to that of the underfur of *C. obscurus*. It appears to me probable that it has been clipped of the longer hairs by the natives, perhaps for purposes of deception, as the majority of the hairs do not taper naturally to a point, but end quite abruptly. Its skull is quite similar to that of *C. obscurus*.

10. Lycaon pictus, Temm.

a. Skin and skull, young.

This specimen, unfortunately without a label, is probably part of the Wadelai collection, as the species is known from Abyssinia and South Africa, but not from Western Africa. The sizes of the milk-premolars in this specimen are as follows:—m. pm.^{2}, length 6·5 millim.; m. pm.^{3}, length 11·4; m. pm.^{4}, length 8·5, breadth 9·5; m. pm.^{2}, length 6·1; m. pm.^{3}, 8·4; m. pm.^{4}, 13·3.

11. Ictidonyx zorilla, L.

a. ♂. Redjaf, near Lado, 1/84.

12. Crocidura doriana, Dobs.

a–c. Wadelai, 10/85 and 4/86.

I am indebted to Dr. Dobson for the determination of this Shrew. The type came from Shoa, and the species is therefore, so far as is yet known, distinctly Abyssinian.

13. Epomophorus (Hypsignathus) monstrosus, Allen.

a–b. ♂ & ♀. Tingasi, 29/10/83.

"Iride fusca. 'Balupa' of natives. Lives upon fruit, and is itself eaten by the natives. Found in flocks of from 50 to 60."—E.

Herr Bohndorff also obtained this species in Niam-niam-land.

Previously only known from West Africa.

14. Epomophorus franqueti, Tomes.

a. Tingasi, 5/82.

This is another wholly West-African species.

15. MEGADERMA FRONS, Geoffr.

a. ♀. Wadelai, 26/6/86.

16. ANOMALURUS PUSILLUS, sp. n.[1] (Plate I.)

a. ♀. Bellima, 21/6/83. *Type*.

b. ♂. Tingasi, 5/82.

Size very much smaller than in any of the other species. General colour above uniform dark grizzled grey, the hairs throughout dark slaty grey for the greater part of their length, this colour gradually darkening to black just below a terminal band of pale grey or olivaceous. Head and limbs like back; sides of parachutes rather darker. Underside pale yellowish white, without a tinge of rufous, the hairs on the belly pale slate basally, and dull yellowish white terminally; outer margins of parachute below covered with coarse dark brown hairs. Tail uniform pale brown, cylindrical, rather bushy, the hairs at its end attaining a length of nearly two inches; scales about 15 in number.

Skull, as compared to that of *A. beecrofti*, distinguished by its very much smaller size, short muzzle, proportionately longer palatine foramina, longer orbital and shorter temporal fossæ, and larger rounder bullæ.

Teeth as usual. Incisors orange above, pale yellow below. Molars readily distinguished by their small size.

Dimensions of a female in skin:—Head and body (to anus) (c.) 280 millim.; (to back of interfemoral membrane), 300; tail 134; hind foot (without claws) 40[2]; ear (dried and shrunk) (c.) 20.

Skull—basal length 41 millim.; greatest breadth 29; interorbital breadth 12·3; height of infraorbital foramen 5·2; palate, length 21·7; diastema 10·1; length of palatal foramen 5·0; length of upper molar series 9·4.

This interesting little animal is most nearly allied to the West-African *A. beecrofti*, Fraser, but differs from that species in its duller and less yellow upperside, in the entire absence of rufous on its neck and belly[3], and, as from all the other described species, in its diminutive size.

17. SCIURUS STANGERI, Waterh.

a. Tingasi, 2/9/83.

"Common in Monbuttu, where it is called 'Mbonga.'"—E.

18. SCIURUS RUFOBRACHIATUS, Waterh.

a. ♂. Bellima, 13/7/83.

b. ♂. Bongereh, 21/7/83.

c, *d*. Tingasi, 5/82 and 7/83.

"Iride fusca. 'Bonga.'"—E.

[1] Preliminary diagnosis published, Ann. Mag. N. H. [5] xx. p. 440, Dec. 1, 1887.

[2] In specimen *b*, an adult male, rather smaller than *a*.

[3] Young specimens of *A. beecrofti* are also without the bright rufous on the belly characteristic of the species, but the size of their feet and teeth would always distinguish such specimens from *A. pusillus*.

These specimens vary very considerably in the colour of the belly-hairs, which in some of them, notably in *a*, are pure white, while in others they are of the usual dull grey and white found in Western Coast specimens.

19. Sciurus annulatus, Desm.

a. ♀. Lado, 16/2/84.
b. ♂. Tobbo, 18/5/83.
c. ♀. Tobbo, 18/5/83.

20. Sciurus pyrrhopus, F. Cuv.

a. ♂. Tingasi, 16/9/83.
b. ♀. Tingasi, 10/10/83.
"Iride fusca. 'Kejo.'"—E.

Specimen *a* has the hairs of the belly, usually pure white, richly washed with red.

S. stangeri, *S. rufobrachiatus*, and the present species are all strictly West-African forms, this being by far their most easterly recorded locality.

21. Sciurus boehmi, Reichen.

a, *b*. ♂ & ♀. Tangasi, 7 and 9/83.
c, *d*. ♂ & ♀. Stat. Gadda, 2 and 3/84.
e. ♂. Nendja (Monbuttu), 9/7/83.
f. ♂.
"'Nangeri.' Common from 4° N. lat. southwards. As yet only taken to the west of the Bahr el Djebel."—E.

These beautiful little Squirrels quite agree with the description given by Dr. Reichenow (Zool. Anzeiger, 1886, p. 315) of some specimens obtained by Dr. R. Böhm in the Marungu country, at the south-west corner of Lake Tanganyika. Whether the species is really distinct from *S. congicus*, Kuhl, is a question which will have to be decided later, when further specimens are available from other localities. It appears to me to be by no means improbable that not only will *S. boehmi* be found to grade into *S. congicus*, but that the latter also will equally pass into *S. poensis*, Smith, of which I have seen specimens with just a faint indication of a whitish back-stripe. This stripe then becomes bright and prominent in *S. congicus*, with a darker band below and external to it; while further, in *S. boehmi* this latter dark band is quite black, and is supplemented internally by a second even more prominent black stripe. These gradations from the normally wholly unstriped *S. poensis* to the brilliantly banded *S. boehmi* show how little these dorsal bands can be trusted for the division of the Squirrels into groups, or even for the discrimination of the species. No appreciable seasonal change is visible between the different specimens of the series.

The Squirrel from "Tamaja" referred to and figured by Leche[1] as *S. lemniscatus*, Le Conte, appears also to belong to this species, which, while having the same number of stripes as *S. lemniscatus*,

[1] *T. c.* p. 117, pl. iii.

is apparently, as already remarked, more nearly allied to *S. congicus*. Prof. Leche's six specimens are stated to be all immature, a statement that perhaps only rests on their inferior size as compared with *S. lemniscatus*, *S. boehmi* being decidedly smaller than that species. Indeed the beautiful figure given by Prof. Leche represents, when increased to scale, an animal quite as large as the largest of our specimens of *S. boehmi*, all of which are undoubtedly fully adult.

Notes on the habits of this species have been made both by Dr. Böhm (Noack, *l. c.* p. 251) and Dr. Emin himself (Leche, *l. c.*).

22. Xerus erythropus, Geoffr.

a. ♂. Tingasi, 16/10/83.
b. ♂. Stat. Gadda, 4/2/81.
c. Skeleton. Stat. Gadda.
d. Skull. Foda, Lake Albert Nyanza, 12/85.
"Iride fusca. Monbuttu name 'Koro.' Common everywhere."—E.

No difference that could be ascribed to season is observable between *a* and *b*, collected respectively in October and February.

23. Gerbillus, sp. (allied to *G. leucogaster*, Peters).

a. ♀. Tingasi, 31/8/83.
b. ♀. Stat. Gadda, 24/1/84.
"Monbuttu names 'Kota' and 'Sinsi.'"—E.

24. Gerbillus, sp.

a, *b*. Wadelai. 5/86.

In the state of confusion in which the species of Gerbilles are at present it is impossible to determine these specimens with certainty, but they are nevertheless of the utmost value as supplying material for a future revision of the group.

25. Cricetomys gambianus, Waterh.

a, *b*. ♂ & ♀. Bellima, Monbuttu, 16/7/83.
c, *d*. Tingasi, 8/83.
e. Skeleton ♀. Tingasi, 7/9/83.
f–*i*. ♂ & ♀. Stat. Gadda, 2/84.
j. Skeleton ♂. Stat. Gadda, 14/3/84.
k. Skull, ♂. Kubbi, Monbuttu, 7/83.
l. Skull, ♀. Foda, Lake Albert Nyanza, 12/85.
"Iride fusca. Native name 'Assumba.'"—E.

Specimens *a* and *b*, from Bellima, differ from the rest by their greyer colour, grey instead of pure white bellies, and the less sleek character of their fur, differences which, as shown by the fine series obtained, are neither seasonal nor sexual. Their skulls, however, do not present any valid specific distinction, and it is probable that we have here one of the definite but non-specific variations often known to be due to some difference in the nature of the locality—as, for example, a difference either in altitude, presence or absence of forest, or amount of rainfall.

26. Malacomys longipes, M.-Edw.

a–d. ♂ &3 ♀. Tingasi, 7 and 9/83.
(*a*) "Iride fusca. 'Nesanda.' In and by water."
(*b*) "In the forest."—E.

This most interesting form was only previously known from a single specimen from the Gaboon in the collection of the Paris Museum, the skull of which has unfortunately been destroyed. An examination of the skulls sent by Dr. Emin shows that *Malacomys* has perfectly smooth incisors, and the molars of a typical *Mus*, and is therefore only distinguished by its very different external proportions. As a species *M. longipes* is characterized by its rounded supraorbital edges, elongated muzzle, small teeth, and short palatine foramina, the latter and the teeth being each only 6 millim. in length, as compared to a basal length of 35·5, and a palate length of 22 millim.

27. Mus (Isomys) barbarus, L.

a. ♂. Stat. Gadda, 10/1/84.
b–g. Tingasi, 7 to 9/83.
h. ♂. Wadelai, 24/7/85.
"Iride fusca. Native name 'Nadje' or 'Nage Nadje.' Found along the edges of the forest."—E.

No remark to this very common and widely spread species would be needed were it not that the three authors whose papers have been above referred to have all expressed different views as to its nomenclature, and it is therefore advisable for me to explain my reasons for the name I myself use. Thus Dr. Pagenstecher, although only having two of the ordinary specimens for comparison, calls the Masai form "*Mus* (*Lemniscomys*) *barbarus*, var. *massaicus*"[1], a form, however, that I do not think distinct enough to merit a varietal name, especially as the Emin series contains individuals precisely agreeing both with ordinary West-African specimens and with those described by Dr. Pagenstecher.

Dr. Leche[2] puts all under "*Mus barbarus*" and expresses his opinion that the variety known as "*pulchellus*," Gray, is not really distinct—a view with which I most fully agree, although I prefer to recognize the subgenus "*Isomys*," with which at the same time I think "*Lemniscomys*" should be amalgamated, the two grading quite insensibly into each other.

Finally Dr. Noack[3] uses Dr. Gray's obsolete name of "*Golunda pulchella*" for the species, being apparently unaware either of its position in the subgenus *Isomys*, or of the fact that the generic name *Golunda* belongs properly to a very different animal, for which in its turn[4] he uses Peters's name of *Pelomys*, although the latter's identity with *Golunda* was shown by Mr. Blanford as long ago as 1876[5].

[1] *T. c.* p. 45.
[2] *T. c.* p. 119.
[3] *T. c.* p. 239.
[4] *T. c.* p. 235.
[5] J. A. S. B. xlv. part ii. p. 165.

28. Mus (Isomys) abyssinicus, Rüpp.

a. ♀ juv. Lado, 16/2/84.
"House-mouse; very common."—E.

29. Mus gueinzii, Peters.

Dasymys gueinzii, Peters, MB. Ak. Berl. 1875, p. 12, pls. i. & ii.

a, *b*. ♂ & ♀. Stat. Gadda, 1/84.
"Monbuttu name 'Suhr.'"—E.

These two specimens agree in all essential characters with Dr. Peters's description, the type of which I have examined in Berlin. His specimen came from the interior of Natal, and this occurrence of the species in Monbuttu is therefore a most remarkable and interesting fact, quite unparallelled by any of the other small mammals of the Emin collection.

With regard to the genus "*Dasymys*" formed by Dr. Peters for this animal, and its alleged relationship to *Otomys*, I can only say that I am quite unable to see any reason why the species should not be included in the genus *Mus*, an opinion I first came to in Berlin when examining the type, and since confirmed by a direct comparison of Dr. Emin's specimens with *Otomys* and with many other species of the genus *Mus*.

30. Mus kaiseri, Noack.

a–*c*. ♀. Stat. Gadda, 1/84.
d. Skeleton. Stat. Gadda.
"Bomu" or "Sinsi."—E.

These specimens agree very fairly well with Dr. Noack's description of a new species obtained by Dr. Böhm in Marungu.

31. Mus rufinus, Temm.

a, *b*. ♀ & yg. Stat. Gadda, 1/84.

I am not very certain about the determination of these specimens, as Temminck's description is exceedingly vague, and the skull of the type is, unfortunately, in so dilapidated a condition that, as Dr. Jentink has been kind enough to inform me, no exact measurements can be taken upon it for comparison with those of Emin Pasha's specimen.

32. Mus univittatus, Peters.

a. ♂. Tingasi, 24/7/83.
b. ♂. Tingasi, 9/10/83.
c. ♂. Stat. Gadda, 23/1/84.
"Iride fusca. Monbuttu name 'Tibo.' Lives in and by water, and swims with facility."—E.

This rare species has been previously only recorded from West Africa, the specimens that I have seen being from Dongila (Buchholz, Mus. Berl.), Gaboon (Aubry Le Conte, Mus. Paris and Brit.), and Cameroons (Johnston, Mus. Brit.). Dr. Emin's examples are more

deeply rufous on their flanks and rumps, and have less strongly marked, in fact almost indistinguishable, dorsal stripes, but are obviously not specifically separable.

33. Mus, sp.[1]

a–e. 5 specimens. Tingasi.
f, *g*. Stat. Gadda.
h. Wadelai.
"Monbuttu name 'Babili.'"—E.

These specimens all belong to a group of Rats varying considerably in size, length of fur, and size of ears, but all agreeing in their general proportions, and in the possession of a very large number of mammæ placed in a continuous series down the sides of the abdomen, and varying in actual number from 16 to 24. To this group, whether containing several valid species or, as I am inclined to suspect, only a single variable and widely spread one, the following appear to belong:—*Mus coucha*, Sm., *M. silaceus*, Wagn., *M. microdon*, Peters, *M. macroïepis*, Sund., and probably several of the other earlier described species. In the existing state of confusion in regard to these species, I prefer to leave the present series of specimens without a definite name.

34. Mus (Leggada) minutoides, Sm.

a–e. 5 specimens. Wadelai.
f. Tingasi.
"Found in pairs in the gardens and plantations."—E.

I have seen specimens referable to this species from almost every part of the Ethiopian region, and among others the types of *Mus musculoides*, Temm., and *M. minimus*, Peters, both of which names must therefore give way to that of Smith. Specimen *f*, from Tingasi, is considerably larger than usual, but is not apparently specifically separable from the rest.

35. Lophuromys sikapusi, Temm.

a. ♂. Stat. Gadda, 25/1/84.
b. Skeleton.

This rare species is a purely West-African one, but the genus is

[1] I take this opportunity of clearing up the history of another species of *Mus*, which will, no doubt, be found to occur in Monbuttu, as Herr Bohndorff obtained it at N'doruma, in the Niam-niam country, namely *Mus alleni*, Waterh. (P. Z. S. 1837, p. 77), of which the type is a very young individual with its teeth still uncut. This type is, however, unquestionably specifically identical with the Niam-niam specimen, as also with two in spirit from Old Calabar (Dr. J. A. Smith), and one skin from Angola (Mr. Monteiro), in the Natural History Museum. There are also in the Berlin Museum several specimens of it obtained on the Gold Coast by Drs. Buchholz and Reichenow, and the characters of these specimens, and therefore of the adult *M. alleni*, have been pointed out by Dr. Peters (MB. Ak. Berl. 1876, p. 479) under the erroneous name of *M. erythroleucus*, Temm.

represented in Abyssinia by a second species described in the accompanying footnote [1]. Dr. Emin's specimen agrees in every respect with typical West-African individuals, and shows no approach to the new Eastern form.

36. GEORYCHUS OCHRACEO-CINEREUS, Heugl.

a, *b*. ♂. Bellima, Monbuttu, 14/7/83.

The type specimen of this rare species was obtained by its describer in Bongo, only a few degrees north of the present locality, and is now in the Stuttgart Museum, where, by the kindness of Dr. Krauss, I have had an opportunity of examining it. In the collection worked out by Dr. Leche there were also several *Georychi*, divided by him into two species—a larger darker-coloured one, determined as *G. damarensis*, Og., and a smaller sandy one, considered to be *G. ochraceo-cinereus*. The first of these was so named on my authority, Dr. Leche having sent me one of the specimens to compare with Ogilby's type. At that time, however, not having at all investigated the subject, I did not know that there were two species found in this Central district, and assumed that the specimen sent was *G. damarensis*, to which I still think it is exceedingly closely allied. Now, however, Dr. Leche's descriptions and excellent figures show the distinction of the two forms, of which the names given by him must certainly be reversed, *G. ochraceo-cinereus* being the larger, and *G. damarensis* the smaller form, as I have been able clearly to make out by measurements taken on the two typical skulls as compared with those given by Dr. Leche. I can therefore only express my sincere regret to Dr. Leche at having led him wrong, and must plead the close relationship of the two forms as my

[1] LOPHUROMYS FLAVO-PUNCTATUS, sp. n.

Size and proportions as in *L. sikapusi*, but differing markedly from that species in the character and colour of its fur, which, instead of being long, sleek, unicolor, and all of one sort, is short, comparatively coarse, and finely freckled all over with orange or yellow, and has a considerable number of longer hairs intermingled with it. The individual hairs are brown for the greater part of their length, broadly tipped with orange or yellow, the former colour along the top of the head and back, the latter on the flanks. Belly dull yellowish white, not sharply defined. Hairs round the front of the base of ear prominently tipped with bright orange, those behind it pale yellow. Feet irregularly patched with white and dark chocolate-brown. Tail closely covered with short crisp hairs, brown above, white beneath.

Skull much as in *L. sikapusi*, but the zygomata more widely expanded anteriorly, and the interorbital region narrower and flatter above. The interparietal also is shorter antero-posteriorly, and the nasals are narrower and more pointed behind.

Dimensions of the type, an adult specimen in skin:—Head and body 129 millim.; tail 51; hind foot 21; ear 10.

Skull—basal length 26 millim.; greatest breadth 16; nasals, length 12·6, greatest breadth 3; interorbital, breadth 5·6; interparietal, length 3, breadth 9·8; palatal foramen 6·6; length of molar series 5.

Hab. Shoa (*Capt. W. C. Harris*).

Two specimens of this species were received from the East-India Company's Museum in 1860, and were no doubt collected by Capt. Harris during his mission to Shoa in 1843.

excuse. The present specimens agree in every respect with Dr. Leche's figure and description of "*G. damarensis*," and also, except in being a little darker coloured, with the type of *G. ochraceo-cinereus*.

37. ATHERURA AFRICANA, Gray.

a–d. 2 ♂, ♀ and young. Monbuttu.

"Very common. Monbuttu name 'Kolia.' Is eaten by the natives."—E.

The peculiar fimbriation of the lower sides of the spines in this species, previously noticed by Waterhouse[1], is unusually well-marked in these specimens, the spines being as it were finely feathered on their edges and inferior[2] surfaces[3]. This animal is one of the most distinctly West-African forms in the whole collection, the genus *Atherura* being, so far as Africa is concerned, entirely confined to that district, and only reappearing again in the Malay part of the Oriental Region.

38. DENDROHYRAX EMINI, sp. n.[4] (Plate II.)

a. Yg. sk. Tingasi, 6/7/83. *Type*.

"Iride fusca."—E.

Fur long, extraordinarily soft and fluffy. General colour pale yellowish white, wholly different from that of any other species of the group, and indeed scarcely to be matched as a general body colour in any other mammal; its tint all over the body something like that of the centre of the belly of *D. arboreus*. Hairs of upper side dull brown for three fourths of their length, their tips pale yellow, whiter on the head, deeper yellow on the rump. Hairs of underside and limbs similar, but the brown gradually decreasing in extent downwards, those of the chin, chest, and belly wholly pale yellow; cheeks, a ring round each eye, hands and feet, and hairs on ears white; hairs of the dorsal spot also white.

This most remarkable species is unfortunately only represented by a single young individual, in which the milk-dentition is still in position. The only adult dimension that I am able to give is, therefore, that of the first true molar (7·2 millim. long externally, and 5·6 broad anteriorly above, and 6·6 long below); but comparing the specimen with equally young individuals of *D. arboreus*, it is evident that its size when adult would be just about the same as in that species. Its actual dimensions are:—Head and body 295 millim.; hind foot 48; ear (above crown) 13. Skull—basal length 55; interparietal length 11, breadth 16·2; diastema between incisors 4·7, behind incisors 5·3; lengths of upper milk-premolars: m.pm.^{2} 5, m.pm.^{3} 6·2, m.pm.^{4} 7.

[1] N. H. Mamm. ii. p. 477, 1848.

[2] *I. e.* posterior, when they are set vertically in the skin.

[3] Prof. Stewart has been kind enough to examine the fringes on these spines microscopically for me, and he tells me that "they are only extensions of the cuticular layer of the spines. On the under surface of the spines they are thin and scale-like, becoming simple and hair-like at the margins."

[4] Preliminary diagnosis given, Ann. Mag. N. H. [5] xx. p. 440, Dec. 1, 1887.

The peculiar pale colour of this Coney is evidently neither due to its youth, for young specimens of the other species are, if anything, darker and not lighter than the adults, nor to albinism, as is shown by the brown bases to the hairs; and I am therefore compelled to look upon it as representing a new species, distinguished from all other members of the group by the colour and fluffiness of its fur.

I have very great pleasure in connecting with this interesting animal the name of its discoverer, to whom science is indebted for so large a contribution to our knowledge of the fauna of Central Africa.

39. MANIS TRICUSPIS, Raf.

a. Kudurma, Makraka, 1/84.
b. Kabajendi, Makraka, 8/84.
c. Monbuttu, 5/84.
" Monbuttu, 'Nakito.' Sandeh, 'Kiro.' "—E.

These specimens all agree in having 21 longitudinal series of body-scales. Specimen *c*, the only one with a perfect tail, has 37 marginal, 33 central single, and 6 pairs of terminal caudal scales.

In considering the geographical relations shown by the present collection, it will be advisable at first only to take into consideration the species obtained in Monbuttu. These (excluding two unnamed) are the following :—

1.	Anthropopithecus troglodytes.	*	
2.	Galago demidoffi.	*	
3.	Felis servalina.	*	
4.	„ caligata.	†	
5.	Poiana richardsoni.	*	
6.	Crossarchus zebra.	A	
7.	„ obscurus.	*	
8.	Epomophorus monstrosus.	*	
9.	„ franqueti.	*	
10.	Anomalurus pusillus.	‡	
11.	Sciurus stangeri.	*	
12.	„ rufobrachiatus.	*	
13.	„ pyrrhopus.	*	
14.	„ boehmi.	‡	
15.	Xerus erythropus.	†	
16.	Cricetomys gambianus.	†	
17.	Malacomys longipes.	*	
18.	Mus (Isomys) barbarus.	†	
19.	„ gueinzii.	N	
20.	„ kaiseri.	‡	
21.	„ rufinus.	*	
22.	„ univittatus.	*	
23.	„ (Leggada) minutoides.	†	
24.	Lophuromys sikapusi.	*	
25.	Georychus ochraceo-cinereus.	‡	
26.	Atherura africana.	*	
27.	Dendrohyrax emini.	‡	
28.	Manis tricuspis.	*	

Of these 28 species, no less than 16 (marked with a *) are wholly West-African, 14 of them having never been hitherto recorded out of the West-African region at all, and therefore Dr. Emin has extended the known ranges of every one of these 14 by something like a thousand or twelve hundred miles. Of the others, 5 (marked with a †), although found in other regions, also occur in West Africa; 5 (‡) are either peculiar or only otherwise known from neighbouring Central-African localities; one only is Abyssinian (A); and one is as yet elsewhere only known from Natal (N).

The collection as a whole is therefore distinctly West-African in character, and presents no appreciable intermixture of other forms.

J. G. Keulemans del. et lith.

Mintern Bros. imp.

INDICATOR EMINI.

It thus gives final and conclusive evidence that the western forest-fauna extends right across the centre of Africa in this direction at least as far as 28° east longitude, and slightly further to the north, judging by the few specimens from Makraka, as far as 30° E. This is, in fact, quite to the extreme limit of the Congo basin, the watershed apparently here abruptly dividing the two faunas, the few Wadelai and Lado specimens showing no trace whatever of any West-African affinity.

The abruptness with which the change of fauna occurs on the watershed is, considering the insignificant nature of the physical barriers, very remarkable, and almost unequalled in the distribution of the mammals of any part of the world. The reason of the change is, however, clear enough, being not the occurrence of such barriers to migration as mountains or rivers, but the abrupt ending of the great West-African forest, which, as we know from the travels of Schweinfurth and others, extends quite into this region, but abruptly ceases before the slopes of the Upper Nile basin are reached.

Finally, I may express the hope that this valuable and interesting collection may be succeeded by others from the same quarter, and that I, or some more competent person, may have the opportunity of drawing up a mammal-fauna of the Wadelai district itself, and of further adding to our knowledge of the mammals inhabiting the rich region tapped by Emin Pasha, whenever he crosses to the west of the Congo-Nile watershed.

2. On a Collection of Birds made by Emin Pasha in Equatorial Africa. By Captain G. E. Shelley, F.Z.S.

[Received January 13, 1888.]

(Plate III.)

It is several months since letters were received from Emin Pasha announcing the despatch of some cases of natural-history specimens from Wadelai, and their receipt has been a source of the greatest satisfaction to the authorities of the British Museum, knowing the troubles which have been going on in Uganda, by which route the collections were to be despatched to Zanzibar. No slight apprehensions were entertained as to their detention in that country, and it seemed almost hopeless to expect their safe arrival on the coast. That they did so arrive is doubtless due to the exertions of the Rev. Mr. Mackay, and he will surely receive the thanks of every naturalist for the care with which he has managed to send the collection home.

The birds now sent by Emin Pasha evidently belong to two categories. Many of them have been collected about the stations of Lado and Wadelai, and most of these species have been described by Dr. Hartlaub in one of the papers mentioned below. At the same

time there are many examples of species obtained on the Pasha's last expedition to the shores of the Albert Nyanza and the Monbuttu country, and these are most interesting. We have no map to show the last researches of Emin Pasha in this district, and therefore some little time may elapse before all the places mentioned in this paper are identified; but the peculiar nature of the avifauna is manifest. The collection is of the same character as that of Mr. Bohndorff's from the Niam-niam country, and, as pointed out by Mr. Bowdler Sharpe, is *West* African.

On the western watershed of the lake-system of Equatorial Africa the Abyssinian fauna disappears and is replaced by the purely tropical features of the West-African river-system: thus we find in Emin Pasha's collection examples of such genera as *Indicator*, *Pyrenestes*, and *Spermospiza*, purely West-African in character. To point out the limits of these two diverse zoo-geographical areas will be the work of an observer on the spot, and it is to be hoped that Emin Pasha may be gifted with health for many years to come to finish the work he has so well begun.

This is the first consignment which the British Museum has received from the Lado district, and it adds a large number of species to the collection, besides the types of the four following new species:—*Indicator emini*, *Spermospiza ruficapilla*, *Ploceus castanops*, and *Glareola emini*. The further researches of the traveller in the region of the Albert Nyanza will be awaited with eagerness.

In my present notes on this collection I have referred to the following papers, which deal with the former collections of Emin Pasha:—

1. "Beitrag zur Ornithologie der östlich-äquatorialen Gebiete Afrika's. Von Dr. G. Hartlaub, nach Sendungen und Noten von Dr. Emin Bey in Lado." Abhandl. nat. Ver. Brem. vii. pp. 83, 128, pl. 5.
2. "Ueber eine Sendung von Vögeln aus Central-Afrika. Von August von Pelzeln." Verhandl. zool.-bot. Ges. Wien, xxxi. pp. 141–156.
3. In the same volume pp. 605–618, is another article by Herr von Pelzeln entitled "Ueber Dr. Emin Bey's zweite Sendung von Vögeln aus Central-Afrika."
4. In the next volume, pp. 499–512, is another article on Emin Pasha's birds:—"Ueber Dr. Emin Bey's dritte Sendung von Vögeln aus Central-Afrika."
5. Dr. Hartlaub, in his "Zweiter Beitrag zur Ornithologie der östlich-äquatorialen Gebiete Afrika's," Abhandl. nat. Ver. Brem. viii. 1882, pp. 184, 232, gives an enlarged map of Lado and the country for about 100 miles to the south-east. This paper includes a list of 276 species as having up to this time been procured by Emin Pasha, also many of the collector's original notes, amongst which are the latitudes and longitudes of some 17 of the little-known localities mentioned. I much regret that I have not been able to continue this useful portion

of the work; but I trust we may not have long to wait before an accurate map of the little-known district may be published under the auspices of Emin Pasha, who we all hope will soon return safely to Europe after the arduous and important duties he has so ably performed during many years in the Upper White Nile district.

In my present list I have followed, as closely as I considered advisable, the order of the species adopted by Dr. Hartlaub, and have given references, not only to all the above-mentioned papers, but also to Mr. R. B. Sharpe's "Notes on a Collection of Birds made by Herr F. Bohndorff in the Bahr el Gazel Province and the Nyam-nyam Country in Equatorial Africa," published in the Linnean Society's Journal (Zool.), xvii. 1884, pp. 419–441. I have also thought it advisable to give what I have considered to be the most important references for the identification of each species.

I should like, in conclusion, to state that this collection has been entirely worked out in the Bird-room of the Natural History Museum, where I have found every convenience for regular study, with the finest collection in the world before me, which, owing to Mr. Bowdler Sharpe's untiring energy, is now as accessible for work as any small private collection, with this further advantage, that very few species are wanting, and generally a good series of specimens is available. I trust that these remarks may not lead to an overwhelming influx of ornithological students to the bird-room, for Mr. Sharpe's sake; but even then I believe that his courtesy would be equal to the task, as I presume that there is nothing which would please him more than to find the British Museum the centre of all ornithological study, as it ought to have been years ago, and as it most certainly was *not* in former days.

Emin Pasha's consignment consists of two very distinct collections: one from what I shall call the Wadelai district, including Lado, Redjaf, Kiri, Tobbo, Wadelai, and Kiberi, comprised within the limits of 2° and 5° N. lat., and 31° and 33° E. long; the other is from the Tingasi district, including Bellima, Tomaja, and Tingasi, extending westward of 31°, and comprising portion of the Monbuttu country.

Comparing these two collections we find:—

Wadelai collection:—114 species, 10 local, 1 W.-African, 27 N.E.-African, 6 E.-African.

Tingasi collection:—43 species, 3 local, 27 W.-African, *none* N.E.-African, *none* E.-African.

From the above it is evident that the Wadelai district belongs to the great N.E.-African or Abyssinian Region, and the Tingasi district to the W.-African Region; and on regarding the close proximity of these districts, the fact of the fauna of a continent following its great watersheds and forests is strikingly exhibited, and the presence of an almost impassable barrier is suggested. Thus physical geography and ornithology lend each other a friendly hand in the elucidation of scientific problems.

I. PASSERES.

1. Sylvia hortensis, Bechst.

Sylvia hortensis, Seebohm, Cat. B. Brit. Mus. v. p. 10; Hartl. Abhandl. nat. Ver. Brem. vii. 1881, p. 95.

No. 23. ♂. Tingasi, Sept. 20, 1883.
No. 194. ♂. Kibero, Oct. 8, 1886.

2. Phylloscopus trochilus (Linn.).

Phylloscopus trochilus, Seebohm, Cat. B. Brit. Mus. v. p. 56.
Phyllopneuste trochilus, Hartl. Abhandl. nat. Ver. Brem. vii. 1881, p. 94, 1882, p. 193.

♂. Lado, Oct. 19, 1885.
No. 128. Wadelai, Sept. 14, 1885.
No. 173. ♂. Wadelai, Oct. 18, 1885.

3. Hypolais pallida (Hempr. & Ehr.).

Hypolais pallida, Seebohm, Cat. B. Brit. Mus. v. p. 82; Hartl. Abhandl. nat. Ver. Brem. viii. 1882, p. 193; Pelz. Verh. Wien, xxxii. 1882, p. 502.

No. 238. ♂. Lado, March 3, 1884.
No. 915. ♂. Gondokoro, Nov. 16, 1883.
No. 13. ♂. Wadelai, Jan. 15, 1886.
No. 54. ♀. Wadelai, Feb. 2, 1886.
The dates of capture seem to show that this species winters in Equatorial Africa.

4. Acrocephalus phragmitis (Bechst.).

Acrocephalus phragmitis, Seebohm, Cat. B. Brit. Mus. v. p. 91.
No. 176. ♂. Wadelai, Oct. 29, 1885.

5. Ruticilla phœnicurus (Linn.).

Ruticilla phœnicurus, Seebohm, Cat. B. Brit. Mus. v. p. 336; Hartl. Zool. Jahrb. ii. 1886, p. 319.

No. 949. ♂. Redjaf, Dec. 1, 1883.
♀. Foda, Oct. 21, 1885.

6. Pratincola rubetra (Linn.).

Pratincola rubetra, Sharpe, Cat. B. Brit. Mus. iv. p. 179; Hartl. Abhandl. nat. Ver. Brem. vii. p. 89.
No. 177. ♂. Redjaf, Feb. 2, 1884.

7. Bradyornis pallida (v. Müll.).

Bradyornis pallida, Sharpe, Cat. B. Brit. Mus. iii. p. 310; Hartl. Abhandl. nat. Ver. Brem. viii. 1882, p. 191.
No. 329. ♀. Nov. 20, 1882.

8. Pentholæa clericalis, Hartl.

Pentholæa clericalis, Hartl. J. f. O. 1882, p. 321; id. Abhandl.

nat. Ver. Brem. viii. 1882, p. 321; Sharpe, Cat. B. Brit. Mus. vii. p. 18; Hartl. Zool. Jahrb. ii. 1886, p. 317, pl. 13. figs. 7 ♂, 8 ♀.

Nos. 557, 569. ♂. Kuterma, May 1883.

No. 530. ♀. Tobbo, May 21, 1883.

A perfectly distinct species, of which Emin Pasha sends three fine adult specimens.

9. Cossypha heuglini, Hartl.

Bessornis intermedius, Cab. in V. d. Decken's Reis. iii. p. 32 pl. 12

Cossypha heuglini, Hartl. Abhandl. nat. Ver. Brem. viii. 1882, p. 187; Sharpe, Cat. B. Brit. Mus. vii. p. 41.

No. 211. ♀. Kibiro, Oct. 11, 1886.

10. Cossypha verticalis, Hartl.

Cossypha verticalis, Sharpe, Cat. B. Brit. Mus. vii. p. 45; Hartl. Zool. Jahrb. ii. 1886, p. 313.

No. 822. ♂. Tamaja, Aug. 17, 1883.

This is probably the most eastern locality known for this West-African species.

11. Erythropygia ruficauda, Sharpe.

Erythropygia ruficauda, Sharpe, Cat. B. Brit. Mus. vii. p. 78; Hartl. Zool. Jahrb. ii. 1886, p. 316.

Nos. 182, 188, 206. ♂. Kibero, Oct. 1886.

12. Eminia lepida, Hartl.

Eminia lepida, Hartl. P. Z. S. 1880, p. 625, pl. 60. fig. 1; id. Abhandl. nat. Ver. Brem. vii. 1881, p. 91; id. Zool. Jahrb. ii. 186, p. 334.

Apalis lepida, Sharpe, Cat. B. Brit. Mus. vii. p. 140.

No. 95. ♂. Wadelai, Aug. 17, 1885.

No. 190. ♀. Kibero, Oct. 8, 1886.

The sexes are similar in plumage.

13. Drymocichla incana, Hartl.

Drymocichla incana, Hartl. P. Z. S. 1880, p. 626, pl. 60. fig. 2; id. Abhandl. nat. Ver. Brem. vii. p. 91; Sharpe, Cat. B. Brit. Mus. vii. p. 149.

Nos. 88, 89. ♂ ♀. Wadelai, Aug. 15, 1885.

No. 171. ♀. Wadelai, Oct. 18, 1885.

The sexes are similar in plumage. Neither this species nor the last have been recorded from north of Wadelai.

14. Phyllolais pulchella (Rüpp.).

Phyllolais pulchella, Hartl. Abhandl. nat. Ver. Brem. vii. 1881, p. 90; viii. 1882, p. 190; Pelz. Verh. Wien, xxxii. 1882, p. 501; Sharpe, Cat. B. Brit. Mus. vii. p. 149.

No. 481. ♂. Lado, Nov. 20, 1884.

15. Sylviella microura (Rüpp.).

Oligocercus rufescens, Hartl. Abhandl. nat. Ver. Brem. vii. 1881, p. 92.

Oligura microura, Pelz. Verh. Wien, xxxi. 1881, p. 144; xxxii. 1882, p. 502.

Sylviella microura, Sharpe, Cat. B. Brit. Mus. vii. p. 154.

No. 938. ♂. Gondokoro, Nov. 15, 1883.

16. Eremomela elegans (Heugl.).

Tricholais elegans, Pelz. Verh. Wien, xxxi. pp. 144, 609; Hartl. Abhandl. nat. Ver. Brem. viii. 1882, p. 190.

Eremomela elegans, Sharpe, Cat. B. Brit. Mus. vii. p. 163.

No. 338. ♂. Lado, April 23, 1884.
Nos. 345, 356. ♂. Redjaf, May 1884.
No. 975. ♂. Redjaf, Dec. 17, 1885.
a, d. Wadelai, July 7, 1885.

17. Camaroptera brevicaudata (Rüpp.).

Camaroptera brevicaudata, Hartl. Abhandl. nat. Ver. Brem. vii. 1881, p. 90; Pelz. Verh. Wien, xxxi. 1881, p. 144; xxxii. 1882, p. 502; Sharpe, Cat. B. Brit. Mus. vii. p. 168.

No. 409. ♂. Lado, Aug. 30, 1884.

18. Prinia mystacea, Rüpp.

Cisticola tenella, Hartl. Abhandl. nat. Ver. Brem. vii. 1881, p. 89; viii. 1882, p. 189.

Drymœca mystacea, Pelz. Verh. Wien, xxxii. 1882, p. 501.

Prinia mystacea, Sharpe, Cat. B. Brit. Mus. vii. p. 191.

No. 338. Lado, March 28, 1883.
No. 405. Lado, Aug. 27, 1884.
No. 85. ♀. Wadelai, Aug. 15, 1885.
No. 21. ♂. Tingasi, July 19, 1883.

19. Burnesia leucopogon (Cab.).

Burnesia leucopogon, Sharpe, Cat. B. Brit. Mus. vii. p. 207.

Nos. 704, 797. ♂ ♀. July 1883.

The sexes are similar in plumage. This species was formerly only known from the Congo region in W. Africa, from which country there are two specimens in the British Museum.

20. Orthotomus erythropterus (Jard.).

Cisticola iodoptera, Heugl. Orn. N.O.-Afr. p. 247.

Orthotomus erythropterus, Sharpe, Cat. B. Brit. Mus. vii. p. 228.

No. 16. ♂. Tingasi, July 17, 1883.

21. Cisticola mentalis (Fras.).

Melocichla mentalis, Hartl. Abhandl. nat. Ver. Brem. vii. 1881, p. 93; viii. 1882, p. 191.

Cisticola mentalis, Sharpe, Cat. B. Brit. Mus. vii. p. 241.

No. 152. ♀. Risuo, Oct. 3, 1882.

This specimen agrees perfectly with others from the Gold Coast in the British Museum.

22. CISTICOLA CINERASCENS, Heugl.

Drymœca concolor, Heugl. Ibis, 1869, p. 97, pl. 2. fig. 1.
Cisticola concolor, Heugl. Orn. N.O.-Afr. p. 253.
Cisticola cinerascens, Sharpe, Cat. B. Brit. Mus. vii. p. 248.

No. 25. ♂. Tingasi, July 19, 1883.

23. CISTICOLA LATERALIS (Fraser).

Cisticola lateralis, Sharpe, Cat. B. Brit. Mus. vii. p. 251.

No. 775. ♂. Abiambana, July 28, 1883.

This species appears hitherto to have been met with only on the west coast of Africa.

24. CISTICOLA RUFA (Fraser).

Cisticola hypoxantha, Hartl. P. Z. S. 1880, p. 624; id. Abhandl. nat. Ver. Brem. vii. 1881, p. 89; id. Zool. Jahrb. ii. 1886, p. 332.
Cisticola rufa, Sharpe, Cat. B. Brit. Mus. vii. p. 252.

No. 186. ♂. Tobbo, May 19, 1883.

This specimen agrees perfectly with others in the British Museum from the Gold Coast.

25. CISTICOLA FERRUGINEA, Heugl.

Cisticola ferruginea, Heugl. Orn. N.O.-Afr. p. 265; Sharpe, Cat. B. Brit. Mus. vii. p. 257.

No. 28. ♀. Wadelai, July 28, 1885.
Nos. 121, 122, 123. ♂ ♀. Wadelai, Sept. 13, 1885.
No. 55. ♀. Wadelai, Feb. 2, 1886.

The British Museum here receives for the first time a remarkably fine series of this striking little Grass-Warbler.

26. CISTICOLA MARGINALIS (Heugl.).

Cisticola marginalis, Hartl. Abhandl. nat. Ver. Brem. vii. 1881, p. 89; Sharpe, Cat. B. Brit. Mus. vii. p. 258.
Cisticola marginata, Pelz. Verh. Wien, xxxii. 1882, p. 501.

No. 287. ♂. Lado, March 31, 1884.

27. CISTICOLA CISTICOLA (Temm.).

Cisticola cursitans, Heugl. Orn. N.O.-Afr. p. 266.
Cisticola cisticola, Sharpe, Cat. B. Brit. Mus. vii. p. 259.

No. 113. ♂. Wadelai, June 17, 1886.

28. Cisticola strangii (Fraser).

Cisticola ladoensis, Hartl. *op. cit.* viii. 1882, p. 189.

Cisticola strangei et *C. natalensis*, Sharpe, Cat. B. Brit. Mus. vii. pp. 276, 278.

Nos. 54, 101, 102. ♂ ♀. Wadelai, Aug. 1885.

No. 148. ♂. Wadelai, Oct. 4, 1885.

Nos. 9, 19. Tingasi, July 1883.

I have a specimen in my own collection determined by Dr. Hartlaub as *C. ladoensis*; it is in the plumage of *Drymoica curvirostris*, Sundev. For the determination of *D. strangei*, Fras., 1843, and *D. natalensis*, Smith, 1843, I would refer to the conclusions I drew (Ibis, 1875, pp. 380, 381), which I still believe to be correct. As the first names for this species were published in the same year, 1843, I select Fraser's as being the most applicable.

29. Cisticola lugubris (Rüpp.).

Cisticola nævia, Hartl. Abhandl. nat. Ver. Brem. viii. 1882, p. 189; id. Zool. Jahrb. ii. 1886, p. 333.

Cisticola lugubris, Sharpe, Cat. B. Brit. Mus. vii. p. 280.

No. 97. ♂. Wadelai, Aug. 1885.

30. Argya rubiginosa (Rüpp.).

Argya rubiginosa, Hartl. Abhandl. nat. Ver. Brem. vii. 1881, p. 93; Sharpe, Cat. B. Brit. Mus. vii. p. 391.

No. 494. ♂. Lado, Jan. 12, 1884.

Iris pale yellow.

31. Criniger verreauxi, Sharpe.

Criniger verreauxi, Sharpe, Cat. B. Brit. Mus. vi. p. 73, pl. 4.

No. 671. ♂. Bellima, June 22, 1883.

32. Chlorocichla gracilirostris (Strickl.).

Chlorocichla gracilirostris, Sharpe, Cat. B. Brit. Mus. vi. p. 114.

No. 697. ♀. Tingasi, July 1, 1883.

This species was formerly only known from the west coast of Africa.

33. Phyllostrophus sharpii, Shelley.

? *Criniger strepitans*, Reichen. Orn. Centralbl. 1879, p. 139 (Malindi).

Phyllostrephus sharpii, Shelley, Ibis, 1880, p. 334 (Dar-es-Salaam); Hartl. Abhandl. nat. Ver. Brem. viii. 1882, p. 188.

Phyllostrophus strepitans, Sharpe, Cat. B. Brit. Mus. vi. p. 117.

Nos. 45, 59, 60, 96. ♂ ♀. Wadelai, Aug. 1885.

This is certainly my *P. sharpii*, which Dr. Hartlaub considers to be distinct from the *P. strepitans* (Reichen.), the type of which species neither myself nor Mr. Sharpe have seen.

34. Andropadus virens, Cass.

Andropadus virens, Sharpe, Cat. B. Brit. Mus. vi. p. 109; id. Journ. Linn. Soc., Zool. xvii. 1884, p. 424.

No. 18. ♂. Tingasi, July 16, 1883.
No. 50. ♂. Tingasi, Aug. 18, 1883.

This species was first discovered in north-east Equatorial Africa by Herr F. Bohndorff, who procured it at Sassa in the Nyam-nyam country.

35. Telephonus senegalus (Linn.).

? *Telephonus erythropterus*, Pelz. Verh. Wien, xxxi. 1881, p. 147; xxxii. 1882, p. 505.

Telephonus senegalus, Gadow, Cat. B. Brit. Mus. viii. p. 124.

No. 360. ♀. Kiri, May 1884.

36. Telephonus minutus, Hartl.

Telephonus minutus, Hartl. Abhandl. nat. Ver. Brem. vii. 1881, p. 94; Gadow, Cat. B. Brit. Mus. viii. p. 128.

No. 30. ♀. Wadelai, July 29, 1885.
No. 17. Ad. Wadelai, March 1881.

37. Dryoscopus affinis (Gray).

Dryoscopus affinis, Gadow, Cat. B. Brit. Mus. viii. p. 141.

No. 754. ♂. Bellima, July 15, 1883.

38. Laniarius sulfureipectus (Less.).

Dryoscopus sulphureipectus, Heugl. Orn. N.O.-Afr. p. 464.
Laniarius sulfureipectus, Gadow, Cat. B. Brit. Mus. viii. p. 159.

No. 27. ♂. Wadelai, Jan. 19, 1886.

39. Lanius gubernator, Hartl.

Lanius gubernator, Hartl. J. f. O. 1882, p. 323, pl. 1. fig. 2 ♀; id. Abhandl. nat. Ver. Brem. viii. 1882, p. 194.

No. 572. ♀ juv. Kuterma, May 28, 1882.
No. 110. ♀ ad. Kuterma, Sept. 18, 1882.

This is quite a distinct species.

40. Graucalus pectoralis, Jard. & Selby.

Graucalus pectoralis, Sharpe, Cat. B. Brit. Mus. iv. p. 29; id. Journ. Linn. Soc., Zool. xvii. 1884, p. 424.

Ad. Tobbo, May 15, 1883.

This is the first time Enim Pasha has sent this bird to Europe, although in Nyam-nyam, according to Mr. Bohndorff, it is a common species.

41. Alseonax comitata, Cass.

Alseonax comitata, Sharpe, Cat. B. Brit. Mus. iv. p. 130.

No. 753. Bellima, July 15, 1883.

The specimen agrees accurately with others from the Gold Coast

with which I have compared it. It was formerly only known from the west coast.

42. PACHYPRORA SENEGALENSIS (Linn.).

Batis senegalensis, Sharpe, Cat. B. Brit. Mus. iv. p. 134.
Platystira senegalensis, Hartl. Abhandl. nat. Ver. Brem. viii. 1882, p. 197; id. Zool. Jahrb. ii. 1886, p. 336.

No. 349. ♂. Kedjaf, May 10, 1884.
No. 598. ♂. Mundi, June 4, 1883.

43. ARTOMYIAS FULIGINOSUS, J. & E. Verr.

Artomyias fuliginosus, Sharpe, Cat. B. Brit. Mus. iv. p. 144, fig. 1.

No. 760. ♂. Ann Nambiri, July 21, 1883.
Formerly only known from the Gaboon and Congo districts on the west coast.

44. PLATYSTIRA CYANEA (P. L. S. Müll.).

Platystira cyanea, Sharpe, Cat. B. Brit. Mus. iv. p. 145.
Platystira senegalensis, Hartl. Abhandl. nat. Ver. Brem. vii. 1881, p. 97.

No. 788. ♀. Tomaja, Aug. 7, 1883.

45. MUSCICAPA GRISOLA (Linn.).

Muscicapa grisola, Sharpe, Cat. B. Brit. Mus. iv. p. 151; Hartl. Abhandl. nat. Ver. Brem. vii. p. 98.
Butalis grisola, Pelz. Verh. Wien, xxxi. 1881, p. 146.

No. 174. ♀. Wadelai, Oct. 10, 1885.
No. 198. ♂. Wadelai, Nov. 12, 1885.
No. 208. ♂. Kabajirdi, Nov. 1, 1882.

46. MUSCICAPA INFULATA, Hartl.

Muscicapa infulata, Hartl. P. Z. S. 1880, p. 626; id. Abhandl. nat. Ver. Brem. vii. 1881, p. 98.

Wadelai, four males and four females shot in June, July, and August.
The type was obtained at Magungo, on the northern extremity of Lake Albert Nyanza.

47. HYLIOTA FLAVIGASTRA, Swains.

Hyliota flavigastra, Sharpe, Cat. B. Brit. Mus. iv. p. 248; Hartl. J. f. O. 1883, p. 323.
Hyliota orientalis, Hartl. Abhandl. nat. Ver. Brem. viii. 1882, p. 198.

No. 31. ♂. Wadelai, Aug. 1, 1885.
Nos. 564, 565. ♂. Kuterma, May 28, 1883.
Nos. 596, 597. ♂ ♀. Hundii, June 4, 1883.
The specimens agree perfectly with a Senegal specimen in the British Museum.

48. Parisoma plumbeum (Hartl.).

Parisoma plumbeum, Sharpe, Cat. B. Brit. Mus. iv. p. 269.
Stenostira plumbea, Hartl. Abhandl. nat. Ver. Brem. viii. 1882, p. 197.

♀ ad. Wadelai, July 7, 1885.

49. Terpsiphone cristata (Gm.).

Terpsiphone cristata, Sharpe, Cat. B. Brit. Mus. iv. p. 354; id. Journ. Linn. Soc., Zool. xvii. p. 425.
Tchitrea melanogastra, Hartl. Abhandl. nat. Ver. Brem. vii. 1881, p. 97; viii. 1882, p. 197.
Terpsiphone melanogastra, Pelz. Verh. Wien, xxxi. 1881, p. 146; xxxii. 1882, p. 504.

No. 42. ♂ juv. Tingasi, Aug. 1, 1883.

50. Elminia teresita, Antin.

Elminia longicauda minor, Heugl. Orn. N.O.-Afr. p. 446.
Elminia teresita, Sharpe, Cat. B. Brit. Mus. iv. p. 364.

Ad. Wadelai, Aug. 15, 1885.

This species differs from *E. longicauda* only in having the breast, abdomen, and under tail-coverts pure white, not shaded with greyish blue except on the sides of the chest. The outer pair of tail-feathers have a larger amount of white on the margin of the inner web; the inner web of the next feather has a small amount of white. The blackish colouring in front of the eyes is barely perceptible.

E. teresita: length 6·5 inches, wing 2·7, tail 3·5, tarsus 0·65.
E. longicauda: length 7·3 inches, wing 2·65, tail 4·3, tarsus 0·65.

51. Megabias flammulata, J. & E. Verr.

Megabias flammulata, Sharpe, Cat. B. Brit. Mus. iv. p. 387.

No. 22. ♂. Tingasi, Aug. 1, 1883.

I have little doubt that this is an immature male of this species, as it agrees with an adult female specimen from Fantee in the British Museum.

52. Motacilla flava, Linn.

Budytes flava, Pelz. Verh. Wien, xxxi. 1881, pp. 145, 609.
Motacilla flava, Sharpe, Cat. B. Brit. Mus. x. p. 516, pl. 6. figs. 3–5.

No. 849. ♂. Lado, Oct. 2, 1883.

53. Anthus pyrrhonotus (Vieill.).

Anthus gouldi, Hartl. Abhandl. nat. Ver. Brem. vii. 1881, p. 99; viii. 1882, p. 198; id. Zool. Jahrb. ii. 1886, p. 337.
? *Anthus sordidus*, Pelz. Verh. Wien, xxxi. 1881, p. 145.
Anthus pyrrhonotus, Sharpe, Cat. B. Brit. Mus. x. p. 555.

No. 164. ♀. Redjaf, Jan. 26, 1884.

54. ANTHUS CERVINUS, Pall.

Anthus cervinus, Heugl. Orn. N.O.-Afr. p. 323; Sharpe, Cat. B. Brit. Mus. x. p. 585.

No. 121. ♀. Redjaf, Jan. 1, 1884.

55. MACRONYX CROCEUS (Vieill.).

Macronyx croceus, Hartl. Abhandl. nat. Ver. Brem. vii. 1881, p. 99; Pelz. Verh. Wien, xxxi. 1881, pp. 145, 609; Sharpe, Cat. B. Brit. Mus. x. p. 626.

No. 359. ♂. Wadelai, May 19, 1884.

56. MIRAFRA APIATA (Vieill.).

Megalophonus fischeri, Reichen. J. f. O. 1883, p. 202.
Mirafra apiata, Hartl. Zool. Jahrb. ii. 1886, p. 329.

No. 132. ♀. Wadelai, Aug. 11, 1886.

This is the most northern locality yet known for this species, which ranges into South Africa and the Congo region.

57. MIRAFRA BUCOLICA, Hartl.

Mirafra bucolica, Hartl. Zool. Jahrb. ii. 1886, p. 327.

♂ ad. Tobbo, May 16, 1883.

In general colouring and size this Lark much resembles the S.-African *M. sabota*, but differs in the colouring of the quills, two pairs of the outer tail-feathers, and in the character of the feet. The following comparison between *M. bucolica* and *M. sabota* will best point out the characters which appear to me to be of specific value.

M. bucolica.—Primaries broadly edged with rufous buff, that colouring extending to the quill of the first long primary throughout the greater portion of its length; inner webs broadly edged with rufous buff of the same shade for about half the length of the feathers. Two outer tail-feathers—outer one rufous buff with a diagonal dark portion extending from near the end of the inner web over the basal portion of the outer one, but not reaching to the outer web, and divided near the base of the quill by the buff colouring, next feather with a broad rufous-buff edge to the outer web. Feet smaller and buffer, hind claw slightly straighter and longer.

M. sabota.—Primaries partially and very narrowly edged with buffish white, not perceptible on the first long primary; inner margin of primaries whitish but nearly obsolete. Two outer tail-feathers—outer one blackish, with only a broad edging of rufous buff over scarcely more than half the width of the outer web and round the end of the feather; next feather with an almost obsolete pale margin to the outer web, widening slightly at the tip. Feet larger and browner, hind claw slightly more curved and shorter.

58. GALERITA MODESTA, Heugl.

Geocorypha modesta, Heugl. Orn. N.O.-Afr. p. 691, pl. 23; Hartl. Zool. Jahrb. ii. 1886, p. 328.

No. 150. ♀. Redjaf, Jan. 17, 1884.

No. 175. ♂. Redjaf, Feb. 2, 1884.
No. 926. ♂. Redjaf, Nov. 23, 1883.
No. 970. ♂. Redjaf, Dec. 15, 1883.

This species is new to the British Museum Collection. It belongs apparently to the genus *Galerita*, being slightly crested, and it has the bastard primary short, only just extending beyond the primary-coverts, while in plumage it much resembles *G. cristata*.

59. Pyrrhulauda leucotis (Stanley).

Coraphites leucotis, Heugl. Orn. N.O.-Afr. p. 669.

No. 973. ♂. Dec. 16, 1883.

60. Parus niger, Bonn. et Vieill.

Parus leucomelas, Pelz. Verh. Wien, xxxi. 1881, pp. 145, 609.
Parus niger, Gadow, Cat. B. Brit. Mus. viii.

No. 366. ♂. Kiri, May 22, 1884.

This is an adult male with no white edges to the tail-feathers; in this character, and indeed in all other respects, it agrees perfectly with a Damara specimen in the British Museum, so that I cannot admit that there are any constant local races of this species.

61. Ægithalus parvulus, Heugl.

Ægithalus parvulus, Hartl. Abhandl. nat. Ver. Brem. vii. 1881, p. 99; id. Zool. Jahrb. ii. 1886, p. 347, pl. 12. fig. 3.

No. 370. ♂. Kiri, May 24, 1884.

This species has been well figured by Dr. Hartlaub, and is quite distinct from *Æ. capensis*, of which it is the northern representative.

62. Ægithalus musculus, Hartl.

Ægithalus musculus, Hartl. J. f. O. 1882, p. 326; id. Abhandl. nat. Ver. Brem. viii. 1882, p. 198; id. Zool. Jahrb. ii. 1886, p. 347.

No. 218. ♀. Lado, Feb. 25, 1884.
Nos. 252, 283. ♂ ♀. Lado, March 1884.

Like the last, this species is new to the British Museum. It comes nearest to *Æ. caroli*, Sharpe, from which it may be readily distinguished by its hoary white throat and chest, and the abdomen only tinted with rufous buff. The forehead is uniform with the upper parts, and the sexes are similar in plumage.

63. Philetærus arnaudi (Bp.).

Nigrita arnaudi, Hartl. Abhandl. nat. Ver. Brem. vii. 1881, p. 104; Pelz. Verh. Wien, xxxi. 1881, p. 150; xxxii. 1882, p. 207.
Philetærus arnaudi, Shelley, Ibis, 1886, p. 308.

No. 953. ♀. Redjaf, Dec. 2, 1883.

Iris chestnut; bill black; legs dusky flesh-colour.

64. Amadina fasciata (Gm.).

Sporothlastes fasciatus, Hartl. Abhandl. nat. Ver. Brem. vii. 1881, p. 203; Pelz. Verh. Wien, xxxii. 1882, p. 509.

Amadina fasciata, Shelley, Ibis, 1886, p. 313.

No. 976. ♂. Redjaf, Dec. 17, 1882.

65. Pyrenestes ostrinus (Vieill.).

Pyrenestes ostrinus, Shelley, Ibis, 1886, p. 314.

No. 717. ♂. Tingasi, July 4, 1883.

Iris dusky brown; bill black; legs yellowish.

This specimen is small and entirely black and red. Total length 5 inches, culmen 0·5, wing 2·65, tail 2·15, tarsus 0·7. There is a very similar specimen in the British Museum from the Gold Coast.

66. Spermospiza ruficapilla, sp. n.

Entire head, throat, front and sides of the chest uniform scarlet; back of the neck, back, wings and tail when closed, dusky slate-colour; upper tail-coverts red, slightly darker than the head; remainder of the breast black, thickly spotted with white on the chest and barred on the abdomen and under tail-coverts. Under surface of the wings and tail dusky black, mottled or barred with white on the under wing-coverts. Iris dusky brown; bill metallic blue with the end carmine, and the cutting-edges shaded with that colour; legs dusky brown. Total length 6·2 inches, culmen 0·65, wing 2·9, tail 2·6, tarsus 0 95.

No. 752. ♀. Bellima, July 15, 1883.

This species is closely allied to *S. hæmatina* and *S. guttata*, but may be readily recognized, at least in the female, by its having the entire head uniform scarlet. In the colouring of the bill it agrees best with *S. guttata*.

67. Hypargus monteiri (Hartl.).

Pytelia monteiri, Hartl. Abhandl. nat. Ver. Brem. viii. 1882, p. 203.

Hypargus monteiri, Shelley, Ibis, 1886, p. 318.

♂ juv. Lado, Nov. 1, 1885.

No. 59. ♂. Tanjimoro, Sept. 23, 1883.

No. 179. Tanjimoro, Oct. 5, 1886.

The young bird from Lado differs from the adult in having the throat uniform grey, and in there being no white spots on the breast, which is chestnut fading into white on the abdomen. The under tail-coverts are broadly barred with chestnut and white.

68. Pytelia melba (Linn.).

Pytelia melba, Hartl. Abhandl. nat. Ver. Brem. vii. 1881, p. 104; Pelz. Verh. Wien, xxxii. 1882, p. 509; Shelley, Ibis, 1886, p. 319.

Pytelia citerior, Pelz. Verh. Wien, xxxi. 1881, p. 614.

No. 208. ♂. Kibiro, Oct. 11, 1886.

Iris and bill red, culmen blackish; legs flesh-brown.

In the British Museum are apparently typical specimens of both sexes of *P. cinereigula*; the female is a female of this species and the male is *P. afra* (Gm.).

69. Pytelia phœnicoptera, Swains.

Pytelia phœnicoptera, Hartl. Abhandl. nat. Ver. Brem. viii. 1882, p. 203; Shelley, Ibis, 1886, p. 323.

Zonogastris erythroptera, Pelz. Verh. Wien, xxxii. 1882, p. 509.

No. 385. ♂. Lado, Aug. 16, 1884.

Iris red; bill black; legs pale brown.

70. Lagonosticta senegala (Linn.).

Lagonosticta minima, Pelz. Verh. Wien, xxxi. 1881, p. 606.

Lagonosticta senegala, Shelley, Ibis, 1886, p. 323.

No. 182. ♂. Kibero, Oct. 7, 1886.

71. Lagonosticta rara (Antin.).

Rhodopyga hypomelas, Heugl. J. f. O. 1868, p. 13, pl. 1. fig. 4.

Habropyga hypomelæna, Heugl. Orn. N.O.-Afr. p. 611.

Habropyga œnochroa, Hartl. J. f. O. 1882, p. 322; id. Abhandl. nat. Ver. Brem. viii. 1882, p. 203.

Lagonosticta rara, Shelley, Ibis, 1886, p. 323.

Lagonosticta œnochroa, Hartl. Zool. Jahrb. ii. 1886, p. 322, pl. 13. fig. 6.

Ad. Lado, Oct. 24, 1885.

No. 15. ♂. Tingasi, Aug. 9, 1883.

No. 175. ♀. Tingasi, July 3, 1883.

I have referred this species to *L. rara* (Antin.), although I have not examined a typical specimen; but it appears to me to be undoubtedly the same as *L. œnochroa*, Hartl., which, under the impression that it was the type I had examined, I wrongly referred to *L. rhodopareia* (Ibis, 1886, p. 324). *L. rara* has been badly figured by Heuglin under the name of *Rhodopyga hypomelas*, but the sides of the body have been painted black instead of red as described, and this appears to be the only character upon which *L. œnochroa*, Hartl., has been separated.

The real characters for this species appear to be:—the pale patch on the lower mandible, most strongly marked in specimens 15 and 175, and the absence of white spots on the sides of the chest in adult males.

To this species should undoubtedly be referred the *L. melanogastra* of my paper in 'The Ibis,' 1883, p. 153, from Lukoja on the Niger.

72. Estrelda nonnula, Hartl.

Astrilda nonnula, Hartl. J. f. O. 1883, p. 425; id. Zool. Jahrb. i. 1886, p. 321, pl. 13. fig. 5.

Habropyga tenerrima, Reichen. J. f. O. 1887, p. 213, Stanley Falls.

No. 58. ♂. Kubbi, July 1881.
No. 654. ♂. Bellima, June 21, 1883.
♂ ♀. Foda, Oct. 27, 1885.

The males have the bill black, with a red patch on the sides of the culmen and base of the lower mandible, also a patch of scarlet on the sides of the body, of much less extent than in *E. atricapilla*. It is the *Habropyga tenerrima* of Reichenow.

The female differs in having the entire bill dusky black and no red on the sides of the body. This is the *Astrilda nonnula*, Hartl.

73. Estrelda paludicola, Heugl.

Estrelda paludicola, Shelley, Ibis, 1886, p. 331; Hartl. Zool. Jahrb. ii. 1886, p. 321.

No. 706. ♀. Tingasi, July 3, 1883.
New to the British Museum.

74. Estrelda astrild (Linn.).

Estrelda astrild, Shelley, Ibis, 1886, p. 322.

No. 288. ♀. Lado, March 30, 1884.
A variety entirely white, with a red band round the eye.

75. Estrelda rhodopyga, Sundev.

Estrelda rhodopyga, Shelley, Ibis, 1886, p. 333; Hartl. Zool. Jahrb. ii. 1886, p. 322.

Nos. 135, 138. ♂. 136, 139. ♀. Wadelai, Sept. 18, 1885.
No. 154. ♂. Wadelai, Oct. 6, 1885.

76. Estrelda cinerea (Vieill.).

Astrilda cinerea, Hartl. Abhandl. nat. Ver. Brem. vii. 1881, p. 103; Pelz. Verh. Wien, xxxi. p. 614; xxxii. 1882, p. 505; Shelley, Ibis, 1886, p. 333.

Nos. 39, 40. ♂ ♀. Wadelai, Aug. 3, 1885.

77. Estrelda subflava (Vieill.).

Habropyga subflava, Heugl. Orn. N.O.-Afr. p. 609.
Estrelda subflava, Shelley, Ibis, 1886, p. 334.

Nos. 235, 236, 243. ♂. Nos. 234, 242, 248, 253. ♀. Lado, March 1884.

78. Ortygospiza atricollis (Vieill.).

Ortygospiza atricollis, Heugl. Orn. N.O.-Afr. p. 598; Shelley, Ibis, 1886, p. 338.

No. 150. ♂. Redjaf, Jan. 19, 1884.
Nos. 945, 946. ♂ ♀. Redjaf, Nov. 30, 1883.

79. Vidua principalis (Linn.).

Vidua principalis, Hartl. Abhandl. nat. Ver. Brem. vii. 1881,

p. 102; Pelz. Verh. Wien, xxxi. 1881, pp. 151, 613; Sharpe, Journ. Linn. Soc., Zool. xvii. 1884, p. 426; Shelley, Ibis, 1886, p. 341.

No. 46. ♀. Tingasi, Aug. 14, 1883.

80. Coliuspasser macrurus (Gm.).

Penthetria macroura, Hartl. Abhandl. nat. Ver. Brem. viii. 1882, p. 202; Pelz. Verh. Wien, xxxi. 1881, pp. 606, 613; xxxii. 1882, p. 508; Sharpe, Journ. Linn. Soc., Zool. xvii. 1884, p. 426.

Coliuspasser macrurus, Shelley, Ibis, 1886, p. 348.

♂ ad. Tobbo, May 19, 1883.

81. Coliuspasser axillaris (Smith).

Urobrachya axillaris, Hartl. Abhandl. nat. Ver. Brem. vii. 1881, p. 102; viii. 1882, p. 221; Pelz. Verh. Wien, xxxi. 1881, p. 151; xxxii. 1882, p. 508.

Coliuspasser axillaris, Shelley, Ibis, 1886, p. 348.

Penthetria axillaris, Hartl. Zool. Jahrb. ii. 1886, p. 325.

No. 285. ♂. Lado, March 31, 1884.

No. 56. ♀. Lado, July 25, 1883.

82. Pyromelana flammiceps (Swains.).

Pyromelana flammiceps, Pelz. Verh. Wien, xxxi. 1881, pp. 150, 613; Shelley, Ibis, 1886, p. 352.

Euplectes flammiceps, Hartl. Abhandl. nat. Ver. Brem. viii. 1882, p. 201.

Nos. 34, 54, 72. ♂. Tingasi, Aug. 1883.

No. 45. Kubbi, July 1881.

83. Pyromelana ladoensis (Reichen.).

Euplectes taha, Hartl. Abhandl. nat. Ver. Brem. vii. 1881, p. 103; viii. 1882, p. 201; Pelz. Verh. Wien, xxxii. 1882, p. 506.

Euplectes ladoensis, Reichen. J. f. O. 1885, p. 218; Hartl. Zool. Jahrb. ii. 1886, p. 339.

Pyromelana sticta, Shelley (nec Heugl.), Ibis, 1886, p. 354.

No. 408. ♂. Lado, Aug. 30, 1884.

84. Quelea erythrops (Hartl.).

Hyphantica hæmatocephala, Heugl. Orn. N.O.-Afr. p. 545, pl. 19*a*.

Quelea erythrops, Shelley, Ibis, 1886, p. 356.

♂. Kibiro, June 3, 1886.

85. Quelea cardinalis (Hartl.).

Hyphantica cardinalis, Hartl. J. f. O. 1880, p. 325; id. Abhandl. Nat. Ver. Brem. vii. 1881, p. 102; viii. 1882, p. 201; J. f. O. 1881, pl. i. figs. 1, 2; Pelz. Verh. Wien, xxxii. 1882, p. 508.

Quelea cardinalis, Shelley, Ibis, 1886, p. 357.

Nos. 25, 26, 29. ♂. Lado, July 1885.

86. QUELEA QUELEA (Linn.).

Quelea quelea, Shelley, Ibis, 1886, p. 357.

♂. Kibiro, June 5, 1886.

Forehead black, flanks and thighs striped.

The occurrence of the black-fronted *Quelea quelea* on the shores of Lake Albert Nyanza shows, in my opinion, the affinity of the fauna of this part of Africa with that of the Congo on the West Coast; but the view may be entertained that *Q. quelea* and *Q. æthiopica* are not distinct species, but only local and not positively definable forms, and this may be supported by the great similarity of their females and by the form *P. russi*, Finsch, with no black on the head, being common to both, as also are the peculiar brown and pink shaded varieties.

87. PLOCEUS MELANOTIS, Lafr.

Sycobius melanotis, Hartl. Abhandl. nat. Ver. Brem. vii. 1881, p. 101.

Anaplectes melanotis, Pelz. Ver. Wien, xxxi. 1881, p. 150; xxxii. 1882, p. 506; Hartl. Zool. Jahrb. ii. 1886, p. 337.

Calyphantria erythogenys, Fisch. & Reichen. J. f. O. 1884, p. 181.

Ploceus melanotis, Shelley, Ibis, 1887, p. 18.

No. 122. ♂. Redjaf, Jan. 9, 1884.

88. PLOCEUS BAGLAFECT, Vieill.

Hyphantornis guerini, Heugl. Orn. N.O.-Afr. p. 562, pl. 11. fig. 3.

Ploceus baglafect, Shelley, Ibis, 1887, p. 20.

♀. Kibiro, Oct. 8, 1886.

89. PLOCEUS NIGRICOLLIS (Vieill.).

Ploceus nigricollis, Shelley, Ibis, 1887, p. 22.

No. 678. ♂. Wadelai, June 23, 1883. Iris straw-colour; bill black; legs dusky red.

This species has previously only been recorded from the West Coast.

Its near ally *P. melanoxanthus* (Cab.) is fairly abundant on the East Coast, near Lamu and Mombas.

90. PLOCEUS OCULARIUS, Smith.

Hyphantornis crocata, Hartl. Abhandl. nat. Ver. Brem. vii. 1881.

Hyphantornis ocularius, Hartl. Abhandl. nat. Ver. Brem. viii. 1882, p. 200.

Symplectes ocularius, var. *crocata*, Hartl. Zool. Jahrb. ii. 1886, p. 341, pl. 14. fig. 11.

Ploceus ocularius, Shelley, Ibis, 1887, p. 23.

Nos. 175, 176. ♂ ♀. Tanjimoro, Oct. 5, 1886.

91. Ploceus castanops, sp. n.

Male.—Head and underparts bright golden yellow, shading into chestnut on the forehead; cheeks, front of the ear-coverts, chin, and throat chestnut, shading into black in front of the eyes, and with a narrow black edging to the chin; the brown of the throat narrow almost to a point towards the lower neck; back of the neck, back, and scapulars uniform yellowish olive, slightly more yellow on the rump; wings brown, with all the feathers broadly edged with pale olive-yellow; tail olive-brown, with narrow yellowish edges to the feathers; under surface of the wings brown, the coverts pale rufous buff, with a golden shade, and the inner margins of the quills yellow. Bill black; legs reddish brown. Total length 5·6 inches, culmen 0·65, wing 2·8, tail 2, tarsus 0·9.

Female.—Crown and nape nearly uniform dusky brown; back and scapulars more buffish brown, with large dark centres to the feathers; wings, rump, and tail as in the male, but not so bright; underparts brownish buff, paler on the centre of the abdomen. Bill dark above, pale beneath. Total length 5·3 inches, culmen 0·55, wing 2·5, tail 1·8, tarsus 0·9.

In form and size this new species much resembles *P. ocularius*, but in no stage of plumage can it be confounded with that bird, as it has no black stripes through the eye, and the broad pale edges of the wing-feathers contrast strongly with the dark portion. From *P. xanthopterus* it differs in its smaller size, in the more olive colouring of the back and edges of the wing-feathers, and in the brown of the forehead.

92. Ploceus vitellinus (Licht.).

Hyphantornis vitellinus, Hartl. Abhandl. nat. Ver. Brem. viii. 1882, p. 200.

Ploceus vitellinus, Shelley, Ibis, 1887, p. 27.

No. 156. ♂. Wadelai, Oct. 7, 1885. Iris bright yellow.

93. Ploceus luteolus (Licht.).

Hyphantornis luteola, Hartl. Abhandl. nat. Ver. Brem. vii. 1881, p. 100; viii. 1882, p. 200.

Sitagra luteola, Pelz. Verh. Wien, xxxi. 1881, p. 612; xxxii. 1882, p. 506.

Ploceus luteolus, Shelley, Ibis, 1887, p. 31.

Nos. 346, 347. ♂ ♀. Redjaf, May 8, 1884.

Nos. 358, 367, 368. ♀. Kiri, May 1884.

94. Ploceus pelzelni (Hartl.).

Ieteropsis crocata, Pelz. (nec Hartl.) Verh. Wien, xxxi. 1881, p. 149.

Sitagra pelzelni, Hartl. Zool. Jahrb. ii. 1886, p. 343, pl. 14. figs. 9, 10.

Four males and five females, from Wadelai (May).

In the adult of both sexes the bill is black. In the immature

the bill is dusky brown above, pale beneath. In immature specimens, two of which are indicated as males, there is no trace of black on the head.

As this species is but little known, I shall describe the male in full plumage; the female is well figured by Dr. Hartlaub (*l. c.*). Very similar to *P. luteolus*, but rather larger, and the bill considerably longer. The black of the head is very similar, only it extends slightly further back; remainder of the head, nape, and sides of the neck bright yellow, like the breast, with no olive shade; remainder of the upper parts as in *P. luteolus*.

P. pelzelni, ♂ ad. Total length 5·25 inches, culmen 0·65, wing 2·35, tail 1·8, tarsus 0·75.

P. luteolus, ♂ ad. Total length 4·7 inches, culmen 0·5, wing 2·35, tail 1·7, tarsus 0·7.

95. Ploceus dimidiatus (Salvad.).

Hyphantornis dimidiata, Salvad. & Antin. Ann. Mus. Civ. Gên. 1873, p. 384, pl. 3; Hartl. Abhandl. nat. Ver. Brem. viii. 1882, p. 199.

Ploceus dimidiatus, Shelley, Ibis, 1887, p. 34.

Fifteen specimens of both sexes from Wadelai, procured in June, July, and August.

Iris umber-brown.

96. Ploceus abyssinicus (Gm.).

Hyphantornis habessinica, Hartl. Abhandl. nat. Ver. Brem. vii. 1881, p. 99.

Hyphantornis abyssinica, Pelz. Verh. Wien, xxxi. 1881, p. 612; xxxii. 1882, p. 505.

No. 265. ♂. May 22, 1884.

No. 38. ♂. Kiri, Sept. 12, 1883.

The second specimen is recorded as being in the winter plumage; it closely resembles the figure of *Textor flavirostris*, Rüpp. (Syst. Uebers. pl. 29).

97. Passer rufocinctus, Fisch. & Reichen.

Passer motitensis, Heugl. (nec Smith) Orn. N.O.-Afr. p. 634.

Passer rufocinctus, Fisch. & Reichen. J. f. O. 1884, p. 55.

No. 30. ♂. Lado, April 9, 1884.

98. Sorella emini, Hartl.

Sorella emini, Hartl. J. f. O. 1880, p. 211; J. f. O. 1881, pl. 1. figs. 3, 4; Hartl. Abhandl. nat. Ver. Brem. vii. 1881, p. 104; viii. 1882, p. 201; Pelz. Verh. Wien, xxxi, 1881, p. 150; xxxii. 1882, p. 507; Fisch. J. f. O. 1885, p. 136; Hartl. Zool. Jahrb. ii. 1886, p. 340.

Passer emini, Sharpe, Cat. B. Brit. Mus. xii. p. 332 (1887).

No. 881. Lado, Nov. 2, 1883.

Nos. 204, 205. Lado, Feb. 18, 1884.

Nos. 120, 175. ♂. Redjaf, Jan. 31, 1884.

99. Crithagra barbata, Heugl.

Crithagra barbata, Heugl. Orn. N.O.-Afr. p. 629; Hartl. Abhandl. nat. Ver. Brem. viii. 1882, p. 204.

♀ ad. Tobbo, May 17, 1883.

100. Fringillaria orientalis, Shelley.

Fringillaria orientalis, Shelley, P. Z. S. 1882, p. 308 (Mamboio).

No. 109. ♀. Tingasi, Aug. 1, 1883. Iris dusky, bill brown, legs pale brown.

There is a specimen of this species in the British Museum, labelled by Dr. Reichenow "*Fringillaria major*," from Leopoldville on the Congo.

101. Fringillaria forbesi, Hartl.

Fringillaria capensis, Swains. (nec Linn.) B. W. Afr. i. p. 211, pl. 18.

Fringillaria forbesi, Hartl. J. f. O. 1882, p. 324; id. Abhandl. nat. Ver. Brem. viii. p. 204.

Ad. Kuterma, May 26, 1883. Iris dusky; bill blackish, paler on the lower mandible; legs greyish horn-colour.

102. Lamprocolius splendidus (Vieill.).

Lamprocolius splendidus, Sharpe, Journ. Linn. Soc., Zool. xvii. 1884, p. 426.

No. 135. Tingasi, Sept. 1881.

This Gaboon species was first met with in Central Africa by Mr. Bohndorff in the Niam-niam country.

103. Buphaga africana, Linn.

Buphaga africana, Hartl. Zool. Jahrb. ii. 1886, p. 311.

No. 189. ♀. Kibiro, Oct. 8, 1886.

104. Salpornis salvadorii, Bocage.

Hylipsornis salvadorii, Bocage, Orn. Angola, p. 289, pl. 10. fig. 2.

Salpornis salvadorii, Gadow, Cat. B. Brit. Mus. viii. p. 330.

Salpornis emini, Hartl. P. Z. S. 1884, p. 415, pl. 37; id. Zool. Jahrb. ii. 1886, p. 312.

No. 539. ♂. Tobbo, May 22, 1884.

This is, no doubt, the *S. emini*, Hartl., but I can detect no character by which it can be separated from *S. salvadorii* after comparing it with three specimens of the latter, two from Benguela and one from Mashoona land. The British Museum, since the acquisition of Mr. Hume's valuable collection, contains a large series of *S. spilonata*, from which the present species is barely separable, the Asiatic form having the two centre tail-feathers generally much paler, and the throat and sides of the head of a rather purer white.

105. NECTARINIA PULCHELLA (Linn.).

Nectarinia pulchella, Shelley, Mon. Sun-birds, p. 9, pl. 4; Hartl. Abhandl. nat. Ver. Brem. vii. 1881, p. 107; Pelz. Verh. Wien, xxxi. 1881, p. 609; xxxii. 1882, p. 501.

No. 340. Lado, April 23, 1884. A partially white variety.

106. CINNYRIS CUPREA (Shaw).

Cinnyris cuprea, Shelley, Mon. Sun-birds, p. 191, pl. 58; Sharpe, Journ. Linn. Soc., Zool. xvii. 1884, p. 428.

Nectarinia cuprea, Pelz. Verh. Wien, xxxi. 1881, p. 609; Hartl. Abhandl. nat. Ver. Brem. vii. 1881, p. 108; viii. 1882, p. 205.

No. 584. ♂. Mundri, June 1, 1883.

107. CINNYRIS SUPERBA (Shaw).

Cinnyris superba, Shelley, Mon. Sun-birds, p. 197, pl. 60; id. Sharpe, Journ. Linn. Soc., Zool. xvii. 1884, p. 428.

No. 751. ♂. Bellima, July 15, 1883.

This species was only known from the west coast, until it was recently procured in the Niam-niam country by Mr. Bohndorff.

108. CINNYRIS ERYTHROCERIA (Heugl.).

Cinnyris erythrocerius, Shelley, Mon. Sun-birds, p. 209, pl. 64. fig. 2.

Nectarinia erythroceria, Hartl. Abhandl. nat. Ver. Brem. vii. 1881, p. 108; Pelz. Verh. Wien, xxxi. 1881, p. 144.

No. 68. ♂. Wadelai, Aug. 9, 1883.

109. CINNYRIS CHLOROPYGIA (Jard.).

Cinnyris chloropygius, Shelley, Mon. Sun-birds, p. 257, pl. 79.

No. 736. ♂. Tingasi, July 7, 1883.

Previously only known from the west coast.

110. CINNYRIS ACIK (Antin.).

Cinnyris acik, Shelley, Mon. Sun-birds, p. 295, pl. 82; Sharpe, Journ. Linn. Soc., Zool. vii. p. 428.

Nectarinia acic, Hartl. Abhandl. nat. Ver. Brem. vii. 1881, p. 108; viii. 1882, p. 206.

Nectarinia acik, Pelz. Verh. Wien, xxxi. 1881, pp. 143, 609.

No. 14. ♀. Tingasi, Aug. 10, 1883.

111. CINNYRIS OBSCURA (Jard.).

Cinnyris obscurus, Shelley, Mon. Sun-birds, p. 391, pl. 92.

No. 20, ♂. Tingasi, Oct. 23, 1883.

Formerly only known from West Africa.

112. CYNNYRIS VERTICALIS (Lath.).

Cinnyris verticalis, Shelley, Mon. Sun-birds, p. 301, pl. 97.

Nectarinia cyanocephala, Hartl. Abhandl. nat. Ver. Brem. viii. 1882, p. 206.

No. 718. ♂. Tingasi, July 4, 1883.

Nos. 79, 808. ♀. Tomaja, Aug. 1883.
♀ ♂. Foda, Nov. 1, 1885.
The specimens show that Latham described the female as *Certhia verticalis*, Shaw, the male as *Certhia cyanocephala*.

113. Anthreptes longuemarii (Less.).

Anthreptes longuemarii, Shelley, Mon. Sun-birds, p. 335, pl. 108.
Anthreptes orientalis, Hartl. J. f. O. 1880, p. 213; id. Abhandl. nat. Ver. Brem. vii. 1881, p. 109; viii. 1882, p. 205; Pelz. Verh. Wien, xxxi. 1881, p. 609; xxxii. 1882, p. 501; Sharpe, Journ. Linn. Soc., Zool. xvii. 1884, p. 429.

No. 765. ♂. Bongereh, July 22, 1883.
The British Museum contains eight specimens, which I have compared with two of my own from Lado. My adult male has the lesser wing-coverts brilliant metallic green, which I cannot at all match in any of the other specimens, although a trace of green may be observed in all of them, often so slight as to be easily overlooked. It appears that in my monograph of this family (*l. c.*) I rightly depicted the adult male and female. The immature male, as shown by Emin Pasha's specimen in this collection, has a rather bright yellow abdomen, and has assumed the metallic purple colouring of the head and back before getting the metallic throat or discarding the white eyebrow. This proves, I presume, that Mr. Bohndorff's second specimen from Sassa was a young male, and not a female as Mr. Sharpe records it.

With regard to size, the following measurements of the culmen and wings of ten specimens will show that no importance can be attached to them:—
Gambia, ♂ ♀: culmen 0·6, 0·65; wing 2·95, 2·6.
Cassamanse, ♂ ♀ ♀: culmen 0·65; wing 2·95, 2·65, 2·55.
Sassa, ♂ ad. and probably ♂ juv.: culmen 0·6, 0·65; wing 2·9, 2·65.
Bongereh, ♂ juv.: culmen 0·6; wing 2·75.
Lado, ♀ ♂: culmen 0·6, 0·55; wing 2·6, 2·4.

114. Anthreptes tephrolæma (Jard. & Selby).

Anthreptes tephrolæma, Shelley, Mon. Sun-birds, p. 333, pl. 72. fig 2.

Nos. 24, 27. ♂. Tingasi, Oct. 1883.
This is another of the species hitherto only known from the west coast.

115. Anthreptes hypodila (Fraser).

Anthreptes hypodila, Shelley, Mon. Sun-birds, p. 345, pl. 111. figs. 1, 2.

No. 272. ♂. Lado, Oct. 23, 1885.
No. 30. ♂. Tingasi, July 15, 1883.
These birds agree perfectly with the West-African specimens, and have no metallic green on the outer webs of their primaries and greater wing-coverts.

116. Cotile cincta.

Cotile cincta, Heugl. Orn. N.O.-Afr. p. 164; Sharpe, Cat. B. Brit. Mus. x. p. 101.

No. 155. ♀. Wadelai, Oct. 7, 1885.
No. 64. ♀. Wadelai, Feb. 9, 1886.

117. Hirundo rustica, Linn.

Hirundo rustica, Hartl. Abhandl. nat. Ver. Brem. vii. 1881, p. 109; Sharpe, Cat. B. Brit. Mus. x. p. 128.

♀. Lado, Oct. 30, 1885.
No. 145. ♂. Wadelai, Sept. 30, 1885.

118. Hirundo smithi, Leach.

Hirundo filifera, Heugl. Orn. N.O.-Afr. p. 155.
Hirundo smithi, Sharpe, Cat. B. Brit. Mus. x. p. 150.

Nos. 115, 124. Wadelai, Sept. 1885.

119. Hirundo semirufa, Sundev.

Hirundo semirufa and *H. gordoni*, Sharpe, Cat. B. Brit. Mus. x. pp. 167, 168.

♀. Wadelai, Oct. 12, 1885.

Total length 8·2 inches, wing 4·8. *H. semirufa* from South Africa is said to be slightly larger than *H. gordoni* from West Africa, but I believe that the distinctness of these races cannot be maintained.

120. Psalidoprocne albiceps, Sclat.

Psalidoprocne albiceps, Sclat. P. Z. S. 1864, p. 108, pl. xiv.; Sharpe, Cat. B. Brit. Mus. x. p. 206.

♂. Wadelai, June 28, 1885.
♀. Wadelai, July 5, 1885.
No. 116. ♂ juv. Wadelai, Sept. 12, 1885.

This is only the second time this interesting species has been sent home. The former specimen, the type, was received in spirits from Uzinza, where it was procured by the expedition of Speke and Grant.

II. PICARIÆ.

121. Cosmetornis vexillarius (Gould).

Cosmetornis vexillarius, Sclat. Ibis, 1864, p. 115, pl. 2; Sharpe, Journ. Linn. Soc., Zool. vii. 1884, p. 434.

Nos. 700, 701. ♂. Tingasi, July 2, 1883.

122. Dendropicus lafresnayii, Malh.

Dendropicus lafresnayii, Hargitt, Ibis, 1883, p. 425.

No. 168. ♂. Tobbo, May 16, 1883.

This species was previously known only from the west coast.

123. Campothera nubica (Gm.).

Picus nubicus, Hartl. Abhandl. nat. Ver. Brem. vii. 1881, p. 109; Pelz. Verh. Wien, 1882, p. 510.

Campothera nubica, Hargitt, Ibis, 1883, p. 451.

No. 148. ♀ juv. Redjaf, Jan. 17, 1884.

124. Campothera maculosa (Valenc.).

Campothera maculosa, Hargitt, Ibis, 1883, p. 475.

No. 11. ♀. Tingasi, July 28, 1883.

Formerly only known from the west coast. I have compared it with Gold-Coast specimens in the British Museum and find that it agrees perfectly.

125. Ispidina picta (Bodd.).

Ispidina picta, Sharpe, Mon. Alcid. p. 141, pl. 51; Pelz. Verh. Wien, xxxi. 1881, p. 143; Hartl. Abhandl. nat. Ver. Brem. viii. 1882, p. 207; Sharpe, Journ. Linn. Soc., Zool. xvii. 1884, p. 435.

No. 119. ♀. Wadelai, July 16, 1886.

126. Lophoceros fasciatus (Shaw).

Tockus fasciatus, Elliot, Mon. Bucerot. pl. 50; Sharpe, Journ. Linn. Soc., Zool. xvii. p. 435.

Lophoceros fasciatus, Shelley, Ibis, 1888, p. 59.

No. 1. ♀. Tingasi, Aug. 22, 1883.
No. 111. ♀. ,, Sept. 13, 1883.
No. 112. ♀. ,, July 16, 1883.
No. 62. Kubbi, July 1881.

127. Pogonorhynchus bidentatus (Shaw).

Pogonorhynchus bidentatus, Marshall, Mon. Capit. p. 11, pl. 6; Sharpe, Journ. Linn. Soc., Zool. xvii. 1884, p. 432.

Pogonias bidentatus, Hartl. Abhandl. nat. Ver. Brem. vii. 1881, p. 112.

Nos. 69, 70. ♂ ♀. Umparu, Feb. 16, 1885.

128. Pogonorhynchus leucocephalus (Defil.).

Pogonorhynchus leucocephalus, Marshall, Mon. Capit. p. 15, pl. 8; Pelz. Verh. Wien, xxxi. 1881, p. 151; xxxii. 1882, p. 510; Hartl. Abhandl. nat. Ver. Brem. viii. 1882, p. 209.

Pogonias leucocephalus, Hartl. Abhandl. nat. Ver. Brem. vii. 1881, p. 112.

No. 352. ♀. Redjaf, May 11, 1884.

129. Pogonorhynchus diadematus (Heugl.).

Pogonorhynchus diadematus, Marshall, Mon. Cap. p. 29, pl. 14; Pelz. Verh. Wien, xxxi, 1881, p. 615; xxxii. 1882, p. 510.

Pogonias diadematus, Hartl. Abhandl. nat. Ver. Brem. vii. 1881, p. 112.

No. 237. ♂. Lado, March 3, 1884.

130. Pogonorhynchus lacrymosus (Cab.).

Tricolæma lacrymosa, Cab. J. f. O. 1878, pp. 205, 240.

Nos. 23, 24. ♂. Wadelai, July 26, 1885.

Iris orange-yellow; bill black; legs slate-colour.

No. 18. ♀. Wadelai, July 22, 1885.

The sexes are similar in plumage, and the black pearl-shaped marks on the sides of the chest are equally well defined in all the specimens.

131. Barbatula chrysocoma (Temm.).

Barbatula chrysocoma, Marshall, Mon. Cap. p. 121, pl. 49. fig. 2; Pelz. Verh. Wien, xxxi. 1881, p. 153; Hartl. Abhandl. nat. Ver. Brem. viii. 1882, p. 209.

No. 198. ♀. Kibiro, Oct. 1886.

132. Barbatula leucolæma, Verr.

Barbatula leucolæma, Marshall, Mon. Cap. p. 129, pl. 51. fig. 2.

Nos. 702, 809, 810, 811, 813. Tomaja, Aug. 1883.

Formerly only known from the west coast.

133. Cuculus gularis, Steph.

Cuculus gularis, Sharpe, P. Z. S. 1873, p. 583; Hartl. Abhandl. nat. Ver. Brem. vii. 1881, p. 113; Sharpe, Journ. Linn. Soc., Zool. xvii. 1884, p. 432.

No. 305. ♂. Lado, April 10, 1884.

Iris yellow; bill orange-yellow with the end black; gape orange; eyelids and feet yellow.

134. Cuculus clamosus, Lath.

Cuculus clamosus, Sharpe, P. Z. S. 1873, p. 587; Hartl. Abhandl. nat. Ver. Brem. viii. 1882, p. 210; Sharpe, Journ. Linn. Soc., Zool. xviii. 1884, p. 432.

No. 705. ♀juv. Tomaya, Aug. 7, 1883.

135. Chrysococcyx cupreus (Bodd.).

Cuculus cupreus, Sharpe, P. Z. S. 1873, p. 581.

Chalcites cupreus, Hartl. Abhandl. nat. Ver. Brem. vii. 1881, p. 113; viii. 1882, p. 221.

No. 353. ♂. Redjaf, May 11, 1884.

No. 369. ♀. Kiri, May 24, 1884.

136. Pachycoccyx validus (Fisch. & Reichen.).

Cuculus validus, Fisch. & Reichen. J. f. O. 1879, p. 341, Muniune.

Pachycoccyx validus, Cab. J. f. O. 1882, p. 230.

No. 107, ♀. Tangasi, Aug. 2, 1883.

As I only recognized this immature bird by the short note on its plumage given by Dr. Cabanis, *l. c.*, it may be useful to take this opportunity of describing the interesting specimen before me.

Above blackish brown with a faint purple gloss; the crown, back

of the neck, middle of the rump, upper tail-coverts, some of the lesser wing-coverts, all of the median and greater coverts and the quills broadly tipped with buffish white; forehead, nape, and sides of the head almost white; the latter washed on the lores, cheeks, and ear-coverts with dusky grey. Tail with some five or six obsoletely paler bands, the base of the one near the end well defined by triangular white marks on the sides of the feathers, the other bands only indicated by smaller white marks confined to their inner webs, base of the tail white. Underparts whitish buff shaded with rufous buff on the sides of the body, thighs, and under tail-coverts, the latter have two broad black bars across them; under surface of the wing-coverts rufous buff; quills dusky brown, fading into white towards the bases of their inner webs, all the quills broadly tipped with white. Total length 15·2 inches, culmen 0·9, wing 9, tail 8·3, tarsus 1.

There is a nestling of this species in the British Museum labelled "W. Africa, DuChaillu," from which I conclude that it is a Central-African species occasionally extending to the coast both in the east and west.

137. INDICATOR MAJOR, Steph.

Indicator major, Sharpe, in Dawson Rowley's Orn. Miscell. i. p. 204; Hartl. Zool. Jahrb. ii. 1886, p. 311.

No. 131. ♀. Wadelai, Sept. 15, 1885.

Iris umber-brown; bare skin on head leaden grey; bill black; legs dusky.

138. INDICATOR EMINI, sp. n. (Plate III.)

No. 675. ♂. Wadelai, June 23, 1883.

Bill slight. Upper parts uniform dusky brown, very slightly shaded with olive on the crown and back of the neck, slightly more so with deep yellow on the back and scapulars, increasing in amount of yellow on the rump, where a few feathers show white ends; wings dark brown; the coverts shading into olive-yellow on their edges, the quills edged with deep yellow; tail, four centre feathers entirely brown, remainder white, with the base only of the next pair to the four centre feathers dusky brown. Underparts, including the under tail-coverts, ashy brown, fading into white on the centre and sides of the abdomen behind the thighs. Total length 4·6 inches, culmen 0·3, wing 2·6, tail 2·1, tarsus 0·5.

In its slight bill this species approaches nearest to *I. major*, and by that character alone it may be readily distinguished from all the other known species of Honey-Guides. It is very distinct from any other member of the genus, and I am pleased to be able to name such a striking species after its celebrated discoverer.

139. MUSOPHAGA ROSSÆ, Gould.

Musophaga rossæ, Sharpe, Journ. Linn. Soc., Zool. xvii. 1884, p. 433; Schalow, J. f. O. 1886, p. 14.

No. 12. ♀. Tingasi, Aug. 10, 1883.

This appears to be essentially an inland African species, for it has been procured by Mr. Bohndorff at Semmi in Niam-niam, and by Dr. Böhm in Marungu on the western side of Lake Tanyanika. It is also known from the interior of Angola.

140. Corythaix leucolophus, Heugl.

Corythaix leucolophus, Heugl. Orn. N.O.-Afr. p. 703, pl. 24; Hartl. Abhandl. nat. Ver. Brem. viii. 1882, p. 210; Sharpe, Journ. Linn. Soc., Zool. vii. 1884, p. 433; Schalow, J. f. O. 1886, p. 20.

No. 828. ♀. Kabajerdi, Aug. 20, 1883.

Iris brown; eyelids pale blood-red; bill yellow, with a greenish base; legs black.

141. Corytheola cristata (Vieill.).

Turacus giganteus, Sharpe, Journ. Linn. Soc., Zool. xvii. 1884, p. 433.

Corytheola cristata, Schalow, J. f. O. 1886, p. 55.

Nos. 144, 145, 146, 147. Ad. Tingasi, Sept. 1881.

Iris red; bill, basal half yellow, end half red; feet dusky. The red has entirely faded from the bills.

142. Eurystomus afer (Lath.).

Eurystomus afer, Sharpe, Ibis, 1871, p. 274; Hartl. Abhandl. nat. Ver. Brem. vii. 1881, p. 110; Pelz. Verh. Wien, xxxi. 1881, p. 143; xxxii. 1882, p. 500; Sharpe, Journ. Linn. Soc., Zool. xvii. 1884, p. 434.

No. 110. ♀. Tingasi, July 16, 1883.

III. PSITTACI.

143. Psittacus erithacus, Linn.

Psittacus erithacus, Hartl. Abhandl. nat. Ver. Brem. viii. 1882, p. 211.

Psittacus rubrovarius, Rochebrune, Faun. Sénégamb., Ois. p. 84, pl. 10.

No. 158. ♀. Mabode Land, June 1884.

Iris pale yellow; bill black; bare skin on sides of head pearly grey.

This is a peculiar red mottled variety of the Grey Parrot, probably due to some particular food to which the bird becomes partial; for the irregularity of the red marking cannot, I maintain, be of specific value. M. Rochebrune regards it as a good species, and applies to it Brisson's very characteristic name of *rubrovarius*. He also gives a good figure, which exactly represents the specimen before me.

Emin Pasha writes concerning it to the following effect:—"In habits it is said not to differ from the grey form. It was given to me by one of the chiefs in Monbuttu, where it is known by the name 'Curingu,' and the common grey birds by that of 'Makue.'" He also gives some interesting notes on the migrations of the Grey

Parrot; this species, to the east of Lake Albert Nyanza, ranges to about 2° N. lat., and to the west of that lake about a degree further north, being only met with as a straggler in the northern part of Monbuttu. Captain Casati informed him that in Unyoro the Grey Parrot passed in flocks eastward from the 24th to the 28th July, 1886, and repassed westward across the Lake from the 6th to the 12th of March, 1887.

144. AGAPORNIS PULLARIA (Linn.).

Agapornis pullaria, Hartl. Abhandl. nat. Ver. Brem. viii. 1882, p. 212.

Nos. 47, 48. Tingasi, July 30, 1883.

IV. COLUMBÆ.

145. TRERON CALVUS (Temm.).

Treron nudirostris, Hartl. Abhandl. nat. Ver. Brem. vii. 1881, p. 117.

Treron calvus, Shelley, Ibis, 1883, p. 267; Sharpe, Journ. Linn. Soc., Zool. xvii. 1884, p. 436; Hartl. Zool. Jahrb. ii. 1886, p. 329.

No. 816. ♂. Tomaya, Aug. 14, 1883.

146. TURTUR SEMITORQUATUS, Rüpp.

Turtur semitorquatus, Hartl. Abhandl. nat. Ver. Brem. vii. 1881, p. 117; Shelley, Ibis, 1883, p. 303.

One specimen, without label.

V. ACCIPITRES.

147. POLYBOROIDES TYPICUS, Smith.

Polyboroides typicus, Sharpe, Cat. B. Brit. Mus. i. p. 48; id. Journ. Linn. Soc., Zool. xvii. 1884, p. 437.

No. 227. ♂. Lado, Feb. 26, 1886.

Iris dusky brown; bill horn-blue, with the basal half white; cere and feet yellow; skin round the eyes and the lores rough and yellow.

This is an immature specimen in pale brown plumage.

148. CIRCUS ÆRUGINOSUS (Linn.).

Circus æruginosus, Heugl. Orn. N.O.-Afr. p. 102; Sharpe, Cat. B. Brit. Mus. i. p. 69.

No. 274. ♀. Lado, March 19, 1884.

149. MELIERAX POLYZONUS (Rüpp.).

Melierax polyzonus, Sharpe, Cat. B. Brit. Mus. i. p. 88; Pelz. Verh. Wien, xxxi. 1881, pp. 143, 607; xxxii. 1882, p. 500; Sharpe, Journ. Linn. Soc., Zool. xvii. 1884, p. 437.

No. 277. ♂ juv. Lado, March 23, 1884.

150. Melierax niger (Bonn. et Vieill.).

Melierax niger, Sharpe, Cat. B. Brit. Mus. i. p. 91.
Nisus niger, Hartl. Abhandl. nat. Ver. Brem. vii. 1881, p. 116.

No. 90. ♀. Gondokoro, Nov. 15, 1883.
Iris scarlet; cere, base of mandible, and feet cinnabar-red; bill black.

151. Circaëtus cinerascens, Müll.

Circaetus cinerascens, Heugl. Orn. N.O.-Afr. p. 86, pl. 3; Sharpe, Cat. B. Brit. Mus. i. p. 285; Hartl. Zool. Jahrb. ii. 1886, p. 306.

No. 827. ♀. Kabajeudi, Aug. 20, 1883.
Iris pale yellow; bill bluish yellow; base, cere, and legs yellow.

152. Butastur rufipennis (Sund.).

Butastur rufipennis, Sharpe, Cat. B. Brit. Mus. i. p. 299; id. Journ. Linn. Soc., Zool. xvii. 1884, p. 437.
Poliornis rufipennis, Hartl. Abhandl. nat. Ver. Brem. viii. 1882, p. 213.

Nos. 269, 270. ♂.
No. 282. ♀. Lado, March 1884.
No. 118. Redjaf, Jan. 8, 1884.

153. Milvus migrans (Bodd.).

Milvus ætolius, Heugl. Orn. N.O.-Afr. p. 98.
Milvus korshun, Sharpe, Cat. B. Brit. Mus. i. p. 322.

No. 314. ♂. Lado, April 15, 1884.

154. Falco cuvieri, Smith.

Falco cuvieri, Sharpe, Cat. B. Brit. Mus. i. p. 400.

No. 337. ♀. Lado, April 22, 1884.

155. Falco ruficollis, Swains.

Falco ruficollis, Sharpe, Cat. B. Brit. Mus. i. p. 404; Hartl. Abhandl. nat. Ver. Brem. vii. 1881, p. 115, viii. 1882, p. 221; Pelz. Verh. Wien, xxxi. 1881, p. 606, xxxii. 1882, p. 499; Sharpe, Journ. Linn. Soc., Zool. xvii. 1884, p. 438.

No. 266. ♀juv. Lado, March 13, 1884.

156. Tinnunculus tinnunculus (Linn.).

Cerchneis tinnunculus, Sharpe, Cat. B. Brit. Mus. i. p. 425; id. Journ. Linn. Soc., Zool. xvii. 1884, p. 438.
Tinnunculus alaudarius, Pelz. Verh. Wein, xxxi. 1881, pp. 605, 607, xxxii. 1882, p. 500.

Nos. 961, 962. ♂ ♀. Redjaf, Dec. 12, 1883.
No. 171. ♀. Redjaf, Jan. 29, 1884.

157. Tinnunculus alopex (Heugl.).

Falco alopex, Heugl. Orn. N.O.-Afr. p. 41; Hartl. Abhandl. nat. Ver. Brem. vii. 1881, p. 115.

Cerchneis alopex, Sharpe, Cat. B. Brit. Mus. i. p. 432, pl. 14. fig. 1, ♀.

No. 952. Redjaf, Dec. 2, 1883.

No. 167. Redjaf, Jan. 28, 1884.

The male is slightly darker and more strongly streaked.

158. Dissodectes ardesiacus (Bonn. & Vieill.).

Cerchneis ardesiaca, Sharpe, Cat. B. Brit. Mus. i. p. 446; id. Journ. Linn. Soc., Zool. xvii. p. 438.

Falco ardesiacus, Hartl. Abhandl. nat. Ver. Brem. vii. 1881, p. 15; Pelz. Verh. Wien, xxxi. 1881, pp. 143, 606.

No. 290. ♀. Lado, April 2, 1884.

159. Bubo cinerascens, Guér.

Bubo cinerascens, Sharpe, Cat. B. Brit. Mus. ii. p. 32; Hartl. Abhandl. nat. Ver. Brem. viii. 1882, p. 215; Sharpe, Journ. Linn. Soc., Zool. xvii. 1884, p. 438.

No. 172. ♀. Redjaf, Jan. 30, 1884.

Iris dusky; bill blackish; feet beneath the feathers dusky.

Compared with the S.-African *B. maculosus* (Sharpe, Cat. ii. p. 13), I do not see much difference in plumage, and do not think much of the feathering of the toes; but in *B. maculosus* the iris is yellow, which apparently settles the question of the difference in the two species.

160. Scops capensis, Smith.

Scops zorca africana, Heugl. Orn. N.O.-Afr. p. 117.

Scops capensis, Sharpe, Cat. B. Brit. Mus. ii. p. 52, pl. 3. fig. 1.

Nos. 37, 38. Wadelai, Aug. 2, 1885.

Iris sulphur-yellow; bill horn-colour; feet dusky.

This specimen certainly belongs to the *S. capensis* as understood by Mr. Sharpe, and those collected by Mr. Bohndorff (Sharpe, Journ. Linn. Soc., Zool. xvii. 1884, p. 439) in the Niam-niam country to *S. giu*. To say that they are really specifically distinct requires more research than I have given to the subject.

161. Glaucidium perlatum (Vieill.).

Glaucidium perlatum, Sharpe, Cat. B. Brit. Mus. i. p. 209; id. Journ. Linn. Soc., Zool. xvii. 1884, p. 439.

Athene perlata, Pelz. Verh. Wien, xxxi. 1881, p. 143; Hartl. Abhandl. nat. Verh. Brem. viii. 1882, p. 215.

No. 364. ♂. Kiri, May 21, 1884.

b. ♀. [No locality.] March 16, 1883.

162. Strix flammea, Linn.

Strix flammea, Sharpe, Cat. B. Brit. Mus. ii. p. 291; id. Journ. Linn. Soc., Zool. xvii. 1884, p. 440.

No. 63. Tingasi, May 1882.

Small; wing only 9·4 inches, but of the ordinary typical colouring.

VI. PTEROCLETES.

163. Pterocles tricinctus, Swains.

Pterocles tricinctus, Hartl. Abhandl. nat. Ver. Brem. viii. 1882, p. 216.

Nos. 296, 299, 306. ♂ ♀ ad.; ♂ juv. Lado, April 1884.

Skin round the eye and feet yellow. ♂ ad., bill orange; ♂ juv., bill orange, tipped with black; ♀, bill dusky black, fading into orange at the base.

VII. GALLINÆ.

164. Numida ptilorhyncha, Licht.

Numida ptilorhyncha, Rüpp. Syst. Uebers. p. 102, pl. 29; Hartl. Abhandl. nat. Ver. Brem. viii. 1882, p. 116.

Nos. 114, 115. ♀. Tingasi, Aug. 1883.

165. Francolinus icterorhynchus, Heugl.

Francolinus icterorhynchus, Heugl. Orn. N.O.-Afr. p. 894, pl. 29; Hartl. Abhandl. nat. Ver. Brem. vii. 1881, p. 118.

No. 113. ♂. Tingasi, Aug. 20, 1883.

No. 131, 134. ♂ ♀. Tingasi, Sept. 1881.

Iris and legs yellow; bill yellow, with the culmen black.

166. Francolinus granti, Hartl.

Francolinus granti, Hartl. P. Z. S. 1865, p. 665, pl. 39. fig. 1.

Francolinus shoanus, Heugl. Orn. N.O.-Afr. p. 891, pl. 29. fig. 2.

Francolinus pileatus, Hartl. (nec Smith), Abhandl. nat. Ver. Brem. vii. 1881, p. 118.

Francolinus ochrogaster, Hartl. J. f. O. 1882, p. 327; id. Abhandl. nat. Ver. Brem. viii. 1882, p. 218.

No. 256. ♀. Lado, March 1884.

Nos. 298, 303. ♂ ♀. Lado, April 1884.

Iris brown; legs blood-red; bill blackish.

VIII. GRALLATORES.

167. Platalea tenuirostris, Temm.

Platalea tenuirostris, F. & H. Vög. Ostafr. p. 718; Heugl. Orn. N.O.-Afr. p. 1126.

No. 262. ♂ juv. Lado, March 12, 1884.

168. Otis melanogaster, Rüpp.

Otis melanogaster, Heugl. Orn. N.O.-Afr. p. 951.

No. 375. ♀. Redjaf, June 2, 1884.

169. Œdicnemus senegalensis, Swains.

Œdicnemus inornatus, Heugl. Orn. N.O.-Afr. p. 989; Hartl. Abhandl. nat. Ver. Brem. vii. 1881, p. 120; Pelz. Verh. Wien, xxxi. 1881, p. 616.

No. 268. ♀. Lado, March 15, 1884.

170. Œdicnemus affinis, Rüpp.

Œdicnemus affinis, Heugl. Orn. N.O.-Afr. p. 990.

No. 310. ♀. April 14, 1884.

171. Hoplopterus spinosus (Linn.).

Hoplopterus spinosus, Sharpe, Journ. Linn. Soc., Zool. xvii. p. 441; Hartl. Zool. Jahrb. ii. 1886, p. 332.

No. 852. ♀. Lado, Oct. 5, 1883.

172. Ægialitis tricollaris (Vieill.).

Charadrius tricollaris, Heugl. Orn. N.O.-Afr. p. 1027, pl. 34. fig. 5.

Nos. 174, 182. ♂ ♀. Kibiro, June 1886.

173. Ægialitis minor (Meyer & Wolf).

Charadius fluviatilis, Heugl. Orn. N.O.-Afr. p. 1029; Pelz. Verh. Wien, 1881, p. 155.

No. 297. ♂. Lado, April 8, 1884.

174. Ægialitis pecuarius (Temm.).

Charadrius pecuarius, Heugl. Orn. N.O.-Afr. p. 1033, pl. 34. fig. 7.

Nos. 296, 297. ♂ ♀. Kibiro, June 1886.

175. Ægialitis asiaticus (Pall.).

Charadrius damarensis, Heugl. Orn. N.O.-Afr. p. 1018.
Eudromias asiaticus, Pelz. Verh. Wien, 1881, p. 155.

Nos. 284, 285. ♂. Lado, March 30, 1884.

176. Glareola emini, sp. n.

♀. Lado, Oct. 18, 1884. Iris umber-brown; culmen and end of bill black, base of bill and legs vermilion.

This species is closely allied to *G. megapoda*, Gray, and *G. nuchalis*, Gray. From the former it differs in having the nuchal collar white instead of chestnut-buff, from the latter in being much larger and in not having any white on the outer webs of the secondaries.

G. emini: total length 7·9 inches, wing 6·1, tail 2·8, tarsus 0·8.

G. nuchalis: total length 5·6 inches, wing 5·5, tail 2·4, tarsus 0·8.

I have compared the specimen from Lado with three adults and an immature of *G. megapoda* and with the type of *G. nuchalis*.

177. Corythura cinnamomea (Less.).

Corythura cinnamomea, Sharpe, Journ. Linn. Soc., Zool. xvii. 1884, p. 441.

No. 710. Tingasi, July 3, 1883.

IX. NATATORES.

178. PLOTUS LEVAILLANTI, Licht.

Plotus levaillanti, Heugl. Orn. N.O.-Afr. p. 1475; Pelz. Verh. Wien, xxxi. 1881, pp. 606, 618.

No. 844. ♀. Lado, Sept. 29, 1883.

179. QUERQUEDULA HARTLAUBI, Cass.

Querquedula hartlaubi, Oust. Bull. N. Arch. Mus. Paris, 1879, pl. 6.

No. 4. ♂. Tingasi, July 20, 1883.

Iris yellowish brown; bill black, with a broad subterminal yellow band; legs brown.

3. Report on a Collection of Reptiles and Batrachians sent by Emin Pasha from Monbuttu, Upper Congo. By Dr. A. GÜNTHER, F.R.S.

[Received January 10, 1888.]

The specimens, 27 in number, belong to the following species:—

TORTOISES.

1. PELOMEDUSA SUBRUFA, Lac.

LIZARDS.

2. VARANUS NILOTICUS, L.—Two young specimens.

3. HEMIDACTYLUS BROOKII, Gray.

4. LYGODACTYLUS GUTTURALIS, Bocage.

5. CHAMÆLEON SENEGALENSIS, var. LÆVIGATA, Gray.—Three specimens. Although I adopt Mr. Boulenger's view that *C. lævigatus* of Gray should not be specifically distinguished from *C. senegalensis*, still the former may be readily recognized by its conspicuously finer granulation of the skin, and especially the smaller size of the scutella of the side of the head. The type of *C. lævigatus* came from the Soudan; and the three specimens sent by Emin Pasha agree in the characters mentioned with this geographically not very remote form of Chamæleon.

SNAKES.

6. TYPHLOPS ESCHRICHTII, Schleg.—Three specimens.

7. TYPHLOPS LIBERIENSIS, Hallow.—Two specimens.

8. NEUSTEROPHIS ATRATUS, Ptrs. (1877).—This example possesses one anteocular only. The species is new to the collection of the British Museum.

9. AHAETULLA EMINI, sp. n.—Ventral shields without keels, 151; anal bifid; upper labials 9, the 4th, 5th, and 6th entering the orbit; 1 anteocular, 2 postoculars; 6 of the lower labials are in contact with the chin-shields; loreal not twice as long as broad; temporal shields 1+2; scales smooth, in 15 rows. Head of moderate size, not elongate or depressed; body and tail moderately slender. Uniform green; skin between the scales black, each scale with a white spot on the basal half of its outer margin. The specimen measures 29 inches, the head being $\frac{1}{4}$, and the tail 10 long.

10. DASYPELTIS SCABRA, L.

11. PSAMMOPHIS SIBILANS, L.—Three specimens.

12. ATRACTASPIS IRREGULARIS, Reinh.—This species has invariably the subcaudals divided into "scutella"—a term which evidently has been misunderstood by Peters, who persisted in applying it to undivided subcaudal shields, properly "scuta," Peters using the term of *squamæ* for the former. A renewed study of the species of this genus has also shown me that the doubts which Peters cast upon them can only have arisen from the incomplete materials at his disposal.

13. ATRACTASPIS ATERRIMA, Gthr.—The specimen is very much shrunk and possesses 299 ventral shields, the type having 274.

FROGS.

14. RANA OCCIPITALIS, Gthr.

15. RANA MASCARENIENSIS, D. B.—Two specimens.

16. BUFO REGULARIS, Reuss.—Two specimens.

17. RAPPIA CINCTIVENTRIS, Cope.

Of these 17 Reptiles and Frogs, 9 are almost generally distributed over the African Region; of the remainder 7 are known from various parts of West Africa, whilst not a single species known to be peculiar to East Africa is included in this collection. Although it might thus appear that the Reptilian Fauna of the Upper Congo is rather West-African than East-African in its character, we must not lose sight of the fact that many species extend right across from the West to the East Coast, and that if in the end the Eastern and Western Reptilian Faunas should prove to be sufficiently distinct to call for the establishment of two or more separate zoo-geographical districts, our knowledge of the Reptiles of the central parts is at present much too fragmentary to assist in fixing the boundary line between such districts.

4. On the Shells of the Albert Nyanza, Central Africa, obtained by Dr. Emin Pasha. By Edgar A. Smith.

[Received December 5, 1887.]

Among the valuable collections of Natural History recently received from Dr. Emin Pasha are a few shells which he collected in the Albert Nyanza, probably from the eastern side of the Lake.

They are referable to :—

1. *Melania tuberculata*, Müller.
2. *Melania liricincta*, n. sp.
3. *Paludina unicolor*, var.
4. *Bythinia alberti*, n. sp.
5. *Planorbis stanleyi*, n. sp.

It is not surprising that three out of these five species should be undescribed, as, with one exception, no collections of shells have ever reached this country from this particular region.

In 1866 Mr. Henry Adams gave a list, in the 'Proceedings' of this Society (p. 375), of a collection of shells made in Central Africa by Sir Samuel Baker, the discoverer of the lake. I am informed by that gentleman that all the shells mentioned by Mr. Adams, and which he has presented to the British Museum, came from the Albert Nyanza.

Through the kindness of the Rev. Horace Waller I have had the opportunity of examining a series of shells from the same locality, which he also received from Dr. Emin. Among them are examples of two new species, a *Cleopatra* and a *Bythinia*, which are not represented in the two other collections.

Altogether fifteen species are now known from this particular lake, and of these seven appear at present to be peculiar to it. The remaining eight have all been recorded from different parts of the Nile, and one species, *Melania tuberculata*, is also known from three of the other large Central African lakes, namely Nyassa, Tanganyika, and Victoria Nyanza. The *Planorbis sudanicus* also occurs in Lake Tanganyika.

The following is a complete list of the known species from the Albert Nyanza.

1. Melania tuberculata, Müller.

A large series of this remarkably distributed species has been sent by Dr. Emin Pasha. A dark purplish brown or black is the prevailing tint of most of the specimens, with only slight indications of the spotting which is characteristic of the species. Some of the examples, however, possess the usual style of colouring, being pale olive or dirty white and dotted and spotted with red.

2. Melania liricincta, n. sp.

Testa elongata, turrita, sub epidermide nigro-fusca albida ; anfractus persistentes 5, parum convexi, interdum inferne leviter tumidi,

liris spiralibus 2–3 circa partem inferiorem instructi, sutura subprofunda, obliqua sejuncti; ultimus circa medium et basim liris paucis cinctus; apertura pyriformis, intus cærulescens; peristoma tenue, marginibus callo tenui junctis. Longit. anfractuum quinque 26, diam. 9½ millim.; apertura 9½ longa, 5½ lata.

Fig. 1.

Melania liricincta.

On removing the thickish epidermis the shell has a dirty whitish appearance. The spiral ridges are usually rather strong and vary in number to some extent. Two specimens have four round the middle part of the body-whorl and four at the base, the two sets being separated by a smooth blank space. Two or three of the upper series usually revolve up the spire upon the lower portion of the upper whorls.

M. victoriæ, Dohrn, from the Victoria Falls, Zambesi River, is an allied form.

3. AMPULLARIA WERNEI.

Amp. wernei, Philippi, Conch.-Cab. ed. 2, p. 19, pl. 5. f. 4, pl. 17. f. 2; Martens, Novit. Conch. vol. iv. p. 22, pl. 114. figs. 1–5.

Lanistes, sp.?, H. Adams, Proc. Zool. Soc. 1866, p. 376.

Hab. White Nile (*Philippi*); Gazelle River (*v. Martens*); Albert Nyanza (*Baker*).

The two young shells referred to the genus *Lanistes* by Adams appear to be the early stages of this species.

4. PALUDINA UNICOLOR, var.

There are in the British Museum twelve specimens from the Albert Nyanza, received from the late General Gordon and Sir Samuel Baker, which are precisely similar to those just obtained from Emin Pasha. They may be regarded as a well-marked variety of *P. unicolor*, Oliver, although differing considerably in outline from the typical form. They appear to be smaller and narrower; the whorls are more rounded and without any indication of angulation at the upper parts, and exhibit more spiral striation. The colour seems to vary considerably: some are entirely of a pale rosy tint; others are nearly white; one or two specimens belonging to Mr. Waller are of a purplish-brown colour, a few are olive-yellow, and the majority exhibit a more or less distinct pale zone at the periphery, which sometimes has a dark band below it.

5. Cleopatra emini, n. sp.

Testa ovato-acuminata, anguste umbilicata, mediocriter tenuis, sordide albida, lutea vel purpureo-fusca, interdum rufo bi- vel trizonata; anfractus 7–8, superne decliviter tabulati, angulati, carinis duobus instructi, lineis incrementi parum obliquis, distincte striati; apertura ovalis, parva, longit. totius ½ haud æquans; peristoma tenue, margine columellari leviter expanso et reflexo. Longit. 11½ millim., diam. 6; apertura 5 longa, 3½ lata.

Fig. 2.

Cleopatra emini.

This pretty species is remarkable for the angulation and carination of the whorls. In five of the specimens at hand there are two keels upon the whorls, whereof the upper and rather stronger one is at the angle, the other being around the middle of the last volution and revolving up the spire just above the sutural line. In one example there is a third slight lira or keel upon the upper part of the whorl between the suture and the angle; and in another specimen the peripherial carina has become obsolete upon the body-whorl and is represented by a colour-band. *C. bulimoides*, Olivier, if keeled and angulated, would closely resemble this species. The operculum in both species is the same. It is spiral at first with a raised edge, and increases afterwards concentrically.

Three specimens of this species have been liberally presented to the Museum by the Rev. H. Waller.

6. Bythinia alberti, n. sp.

Testa parva, subglobosa, brevis, anguste umbilicata, alba, epidermide tenui lutescente induta; anfractus 4, perconvexi, lineis incrementi striati, ultimus haud elongatus; apertura submagna, fere ovalis, longit. totius ½ paulo superans; peristoma continuum, leviter incrassatum, margine columellari anguste reflexo. Longit. 4; diam. maj. fere 4 millim.

The chief distinguishing features of this little species are its short stumpy growth and the narrow umbilicus. Of the known African species, *B. badiella*, received by the British Museum from Parreyss with the locality "Egypt," is the nearest ally of the present form. It is, however, of a somewhat different shape, has a smaller aperture, and is more narrowly perforate.

7. Bythinia walleri, n. sp.

Testa parva, albido-pellucida, nitida, perforata; anfractus 4½–5, perconvexi, striis incrementi tenuissimis sculpti; apertura rotunde

ovata, longit. totius ⅓ haud æquans; peristoma tenue, continuum, marginibus externi et basali levissime expansis. Longit. 5 *millim., diam.* 3; *apertura* $2\frac{1}{4} \times 2$.

Fig. 3.

Bythinia walleri.

This is very different in form from *B. alberti*, having a much higher spire and smaller aperture. The single specimen is at present in the possession of the Rev. H. Waller.

8. Planorbis sudanicus.

Pl. sudanicus, v. Martens, Mal. Blät. 1870, vol. xvii. p. 35; 1874, p. 41; Pfeiffer, Novit. Conch. vol. iv. p. 23, pl. 114. f. 6–9; Smith, Proc. Zool. Soc. 1880, p. 349.

Hab. White Nile (*Consul Petherick* in Brit. Mus.); Gazelle River (Bahr-el-Ghasal) (*v. Martens*); Albert Nyanza (*Baker and Emin*); Tanganyika (*Smith*).

It is interesting to note the distribution of this species as dimly indicating a connection between the two lakes, which at present is but a matter of conjecture.

9. Planorbis stanleyi, n. sp.

Testa mediocriter depressa, utrinque subæqualiter concava, nitida, oblique striata, vix semipellucida, cornea, inferne pallida; anfractus 4, *celeriter accrescentes, rotundati, ultimus magnus, antice paulo inflatus, sutura profunda sejunctus; apertura magna, obliqua, plerumque supra anfr. penultimum elevata; perist. tenue, marginibus callo tenui junctis, columellari leviter incrassato et reflexo. Diam.* 9, *alt.* $4\frac{1}{4}$; *apertura* $4\frac{1}{2}$ *longa,* $3\frac{1}{2}$ *millim. lata.*

This species is remarkable for the rapid enlargement of the last whorl, which ends in a very open aperture and usually is produced above the penultimate whorl; in some specimens, however, it descends somewhat.

10. Corbicula radiata, Philippi.

Cyrena radiata (Parreyss, MS.), Philippi, Abbild. vol. ii. p. 78, pl. 1. f. 8.

Hab. White Nile (Bahr-el-Abiad) (*Philippi*); Albert Nyanza (*Baker and Emin*); Lake Nyassa (*Smith*, P. Z. S. 1877 p. 718).

11. Corbicula pusilla, Philippi.

Cyrena pusilla (Parreyss, MS.), Philippi, Abbild. vol. ii. p. 78, pl. 1. f. 7.

Hab. Upper part of the Nile (*Philippi*); Syene or Assouan on the Nile (*Parreyss in Brit. Mus.*).

12. UNIO ÆGYPTIACUS, Caillaud.

Hab. Various parts of the Nile; Albert Nyanza (*Baker*).

13. UNIO CAILLAUDI, Férussac.

Hab. Same as preceding.

14. UNIO BAKERI.

Unio bakeri, H. Adams, Proc. Zool. Soc. 1866, p. 376.

Hab. Albert Nyanza (*Baker and Emin*).

Only one fresh and two dead valves without the epidermis were obtained by Sir Samuel Baker. Five odd valves, which have been presented by Mr. Waller to the Museum and are in good condition, show that this species, like most others of the genus, is very variable in form, and that the extent and coarseness of the zigzag wrinkling of the surface is very inconstant. A number of so-called species of *Unio* described by Bourguignat[1] from the Victoria Nyanza approach very closely to *U. bakeri*, and indeed I should be surprised if *several* of them on comparison might not satisfactorily be classed with it.

15. UNIO ACUMINATUS.

Unio acuminatus, H. Adams, Proc. Zool. Soc. 1866, p. 376.

The two valves collected by Sir S. Baker are all that is known of this species. It is of a more slender form than the preceding, and has down the posterior dorsal area two subparallel shallow grooves or impressed rays with a raised space between them. This feature is represented in *U. bakeri* by two divergent colour-rays in the same part, but rather more remote from one another.

5. On the Lepidoptera received from Dr. Emin Pasha.

By ARTHUR G. BUTLER, F.L.S., F.Z.S., &c.

[Received December 5, 1887.]

The Lepidoptera received from Dr. Emin Pasha are referable to no less than 156 species, of which thirteen Butterflies and two Moths are new to science; one or two of these are extremely variable and, had the extremes only been obtained, might fairly have been regarded as distinct species.

The collection contains a combination of South-western and North-eastern forms, by far the greater number, especially of those obtained at Wadelai in 1887, being identical with Abyssinian species; a few more southerly forms, identical with species from Kilma-njaro, crop up here and there, such as *Junonia infracta*, *Teracolus aurigineus*, and others.

[1] Moll. fluv. du Nyanza Oukéréwé (Victoria Nyanza), Paris, 1883, pp. 3–15.

RHOPALOCERA.

NYMPHALIDÆ.

EUPLŒINÆ.

1. LIMNAS CHRYSIPPUS.

Papilio chrysippus, Linn. Mus. Lud. Ulr. p. 263 (1764).

♂ ♀. Kangasi, 7th and 20th July; ♀. Fóda, 26th November, 1885, Stazione Gadda, 20th February, 1886; ♂ ♀. Monbuttu, July and August (1886?); Wadelai, 12th January, 5th and 11th March, 1887.

From this form to its variety *L. alcippoides* there is a perfect transitional series commencing with a mere whitening of the median branches of the secondaries and gradually increasing to a well-defined white patch.

Var. ALCIPPOIDES, Moore, P. Z. S. 1883, p. 238, pl. xxxi. fig. 1.

♂ ♀. Kangasi, 17th and 25th July and 21st November, 1883; ♂. Stazione Gadda, 7th May, 1884; ♂ ♀. Fóda, 23rd November, 1885; Monbuttu, July and August; Wadelai, 12th and 13th January, 1887.

This is also linked by intermediate steps to *L. alcippus*: the latter therefore, though a good constant species on the West Coast from Sierra Leone northwards, can here, as at Aden, be only regarded as a variety of *L. chrysippus*.

Var. ALCIPPUS, Cramer, Pap. Exot. ii. pl. cxxvii. E, F (1779).

♂ ♀. Tobbo, 21st May; Kangasi, 14th, 17th, 20th, 22nd, 25th, and 27th July; 12th and 17th October; 14th, 18th, and 21st November; Stazione Bauri, September 1883; Stazione Gadda, 26th January, 1884; Fóda, 1st November, 1885; Wadelai, 13th and 27th January, 1887; Monbuttu in July and August.

2. LIMNAS KLUGII.

Limnas klugii, Butler, P. Z. S. 1885, p. 758. n. 2.

♀. Fóda, 17th and 23rd November, 1885.

Three examples of this species were obtained at Fóda; none elsewhere. No intermediates tending to link it to *L. chrysippus* exist in the collection, so that probably it does not interbreed with the latter in any of the localities visited.

3. TIRUMALA PETIVERANA.

Danais limniace, var. *petiverana*, Doubleday and Hewitson, Gen. Diurn. Lep. p. 93, pl. 12. fig. 1 (1847).

Stazione Bauri, September 1883; Kangasi, 27th July and 14th November, 1883; Monbuttu, in July and August.

This is a common South-western form.

4. AMAURIS HYALITES.

Amauris hyalites, Butler, Cist. Ent. i. p. 209 (1874).

♂ ♀. Kangasi, 17th and 27th July, 1883.

Originally described from a specimen taken at Ambriz by the late Mr. Monteiro.

SATYRINÆ.

5. GNOPHODES DIVERSA.

Gnophodes diversa, Butler, Ann. & Mag. Nat. Hist. ser. 5, vol. v. p. 333 (1880).

Fóda, 28th October and 10th November, 1885.

Smaller than Natal specimens, but otherwise identical.

6. MELANITIS SOLANDRA, var.

Papilio solandra, Fabricius, Syst. Ent. p. 500. n. 244 (1775).

♀. Stazione Bauri, July 1883; ♂. Fóda, 23rd October, 1885.

This is the Congo type of the species; whether it is distinct from the *M. helena* of Westwood or even from the true *M. leda* of Linnæus can only be shown by careful breeding; that it is distinct from my *M. determinata* (the *M. leda* of Indian authors) may be safely taken for granted, since the red-brown, rufous, and russet types do not occur in India.

It is true that in 1867, as Mr. Trimen says, I communicated a paper to the 'Annals and Magazine of Natural History,' in which I described the whole of the olive-brown and rufous types, all the simple-winged and falcated types, all the ocellated and non-ocellated types as varieties of *M. leda*; but I must confess that after the lapse of 20 years I feel considerable doubt as to the correctness of my then untrained opinion; as a matter of fact, nobody has conclusively proved the identity or non-identity of the many named types which have been associated under the name of *M. leda*. This being the case I prefer, when naming a collection, to quote the description or figure which fits the specimens before me, though at the same time I abstain from adding to the series of names which may have to be abolished.

7. MYCALESIS INJUSTA.

Mycalesis injusta, Wallengren, Lep. Rhop. Caffr. p. 33. n. 1 (1857).

Fóda, 22nd and 23rd October, 1885; Monbuttu, July and August.

8. MYCALESIS EUSIRUS.

Mycalesis eusirus, Hopffer, Ber. Verh. Ak. Berl. 1855, p. 641. n. 13.

♂. Tobbo, 21st May, 1883.

9. MYCALESIS CAFFRA.

Mycalesis caffra, Wallengren, Lep. Rhop. Caffr. p. 34. n. 2 (1857).

Kangasi, 22nd July, 1883; Fóda, 26th November, 1885.

The three preceding forms have been regarded as varieties of one

species, but the arguments brought forward in favour of their identity are not conclusive. Mr. Trimen regards all three as varieties of *M. safitza*, and adduces the fact that Hopffer himself marked his *M. eusirus* as synonymous with *M. safitza*, as conclusive evidence; unfortunately naturalists are but human, and it is astonishing what a difference abundant material will make in a man's views as to the distinctness of species.

10. Samanta perspicua.

Mycalesis perspicua, Trimen, Trans. Ent. Soc. London, 1873, p. 104, pl. 1. fig. 3.

Tobbo, 21st May, 1883.

11. Ypthima pupillaris, sp. n.

Allied to *Y. doleta*; smoky brown; wings above with pale external borders bounded internally by a darker stripe and traversed by two slender marginal lines; primaries with a large oval bipupillated ocellus, with blue pupils and yellow (dead-golden) iris, beyond the cell; secondaries with a smaller unipupillated ocellus on first median interspace and a very small double ocellus near anal angle: Under surface apparently similarly coloured but greyer, but actually (when seen through a lens) sandy brown, densely striated with dark olive-brown, with a stripe towards outer margin and a submarginal line dark brown; a marginal black line; fringe tipped with dark brown; ocellus of primaries rather brighter than above: secondaries with three ocelli, the first subcostal near apex; the second and third small, rounded, answering to those of the upper surface, but more equal in size and shape; the subanal ocellus, however, is bipupillated. Expanse of wings, ♂ 38 millim., ♀ 36 millim.

♀. "On the River Dangu," 14th June; ♂. "Ganyese Tambu (Sandel)," 15th June, 1883.

The female is a little paler and greyer than the male.

12. Ypthima simplicia.

Ypthima simplicia, Butler, Ann. & Mag. Nat. Hist. 4th ser. vol. xviii. p. 481 (1876).

Wadelai, 30th July, 1885; 9th April, 1887.

Originally received from Abyssinia.

13. Ypthima itonia.

Ypthima itonia, Hewitson, Trans. Ent. Soc. ser. 3, vol. ii. p. 287. n. 11, pl. 18. fig. 13 (1865).

Kangasi, 17th July; Stazione Bauri, September 1883.

Only two much-damaged examples were obtained.

14. Ypthima albida, sp. n.

Wings above silvery white; primaries with the base, costa, apical area, and external border suffused with smoky greyish brown; a partially obscured oval bipupillated subapical ocellus of the ordinary type: secondaries with a rather broad brown external border tapering

from anal angle to apex; an indication of a small ocellus near the outer margin on the first median interspace: under surface dark smoky brown, sparsely transversely striated with white; primaries with one and secondaries with three ocelli arranged as in *Y. pupillaris*. Expanse of wings 39 millim.

♂. Fóda, 20th October, 1885.

A rather worn male of this remarkable species was obtained; unlike all the other species in the genus, it resembles *Euptychia ocirrhoë* on the upper surface.

Nymphalinæ.

15. Charaxes lucretius.

Papilio lucretius, Cramer, Pap. Exot. i. pl. 82. F, G (1779).

♀. Monbuttu, July or August.

16. Charaxes pollux.

Papilio pollux, Cramer, Pap. Exot. i. pl. 37. E, F (1776).

♂. Monbuttu, July or August.

17. Charaxes kirki.

♀. *Charaxes kirkii*, Butler, Ent. Month. Mag. xviii. p. 105 (1881).

♂. Toro, Fóda, 27th October, 1885.

The male is velvety blue-black; the primaries with a narrow bronze-greenish border, divided by dusky veins; the base shot with steel-blue; a blue spot within the anterior angle of the cell, three opaline white spots (only the central one large) at one third the distance from discoidal cell to apex, two similarly coloured spots and a dot at two thirds: secondaries with a bronze-greenish marginal lunulated stripe, followed by a black fringe, the first four divisions enclosing dark red curved dashes, the remainder more or less golden; a submarginal series of more or less lunate spots, separated from the greenish border by black curved dashes or semicircular spots; this series consists of white-edged spots, all, excepting two confluent ones at the anal angle (which are violet), being blue-green; a short distance from the submarginal series is a discal lunulate green line; on the under surface the male much resembles the female, differing just as the other black males do from their respective females.

18. Palla varanes.

Papilio varanes, Cramer, Pap. Exot. ii. pl. 160. D, E (1779).

A fragment of this species was captured at Faro on the 7th November, 1885.

19. Hypolimnas misippus.

Papilio misippus, Linnæus, Mus. Lud. Ulr. p. 264 (1764).

♂. Stazione Bauri, September; ♂ ♀. Kangasi, 2nd, 16th, and 17th October and 21st November, 1883; Monbuttu in July and August.

20. Hypolimnas inaria.

Papilio inaria, Cramer, Pap. Exot. iii. pl. 214. A, B (1782).

Wadelai: ♂ ♀. 13th and 27th January; ♂. 29th and 31st March; 8th and 9th April, 1887.

This local form of *H. misippus* is chiefly distinguishable in the female sex, which resembles *Limnas klugii*; it can hardly be called a variety of *H. misippus*, inasmuch as it replaces it in the same localities in which *L. klugii* replaces *L. chrysippus*; yet the males of *H. misippus* and *H. inaria* seem almost, if not absolutely, identical in character.

21. Hypolimnas salmacis.

Papilio salmacis, Drury, Ill. Ex. Ent. ii. pl. 8. figs. 1, 2 (1773).

A worn example was taken at Monbuttu in July or August.

22. Panopea lucretia.

Papilio lucretia, Cramer, Pap. Exot. i. pl. 45. C, D (1779).

A good male example. Monbuttu, July or August.

23. Cymothoë cænis.

Papilio cænis, Drury, Ill. Ex. Ent. ii. pl. 19. figs. 1, 2 (1779).

Kangasi, 13th November, 1883; Monbuttu, July and August.

24. Euryphene plistonax.

Euryphene plistonax, Hewitson, Ex. Butt. v. *Eur.* pl. 9. figs. 38, 39 (1871).

♀. Kangasi, 11th August, 1883.

Originally received from Angola.

25. Euphædra eleus.

Papilio eleus, Drury, Ill. Ex. Ent. iii. pl. 12. figs. 1, 2 (1782).

♀. Kangasi, 24th July, 1883.

26. Aterica cupavia.

Papilio cupavia, Cramer, Pap. Exot. iii. pl. 183. E, F (1780).

♂. Fóda, 3rd November, 1885.

27. Aterica veronica, var.

Papilio veronica, Cramer, Pap. Exot. iv. pl. 325. C, D (1782).

♂. Stazione Bauri, September 1883.

The single example obtained is of a rich rufous-chocolate colour below, but does not differ in markings from the typical form.

28. Hamanumida dædalus.

Papilio dædalus, Fabricius, Syst. Ent. p. 482. n. 174 (1775).

Stazione Bauri, September 1883; Fóda, 22nd, 23rd, 26th, 28th, and 31st October, and 25th November, 1885; Wadelai, 16th January, 1887; Monbuttu in July or August.

29. JUNONIA WESTERMANNI.

Junonia westermanni, Westwood, Ent. Month. Mag. vi. p. 278 (1870).

♂. Monbuttu, July or August.

30. JUNONIA CLELIA.

Papilio clelia, Cramer, Pap. Exot. i. pl. 21. E, F (1775).

♂ ♀. Stazione Bauri, September 1883; Fóda, 20th November, 1885; Monbuttu in July and August; Wadelai, 11th, 13th, 20th, 27th, and 31st January, 1887.

31. JUNONIA CEBRENE.

Junonia cebrene, Trimen, Trans. Ent. Soc. London, 1870, p. 353.

♂. Monbuttu; ♂ ♀. Wadelai, 27th January, 5th February, 1887.

32. JUNONIA BOÖPIS.

Junonia boöpis, Trimen, Trans. Ent. Soc. London, 1879, p. 331.

♂. Stazione Bauri, September; ♀. Kangasi, 18th November, 1883; Monbuttu.

Mr. Trimen appears to me to have been unfortunate in defining the distinctive characters between this form and *J. orithyia*; so far as I can judge, he must have had either the Malayan *J. wallacei* or the Javan *J. ocyale* before him when making his comparison. *The width of the subapical bar on the primaries* is very variable; indeed it varies quite one third in the three examples above enumerated: *the adjacent yellow markings* also vary not a little; *the black streak* intersecting the lower part of the bar between the two ocelli is wanting in *J. wallacei*, slightly indicated in *J. ocyale* and *J. orithyia*, rather stronger in the Indian *J. swinhoei*, still stronger in the Australian *J. albicincta*, strongest in *J. here* and *J. boöpis*, but it is not absolutely constant; *the blue of the hind wings* is slightly more restricted than in any of the other forms, and this is, I think, a reliable character, but *the tint* is variable in all the forms, and therefore is valueless as a distinctive character; *the colour of the white spots* is also untrustworthy, but *the border of the secondaries* in all our specimens is greyish, especially in male examples, hardly a trace of white appearing between the black lines in specimens of this sex; indeed, the hind marginal striæ hardly merit the term "whitish" used in Mr. Trimen's description. The example figured on his plate seems unusually large for a male, and the form of its primaries is that of a female; but for Mr. Trimen's declaration that it is a male, I should have suspected it to be hermaphrodite. The colouring of the under surface in typical *J. orithyia*, from China, is browner (more argillaceous, in fact) than in any of the allied forms. I would therefore define *J. boöpis* as differing from *J. orithyia* in the four following characters:—

1. Subapical white bar of primaries, always in the male and

generally in the female, crossed by black veins as in *J. here* and *J. albicincta*.

2. Blue area of secondaries in the male more restricted towards the costal margin.

3. Hind marginal pale striæ in the male grey instead of pure white or bone-white.

4. Under-surface coloration decidedly paler, almost as pale as in *J. here* and *J. swinhoei*.

I have made the above observations because I believe *J. boöpis* to be a good species, and because I feel satisfied that in the present instance my usually most reliable friend has failed, from want of sufficient material, to indicate its real distinctive characters.

33. JUNONIA INFRACTA, sp. n.

Allied to *J. sophia*; the males of the same colours, only slightly redder above; the female before me white instead of fulvous; the yellow belt immediately beyond the basal area of primaries unbroken, forming a regular curved band, divided by the nervures; in the female the basal area is black; on the under surface the black-edged brown oblique band halfway between the cell and apex of primaries is considerably narrower than in *J. sophia*; and the angular band, which in that species runs from the inferior angle of the cell to the external angle (partly bounding the whitish postmedian patch), is absent; in other respects the two species are almost identical. Expanse of wings, ♂ 45 millim., ♀ 50 millim.

♂. Tobbo, 22nd May, Védada, 16th June, 1883. ♀. Forests of Tiveta, Kilima-njaro, March 1885 (*Bishop Hannington*).

Speaking of the white variety of the male of *J. sophia*, which looks like a small *Panopea lucretia*, Mr. Trimen calls attention to the fact that whilst M. Oberthür mentions it, "he does not say whether the variety in question obtains in the female as well as in the male." The only female of the allied *J. infracta* in our possession being black and white, it is highly probable that a similar form of the female occurs in *J. sophia*; so far as my experience goes, melanism is much commoner in the female than in the male sex.

34. JUNONIA AMESTRIS.

Papilio amestris, Drury, Ill. Ex. Ent. iii. pl. 20. figs. 3, 4 (1782).

Stazione Gadda, 14th and 16th January, 1884.

Seven examples of this pretty species were obtained, exhibiting very little variation in colouring and none in pattern.

35. JUNONIA CLOANTHA.

Papilio cloantha, Pap. Exot. iv. pl. 338. A, B (1782).

Wadelai, 5th and 12th March, 1887.

36. JUNONIA CUAMA.

Junonia cuama, Hewitson, Exot. Butt. iii. *Jun.* pl. 1. figs. 4, 5 (1864).

Wadelai, 27th January, 1887.

37. JUNONIA MICROMERA.

Junonia micromera, Butler, Ann. Nat. Hist. 4th ser. xviii. p. 482 (1876).

♂ ♀. Wadelai, 8th April, 1887.

Originally described from Abyssinian examples.

38. JUNONIA PELARGA.

Papilio pelarga, Fabricius, Syst. Ent, p. 513. n. 296 (1775).

♂. Kangasi, 21st November, 1883; ♀. Wadelai, 27th January, 1887.

39. JUNONIA GALAMI.

Vanessa galami, Boisduval, Faune Ent. de Madag. p. 46 (1833).

♂. Kangasi, 20th November, 1883.

40. JUNONIA TEREA.

Papilio terea, Drury, Ill. Exot. Ent. ii. pl. 18. figs. 3, 4 (1773).

♂. Védada, 16th June; Kangasi, 23rd July; Stazione Bauri, September 1883; ♀. Fóda, 28th October, 1885.

41. JUNONIA CHORIMENE.

Vanessa chorimene, Guériu, Icon. Règne Anim., Ins. texte, p. 476 (1844).

♀. Fóda, 27th October, 1885; ♂ ♀. Wadelai, 8th and 9th April, 1887.

42. PROTOGONIOMORPHA ANACARDII.

Papilio anacardii, Linn. Mus. Lud. Ulr. p. 236 (1764).

♂. Monbuttu, July or August.

43. ATELLA COLUMBINA.

Papilio columbina, Cramer, Pap. Exot. iii. pl. 238. A, B (1782).

♂. Stazione Gadda, 6th January, 1886.

One headless example.

44. HYPANIS ILITHYIA.

Papilio ilithyia, Drury, Ill. Exot. Ent. ii. pl. 17. figs. 1, 2 (1773).

♂. Wadelai, 24th January, 1887.

45. HYPANIS GOETZIUS.

Papilio goetzius, Herbst, Natursyst. Schmett. ix. pl. 258. figs. 1–4 (1798).

♀. Fóda, 20th October, 1885; ♂. Wadelai, 8th April, 1887.

It is difficult to comprehend the reluctance of lepidopterists to recognize the species of this genus; they are better defined than any of the species of *Melitæa*, and therefore far more easy to distinguish. The present species is the Western and Eastern form of the more Southern *H. acheloia*.

46. Neptis agatha.

Papilio agatha, Cramer, Pap. Exot. iv. pl. 327. A, B (1782).

Gaynese Tambu (Sandel), 15th June; Kangasi, 17th July, 14th and 20th November, 1883; Stazione Gadda, 16th January, 1884; Fóda, 22nd, 27th, and 31st October, 3rd, 4th, and 26th November, 1885; Wadelai, 12th and 20th January, and 31st March, 1887.

47. Neptis marpessa.

Neptis marpessa, Hopffer, in Peters's Reise n. Mossamb., Ins. p. 383, pl. xxiv. figs. 9, 10 (1862).

Fóda, 20th October, 1883.

The allied *N. saclava* is intermediate between *N. marpessa* and *N. nemetes*, the figure by Chenu being, however, too inaccurate to show this; the larger spots of primaries are wider and whiter, and united at their opposed angles; the band across the secondaries is also slightly wider and of a pure white colour. I cannot find any additional markings in *N. marpessa* such as are described by Hopffer and Trimen, all the white spots in *N. marpessa* from Natal, Angola, and Abyssinia being represented in the three examples of *N. saclava* labelled Madagascar in the Hewitson cabinet; the white spots of the zigzag discal series and of the submarginal series are, nevertheless, more prominent in *N. marpessa*.

Acræinæ.

48. Telchinia bonasia.

Papilio bonasia, Fabricius, Syst. Ent. p. 464. n. 96 (1775).

Kangasi, 17th July, 1883; Monbuttu in July and August.

49. Telchinia vinidia.

Acræa vinidia, Hewitson, Ent. Month. Mag. xi. p. 130 (1874); Exot. Butt. v. *Acr.* pl. 7. figs. 45, 46 (1875).

Kangasi, 17th July, 1883; Ladó, 17th August, 1884; Fóda, 20th November, 1885; Monbuttu, July and August.

50. Telchinia eponina.

Papilio eponina, Cramer, Pap. Exot. iii. pl. 268. A, B (1782).

Tobbo, 22nd May; Kangasi, 14th, 17th, 20th, and 23rd July, 1883; Fóda, 17th and 20th November, 1885; Monbuttu in July and August; Wadelai, 12th, 13th, and 20th January; 16th and 29th March, 1887.

51. Telchinia lycia.

Papilio lycia, Fabricius, Syst. Ent. p. 464. n. 94 (1775).

Ladó, 15th November, 1883, 17th August, 1884; Fóda, 3rd and 14th November, 1885.

Var. Resembling *T. sganzini*, excepting that there is a large diffused white patch on the secondaries.

Fóda, 23rd October, 1885.

Var. T. SGANZINI.

Acræa sganzini, Boisduval, Faune Madag. p. 34, pl. 6. figs. 6, 7 (1833).

Kangasi, 23rd July, 1883; Ladó, 17th August, 1884; Fóda, 27th and 28th October, 1885; Monbuttu.

Var. Entirely fulvous, without the white subapical band or black apex of *T. sganzini*.

Fóda, 27th October and 15th November, 1885.

One of the examples of the typical white form has the primaries suffused with blackish.

52. TELCHINIA CEPHEUS.

Papilio cepheus, Linn. Mus. Lud. Ulr. p. 252 (1764).

♂ ♀. Kangasi, 17th, 20th, 22nd, 23rd, and 24th July, 1883; Monbuttu in July and August.

53. TELCHINIA STENOBEA, var.

Acræa stenobea, Wallengren, Wien. ent. Mon. iv. p. 35. n. 9 (1860).

Wadelai, 9th March and 9th April, 1887.

54. GNESIA MENIPPE.

Papilio menippe, Drury, Ill. Ex. Ent. iii. pl. 13. figs. 3, 4 (1782).

♂. Kangasi, 23rd July, 1883; ♀. Monbuttu.

55. GNESIA PERENNA.

Acræa perenna, Doubleday and Hewitson, Gen. Diurn. Lep. pl. 19. fig. 4 (1848).

♂. Kangasi, 24th July, 1883; Moubuttu.

56. GNESIA PSEUDEGINA, var.

Acræa pseudegina, Westwood in Gen. Diurn. Lep. p. 531 (1852).

♂. Kangasi, 17th July, 1883; ♀. Wadelai, 31st March, 1887.

The two specimens obtained, and especially that taken in July, have the basal three-fifths of primaries suffused with tawny.

57. ACRÆA NEOBULE.

Acræa neobule, Doubleday & Hewitson, Gen. Diurn. Lep. pl. 19. fig. 3 (1848).

♂. Kangasi, 23rd July, 1883.

58. ACRÆA INSIGNIS.

Acræa insignis, Distant, P. Z. S. 1880, p. 184, pl. xix. fig. 6.

♂. Kangasi, 28th July, 1883.

59. PLANEMA LYCOA.

Acræa lycoa, Godart, Enc. Méth. ix. p. 239. n. 27 (1819).

♀. Kangasi, 5th July, 1883.

Erycinidæ.

60. Abisara gerontes.

Papilio gerontes, Fabricius, Spec. Ins. ii. p. 117. n. 524 (1781).
Monbuttu, in July or August.

Lycænidæ.

61. Tingra sanguinea.

Pentila acræa, var. *sanguinea*, Plötz, Stett. ent. Zeit. xli. p. 198 (1880).
Liptena sanguinea, Smith & Kirby, Rhop. Exot. i. p. 2, *Lipt.* pl. 1. figs. 1–4 (1887).
♀. Kangasi, 27th July, 1883.

62. Tingra acræa.

Pentila acræa, Westwood, Gen. Diurn. Lep. p. 504. n. 3, pl. 77. fig. 6 (avowedly incorrectly figured as a *Liptena*)[1].
♀. Monbuttu, in July or August.

63. Tingra mylothrina, sp. n.

Looks like a small *Mylothris*, but is allied to *T. abraxas*. White, slightly opaline and tinted with sulphur-yellow; base of wings orange; primaries with the base of costa blackish-speckled; a broad apical patch commencing at external third of costal margin and terminating below third median branch, but continued as a tapering border by two decreasing oval marginal spots, greyish brown; fringe spotted between all the nervures with white; secondaries with five large and one small marginal brown spots: wings below white, orange at base, primaries with nine marginal spots commencing from the second subcostal branch; secondaries with six marginal spots. Expanse of wings 39 millim.
Monbuttu.
Only one example of this very distinct species was obtained, its body is somewhat injured, but it appears to be normal in colouring.

64. Pentila undularis.

Pentila undularis, Westwood, Gen. Diurn. Lep. p. 504. n. 1 (avowed type of the genus *Pentila*).
Liptena undularis, Hewitson, Exot. Butt. iii. *Pent. & Lipt.* fig. 7 (1866).
Stazione Bauri, September 1883.
As elsewhere stated, *P. undularis* was originally named by Boisduval, entered as *Pentila undularis* by Doubleday in his Museum List, and was stated to be the type of the genus by Westwood (who first characterized *Pentila*). There can be no doubt whatever that

[1] To give the lettering of a plate more authority than the text which corrects it seems to me utterly ridiculous; the lettering of a plate may be tampered with by a lithographic writer, and if an author has no power to point out the error, he may be quoted as the originator of the most absurd nonsense-name.

the characters ascribed to *Pentila* were formulated from an examination of this species. It follows therefore that to accept *Tingra tropicalis* of Boisduval (a species unknown to Professor Westwood when he characterized *Pentila*) as the type of the latter is a proceeding which would render both descriptions of genera and indications of their types utterly valueless.

65. LACHNOCNEMA D'URBANI.

Lachnocnema d'urbani, Trimen, South Afr. Butt. ii. p. 236. n. 238 (1887).

Védada, 16th June, 1883.

66. POLYOMMATUS BÆTICUS.

Papilio bæticus, Linn. Syst. Nat. i. 2, p. 789, n. 226 (1767).

♂. Wadelai, 16th January, 1887.

67. CATOCHRYSOPS ASOPUS.

Lycæna asopus, Hopffer, Ber. Verh. Ak. Berl. 1855, p. 642. n. 22; Peters's Reise, Zool. v. p. 410, pl. 26. figs. 13–15 (1862).

Stazione Bauri, September 1883; Wadelai, 20th January, 19th and 27th March, 1887.

68. CATOCHRYSOPS OSIRIS.

Lycæna osiris, Hopffer, Ber. Verh. Ak. Berl. 1855, p. 642. n. 21; Peters's Reise, Zool. v. p. 409, pl. 26. figs. 11, 12 (1862).

♂. Wadelai, 16th January and 3rd April, 1887.

69. CATOCHRYSOPS CYCLOPTERIS.

Lampides cyclopteris, Butler, Ann. & Mag. Nat Hist. ser. 4, vol. xviii. p. 483 (1876).

♀. Nedada, 16th June; ♂. Tomaja, 6th August, 1883.

Originally described from Abyssinia.

70. TARUCUS PULCHER.

Lycæna pulchra, Murray, Trans. Ent. Soc. 1874, p. 524, pl. 10. figs. 7, 8.

♂. Fóda, 1st November, 1885.

Seasonal form?

About a sixth smaller, of a paler (greyish lilac) tint above, the female with more white on upper surface; markings below paler. (3 males and 1 female.)

Wadelai, 27th January, 5th February, and 10th March, 1887.

Though very distinct in general appearance from the typical form, the pattern of the under surface corresponds with that of *T. pulcher*, of which I think it is probably the early brood.

71. AZANUS MORIQUA.

Lycæna moriqua, Wallengren, Lep. Rhop. Caffr. p. 39. n. 9 (1857).

♂ ♀. Wadelai, 16th and 24th January, 1887.

72. Castalius isis.

Papilio isis, Drury, Ill. Exot. Ent. ii. pl. 3. figs. 4, 5 (1773).

♂. Stazione Bauri, September 1883; Monbuttu, July and August.

73. Zizera knysna, var.

Lycæna knysna, Trimen, Trans. Ent. Soc. ser. iii. vol. i. p. 282 (1862).

♂. Wadelai, 13th January, 1887.

A worn specimen, differing from the normal type in its greyer coloration, with silvery-blue scaling on the basal three-fourths, but most distinctly towards the base.

74. Lycænesthes princeps.

Lycænesthes princeps, Butler, Ann. & Mag. Nat. Hist. ser. 4, vol. xviii. p. 484 (1876).

♀. Tobbo, 22nd May, 1883.

Originally described from Abyssinian examples.

75. Hyreus lingeus.

Papilio lingeus, Cramer, Pap. Exot. iv. pl. 379. F, G (1782).

♂. Stazione Bauri, September 1883.

76. Hypolycæna (Tatura) pachalica, sp. n.

Allied to *H. philippus*. Wings above deep rufous-brown, glossed with purple in male examples; with a black marginal line; primaries with orange basicostal margin, and with greyish fringe, traversed by a darker central line; secondaries with the usual black spots bounded by orange lunules above the tails, the anal spot flecked with pale metallic green; a simple black spot between them, an abbreviated submarginal line, a line at the base of the fringe, the fringe, and tips of the tails white; body black, the head varied with tawny scales: under surface of wings pale stone-grey; a short bar at the end of each discoidal cell, a band across the disk, and a submarginal stripe bright reddish orange, edged with black and margined with whitish; a white submarginal line, separated by an orange line from the black marginal line; secondaries with an orange subcostal spot at basal third, the discal band elbowed and interrupted at the submedian vein, a short orange marginal band above the abdominal sinus; a dark grey band (also, less strongly indicated, on the primaries) tinted with orange towards costa, between the submarginal and marginal stripes; præcaudal spots nearly as above, but the anal spot flecked with metallic leaden scales, the intermediate spot wanting: body below white, the legs barred with black. Expanse of wings 23–25 millim.

2♂ & 1♀. Wadelai, 29th March, 1887.

A very distinct and pretty little species.

A worn and broken female example of an apparently new *Virachola*, allied to *V. anta*, was obtained at Stazione Bauri in September 1883.

77. Zeritis harpax, var.

Papilio harpax, Fabricius, Syst. Ent. App. p. 809 (1775).

♂ ♀. Wadelai, 9th April, 1887.

The pair obtained differs from the normal type in its superior size, but does not exhibit any other distinctive character.

78. Myrina silenus.

Papilio silenus, Fabricius, Syst. Ent. p. 531. n. 378 (1775).

♀. Wadelai, 16th January, 1887.

Papilionidæ.

Pierinæ.

79. Mylothris chloris.

Papilio chloris, Fabricius, Syst. Ent. p. 473. n. 129 (1775).

♀. Kangasi, 13th November, 1883; ♂. Stazione Gadda, 13th and 14th January, 1884; Monbuttu, in July or August.

80. Mylothris clarissa, sp. n.

♀. Primaries as in the male of *M. chloris*, excepting that the apical patch is cut rather more obliquely on its inner edge, and that the marginal spots are both well-defined; secondaries creamy ochreous, with a broad grey-brown external border, considerably narrower, however, than in *M. chloris*, and with nearly rectangular inner edge: under surface much like the male of *M. chloris*, excepting that the border of secondaries has a nearly rectangular inner edge, and extends further along the costal margin; the primaries, however, are more widely orange at base, and the subapical area is decidedly yellower. Expanse of wings 66 millim.

Wadelai, 28th March, 1887.

81. Mylothris poppea.

Papilio poppea, Cramer, Pap. Exot. ii. pl. 110. D (1779).

♂. Monbuttu, in July or August.

Only one very much shattered male was obtained.

82. Nychitona sylvicola.

Leucophasia sylvicola, Boisduval, Faune Ent. de Madag. p. 20 (1833).

Fóda, 22nd October, 1885.

83. Terias brigitta.

Papilio brigitta, Cramer, Pap. Exot. iv. pl. 331. B, C (1782).

♂ ♀. Wadelai, 11th, 13th, and 20th January, 15th and 16th March, 1887.

84. Terias zoe.

Terias zoe, Hopffer, Ber. Verh. Ak. Berl. 1855, p. 640. n. 5; Peters's Reise, Zool. v. p. 369, pl. 23. figs. 10, 11 (1862).

♂. "Stat. Mundú," 1st June, 1883.

One fragmentary example only of this species was obtained.

85. Terias regularis.

Terias regularis, Butler, Ann. & Mag. Nat. Hist. ser. 4, vol. xviii. p. 486 (1876).

Kangasi, 17th July, and October; Stazione Bauri, September 1883; Fóda, 20th, 22nd, 27th, and 28th October, 1st November, 1885; Monbuttu, in July and August.

Originally described from Abyssinian examples.

86. Terias solifera.

Terias solifera, Butler, Ann. & Mag. Nat. Hist. ser. 4, vol. xv. p. 396. n. 3 (1875).

♂. Tobbo, 21st May, 1883.

The type was from the Congo.

87. Terias orientis, sp. n.

♂. Above gamboge-yellow, primaries with black costal margin; outer border black-brown, wide at costa, whence it decreases in width to external angle; in form it somewhat resembles the border of *T. senegalensis*, but it is wider on the costa, and terminates in an acute angle as in *T. dentilimbata*; the secondaries have a narrow sinuated black-brown outer margin, often broken up into a mere marginal series of spots: the under surface is lemon-yellow, the ordinary markings ill-defined or wanting. Expanse of wings 42 millim.

♀. Pale sulphur-yellow, either spotless below or with the ordinary markings badly defined. Expanse of wings 40–45 millim.

♀. Tobbo, 21st May, 1883; ♂. Wadelai, 31st March, 1887.

We have ten examples of this species in the Museum series from Upper Egypt, the White Nile, Abyssinia, and the Victoria Nyanza.

88. Terias bisinuata.

Terias bisinuata, Butler, Ann. & Mag. Nat. Hist. ser. 4, vol. xviii. p. 485 (1876).

Fóda, ♀ 27th October, ♂ 1st November, 1885.

Originally described from Abyssinia.

89. Terias boisduvaliana.

Terias boisduvaliana, Mabille in Grandidier's Hist. Madag. vol. i. p. 253. n. 5, pl. xxxii. figs. 4, 4*a*, & 5.

♂. Stazione Bauri, September 1883; Monbuttu in July or August.

Two fine specimens and one less perfect were obtained. The species most nearly resembles *T. brenda* of Doubleday, but has a rather wider border to the primaries above; below it is a little

clearer in colour and the markings are almost wholly obliterated The figures in M. Grandidier's work are taken from rather small examples; but this form of *Terias* is very variable in size, our smallest male example expands 28 millim. and our largest 55 millim.

Var. ? The external border of primaries wider and more quadrate at apex, narrower or obliterated at external angle. Expanse of wings, ♂ and ♀ 37 millim.

♂. Stazione Bauri, September 1883; ♀. Ladó, 20th August, 1884.

Now that the text of Monsieur Grandidier's work has appeared I much regret to find that the serious errors, which I pointed out in my paper on Lepidoptera from Somali-land (P. Z. S. 1885, pp. 762, 767, 768, 769), have not only not been corrected, but, on the contrary, have been insisted on. Now, whilst no great blame attaches to a Lepidopterist who accepts the statement of his collector as to the capture of a series of Arabian species in Madagascar, he injures his reputation when he persists in associating as male and female the males of different species, as M. Mabille has done in the case of the males of *Charaxes antamboulou* and *C. cowani*; that both are males, the fidelity of the illustrations shows at a glance, apart from the fact that the sexes of both are in the Museum collection: the coloration and pattern of the under surface in these two species differs more than in the sexes of any *Charaxes* known to me; in the true sexes there is no such difference.

90. TERACOLUS AURIGINEUS.

Teracolus aurigineus, Butler, Ann. & Mag. Nat. Hist. ser. 5, vol. xii. p. 103 (1883).

♂ ♀. Wadelai, 16th, 28th, 29th, and 31st March, and 8th April 1887.

Originally described from the Victoria Nyanza and subsequently received from Kilima-njaro; the examples from the latter locality have the veins of the wings blacker and the black bands across the wings slightly broader than in the type.

91. TERACOLUS PROTOMEDIA.

Pontia protomedia, Klug, Symb. Phys. pl. 8. figs. 13, 14 (1829).

♂ ♀. Wadelai, 9th, 16th, 19th, and 31st March, 1887.

Occurs in Upper Egypt, Nubia, Aden, and Somali-land.

92. TERACOLUS PUNICEUS, sp. n.

♂. Allied to *T. hetæra*, but smaller, the magenta-coloured apical patch triangular, terminating at the third median branch; the blackish border narrower; a minute black dot at end of cell; the secondaries immaculate: under surface of primaries white with cream-coloured apical patch, of secondaries cream-coloured, crossed beyond the middle from costal to third median branch by an oblique interrupted narrow brown line, beyond which there is a single spot on second median interspace. Expanse of wings 64 millim.

Wadelai, 8th April, 1887.

The female is in the Museum from the Victoria Nyanza, and I formerly supposed it to be that sex of *T. hetæra*; it is somewhat like a large edition of *T. jobina* ♀, but has a few scales of magenta-red in each of the white spots towards apex of primaries. This species should stand between *T. eunoma* and *T. hetæra*.

93. Teracolus phlegyas.

Anthocharis phlegyas, Butler, P. Z. S. 1865, p. 431. n. 3, pl. 25. figs. 3, 3*a*.

♂. Wadelai, 16th January, 1887.

94. Teracolus bacchus, sp. n.

♂. Size of *T. ione* or slightly smaller. Wings above white; primaries with narrow black costal margin; the base sprinkled with black scales; apical area blue-black, with dentate-sinuate inner edge, and crossed by a wide belt of brilliant changeable purple (wider and bluer than in *T. ione*); the spot at end of cell scarcely visible, reduced to two or three scales; secondaries white, with blackish veins terminating in minute black spots on the outer margin. Wings below white, the apex of primaries and whole of secondaries very pale sulphur-yellow, crossed by well-defined black veins terminating in small subconfluent black spots on the outer margin; costal margin of primaries black; a black dot at the end of the cell: secondaries with the basal half of the costal margin yellow; a black transverse dash from costal to subcostal vein, forming the commencement of an ill-defined oblique stripe, indicated by scattered black scales as far as the third median branch. Expanse of wings 57 millim.

♀. White above; the base rather broadly irrorated with blackish scales; primaries with the costal margin black; a broad external blackish border crossed by black veins, widest at costa, gradually diminishing in width from costa to first median branch, to which point it is internally dentate-sinuate and traversed by six white spots in an arched series, narrow and internally widely sinuated from first median branch to submedian vein; a black spot at the end of the cell; a transverse blackish spot at external third of interno-median area: secondaries with a marginal series of large subconfluent blackish spots crossed by black veins; a blackish subapical oblique stripe from costa, connected with the macular border by black veins: body quite normal. Primaries below white, the costa and apical area pale yellow; veins towards outer margin dark brown; a subapical series of angulated brown dashes; a black spot at the end of the cell; two small black spots on interno-median area and three brown triangular spots at end of first median branch, interno-median fold, and submedian vein: secondaries pale yellow, base of costal margin and a spot at the end of the cell bright yellow; veins, an elbowed stripe beyond the middle, and the fringe excepting at the extremity of the internervular folds, dark brown: body below white. Expanse of wings 55 millim.

♀. Lado, 20th August, 1884; ♂. Wadelai, 27th January, 1887.

This species is readily distinguished from all its allies by the well-defined dark-coloured veins on the under surface.

95. TERACOLUS PHŒNIUS.

♂. *Teracolus phœnius*, Butler, Ann. & Mag. Nat. Hist. ser. 4, vol. xviii. p. 488 (1876).

♂ ♀. Wadelai, 8th December, 1885; 13th and 16th January, 31st March, and 8th April, 1887.

The female originally described as belonging to this species proves to be the pale form of the female of *T. anteupompe*; the true female of *T. phœnius* is of a pale sulphur-yellow colour and is much less heavily suffused with grey at the base than in *T. anteupompe*; the veins on the apical area are also much less prominent and the disco-cellular spot is smaller; below, the wings are also sulphur-yellow, the primaries only being crossed by an oblique white belt; the veins towards the outer margin are black, widening towards outer margin in the characteristic manner noticeable in the male.

It is always a mistake to conclude too hastily that Indian and African species are identical; now that the sexes of this species are finally determined, it becomes evident that Col. Swinhoe's decision as to the identity of *T. phœnius* with *T. dirus* of Sind is incorrect. The female, which I at first supposed to be that sex of *T. phœnius*, does indeed bear a considerable superficial resemblance to some of the pale females of *T. dirus*, just as the many pale females of *Colias* greatly resemble one another; but when we compare the two red-tipped females of *T. anteupompe* and *dirus*, we see at a glance that they are utterly distinct:—the former has two-fifths of the wing red, crossed by black veins and interrupted by an angular series of small black spots; the latter has the red area much more confined, usually only forming an oblique band, but occasionally extending a short distance beyond the black macular bar; the outer margin is also heavily bordered with black.

96. TERACOLUS PSEUDACASTE.

Teracolus pseudacaste, Butler, P. Z. S. 1876, p. 156. n. 103, pl. 6. fig. 11.

♂. Wadelai, 16th January and 9th March, 1887.

97. TERACOLUS ANTEVIPPE.

Anthocharis antevippe, Boisduval, Sp. Gén. Lép. i. p. 572. n. 18, pl. 18. fig. 3 (1836).

♂. Wadelai, 19th March, 1887.

98. TERACOLUS HELLE.

Teracolus helle, Butler, P. Z. S. 1876, p. 149. n. 75.

♀. Fóda, 5th November, 1885; ♂. Wadelai, 31st March, 1887.

99. TERACOLUS EIONE.

Anthocharis eione, Boisduval, Sp. Gén. Lép. i. p. 578. n. 29 (1836).

♀. Wadelai, 31st March, 1887.

100. Teracolus evarne.

Pontia evarne, Klug, Symb. Phys. pl. 6. figs. 1–4 (1829).

♂. Wadelai, 13th January; ♀. 28th March, 1887.

There are evidently large and small forms of this species, as in the allied *T. phillipsii* from Somali-land: hitherto we have received male examples equal in size to that figured by Klug; the male now received is much smaller and has lost the marginal spots on secondaries; on the other hand, the female figured by Klug is small and evidently belongs to our small male, whilst the female just received is large and heavily marked and belongs to Klug's male. It is probable that the small type is the winter form of the species; but, after all, conjectures are valueless in these questions.

101. Catopsilia pyrene.

Colias pyrene, Swainson, Zool. Ill. i. pl. 51 (1820–1821).

♂ ♀. Kangasi, 17th, 20th, 23rd, 24th, and 27th July, 2nd October; Stazione Bauri, September 1883; Stazione Gadda, 17th, 26th, 27th, and 28th January, 10th February and 6th June; Lado, 20th August, 1884; Fóda, 27th October, 1885; Monbuttu in July and August; Wadelai, 9th March, 1887.

102. Glutophrissa contracta, sp. n.

Intermediate in some respects between *G. saba* of West Africa and *G. malatha* of Madagascar. The male differs from both species in the slightly narrower black border to the primaries above, the creamy colour of the apical area and secondaries, and total absence of all black spots on the under surface; the female differs from both in having the white belt of primaries above contracted to a narrow oblique spot at the end of the cell, though from the median vein to the inner margin it remains as wide as usual; on the under surface the yellow colour at the base is duller and more saffron-tinted; the apex is as white as in the Madagascar form. Expanse of wings, ♂ 56–58 millim., ♀ 49–58 millim.

Wadelai, ♂ 13th, 16th, 20th, and 27th January; ♀ 19th March; ♂ ♀ 8th April, 1887.

Nine examples were obtained; the male most nearly resembles M. Mabille's figure of *G. epaphia* ♂, a form which I have never seen from Madagascar. The true *G. epaphia* is the *Pieris matuta* of Doubleday and is the male of *G. saba*. The male of *G. malatha* (the Madagascar form) has similar black spots below, but is yellower in tint; it does not agree with M. Mabille's narrow-bordered males.

103. Pinacopteryx pigea.

Pieris pigea, Boisduval, Sp. Gén. Lép. i. p. 523. n. 134 (1836).

♂ ♀. Fóda, 20th October and 25th November, 1885.

The female is a singularly beautiful example, the whole of the ground-colour being of a bright sulphur-yellow.

104. Pinacopteryx ortygna.

Pieris ortygna, Hübner, Zutr. exot. Schmett. figs. 985, 986 (1832).

♂. Fóda, 23rd, 28th, and 31st October; 20th and 23rd November, 1885.

The female of this species is unknown to me, but there is no doubt that it somewhat resembles the female of *Ganoris rapæ*. Mr. Doubleday identified this species with the *Pieris orbona* of Boisduval's 'Lepidoptera of Madagascar,' and thus led me into error: the latter is a *Glutophrissa*.

105. Phrissura sylvia, var.

Papilio sylvia, Fabricius, Syst. Ent. p. 470. n. 115 (1775).

♂. Kangasi, 20th November, 1883; Stazione Gadda, 31st January, 1884; Monbuttu in July and August.

106. Belenois instabilis, sp. n.

A very variable species, allied to *B. calypso*; much smaller. The male above milk-white; primaries with narrow costal margin black excepting at base where it is grey; a black wedge-shaped costal dash extending in a thin line along the upper discocellular veinlet; a large black spot on the lower discocellular; apical area and external border black, wider than in *B. calypso*, but with the same white spots upon it: secondaries with a minute black dash on the lower discocellular; an arched series of black spots, the first three in an oblique subapical series, the last three submarginal, connected by a grey nebulous streak; a marginal series of six large triangular black spots, united externally by a black marginal line; body normal. Primaries below nearly as in *B. calypso*, but the subapical angulated black band more regular, not so much broken up, an additional blackish spot on the first median interspace; the apical area creamy white divided by black veins, which are less widely black-bordered than in *B. calypso*: secondaries sulphur-yellow, with brown veins terminating in triangular marginal spots; a dark brown spot at the end of the cell and seven submarginal spots: body below white. Expanse of wings 64 millim.

♀. Darker than the darkest females of *B. calypso*; resembling, in fact, the female of *B. clytie*, but without the subapical white spots, with the basal area heavily suffused with grey, and with the oblique bar at the end of the discoidal cell of primaries imperfectly separated from the broad blackish external area: on the under surface it differs from the darkest females of *B. calypso* in having the macular subapical band of the primaries widened into a broad black belt, almost touching the oblique discocellular bar, the lower submarginal spots small and the basal area yellower; the secondaries with the veins blackened from the middle outwards, the submarginal black spots united into a blackish belt, and the last five yellow marginal spots rounded and smaller. Expanse of wings 58 millim.

♂ ♀. Fóda, 23rd, 27th, and 28th October; 17th and 26th November, 1885.

Var. *a*. ♂. Slightly smaller, the black cuneiform costal dash of primaries replaced by an oblique black line; all the black markings more sharply defined; the white apical dashes narrower, the black spots of the subapical and submarginal series of secondaries smaller; below the oblique black dash at end of cell of primaries interrupted, the apical area of primaries and ground-colour of secondaries clear sulphur-yellow; the veins less distinctly black, the costa, two abdominal streaks, and the pale spots of the external border saffron-yellow. Expanse of wings 55 millim.

♀. Above with the black external area much narrower (about one half the width of the typical form), but the veins blackened from the middle; the black spots better defined, owing to their not being obscured by the wide border; the basal area also less suffused with blackish. Primaries below with narrower discocellular bar and discal belt; the veins towards apex and on secondaries less broadly black-bordered: secondaries chrome-yellow, the submarginal spots smaller and only connected by grey scales; the marginal spots of the ground-colour shaped more nearly as in *B. calypso*. Expanse of wings 55 millim.

♀. Fóda, 20th October, 1885; ♂. Wadelai, 29th March, 1887.

Var *b*. ♂. Above with the black markings less strongly defined, the oblique discocellular line of primaries sometimes obliterated; the apical area of primaries and the ground-colour of secondaries creamy whitish, the saffron-coloured markings replaced by pale yellow; the veins only blackened at their outer extremities. Expanse of wings 57 millim.

♀. Above white, not obscured at the base; black markings nearly as in *B. calypso* ♀, but with grey-bordered white dashes on the apical area of primaries, and the marginal spots of secondaries obscured with grey towards anal angle: apical area of primaries below creamy white, the veins across it very slenderly black; the subapical black belt narrow; secondaries slightly pearly, the black spots small, the other characters as in the male. Expanse of wings 56 millim.

♂. Kangasi, 18th November, 1883; ♂ ♀. Wadelai, 16th January, 1887.

Apart from all less constant characters, the whole of the varieties of this species can be at once distinguished from *B. calypso* by the six subapical and submarginal black spots on the upper surface of the secondaries, which are perfectly defined in both sexes, by the regular and unbroken character of the subapical bar or belt on the under surface of the primaries, and by the more or less developed black borders to the veins on the under surface of the secondaries.

107. Belenois calypso, var.?

Papilio calypso, Drury, Ill. Exot. Ent. ii. pl. 17. figs. 3, 4 (1773).

♂. Kangasi, 24th March, 1883.

One injured male only was obtained: we have a similar male from the Congo. It differs from typical *B. calypso* in the white

under surface of the secondaries, the costal border and an internomedian streak from the base only being saffron-yellow. Though this may perhaps be a distinct species, there is not at present sufficient material to warrant its separation on mere colour-characters apart from marking.

108. Belenois dentigera, sp. n.

♂. Belongs to the *B. calypso* group; above white: the primaries with blackish costal edge; the subcostal furca widely blackish-bordered; five other blackish triangular marginal spots in a decreasing series; three widely separated greyish dots in an angular subapical series; secondaries with four small black marginal spots; thorax greyish, abdomen white. Wings below white; primaries with black costal edge, a black dot on the lower discocellular veinlet; five unequal black spots in an angular subapical series; seven black marginal spots at the extremities of the veins: secondaries very faintly rose-tinted; costal border orange on basal and apical thirds; an ill-defined orange basi-abdominal streak; a black dot at end of cell; a submarginal series of seven unequal black spots and a marginal series of six. Expanse of wings 60 millim.

Stazione Gadda, 10th February, 1884.

Only one male of this very distinct species was obtained; it comes nearest to an unnamed male in the Museum collection from Angola.

109. Belenois gidica.

Pieris gidica, Godart, Enc. Méth. ix. p. 131. n. 37 (1819).

♂. Fóda, 1st November, 1885; ♀. Wadelai, 31st March, 1887.

110. Belenois severina.

Papilio severina, Cramer, Pap. Exot. iv. pl. 338. G, H (1782).

111. Belenois infida, sp. n.

♂. Above like *B. severina*, excepting that it is a little smaller, and has a distinct black bar, commencing with a cuneiform black costal spot, at the end of the discoidal cell of primaries; the border of secondaries narrower and interrupted by larger white spots. Below, the costal border of primaries is not yellowish, the ground-colour of the apical area is considerably browner, this border narrows abruptly from the second, instead of remaining wide to the first median branch; the secondaries have a whitish abdominal border and all the veins and the outer border are widely rufous-brown, the latter interrupted by the usual yellow spots. Expanse of wings 46 millim.

♀. Extremely variable, the primaries either pinky white or chrome-yellow with a black external border occupying from one third to more than half the wing; a broad oblique black bar across the end of the cell, connected by black veins with the outer border, or, in some examples, perfectly lost in it, a small costal spot of the ground-colour alone remaining to show the point of union; three,

two, or no subapical spots of the ground-colour, when three are present they form an oblique series; secondaries sulphur- or chrome-yellow, the external black border broad, sometimes like that of *B. severina*, excepting that it is connected with a discocellular triangular spot by black veins (median and radial), but more frequently occupying half the wing, so as entirely to obliterate the subapical costal spots; fringe spotted with white. Below always yellower than in *B. severina*, the primaries with broad black oblique bar at the end of the cell, either connected by black veins or confluent with a more or less broad external border as above, this border, however, never stops short at first median branch as in *B. severina*, but is continued to the inner margin; the secondaries below always have a wider external border than in *B. severina*, frequently almost extending to the cell, and the veins are all widely bordered with brown. Expanse of wings 50–51 millim.

♂. Wadelai, 16th January; ♀. 28th, 29th and 31st March; 8th and 9th April, 1887.

Of this well-marked species thirteen examples were collected; unfortunately, twelve of these are females, and therefore it is impossible to say whether the extraordinary variability in the width of the black border extends to the male sex; of the females no two specimens are quite alike.

This is what I understand by a variable species; many Lepidopterists confound the idea of a variety or sport with that of a fixed local form (which I regard as the only species in Lepidoptera), and this leads them into such a perplexed condition of mind that they have some difficulty in deciding as to whether a new form shall be called a new species or a variety. In Mr. Semper's recently published 'Reisen im Archipel der Philippinen,' 2nd part, p. 84, the difficulty is thus met—"105 *a*. var. *Euripus lucasioides*, n. sp."

112. Belenois agrippina.

Pieris agrippina, Felder, Reise der Nov., Lep. ii. p. 173. n. 159 (1865).

♂ ♀. Wadelai, 13th and 16th January; 19th and 29th March; 8th April.

I doubt very much whether the distinction between this species and *B. lordaca* can be maintained, the difference (chiefly in size) appears to be more and more unsatisfactory as additional specimens are received.

Papilioninæ.

113. Papilio policenes.

Papilio policenes, Cramer, Pap. Exot. i. pl. 37. A, B (1776).

Kangasi, 20th August, 1883; Monbuttu in July or August.

Only three imperfect specimens were obtained.

114. Papilio antheus.

Papilio antheus, Cramer, Pap. Exot. iii. pl. 234. B, C (1782).

Stazione Gadda, 19th January, 1884.

Only one male was obtained; the species appears to be somewhat rare.

115. Papilio pylades.

Papilio pylades, Fabricius, Ent. Syst. iii. 1, p. 34. n. 100 (1793).

Tobbo, 22nd May; Kangasi, 27th and 29th July, 6th, 7th, 12th, 16th October, 16th, 20th, and 22nd November; Stazione Bauri, in September 1883; Stazione Gadda, 17th, 19th, 26th, and 28th January, 10th February, 1884; Fóda, 31st October and 25th November, 1885; Monbuttu in July and August.

116. Papilio tynderæus.

Papilio tynderæus, Fabricius, Ent. Syst. iii. 1, p. 35. n. 104 (1793).

Monbuttu in July and August.

117. Papilio leonidas.

Papilio leonidas, Fabricius, Ent. Syst. iii. 1, p. 35. n. 103 (1793).

Kangasi, 3rd November, 1883.

118. Papilio ridleyanus.

Papilio ridleyanus, White, Ann. & Mag. Nat. Hist. xii. p. 262 (1843).

Kangasi, 20th July, 1883.

119. Papilio demoleus.

Papilio demoleus, Linnæus, Mus. Lud. Ulr. p. 214 (1764).

Stazione Bauri, September; Kangasi, 20th, 24th, 25th, 29th, and 31st July, 9th October, 20th and 21st November; Ladó, 20th December, 1883; Stazione Gadda, 17th and 19th January and 1st April, 1884; Monbuttu in July or August; Wadelai, 16th January and 9th April, 1887.

A much-worn example of an apparently new species of *Papilio* allied to *P. cynorta* was obtained at Monbuttu; it is unfortunately not sufficiently perfect to be worth describing.

120. Papilio erinus.

Papilio erinus, Gray, Cat. Lep. Ins. B. M. i. p. 35. n. 127 (1865).

Kangasi, 17th July and 2nd October, 1883; Monbuttu, in July or August.

121. Papilio bromius.

Papilio bromius, Doubleday, Ann. & Mag. Nat. Hist. xvi. p. 176 (1845).

Stazione Bauri, September 1883; Stazione Gadda, 6th June, 1884; Monbuttu in July or August.

122. Papilio hesperus.

Papilio hesperus, Westwood, Arc. Entom. i. pl. 48 (1843).
Monbuttu in July or August.
Only one damaged example was taken.

Hesperiidæ.

123. Hesperia forestan.

Papilio forestan, Cramer, Pap. Exot. iv. pl. 391. E, F (1782).
Monbuttu, in July or August.
Two fragmentary specimens.

124. Chapra mathias.

Hesperia mathias, Fabricius, Ent. Syst. Supp. p. 433 (1798).
Kangasi, 22nd July, 1883; Wadelai, 9th April, 1887.

125. Parnara inconspicua.

Hesperia inconspicua, Bertoloni, Mem. Acc. Bon. 1849, p. 15.
Wadelai, 3rd and 8th April, 1887.

126. Gomalia elma.

Pyrgus elma, Trimen, Trans. Ent. Soc. ser. 3, vol. i. p. 288 (1862).
Gomelia albofasciata, Moore, P. Z. S. 1879, p. 144.
Wadelai, 8th April, 1887.

127. Pardaleodes edipus.

Papilio edipus, Cramer, Pap. Exot. iv. pl. 366. E, F (1782).
♀. Védada, 16th June, 1883.

128. Thanaos djælælæ.

Pterygospidea djælælæ, Wallengren, Lep. Rhop. Caffr. p. 54 (1857).
♀. Wadelai, 29th and 31st March, 8th April, 1887.
The females show no trace of the ochraceous colouring on the under surface which characterizes the male specimens.

HETEROCERA.

Agaristidæ.

129. Eusemia euphemia.

Phalæna euphemia, Cramer, Pap. Exot. iv. pl. 345. A (1782).
Wadelai, 4th January and 31st March, 1887.

130. Ægocera tricolor.

Ægocera tricolor, Druce, Ent. Month. Mag. xx. p. 155 (1883).
Wadelai, ♀, 16th March; ♂, 3rd April, 1887.

131. ÆGOCERA MAGNA.

Ægocera magna, Walker, Cat. Lep. Het. i. p. 56. n. 3 (1854).

Kangasi, 29th July, 1883; Wadelai, 8th and 28th March, 1887.

132. ÆGOCERA RECTILINEA.

Ægocera rectilinea, Boisduval, Sp. Gén. Lép. i. pl. 14. fig. 5 (1836).

Wadelai, 9th and 11th March and 8th April, 1887.

ARCTIIDÆ.

133. EUCHROMIA FULVIDA.

Euchromia fulvida, Butler, Trans. Ent. Soc. 1888, pl. iv. fig. 9.

Euchromia sperchius (part.), Walker, Cat. Lep. Het. i. p. 220. n. 24 (1854).

Kangasi, 27th July, 1883; Monbuttu in July and August.

134. ALPENUS ÆQUALIS.

Alpenus æqualis, Walker, Cat. Lep. Het. ii. p. 686. n. 1 (1855).

Wadelai, 11th March, 1887.

135. TÆNIOPYGA SYLVINA.

Phalæna-Noctua sylvina, Stoll, Suppl. Cramer, Pap. Exot. pl. 40. fig. 4 (1791).

♀. Stazione Gadda, 23rd April, 1884.

136. PLERETES PACTOLICUS, sp. n.

Bright orange, with black-bordered steel-blue markings; primaries with two subconfluent spots placed obliquely close to the base (in the female they are confluent and form a short oblique bar); three nearly straight bands, nearly equidistant on the costal margin, crossing the wing to inner margin, the outer edges of these bands are slightly convex, and the outermost band tapers (in the male especially) towards its inferior extremity; a short subapical bar or blotch, and two large spots, the upper one discal, ovate or pyriform, the lower quadrate or triangular and placed at external angle; a large apical spot and five or six (in the female) marginal spots; the apical and three first marginal spots confluent in the female: secondaries of male with a small costal spot before the middle; a tolerably wide external border, widest at apex, where it is interrupted by an externally bisinuated spot of the ground-colour, interrupted on the third median branch by a square excavation, near to which is a yellow spot on the fringe: secondaries of female with a clavate patch commencing in a large costal spot and crossing the cell; a narrow curved bar at the end of the cell and a tolerably broad uninterrupted external border: face, tips of palpi, antennæ, two spots on the collar, a large spot on each tegula, a large dorsal spot on the female, a second (metathoracic) dorsal spot on both sexes, and in the female the anal segment, blue-black; body below transversely barred with black; legs black. Expanse of wings, ♂ 70 millim., ♀ 71.

Wadelai, 11th and 12th January, 1887.

Nearest to *P. thelwallii*, Druce, but differing from it in the narrower border to the secondaries, and from all the three described species—*P. thelwallii*, *P. bellatrix*, and *P. tigris*—in the straight instead of angulated bands on the primaries; the orange of the male is paler than in the female but is quite uniform; in *P. tigris* the primaries are decidedly paler than the secondaries.

Lithosiidæ.

137. Argina cingulifera.

Deiopeia cingulifera, Walker, Cat. Lep. Het. ii. p. 569. n. 7 (1854).

♀. Wadelai, 18th March, 1887.

138. Deiopeia pulchella.

Tinea pulchella, Linnæus, Syst. Nat. i. 2, p. 884. n. 349 (1766).

Wadelai, 13th and 20th January, 8th and 9th February, and 11th March, 1887.

Nyctemeridæ.

139. Leptosoma leuconoë, var.

Nyctemera leuconoë, Hopffer in Peters's Reise, pl. 28. fig. 3.

Fóda, 3rd and 20th November, 1887.

Liparidæ.

140. Cropera testacea.

Cropera testacea, Walker, Cat. Lep. Het. iv. p. 826. n. 1 (1855).

♀. Monbuttu, in July or August.

One much worn example. The species was originally described from Natal.

Lasiocampidæ.

141. Jana gracilis.

Jana gracilis, Walker, Cat. Lep. Het. iv. p. 913. n. 8 (1855).

Kangasi, 3rd October, 1883.

One very much-worn male.

142. Jana strigina.

Jana strigina, Westwood, P. Z. S. 1849, p. 37.

♀. Stazione Bauri, September 1883.

The description of this species was taken from an example received from Sierra Leone; it is rather vague, but agrees in so many respects with the specimen now obtained that I have no hesitation in identifying the latter with it; the basal half of the secondaries is not strictly speaking black, for the costal third is of a pale brown colour, crossed by the white belt before basal third; this belt also is very wide in front, so that towards the costa it occupies quite a third of

the basal half; then, again, the whole of the brown stripes on the primaries cross these wings from costal vein to inner margin; but the primaries of the type may have been somewhat rubbed, which would account for this discrepancy.

Saturniidæ.

143. Henucha delegorguei.

Saturnia delegorguei, Boisduval, Voy. de Deless. ii. p. 601 (1847).

♂ ♀. Monbuttu.

One much-worn pair.

144. Attacus bauhiniæ.

Bombyx (*Saturnia*) *bauhiniæ*, Boisduval in Guérin's Règne Anim., Ins. p. 506, pl. 86. fig. 1.

♂. "Vusterma," 26th May, 1883.

145. Antheræa emini, sp. n.

♀. Nearest to *A. gueinzii* and *A. wahlbergii*; bright chrome-yellow, the central belt across the wings formed as in *A. gueinzii*; the bands limiting this belt rufous-brown, irrorated with grey and pink scales, the centre rather densely irrorated with dull ferruginous scales; the ocellus at the extremity of the discoidal cell of primaries D-shaped, its outer edge dark plum-colour, its iris orange, its pupil hyaline-white; the ocellus of the secondaries almost exactly as in *A. gueinzii*, a broad submarginal zigzag rusty brown squamose band, which, however, is wanting on the apical half of secondaries; outer margin orange-tinted, fringe brown: antennæ and face somewhat rufous; abdomen with ill-defined rust-brownish dorsal region; underside with markings less defined than above; the inner band of the central belt wanting, the whole basal area of secondaries flesh-tinted, the zigzag submarginal band replaced by a series of triangular rufous-brown spots. Expanse of wings 148 millim.

Stazione Gadda, 1st June, 1884.

This magnificent species is considerably larger than either of the allied forms with which I have compared it.

Apamiidæ.

146. Amyna undulifera.

♂. *Amyna undulifera*, Butler, Ann. & Mag. Nat. Hist. ser. 4, vol. xvi. p. 403 (1875).

♀. Wadelai, 8th April, 1887.

One worn example, apparently referable to this species.

Ophideridæ.

147. Ophideres materna.

Phalæna-Noctua materna, Linn. Syst. Nat. ii. p. 840. n. 117 (1766).

♀. Wadelai, 15th March, 1887

Ommatophoridæ.

148. Cyligramma latona.

Phalæna-Noctua latona, Cramer, Pap. Exot. i. pl. 13, B (1779).

Wadelai, 12th March, 1887.

We have this species from Western and Eastern Africa; it is abundant, and occurs in nearly every African collection received.

Ophiusidæ.

149. Sphingomorpha monteironis.

Sphingomorpha monteironis, Butler, Ann. & Mag. Nat. Hist. ser. 4, vol. xvi. p. 406. n. 81 (1875).

Wadelai, 15th March and 12th April, 1887.

150. Ophiusa angularis.

Ophiusa angularis, Boisduval, Faune Ent. de Madag. pl. 13. fig. 2 (1833).

Wadelai, 8th April, 1887.

151. Grammodes geometrica.

Phalæna-Noctua geometrica, Rossi, Fauna Etr. ii. p. 179.

Wadelai, 11th March, 1887.

152. Trigonodes acutata.

Trigonodes acutata, Guénée, Noct. iii. p. 283. n. 1728 (1852).

Wadelai, 15th March, 1887.

Remigiidæ.

153. Remigia pellita.

Remigia pellita, Guénée, Noct. iii. p. 318. n. 1780 (1852).

Wadelai, 8th April, 1887.

Polydesmidæ.

154. Polydesma boarmioides.

Polydesma boarmioides, Guénée, Noct. ii. p. 442. n. 1315 (1852).

Wadelai, 10th March, 1887.

Macariidæ.

155. Tephrina defectaria?

Tephrina defectaria, Walker, Cat. Lep. Het. xxiii. p. 962. n. 29 (1862).

Wadelai, 15th March, 1887.

Fidoniidæ.

156. Sterrha sacraria.

Phalæna-Geometra sacraria, Linn. Syst. Nat. i. 2, p. 863 (1766).

Wadelai, 27th January and 29th March, 1887.

6. On some Coleoptera from Eastern Equatorial Africa, received from Emin Pasha. By Charles O. Waterhouse, F.E.S.

[Received January 6, 1888.]

The small series of Coleoptera received from Emin Pasha is interesting as containing examples of one species new to science, and of six which had previously been received at the British Museum from West Africa only, as indicated in the following list. The localities from which the other species have been recorded are also here given.

1. Tefflus hacquardi, Chaudoir.	Zanzibar.
2. Tefflus carinatus, Klug.	Mozambique.
3. Catharsius sesostris, Dej. (*in litt.*).	Egypt.

A single male example which agrees well with one from Egypt from Dejean's collection and labelled by him '*sesostris*.' *C. sesostris*, Dej., according to Gemminger and Harold's Catalogue of Coleoptera, is the same as *C. pithecius*, Fabr., and has the habitat Tropical Africa placed to it. *Scarabæus pithecius*, Fabr. (Syst. Ent. p. 21), however, is an Indian species (as Fabricius correctly states), and the type in the British Museum collection is simply an immature specimen of *Scarabæus sabæus*, Fabr. (Spec. Ins. i. p. 23), the type of which is also in the British Museum.

The African species differs from the true *sabæus* in having the sides of the thorax less rounded anteriorly, and the anterior angles are punctured all over, whereas in *C. sabæus* they are impunctate[1].

4. Coryphocera africana, Drury.	W. Africa.
5. Sternocera klugii, Thomson.	Nubia.
6. Tetralobus subsulcatus, Guérin.	Abyssinia.
7. Tetralobus dufouri, Candèze.	Senegal.

8. Tetralobus cribricollis, n. sp.

Piceo-niger, parum nitidus, subtiliter griseo-pubescens; capitis fronte antice modice angustata, medio fovea elongata impressa, vertice carina brevi munito; thorace nigro, bene convexo, confertim sat fortiter rugoso-punctato; elytris creberrime subtiliter punctatis, striis dorsalibus obsoletis, striis duabus abbreviatis prope humeros distinctis.

Long. 13–16½, lat 4½–5¾ lin.

Allied to *T. rotundifrons*, but narrower, less shining, and with the thorax rugosely punctured. Frontal plate distinctly narrowed in

[1] *C. cribricollis*, Walker, placed as a synonym of *C. sabæus* in Gemminger's Catalogue, differs from that species in being less shining and in having only the outer half of the anterior angles of the thorax punctured.

front, closely and coarsely punctured, the front margin scarcely reflexed, interrupted in the middle. Lamellæ of the antennæ not very long. Thorax very convex, one-fifth broader than long, with a trace of an impression on each side of the disk, rounded anteriorly, parallel at the sides in the middle, *very slightly* constricted before the diverging posterior angles. The surface is densely and very coarsely punctured and rugulose, except on each side of the base, where it is even and much less coarsely punctured. The punctuation of the elytra (as compared with allied species) is rather strong and very dense at the sides and humeral region. There are no distinct striæ except at the base, and two short ones at the side, near the shoulder. The posterior coxæ are concave for about half their length. Punctures on the prosternum large and deep, moderately close together, but very irregular.

9. Rhytidonota plicata, Kraatz.	Nubia.
10. Aspidosternum metallicum, Fabr.	W. Africa.
11. Sternotomis bohndorfi, Waterhouse.	E. Africa.
12. Quimalanca regalis, Fabr.	W. Africa.
13. Ceratites jaspideus, Serville.	W. Africa.
Has been received from most parts of Africa.	
14. Petrognatha gigas, Fabr.	W. Africa.
15. Diapromorpha trifasciata, Oliv.	Pt. Natal.

February 7, 1888.

Prof. Flower, C.B., LL.D., F.R.S., President, in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of January 1888:—

The registered additions to the Society's Menagerie during the month of January were 64 in number. Of these 38 were acquired by presentation, 1 by exchange, and 25 by birth. The total number of departures during the same period, by death and removals, was 147.

Mr. E. G. Loder, F.Z.S., exhibited a tusk of an African Elephant, and made the following remarks:—

The Elephant-tusk exhibited this evening is (as far as I can ascertain) the heaviest that has ever been seen in this country.

Its weight is 1 cwt. 2 qrs. 16 lbs. = 184 lbs., as will be seen by the accompanying "weight account" signed by the warehousekeeper of the London and St. Katherine Docks. The length of the tusk along the curve is 9 ft. 5 in., the maximum circumference 22½ inches.

It was shipped from Bombay to London, so that it probably came from the east coast of Africa, possibly from Zanzibar.

Mr. A. Thomson exhibited a living specimen of the larval form of a Stick-insect from Southern France (*Empusa egena*), from the Society's Insect-house, and spoke of its manner of catching flies.

The following papers were read :—

1. Third Contribution to the Herpetology of the Solomon Islands[1]. By G. A. Boulenger, F.Z.S.

[Received January 11, 1888.]

Mr. C. M. Woodford has brought home a large series of Reptiles and Batrachians obtained during his visit to the Islands of Guadalcanar and New Georgia. The fact that, in spite of the extent of the collection (over 200 specimens) and the special attention paid by the collector to this group of animals, only four species are thereby added to the herpetological list of the Solomons, shows that our knowledge of this part of the fauna approaches completion. *Dendrophis calligaster*, Gthr., and *Cornufer corrugatus*, A. Dum., are recorded for the first time from the Solomon Islands, and two new snakes are described further on.

The following is a list of the species obtained :—

Guadalcanar :—*Crocodilus porosus*, Schn., *Gehyra oceanica*, Less., *Varanus indicus*, Daud., *Lygosoma cyanurum*, Less., *L. nigrum*, H. & J., *L. albofasciatum*, Gthr., *Corucia zebrata*[2], Gray, *Enygrus carinatus*, Schn., *Dendrophis calligaster*, Gthr., *Dipsas irregularis*, Merr., *Hoplocephalus melanurus*, sp. n., *Rana guppyi*, Blgr.[3], *R. krefftii*, Blgr., *Cornufer solomonis*, Blgr., *C. corrugatus*, A. Dum., *Ceratobatrachus guentheri*, Blgr., and *Hyla macrops*, Blgr.

Rubiana, New Georgia :—*Lygosoma cyanurum*, Less., *L. cyanogaster*, Less., *L. nigrum*, H. & J., *Enygrus carinatus*, Schn., *Dendrophis solomonis*, Gthr. (a variety with uniform green upper parts), *Dipsas irregularis*, Merr., *Hoplocephalus woodfordi*, sp. n., *Rana guppyi*, Blgr., *Cornufer corrugatus*, A. Dum., and *Ceratobatrachus guentheri*, Blgr.

Hoplocephalus melanurus, sp. n.

Body rather stout. Head depressed, slightly widened posteriorly; snout short, without canthus rostralis; eye moderate; no superciliary ridge; rostral considerably broader than deep, its upper border forming a very open angle; internasals half as long as the præfrontals, which are a little shorter than the frontal; latter shield

[1] P. Z. S. 1887, p. 333.

[2] Mr. Woodford confirms from actual observation the statement made by me that the tail is a prehensile organ. This Lizard was seen to suspend itself to branches of trees by means of the tail.

[3] The largest female specimen measures 21 centim., from snout to vent, the largest male only 10; the male is characterized by the presence of a small external vocal sac on each side of the throat. These frogs feed chiefly upon large crustaceans (*Sesarma lafordii* and *Cardiosoma carnifex*, fide Pocock).

pentagonal, only a little longer than broad, and broader than the supraocular; parietals as long as the præfrontals and frontal together; nasal forming a short suture with the præocular; two postoculars, lower largest; seven upper labials, third and fourth entering the eye, first smallest, sixth largest; seven lower labials, four in contact with the chin-shields, fourth and sixth largest; one temporal in the first row, two in the second, three in the third. Scales in 15 or 17 rows; ventrals 165 to 171; anal divided; subcaudals single, 38 to 48. Upper surface of tail with a more or less complete series of transversely enlarged scales. Head and sides usually reddish, dorsal region dark brown; some or all of the scales with a black border; tail black; some specimens nearly entirely black, others with traces of black transverse bands; ventrals yellow, on the hind part of the body with dark brown or black margin.

Numerous specimens; the largest measures one metre, in which the tail enters for 14 centim.

HOPLOCEPHALUS WOODFORDI, sp. n.

This species agrees in every respect with the preceding, save that the scales are somewhat longer, and the subcaudals (with the exception of the first and third) double. Scales 17; ventrals 166; anal divided; subcaudals 45. Head dark brown; body brownish white, each scale with a blackish-brown border, forming a reticulate pattern; lower parts white, subcaudals with dark brown border. Total length 67 centim., in which the tail enters for 10. A single specimen.

Considering that this species, in spite of its divided subcaudals, is extremely closely allied to the preceding, as well as to *H. par*[1] and *Pseudechis porphyriaca*, I have not the slightest hesitation in referring it to the genus *Hoplocephalus*. It is clear to me that, in these elapoid forms, the character of divided or single subcaudals cannot be employed in defining genera, not more than in the genus *Bothrops*. Nor can I regard the division or non-division of the anal as a generic character.

A complete list of the Reptiles and Batrachians of the Solomon Group is appended to this note, with a table showing their distribution in the various islands which have been explored, their presence being indicated by a *. An asterisk prefixed to the name, signifies that a species is, according to present information, restricted to this group of islands. The table well shows the considerable difference between the fauna of the two extreme islands, viz. Faro and San Christoval, the former exhibiting, chiefly in the abundance and variety of Batrachian life, a more Papuasian, the latter a more Polynesian character.

[1] The statement in my description (Tr. Z. S. xii. p. 46), that the subcaudals are in pairs, is a lapsus; they are all simple.

	Faro.	Shortland.	Treasury.	N. Georgia.	Guadalcanar.	S. Christoval and neighbouring small Islands.
REPTILIA.						
CROCODILIA.						
1. Crocodilus porosus, *Schn.*	...	*	...	*	*	*
LACERTILIA.						
2. Gymnodactylus pelagicus, *Gir.*	*	*				
3. Gehyra oceanica, *Less.*	*	*	...	...	*	
*4. Lepidodactylus guppyi, *Blgr.*	*					
*5. —— woodfordi, *Blgr.*	*					
6. Gecko vittatus, *Houtt.*	*	...	...	...	...	*
7. Gonyocephalus godeffroyi, *Ptrs.*	...	...	*	...	...	*
8. Varanus indicus, *Daud.*	*	*	...	...	*	*
*9. Corucia zebrata, *Gray.*	...	*	...	...	*	*
*10. Lygosoma solomonis, *Blgr.*	*					
*11. —— woodfordi, *Blgr.*	*					
*12. —— concinnatum, *Blgr.*	*					
13. —— smaragdinum, *Less.*	*	...	*			
*14. —— anolis, *Blgr.*	...	*	*	...	...	*
15. —— cyanurum, *Less.*	*	*	*	*	*	*
16. —— cyanogaster, *Less.*	*	...	*	*	...	*
17. —— nigrum, *H. & J.*	*	...	*	*	*	*
18. —— albofasciolatum, *Gthr.*	*	...	...	...	*	
OPHIDIA.						
*19. Typhlops aluensis, *Blgr.*	..	*				
20. Enygrus carinatus, *Schn.*	*	*	*	*	*	*
21. —— bibronii, *H. & J.*	...	...	...	...	...	*
22. Dendrophis calligaster, *Gthr.*	...	...	...	...	*	
23. —— solomonis, *Gthr.*	...	*	...	*	...	*
24. Dipsas irregularis, *Merr.*	*	*	*	*	*	
*25. Hoplocephalus par, *Blgr.*	*					
*26. —— melanurus, *Blgr.*	...	...	...	...	*	
*27. —— woodfordi, *Blgr.*	...	...	...	*		
28. Platurus fasciatus, *Daud.*						
BATRACHIA.						
*1. Rana bufoniformis, *Blgr.*	*	...	*			
*2. —— guppyi, *Blgr.*	*	*	...	*	*	
*3. —— opisthodon, *Blgr.*	*	*				
*4. —— kreffii, *Blgr.*	...	...	...	...	*	*
5. Cornufer dorsalis, *A. Dum.*	*					
*6. —— guppyi, *Blgr.*	*	...	*			
7. —— corrugatus, *A. Dum.*	...	...	...	*	*	
*8. —— solomonis, *Blgr.*	*	*	*	...	*	
*9. Batrachylodes vertebralis, *Blgr.*	*					
*10. Ceratobatrachus guentheri, *Blgr.*	*	*	*	*	*	
*11. Hyla lutea, *Blgr.*	*					
*12. —— macrops, *Blgr.*	...	...	*	...	*	
*13. —— thesaurensis, *Ptrs.*	...	...	*			

2. Descriptions of some new Lepidoptera from Kilima-njaro.

By Arthur G. Butler, F.L.S., F.Z.S, &c.

[Received December 14, 1887.]

Examples of some of the species here described were collected by the late Bishop Hannington and of others by Mr. F. J. Jackson; in not a few cases specimens of the same species were obtained by both gentlemen.

RHOPALOCERA.

Nymphalidæ.

Euplocinæ.

1. Amauris hanningtoni, sp. n.

Primaries black, with pure white markings as in *A. egialea*, excepting that all the larger spots are reduced one third in size; secondaries dark brown, with a sharply defined oblong belt united by a short band to costa, from the abdominal margin to a little above the cell, sordid white; seven submarginal white spots, the relative sizes of which, reckoning from costa, are 4, 6, 5, 1, 2, 7, 3; two or three white dots nearer to the margin; under surface only differing from the upper surface as in the allied *A. egialea* and *A. hyalites*. Expanse of wings 81 millim.

Two males; Hills of Terta in April (*Hannington*).

Acræinæ.

The female of *Acræa* (*Planema*) *johnstoni* of Godman was in the same collection and is evidently modified in imitation of the foregoing *Amauris*; it is black, with four white spots arranged obliquely in pairs and a dull white or yellowish belt across the secondaries as in the male; the receipt of this female is most interesting, as it is a clue to the position of the species, which is clearly seen to be allied to *A.* (*P.*) *lycoa* from the west coast; one example was received from the Hills of Terta, another between 3000–8000 feet on the slopes of Kilima-njaro in March.

2. Planema montana, sp. n.

♂. Allied to *P. aganice*, but differing in the bright orange-fulvous colour of the bands and in the greater width of the angulated band of primaries. Expanse of wings 68 millim.

Slopes of Kilima-njaro, 3000–5000 feet, in March (*Hannington*).

Nymphalinæ.

3. Euryphene violacea, sp. n.

♂ ♀. Allied to *E. neophron* of Hopffer (a common Zanzibar species), but differing in the purple instead of greenish-blue coloration of the upper surface, the narrower and duller orange-ochreous belt across the black apical half of primaries, and the more prominent

longer apical ochreous patch; on the under surface the ground-colour is suffused with yellow instead of with lilac, and the white markings are washed with yellowish; a distinctly dull yellow patch replacing the white spot at apex of primaries. Expanse of wings ♂ 70 millim.; ♀ 87 millim.

Slopes of Kilima-njaro, 3000–5000 feet, in March (*Hannington*).

This appears to be a fairly common species, it was also obtained by Mr. Jackson; but, unfortunately, his specimens were all more or less damaged by some larger insects, which got loose in the box and broke them on the way home.

Amongst other *Nymphalinæ*, Mr. Jackson obtained *Eurytela dryope* and *E. ophione* and a *Neptis* allied to *N. melicerte* (two specimens of which from Zanzibar stand in the Hewitson collection along with the latter species).

4. Neptis goochii, Trimen, var.

Nearly allied to *N. melicerte*, but the white discoidal patch of primaries reduced to a small spot near the end of the cell; the large discal spots wider, those of the upper patch placed less obliquely and therefore more compactly together; the belt of secondaries broader and with more convex inner edge; on the under surface the discoidal spot is large and fills the cell, but the other differences hold good. Expanse of wings 44 millim.

Kilima-njaro (*F. J. Jackson*).

The specimens from Zanzibar are smaller and the discoidal spot is a little larger than in the type; they represent the common form of the species.

Papilionidæ.

Pierinæ.

Mr. Jackson obtained no less than eleven species of *Teracolus*, and Bishop Hannington two others, viz:—

Teracolus mutans. In the forests of Tiveta (*Hannington*).
—— *aurigineus*. In the forests of Tiveta (*Hannington* and *Jackson*).
—— *venustus*, sp. n. Kilima-njaro (*Jackson*).
—— *chrysonome*, ♂ ♀. Kilima-njaro (*Hannington*)
—— *calais*, ♂ ♀. Kilima-njaro (*Jackson*).
—— *leo*, ♂ ♀. Forests of Tiveta (*Hannington* and *Jackson*).
—— *miles*, ♂ ♀. Slopes of Kilima-njaro (*Hannington* and *Jackson*).
—— *pseudacaste*, ♂. Slopes of Kilima-njaro (*Jackson*).
—— *citreus*, ♂ ♀. Slopes of Kilima-njaro (*Jackson*).
—— *incretus*, ♂ ♀. Forests of Tiveta (*Hannington* and *Jackson*).
—— *antevippe*, ♂. Kilima-njaro (*Jackson*).
—— *omphaloides*. Kilima-njaro (*Jackson*).
—— *comptus*, sp. n. Kilima-njaro (*Jackson*).

In my monograph of *Teracolus* (P. Z. S. 1876), I placed *T. leo* as synonymous with *T. halimede* of Klug; my type was a faded and

somewhat worn male, received from the White Nile; the fresh specimens now in the collection prove me to have been wrong in doing so, the characters which distinguish the two forms being well marked and constant. In *T. leo* the saffron-yellow of the primaries extends only from the inner margin upwards to the first median branch, whereas in *T. halimede* it spreads to above the third branch; all the black markings are smaller and much more prominent in *T. leo*, but the female has a blackish bar across the cell of primaries, limiting the grey basal area; this sex also has the apex of primaries and the whole ground-colour of secondaries of a sandy-buff hue, the latter wings having a conspicuous white spot at the end of the cell and an unevenly arched series of brown spots across the disc; some females have no saffron-yellow on the upper surface.

The female of *T. miles* proves to be a black-and-white form, not unlike the white female of *T. pseudacaste*, but with less black above, the veins at apex of primaries below not blackened, and the secondaries buff instead of white; there is, however, a red-tipped female which, I think, belongs to the same species and which has the apex of primaries and ground-colour of the secondaries below sulphur-yellow. The female of *T. citreus* from Kilima-njaro is, on the upper-side, very like that sex of *T. topha*, but the black markings are reduced and more sharply defined; below it more nearly resembles *T. xanthevarne* ♀, the secondaries white with pale yellowish-brown markings and olive and black mottling as in *T. eucharis* ♀, but with a conspicuous brown-edged white discocellular spot.

The synonymy of *T. incretus* will, as I suspected, stand as follows:—

TERACOLUS INCRETUS.

♀. *Teracolus incretus*, Butler, Ent. Month. Mag. xviii. p. 146 (1881).

♂. *Callosune vulnerata*, Staudinger, Exot. Schmett. pl. 23. fig. 21 (1884).

Both sexes of this, the largest species of the *T. evarne* group, were obtained both by Bishop Hannington and Mr. Jackson; so that there is now no doubt of the correctness of my expressed opinion that *C. vulnerata* would prove to be the male of my species; the figure by Staudinger is poor, the colouring of the secondaries being exaggerated and the black bordering of the primaries incorrectly drawn, still it is as good as the majority of the illustrations in this book, which (whatever its faults may be) has the merit of being cheap. As with other species of the *T. evarne* group, a white form of the female is by no means uncommon; it is a little smaller than the yellow female and, excepting in its superior size and in the details of marking on the under surface, greatly resembles that sex of *T. topha*.

The male, on the under surface, is extremely variable; indeed no two specimens are alike; the following may be noted:—

a. Secondaries below whitish sulphur, excepting at the borders, which are pure sulphur-yellow; a minute dusky costal spot, dark

brown discocellular spot with white pupil, and six minute black marginal dots between the veins.

b. Secondaries below sulphur-yellow throughout, two additional brown spots, on the interno-median and second median interspaces.

c. Secondaries below flesh-pink with yellowish margins, the whole surface mottled with indistinct olive spots, a dusky longitudinal streak through the cell; other markings as in var. *a*, but less distinct.

d. Secondaries inclining to ferruginous excepting towards apex, where the ground-tint is yellow, a yellowish streak above a black-mottled dusky longitudinal streak through the cell; the whole remaining surface mottled with olive and black; other markings as in var. *b*, but larger.

In addition to the above modifications, the black border on the upper surface of the primaries varies both in width and length; but its inner edge is always more or less dentate-sinuated.

5. Teracolus venustus, sp. n.

♂. Above like a small specimen of *T. aurigineus*, but with narrow external black borders to the wings, a smaller spot at the end of the discoidal cell of primaries, and the black band of secondaries terminating at third median branch; below it also differs in having the apex and outer border of primaries and ground-colour of secondaries sandy buff instead of sulphur-yellow. Expanse of wings 36 millim.

Kilima-njaro (*F. J. Jackson*).

Allied to the preceding is a species of which we have received no less than nine specimens from Somali-land, but which, from an omission to examine them individually, I confounded with the *T. chrysonome* of Klug; I describe it as follows:—

Teracolus helvolus, sp. n.

Nearly allied to *T. chrysonome*, the wings a little shorter and smaller; the indication of a band across the secondaries much more decided; the discal zigzag band of primaries below ending in a black spot; the apex and outer border of primaries and entire ground-colour of secondaries on the under surface flesh-pink instead of sulphur-yellow. Expanse of wings 33–35 millim.

T. chrysonome measures 40–44 millim. in expanse; it is a wider-ranging species than *T. helvolus*, which is probably restricted to Somali-land.

6. Teracolus comptus, sp. n.

Nearly allied to *T. antigone*, which we have in both sexes from Accra, but larger, the wings decidedly longer, the black external border of primaries narrower; the black spots of secondaries much smaller; the internal band on the male more or less prominent, more so than in our specimen of *T. antigone*, in both males before me; the orange apical patch of the male broader and not so red; the black apical patch in the female connected by a line of black

scales with the internal band, which is much darker than in *T. antigone*; the cell, however, is not suffused with grey at the base as in that species; costal band much blacker; marginal spots smaller towards anal angle. Expanse of wings 38 millim.

Kilima-njaro (*F. J. Jackson*).

Before proceeding to another genus I think it will be useful to refer to two species described by Herr Aurivillius in the 'Öfversigt Kongl. Vetensk.-Akad. Forhandl.' for 1879, in a memoir on the Lepidoptera of Damara-land.

The first of these is described as *Callosune deidamioides* and is, I believe, only a slight variety of *C. eveninus*, which varies considerably in the very characters used for discriminating *C. deidamioides*.

The second is named *C. damarensis*; it answers perfectly to some of the male specimens of my *T. ignifer*, var., and I do not doubt its identity with that form; it may be a good species, but the points which separate it from typical *T. ignifer* are very slight, the principal distinction being the pinker tint of the under surface of the secondaries.

7. Mylothris narcissus, sp. n.

Nearest to *M. trimenia*, of the same colours, but the primaries quite distinct in pattern, the base being broadly black (to the middle of the discoidal cell) in the male and dark brown in the female; the costal margin black; apical black border and marginal spots of male fully three times as broad as in *M. trimenia*; in the female there is a broad dark brown external border tapering on the costal margin, its inner edge acutely tridentate on the median branches and its posterior termination, obtusely pointed, extending one third towards the base; first marginal black spot of secondaries enlarged in both sexes, but especially in the male, other spots smaller than in *M. trimenia*: on the under surface the apex of primaries and entire surface of secondaries are sulphur-yellow in the male and chrome-yellow in the female, not gamboge-yellow as in the S.-African insect; there are also no black marginal spots on the primaries and those of the secondaries are smaller. Expanse of wings ♂ 53 millim., ♀ 54 millim.

Forests of Tiveta (*Hannington*).

The costal margin of the primaries is noticeably shorter in this species than in *M. trimenia*.

Mr. Jackson obtained a species of *Terias* allied to *T. chalcomiæta*, or perhaps that species; it is not absolutely constant in pattern, and some examples differ so little from the common type of Aden that I am unwilling to separate it. As it has been suggested to me that *T. chalcomiæta* is "only a variety" of *T. hecabe*, I may say once for all that the phrase is utterly unintelligible to me; there is only one *Terias* (to my knowledge) in Aden, and it is about as unlike *T. hecabe* as any two species of *Terias* can well be. Undoubtedly we have the strongest evidence that there once was only one *Terias* and that all the species now existing are local races or climatic forms of

that probably long extinct type; but to associate, as one, all the species or half the species now existing, is to hinder the study of the genus. Those Lepidopterists who, professing to believe in evolution, practically deny its existence, inasmuch as they associate nearly all allied forms under one specific name, are constantly getting into difficulties; so much perplexed are they as to whether they shall call a new form a "species" or a "variety," that they will even speak of it as "more or less synonymous" with something previously described.

8. Herpænia iterata, sp. n.

Nearest to *H. melanarge* of Somali-land, but constantly considerably larger, the white marginal spots of secondaries larger, the subbasal black belt broader. Expanse of wings 55 millim.

Kilima-njaro (*F. J. Jackson*).

Although the distinction between this form and *H. melanarge* is chiefly one of size (the latter expanding only 44 millim.) the constancy of this character in my opinion constitutes it a separate species and entitles it to a name of its own.

Mr. Jackson obtained *Nepheronia argia*, the male in every respect identical with examples from Sierra Leone, the female nearest to the variety named *N. poppea*, but differing above as follows:—the patch at base of primaries vermilion-red; the outer border narrower and enclosing a large white subapical spot; the secondaries with five somewhat diffused marginal dark brown spots.

I may be deemed inconsistent for not naming the foregoing form; but as only one example has come to hand, and the females of *N. argia* are known to be extremely variable, I do not believe that I have anything before me but an individual sport (*i. e.* a variety).

Dr. Boisduval, after describing the yellow female under the name of *Pieris idotea*, concludes by saying—"Nous n'avons pas vu la femelle."

9. Eronia dilatata, sp. n.

Nearly allied to *E. cleodora*, the apical area of primaries above always marked with two and sometimes with three white spots; secondaries almost invariably with a broader external border, often twice the width of that of *E. cleodora*; below, the yellow patch on the apical area of primaries and the ground-colour of the secondaries are paler than in *E. cleodora*, lemon-yellow instead of saffron; the outer border of secondaries is invariably much wider, and the other markings are comparatively shorter and broader than in the southern form. Expanse of wings 62–71 millim.

♂. Taveta, 2000–3000 feet, in dense forest (*H. H. Johnston*); ♂, ♀. Forests of Taveta (*Bishop Hannington*); Kilima-njaro (*F. J. Jackson*).

As will be seen from the above description, the only satisfactory distinguishing characters in *E. dilatata* are the different yellow colour and much wider border to secondaries on the under surface;

but after examination of a good series of specimens I have come to the conclusion that these characters are constant.

Mr. Jackson obtained three species of *Papilio*,—*P. philonoë* and *P. constantinus* of Ward and *P. ophidicephalus* of Oberthür: the last mentioned does not differ from the southern type.

Hesperiidæ.

Hesperia keithloa and *H. bixæ* were obtained; also *Chætocneme cerymica*, one or two obscure little species which have probably been named by Monsieur Mabille or Herr Plötz, and the following:—

10. Plesioneura biseriata.

Nearest to *P. galenus*, a little larger; primaries with the same pattern, but the spot on basal area smaller; secondaries with two distinct sinuous series of orange spots, the inner series consisting of seven spots, of which the second is large and diamond-shaped; the third and seventh reduced to mere points; outer series consisting of five decreasing spots, the first and largest bifid and touching the outer margin; fringe orange, divided by black lines at the extremities of the veins; discoidal spot indistinct; secondaries below paler than above, but similar in pattern; in other respects this species agrees with *P. galenus*. Expanse of wings 43 millim.

Kilima-njaro (*F. J. Jackson*).

HETEROCERA.

Aellopus hirundo appears to be the common Hawk-moth; Mr. Jackson brought home six or seven specimens, but unfortunately these and many others of his moths got more or less broken, owing to some beetles getting loose and rattling about amongst them: the following, however, fortunately came to hand in splendid condition.

Arctiidæ.

Charideinæ.

11. Pompostola smaragdina, sp. n.

Wings blue-black, the basal fifth and the costal border to the end of the cell mottled with brilliant metallic emerald-green spots and dashes; two cuneiform spots, confluent behind, within the cell, the inner one metallic green, the outer one hyaline white, richly glossed with emerald-green; a quadrate green-glossed hyaline spot immediately beyond the cell; a long oblique tapering green-glossed hyaline streak from the median vein just below the double discoidal spot almost to the external angle; in some specimens, however, this streak is widely interrupted in the middle, leaving only two small spots; a subcostal metallic green streak, from the centre of which a transverse irregular green-glossed hyaline band runs almost to outer margin at about apical fourth; costal border of secondaries rufous brown; a small hyaline white subcostal spot, followed by a

metallic emerald-green streak; an oblique cuneiform trifid green-glossed hyaline-white spot across the middle, two large patches almost filling the interno-median and the abdominal areoles, and a minute spot near outer margin on the second median interspace; thorax blue-black, frons and vertex of head metallic emerald-green; collar above with two large spots of metallic golden green, a triangular dorsal spot of the same colour; posterior half of patagia metallic fiery copper; metathorax and the two basal segments of abdomen metallic golden green: the two following segments deep brick-red edged with black; remaining segments blue-black, banded in front with metallic emerald-green; primaries below purplish towards the base, otherwise nearly as above; secondaries with a broad metallic-green costal stripe from base to apex; pectus bronze-brown sprinkled with metallic-green scales; legs blackish brown, the coxæ of the first pair and the tibiæ of the other pairs with a large white spot; venter blue-black, with two unequal central white spots. Expanse of wings 32–41 millim.

Slopes of Kilima-njaro (*F. J. Jackson* and *Bishop Hannington*).

The examples collected by Bishop Hannington are smaller and have the markings on their wings smaller and narrower than in the type collected by Mr. Jackson.

Lithosiidæ.

12. Lepista limbata.

Near to *L. pandula*, Boisd. (*Dyphlebia trimenii*, Feld.); larger, of a deeper orange-ochreous colour: the black border wider, that of primaries occupying two fifths instead of less than one third of the external area, its inner edge more oblique, that of secondaries about one third wider. Expanse of wings 24 millim.

Kilima-njaro (*F. J. Jackson*).

We have *L. pandula* from Delagoa Bay.

Two interesting species of *Chalcosiidæ* collected by Mr. Jackson have been separately described. Of the *Liparidæ* one species, *Aroa discalis*, Walk., is in the collection; hitherto we have only received it from the Cape and Natal. Amongst the Noctuites *Eurhipia bowkeri* and *Asymbata roseiventris*, or species scarcely distinguishable from the latter, were obtained, as also the handsome but common *Hypopyra capensis*.

3. On certain points in the Visceral Anatomy of the Lacertilia, particularly of *Monitor*. By Frank E. Beddard, M.A., Prosector to the Society, Lecturer on Biology at Guy's Hospital.

[Received February 7, 1888.]

The present paper contains the results of some investigations into the visceral anatomy of the Lacertilia; the specimens were in every

case from the Society's collection. The points which I have particularly studied are two:—(1) the bile-ducts, which are curiously complicated in *Varanus*, (2) the relations of the peritoneum to the enclosed viscera. In respect of both these points the Varanidæ differ very strikingly from all other Lacertilia; but as the number of genera which I have been able to investigate is small, I can at present only put forward tentatively a suggested emendation in the current schemes of classification of the Lacertilia.

1. *Peritoneum.*

In *Iguana* the body-cavity is a spacious pleuroperitoneal cavity lined by peritoneum, which, as in *Lacerta*, is deeply pigmented posteriorly; this cavity is partially divided into two, right and left, halves by the umbilical ligament (fig. 1); the heart is surrounded by a special serous sac, the pericardium; beyond this there is no subdivision of the body-cavity. It is commonly stated that the diaphragm is unrepresented in the Lacertilia; the attachment of the pericardium to the parietes may, however, as has been suggested, be an indication of such a structure.

In *Monitor* (fig. 2) there is some little difference; when the body-walls are cut open and reflected, the alimentary viscera are not exposed as they are in *Iguana*. A loose membrane covers these viscera; the membrane looks as if it were simply the lining peritoneum of the abdominal cavity which had got separated and detached from the abdominal parietes; this is, however, not the case; an examination by the aid of the microscope showed clearly that a layer of peritoneum covers the abdominal musculature, and is quite distinct from the horizontal membrane; in *Varanus griseus* the peritoneal layer was particularly distinct, for the reason that it contained numerous pigmented corpuscles. For the greater part this membrane is free from the ventral parietes; anteriorly it is attached to the median ventral line; dorsally it is attached along the spinal column; here and there it is also attached to the lateral parietes by membranous bands. It passes over the lobes of the liver and the stomach, and shuts off the lungs from the abdominal cavity. The umbilical ligament dividing the two liver-lobes is present as in *Iguana*, and is attached to the dorsal side of the horizontal membrane. This horizontal membrane also separates the kidneys from the reproductive glands; the latter lie internally to it; the kidneys are placed outside it. The ventral surface of this membrane bears a vein of some size, the anterior abdominal vein. The fat-body when present lies below the membrane, and is therefore shut off from the abdominal cavity.

I found this membrane present, with the general arrangement that has been above stated, in

Monitor gouldi.
Monitor bengalensis.
Varanus salvator.
Varanus niloticus.
Varanus griseus.

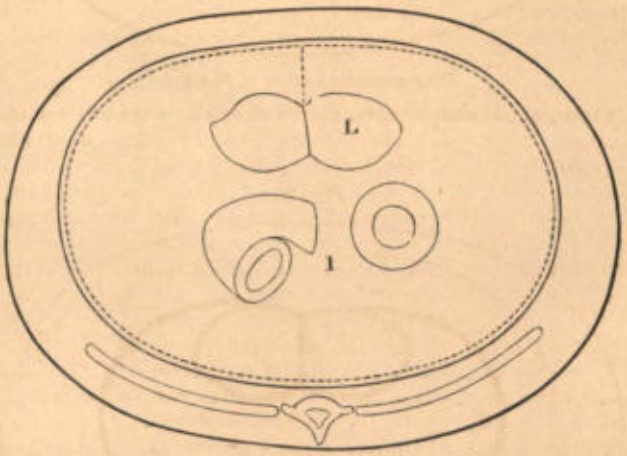
On the other hand a large number of Lacertilia agree, in the structural features that have been referred to, with *Iguana*.

I have had the opportunity of examining the following genera and species:—

Lacerta.
Uromastix hardwickii.
Uromastix spinipes.
Teius teguexin.
Cyclodus gigas.
Iguana tuberculata.
Cyclura nubila.
Plestiodon auratus.
Trachydosaurus rugosus.

In all of these there is a general agreement with *Iguana*; the

Fig. 1.



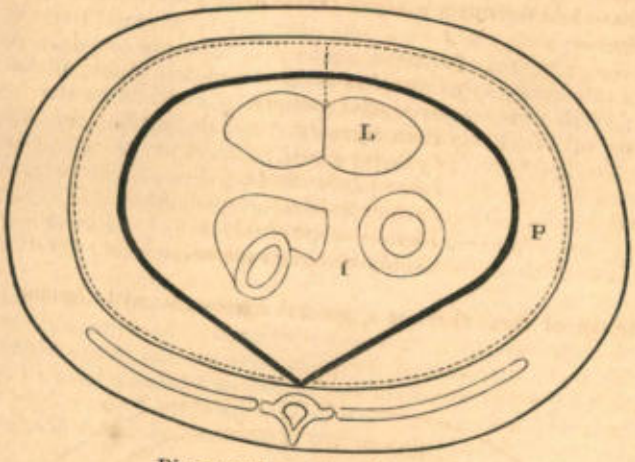
Diagrammatic section through body of *Lacerta*.

L, Liver; I, intestines; parietal layer of peritoneum and umbilical ligament indicated by a dotted line.

horizontal membrane is absent for the greater part; when the fat-body is present it lies in the hinder region of the abdomen, from which, however, it is cut off by a membrane; this presumably represents the posterior region of the horizontal membrane in *Varanus* and *Monitor*. Other than this there is no trace of the horizontal septum in any of the Lizards whose names are given in the second list.

In *Lacerta*, *Cyclura*, *Uromastix*, and *Teius* the umbilical ligament is present with the same relations as in *Iguana*; it only varies in the greater or less extent of its attachment to the ventral median line.

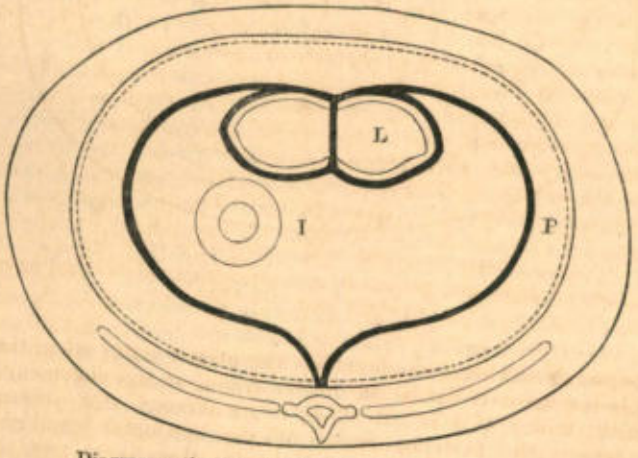
Fig. 2.



Diagrammatic section of *Monitor*.

P, Peritoneal fold circumscribing abdominal cavity; other letters as above.

Fig. 3.



Diagrammatic section through body of a Crocodile.

P, Peritoneal fold, continuous with serous sacs enveloping lobes of liver; other letters as above.

In *Cuclodus gigas*, however, there is a curious difference; the

tion of the Lacertilia with which I am acquainted there is no tendency to separate the Varanidæ from other Lizards, although it is true that Mr. Boulenger remarks upon them as forming "a perfectly isolated group"[1]. He does not, however, lay weight upon this opinion by separating the family in any way; it is, indeed, particularly associated in his scheme with the Helodermatidæ, Zonuridæ, Iguanidæ, &c. I have not yet had an opportunity of studying the structure of *Heloderma*; and such papers as have been published upon the anatomy of this genus do not touch upon the points to which I have directed attention in this communication. I cannot, however, agree to such a close association of the Varanidæ and Iguanidæ as is proposed by Mr. Boulenger; and other facts, to which I shall direct attention presently, point unmistakably to the isolation of the Varanidæ, and perhaps to affinities with the Crocodilia.

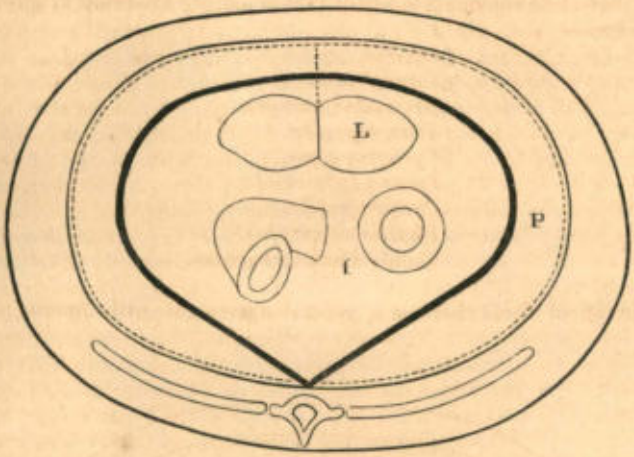
There is little reason to doubt that the Sauropsida form a group which have been derived from a single Reptilian ancestor; this is allowed by Cope[2] except in so far as regards the Icthyosauria. Dr. Baur[3] derives all the Sauropsida from the Carboniferous Proganosauria, which, in his opinion, is a group of Reptiles, though Cope with some uncertainty assigns this same group to the Amphibia. Both these writers concur in the belief that the Rhynchocephalia (*Hatteria*) are the most generalized of all living reptiles, and most nearly represent the primitive stock from which all existing as well as extinct orders of Reptiles took their origin.

Dr. Baur is of opinion that the existing Lacertilia (and Ophidia) come nearer to this primitive stock than do any other orders of the Sauropsida, while Prof. Huxley[4] thinks that the differences between *Hatteria* and other Lacertilia have been made too much of. The visceral anatomy of *Hatteria* is certainly much nearer to that of *Lacerta* than to any other Sauropsidan, and the Lacertilia as a whole are decidedly at a much lower grade of organization, as regards the viscera, than are either the Crocodilia and Aves on the one hand, or the Testudinata on the other.

These considerations render the existence of Crocodilian affinities in *Monitor* more intelligible than might at first sight appear; they also point to the conclusion that the difference in structure between the Varanidæ and other Lizards to which attention has been here directed must have existed in the ancestral Reptilian stock which gave rise to the existing Lacertilia, Crocodilia, and Aves; I would argue, in fact, for the extreme age of a Reptilian type closely allied to *Varanus* and *Monitor*. Can this type be *Protorosaurus*? It is a Permian Reptile undoubtedly with near affinities to the existing Lacertilia, though with thecodont teeth as in the Crocodilia; it has been stated that this Lizard approximates closely to the living Monitors[5].

[1] Ann. & Mag. Nat. Hist. xiv. (1884), p. 117.
[2] American Naturalist, 1885, p. 245.
[3] Journal of Morphology, vol. i. p. 93. [4] Quart. Journ. Geol. Soc. 1887.
[5] See, however, a paper on *Protorosaurus* by Seeley (Phil. Trans. 1887), who does not allow any special Lacertilian affinities.

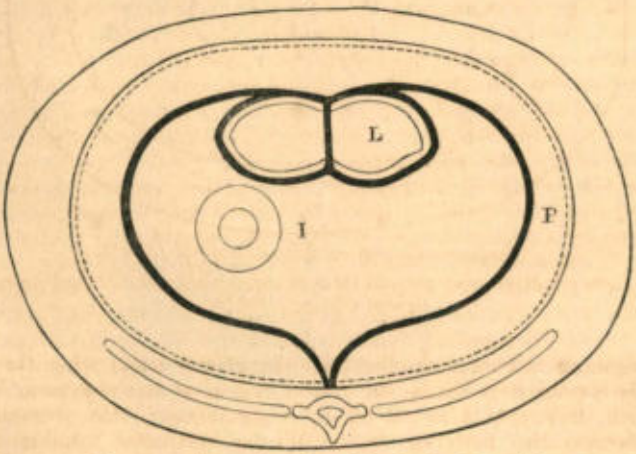
Fig. 2.



Diagrammatic section of *Monitor*.

P, Peritoneal fold circumscribing abdominal cavity; other letters as above.

Fig. 3.



Diagrammatic section through body of a Crocodile.

P, Peritoneal fold, continuous with serous sacs enveloping lobes of liver; other letters as above.

In *Cyclodus gigas*, however, there is a curious difference; the umbilical ligament is double, two distinct membranes passing between the liver and the ventral parietes; these unite anteriorly into a single membrane; the right-hand one probably represents the single umbilical ligament of other Lizards, since it bears the vein. As I found this in two specimens, it may be regarded as characteristic.

In *Plestiodon auratus* a fine tendinous line traverses the lower surface of the liver, running parallel to the attachment of the umbilical ligament; this is very probably the rudimentary representative of the second ligament present in *Cyclodus*. These two genera are commonly assigned to the same family (Scincidæ).

In *Trachydosaurus rugosus*, another member of the same family, the disposition of the umbilical ligaments is identical with that of *Cyclodus*.

These points of difference between the Scincidæ and Lacertidæ, &c., do not seem to me, for reasons which will be brought forward presently, so important as the presence or absence of the horizontal septum; the presence of this separates the Varanidæ from all other Lizards which I have been able to examine. It is, in any case, opposed to the association of the Varanidæ and Lacertidæ into a suborder Fissilinguia.

I can find no statement about this structural feature, which separates the Varanidæ from other Lacertilia, in any text-books to which I have had access; there is nothing, so far as I can ascertain, in the Treatise on the Lacertilia, by Prof. Hoffmann, which occupies part of Volume vi. of Bronn's 'Thierreichs.' Prof. Rolleston, in his 'Forms of Animal Life'[1], states that "the lungs . . . . . in the Loricata (=Chelonia and Crocodilia) differ from those of other Reptiles in not projecting freely into the general cavity of the body, dissepimental processes of peritoneal membrane separating them from it, and foreshadowing thus, as also by their possession of intrinsic muscular fibres, the diaphragm of warm-blooded animals." Hoffmann, in the work referred to[2], distinguishes the Crocodilia from the remaining Saurians, by virtue of the fact that the latter, instead of having the body-cavity divided into numerous compartments, as in the Crocodilia, "possess only two sacs, the pericardium and the peritonæum; from the latter is derived the covering of the lungs." Both these writers, however, quote a paper by Brücke[3], which is chiefly devoted to a statement of the fact that in *Varanus*[4] the mesenteries contain unstriated muscular fibres; in this paper, however, Brücke remarks that the muscular fibres of the umbilical ligament are continued into a membranous diaphragm ("häutige Zwergfell"). Whether this diaphragm represents the horizontal septum which I have described in this paper as existing in *Varanus*, I am unable to say, as there is no further description of it. Evidently, however, Profs. Rolleston and Hoffmann have not interpreted Brücke's

[1] Introduction, p. lx.
[2] P. 922.
[3] Wiener Sitzungsber. vii. (1852), p. 246.
[4] Leydig has subsequently shown that this holds good in the case of other Lizards.

statements in this way, unless, indeed, the last half of the sentence from Hoffmann, quoted above, may be held to imply that the lungs are shut off from the abdominal cavity by a membranous partition. I should myself consider that these words only refer to the reflected layer of peritoneum which covers each lung; this is, of course, quite a different thing from the horizontal membrane in *Varanus*, which shuts off *both* lungs from the abdominal cavity.

I find, however, in an account of the dissection of a *Monitor* published in the very first volume of the 'Proceedings'[1] of this Society, by Dr. Martin, a couple of sentences which in all probability do refer to this structure, which, so far as my experience goes, is so highly characteristic of the Monitor Lizards and of that group only. The author writes: "the chest is divided from the abdomen by a partial membranous diaphragm attached to the parietes of the abdomen by numerous strings or filaments . . . . . the liver lies in the abdominal cavity just below the diaphragm." There is, however, no further remark concerning the structure in question; it is not emphasized as a peculiarity of the Monitor nor is it compared in any way with what I believe to be an homologous structure in the Crocodilia.

This horizontal septum closely resembles a structure in the Crocodilia (fig. 3) which has been described by Prof. Huxley[2] as well as by others: this consists of a membrane, partly muscular, which is attached to the pubis and to the abdominal parietes behind, and in the median dorsal line to the backbone; it entirely envelopes the coils of the intestines, so that they are not visible when the body-wall is cut through. Anteriorly this muscular expansion is attached to the fibrous compartments in which are lodged the stomach and the two lobes of the liver; the lungs are thus shut off from the abdominal cavity; this membrane bears on the ventral surface the anterior abdominal veins: there is evidently a close similarity, so far, between the Crocodile and the Lizard; furthermore in both animals the lateral regions of the membrane are connected with the lateral parietes by fibrous bands, and in both the fat-body lies outside of the membrane and outside of the abdominal cavity; the reproductive glands and the kidneys have a similar relation to the membrane in both types; in the Crocodile as in the Lizard the reproductive glands and the kidneys are separated by the membrane; the former lie within, the latter without, the abdominal cavity. The only differences are that in the Crocodile the membrane is largely covered by muscular tissue, and that instead of simply passing over the liver and stomach, it becomes connected with special sheaths enveloping these several organs. In these points the Crocodile, as Prof. Huxley has pointed out, resembles birds.

The above considerations point, in my opinion, to an unmistakable resemblance between the Monitor Lizards and the higher Sauropsida, a resemblance which is, perhaps, a little unexpected. There has never, so far as I am aware, been any doubt as to the thoroughly Lacertilian nature of the Varanidæ; in all the schemes of classifica-

[1] P. Z. S. 1831, p. 138. [2] P. Z. S. 1882, p. 568.

tion of the Lacertilia with which I am acquainted there is no tendency to separate the Varanidæ from other Lizards, although it is true that Mr. Boulenger remarks upon them as forming "a perfectly isolated group"[1]. He does not, however, lay weight upon this opinion by separating the family in any way; it is, indeed, particularly associated in his scheme with the Helodermatidæ, Zonuridæ, Iguanidæ, &c. I have not yet had an opportunity of studying the structure of *Heloderma*; and such papers as have been published upon the anatomy of this genus do not touch upon the points to which I have directed attention in this communication. I cannot, however, agree to such a close association of the Varanidæ and Iguanidæ as is proposed by Mr. Boulenger; and other facts, to which I shall direct attention presently, point unmistakably to the isolation of the Varanidæ, and perhaps to affinities with the Crocodilia.

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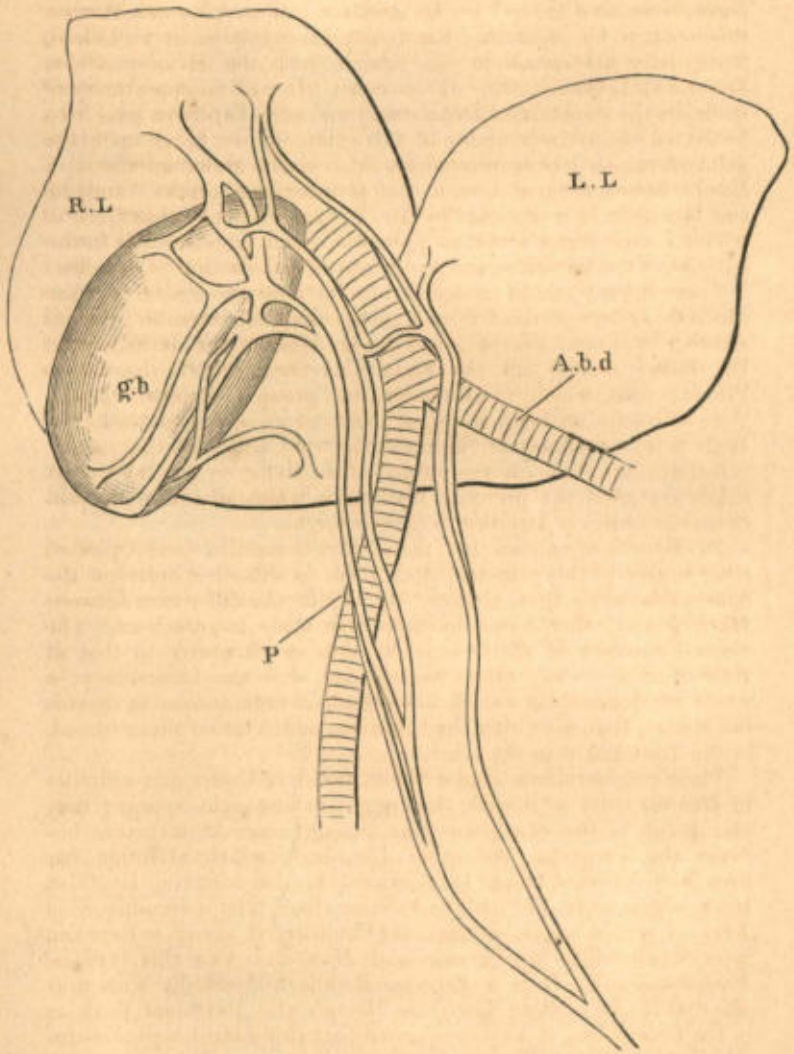
[3] Journal of Morphology, vol. i. p. 93. [4] Quart. Journ. Geol. Soc. 1887.
[5] See, however, a paper on *Protorosaurus* by Seeley (Phil. Trans. 1887), who does not allow any special Lacertilian affinities.

Fig. 4.



Liver, bile-ducts, &c. of *Varanus salvator*.

L.L, R.L, Right and left lobes of liver; *g.b*, gall-bladder; P, portal vein; *A.b.d*, abdominal vein.

2. *Bile-ducts.*

The accompanying drawing (fig. 4, p. 105) illustrates the very remarkable condition of the bile-ducts which characterizes *Varanus salvator*; the bile-ducts, both cystic and hepatic, form a highly complicated network, which is found in many serpents, but not, so far as I am aware, in any other Lizard. This fact, however, is not new, but has already been recorded[1] by Pagenstecher, who, however, has not stated what particular species his observations referred to. I have therefore thought it worth while again to bring this matter forward, as I am able to state the exact species in which this structural peculiarity occurs. It is important to notice that it is only in *Varanus salvator* that the cystic and hepatic ducts form a network; in the other species of *Varanus* and *Monitor* which I have had the opportunity of dissecting the bile-ducts are quite single, as in other Lacertilia: I find that Dr. Günther, who has dissected *Regenia ocellata*[2], *R. albigularis*, and *Monitor niloticus*[3], makes no mention of any resemblance to *Varanus salvator*; I conclude therefore that in the former species also the bile-ducts are single.

In *Alligator lucius* (Bronn's 'Thierreichs,' Taf. C. fig. 4) there appears to be just a trace of this network of bile-ducts.

In the same work Hoffmann refers to the similarity which the teeth of *Monitor* show to those of the Crocodilia in their development. Mr. Boulenger has kindly directed my attention to a note in the 'Zoologischer Anzeiger' (Bd. x.), by Van Bemmelen, upon the structure of the vessels of the neck in the Sauropsida. From his results it would appear that the Monitors differ greatly from other Lacertilia, and are, in fact, more aberrant than even *Hatteria*. These facts are all in harmony with my contention that the Monitors should be widely separated from other Lacertilia, and some of them are by no means at variance with my belief that the Monitors show Crocodilian affinities.

Summary.

The principal facts recorded in the present paper and the conclusions to which they lead are as follows:—

(1) The Varanidæ differ from other Lacertilia in two important particulars:—in (i.) the occasional complication of the cystic and hepatic ducts, which form a network, (ii.) the presence of a fold of peritoneum, reflected from the lining peritoneum of the abdominal cavity, which surrounds the abdominal viscera.

(2) This fold of peritoneum has its exact counterpart in Crocodilia and Aves, where, however, the subdivision of the cœlom into a number of separate cavities is carried on still further.

(3) The Varanidæ, therefore, alone (?) of existing Lacertilia show the first beginnings of the subdivision of the cœlom, which reaches its extreme in the higher Sauropsida.

[1] Würzburg Naturwiss. Zeitschr. i. p. 248.
[2] P. Z. S. 1860, p. 60.
[3] P. Z. S. 1861, p. 109.

(4) These facts necessitate the separation of the Varanidæ from the true Lacertilia into a group equivalent to that of, *e. g.*, Rhynchocephalia.

(5) It is probable, as generally believed, that the Lacertilia more nearly represent the primitive Reptilian stock than any other Sauropsida.

(6) The particular resemblance between the Varanidæ and the Crocodilia renders it probable that some Reptilian type existed in early Mesozoic or late Palæozoic times, which in many points, especially those enumerated in (1), resembled the existing Varanidæ. From this type originated the Crocodilia, Dinosauria, and Aves.

4. On a new Species of *Elainea* from the Island of Fernando Norohna. By R. Bowdler Sharpe, F.L.S., F.Z.S., &c.

[Received January 18, 1888.]

My colleague Mr. H. N. Ridley, during his recent visit to the island of Fernando Norohna, procured several specimens of a Tyrant-bird, which is evidently undescribed. I propose therefore to call it

Elainea ridleyana, sp. n.

Adult male. General colour above dusky olive-brown, slightly paler brown on the lower back and rump; lesser wing-coverts olive-brown, the lower ones edged with white; median and greater coverts dark sepia-brown, tipped with white, forming wing-bars; bastard-wing, primary-coverts, and quills dark brown, the latter edged with whity brown, the inner secondaries with white like the greater coverts, broadening towards the ends of the outer web; upper tail-coverts and tail-feathers dark brown; crown of head crested, a little more dusky in colour than the back, with a concealed white streak in the centre; lores dull ashy; feathers round eye and ear-coverts dark olive-brown; cheeks ashy grey, with an olive tinge; throat ashy whitish; fore neck and chest ashy grey, with an olive tinge; breast and abdomen pale sulphur-yellow; sides of body and flanks ashy, washed with olive; thighs yellowish, with brown bases; under tail-coverts pale sulphur-yellow; under wing-coverts and axillaries pale sulphur-yellow; quills below dusky, pale ashy olive along the inner edge. Total length 6·7 inches, culmen 0·6, wing 3·25, tail 2·9, tarsus 0·8.

Hab. Island of Fernando Norohna (*Ridley*).

This species approaches *Elainea pagana* (Licht.) in general appearance, but is a much darker bird, with dusky brown head and ear-coverts, and is at once to be recognized by its conspicuously longer bill.

5. On the Caves containing Edible Birds'-nests in British North Borneo. By D. D. Daly, Assistant Resident, British North Borneo[1].

[Received February 2, 1888.]

The increasing attention to valuable products of trade in new countries has led me to prepare the following notes on the Birds'-nest Caves of Northern Borneo gathered during a residence of nearly five years in that country. The number of caves that are known to be in existence up to date are referred to in the order of their size, wealth, value, and importance both as regards the quantity and quality of the nests. Many of these mountain-caves have been visited by Europeans since the establishment of British North Borneo as a Colony under Royal Charter in November, 1881; but there are a few that are so inaccessible amid inland mountains and among semi-hostile tribes that they have not yet been explored, and are only alluded to from native information.

The edible nests of the Swift (*Collocalia fuciphaga*) are valued in China only; to the European palate birds'-nest soup has an insipid taste.

Many theories, some of them absurd, have been propounded with respect to the mode of formation of the nests; it may, however, be laid down as indisputably proved by experts that the nests are made by the Swifts of their own inspissated saliva[2]. The nests have been carefully analyzed by chemical experts, and no traces of vegetable matter have been discovered. The thready mucus is worked up by the Swift from the salivary glands in its neck.

The strings of mucus are plainly visible in the nests which I have the pleasure of exhibiting at this meeting, and which were brought

[1] In the discussion which followed the reading of this paper, Mr. W. H. Treacher (late Governor of British North Borneo) pointed out, in reference to Mr. Daly's explanation of the differences in the colour and value of the nests, that Sir Hugh Low, writing on Sarawak about 40 years ago, maintained that two distinct varieties of birds formed the white and the black nests respectively, the latter being a smaller dull-coloured bird, generally found in the inland caves, and the former a large bird, of livelier colour, with a white belly, and found in the caves near the sea-shore; and that the natives of whom he had inquired, corroborated Sir Hugh's statement; he also pointed out that the Sigalong caves yielded almost entirely white nests, while those of Madai, close by, were almost all black ones. In the Gomanton series some of the caves always yielded black nests, and others always white ones, although the nests in all were collected with equal regularity. The Hon. Ralph Abercromby said that when he visited the Gomanton caves the natives showed him three different-sized eggs, and said the largest was the egg always found in the white nests; he added that a German naturalist, who had resided in Palawan, had, however, given him an explanation similar to Mr. Daly's.

Mr. Sclater said that only one kind of Swift had been sent to him from Borneo for identification, and that that, as determined by Mr. Sharpe (see P. Z. S. 1886, p. 54), was *Collocalia fuciphaga*; he suggested that the Company's officers might easily settle the question by procuring specimens and sending them home for determination, and urged them to adopt this plan.

[2] See Mr. H. Pryer's paper on this subject, P. Z. S. 1884, p. 532 and the accompanying footnote.

by me last July from North Borneo. They were taken from the Tatalahan Caves on the west coast.

The later geological formation of British North Borneo, superincumbent on the granitic and older rocks is a slate composed of sandy and muddy sediments with occasional intercalated zones of limestone. In the caves found in these limestone deposits the Swifts make their homes, and build the nests so much coveted by the Chinese. The demand for these ingredients of gelatinous soup is constant among the wealthier Chinese, and the supply is extremely limited; the product is consequently of increasing value as a luxury. There are three qualities of these nests:—

1. The white nests, which are gathered before the bird has commenced to lay any eggs, and which are composed of a clear transparent mucilaginous matter, with very few feathers mixed with them.

2. The *red* or *grey* nests[1] which are partly mixed with feathers, in which eggs are sometimes found, and which have to be cleared of much extraneous matter. The part of the nest adhering to the limestone is sometimes tinged with pink.

3. The *black* nests, which are much mixed with feathers. Sometimes fledglings may be found therein. These nests have been overlooked at the previous gathering, and have darkened or deteriorated from exposure to water and to the atmosphere of the caves. The partial decomposition of the mucous matter renders them the least valuable.

The following market-quotations of the birds'-nests are taken from the 'British North Borneo Herald,' of 1st December, 1887.

White birds'-nests,	best,	per catty	$16	to	$12
,, ,,	2nd quality	,,	9	,,	7
,, ,,	red	,,	7	,,	5
,, ,,	common	,,	1·80cts.	,,	2
Black birds'-nests,	best,	per picul	$80		
,, ,,	2nd quality	,,	50		
,, ,,	3rd quality	,,	40		

The following are the names of the principal mountains containing caves to which the Edible Swift resorts for the purpose of breeding, so far as they are yet known:—

No. 1. Gomanton.
,, 2. Madai.
,, 3. Sigalong.
,, 4. Baturong.
,, 5. Batu Timbang.
,, 6. Senobang.
,, 7. Obang Obang.
,, 8. Tatalahan.
,, 9. Bod Narkiow.
No. 10. Butong.
,, 11. Bukit Malingai.
,, 12. Pigton.
,, 13. Bahalla.
,, 14. Ulu Sembakong.
,, 15. Waleigh-waleigh, Kinoram River.
,, 16. Mantanani.

[1] When the nests are left untaken for too long a period after they have been built, the part or hinge adhering to the limestone first turns red, then black, and finally the nest drops to the ground, oftentimes with young

No. 1. The Gomanton Caves, near Sandakan, East Coast, are by far the most extensive and rich in quantity and quality of birds'-nests. These limestone caves are reached from Sandakan, the capital of British North Borneo, by ascending the Sapagaya River, which flows into the vast harbour of Sandakan, and from the head of the navigation of the Sapagaya by a jungle-track, 7¼ miles in length, to the Gomanton caves. These caves can therefore easily be reached in half a day from Sandakan. Marching along the narrow track, between green walls of tropical jungle, the traveller at times takes breath to notice ferns, lycopodiums, pitcher-plants, and orchids that love the shade of valuable hard-wood forest trees. The crow of the Argus Pheasant frequently breaks the stillness, and the monster ape, the "Orang utan" (in Malay "Mias") looks down with surprise at the passing wayfarer from lofty branches overhead. As the caves are approached, half a mile off, the air is strongly impregnated with the odour of guano, of which there are valuable deposits; then slippery, moss-grown limestone boulders are scaled until the entrance, "Simud Putech" (Malay for "white entrance"), is reached. This porch is situated at an altitude of 570 feet, by aneroid, above the sea, and being 30 feet high by 50 feet wide, presents a noble entrance. Leaving this, a further climb of 500 feet brings the traveller to the summit of the Gomanton Caves. Peering down a small aperture, a magnificent cavern variously estimated at 850 to 900 feet in depth, or upwards of twice the height of St. Paul's, London, is disclosed. The native climbers descend from this hole, holding on to a network of rattan ladders that spread over the limestone roof of the vaults; as seen from the floor of the cave, the collectors appear like flies as they clamber about in their perilous work. Here, on the summit, there are some cocoa-nut trees, lime trees, and a plateau of grass. A grand panoramic view is unfolded, Sandakan harbour and distant cloud-capped ranges being prominent. Looking down from the plateau, there is a precipitous cliff inviting the weary mind with suicidal intent. Let us descend again to the Simud Putech entrance. It is very steep and slippery work; suddenly a vast dome-shaped chamber is entered. This dome is honeycombed with other domes, all of which have their native names, as precise as the nomenclature of the leading thoroughfares into Trafalgar Square. The vaulted corridors leading to this dome are about 150 feet high. Let no man enter these caves without torch or candle, as there are dangerous fissures. In this, the Simud Putech cave, looking to the left, a dark abyss, known as the Simud Itam (Malay for "black entrance") Cave, is pointed out by the guide; its depth is estimated at 400 feet. The Simud Putech Cave is coated with a layer of Swifts' guano from 5 to 15 feet in depth; it is less valuable than the Bats' guano in the Simud Itam and other caves.

Swiftlets in them. These nests having been overlooked or being inaccessible to the inexpert climber, are used by the birds for laying their eggs and rearing young ones year after year, until they turn black and worthless.

No. 2. The Madai Caves, Darvel Bay, East Coast.

In July 1884 I visited these caves in company with Governor Treacher. The approach to the shore in a steam-launch was intricate work, as many coral patches obstructed the entrance. Having anchored at the mouth of the Tucgabuah River, we paddled up for about an hour and landed. A three-mile jungle-track, much broken up by Elephants, Rhinoceroses, wild Cattle, and wild Pigs, brought us to the entrance of the caves, which is on a level with the surrounding country. The limestone walls rose rugged and precipitous, and glittered in the light of the morning sun. As we entered, there were flights of Swifts whizzing and flitting past our heads, and we found many of the young birds, tied together by the wings, lying on the floor ready to be carried away for food by the collectors. These men belong to the Erahan tribe, and we found some twenty of them living on stages inside the caves. They handed to us torches and bees'-wax tapers, which were most welcome as we clambered in the murky darkness over the slippery limestone boulders. In the hollows of the floor there were thick layers of guano, which was saturated with the rain-water that percolated through the limestone ceiling; the result was that we were frequently immersed up to our middle in these offensive deposits.

Unlike Gomanton, which boasts one monster cave, Madai presents a series of chambers, about 150 feet in height, connected with each other by narrow passages. There are very few Bats, the Swifts having taken possession of the most advantageous nest-building sites and being evidently too numerous for the unremunerative mammalia to lead a peaceable existence.

As we walked through the six caves, the collectors pointed out to us 23 "lobangs," as they are called by the natives. These are domes or vaults, each one of which is owned by a separate proprietor. The natives say that 20 of these vaults contain black nests only, and that three vaults only hold white nests.

This would denote, as native information frequently asserts, that there are two kinds of Swifts, viz., one that builds black nests and the other white nests. In fact some natives maintain that there are as many as four different kinds of Swifts. Further investigation is required to clear up this question.

There are three collecting-seasons in one year; the last season yields nests of an inferior quality to the other two. The total harvests of both black and white nests are valued at $15,000 per annum.

No. 3. The Sigalong Caves, Darvel Bay, East Coast, are situated about 21 miles S.E. from the Madai Caves, and are approached through coral reefs. The chambers are low, and the openings are small and difficult to enter for Europeans.

The native collectors enter some of these limestone caves by loop-holes from the summit, which is about 250 feet above the surrounding country. There is a preponderance of Bats over Swifts, but the deposit of guano is not so large as in the Gomanton and Madai Caves. I

was only able, owing to darkness coming on, to visit a few of these caves; the Erahan collectors said that there were 14 of them, and gave us the names of the proprietors and the yield of nests of each cave.

The Sigalong caves have all white nests, and the harvest is valued at $12,500 per annum.

No. 4. The Baturong Caves, near the Madai Caves, Darvel Bay, East Coast, were first visited by Mr. F. G. Callaghan, the Assistant Resident of Darvel Bay, in July 1887, and the following extract from his official report will be of interest:—

"The next morning we started for Madai, but, only being able to get four Ehrans as baggage-carriers, the greater portion of our stores was left in the boats.

"Reaching Madai at about 10 o'clock, I obtained a party of fifteen Ehrans, and started for Baturong at 12. The track lies at the back of Madai and passes close underneath the high hill called Pigtong, and also near another range of the name of Gelass. This latter hill used to produce birds'-nests, but for some reason has not been worked for thirty seasons (?). The nests were of both kinds, black and white. The track lay through flat and rather swampy ground with outcropping of limestone in several places. We halted for the night at the Kiten River. Sri Rajah, who accompanied us, followed as a guide.

"Leaving the next morning at daybreak, we ascended a gradual slope for nearly an hour, the jungle full of durians, langssats, and other fruit-trees. For about another hour we continued along this range, called Bukit Telang, of about 400 to 500 feet high, direction E. by S.

"On leaving the hill, we met the following tributaries of the Tinkayu River—the Bitaspalino, Natunde-Batas, Segas, and Binnan rivers, all of which are of fair size. The Tinkayu is a fine river, but is not navigable to this point, owing to large rapids and falls. The natives say it is about six days' paddle up from the mouth to the first rapids, the noise of which we heard.

"The country is very flat between these rivers, and, owing to the heavy rains, a good deal inundated, making travelling very difficult.

"We reached the Baturong Caves at 2.30 and found the Tedong people had all left, probably four or five days before. Baturong is a hill about 2000 feet high, nearly perpendicular; it appears to be all of white glistening limestone. It contains fifteen 'lobangs' or holes, out of which Suggin and Selagas appear to be the most valuable, producing seven and four catties of white nests yearly respectively. These two holes are worked three times a year, but the remainder only once. The estimate in the 'Herald,' of September 1884, gives the out-turn at one picul yearly, but I do not believe that more than twenty catties or so are gathered. The entrance to the cave is about 40 feet from the ground, a large tree growing up alongside the rock affording a kind of ladder, and from the branches of the tree a kind of suspension-bridge to the cave has been made. I did not attempt therefore to enter the caves, which, I

was informed, are nearly twice as high as Madai. A stream of good water flows just below the cave.

No. 5. The Batu Timbang Caves are situated at the head of the Quarmote River, a branch of the Kinabatangan River, East Coast, and are almost inaccessible when the Quarmote River is in flood, on account of dangerous rapids. During other seasons the journey from the Kinabatangan to the caves can be accomplished there and back in a fortnight. When I visited the Quarmote in September 1884 it was impossible to stem the flood. The chief, Rajah Tuah Dorkas, concurred that a road would be a great advantage, inasmuch as three seasons for gathering the nests would then be available, and the nests would all be in good order and of higher value. At present there are two seasons—one dry, when the nests are picked and in fair order; the other when the rains are on, which, percolating the limestone vaults, trickle into and damage the nests. When the rainy season lasts an unusually long time and the caves cannot be reached, the nests are left on the walls for too long a period and become black and nearly worthless. Men are frequently drowned over the cataracts. There are many vaults in these caves, and the chief told me that he had gathered 15 catties (= 20 lbs. avoirdupois) of white nests, and one picul (= 133⅓ lbs.) of black nests from one vault alone during the last season. The expenses of collecting are considerable. When the collecting-season has arrived, a fleet of flat-bottomed boats start from the Kinabatangan River; sometimes there are as many as 90 boats, and allowing five men to each boat, the force would number 450 men. As there is no currency in silver or copper, all these people are paid in birds'-nests, which come into the traders' hands and find their way to Sandakan.

The Batu Timbang Caves had been abandoned for some years until the British North-Borneo Company proclaimed the Royal Charter in 1881. There are powerful tribes in the interior, the principal one being the Tingallans, who are head-hunters, and the collectors were decimated year after year. Since the advent of the British North-Borneo Company, the people have been able to work the caves without molestation.

No. 6. The Senobang Caves are situated on the Upper Penungah River, a tributary of the Kinabatangan River, East Coast. The late much-lamented Mr. Frank Hatton, in 1882, made a gallant attempt, in the face of hostility from the Tungara tribe, to visit them. The savages were conciliated, chiefly by his pluck and tact; but the floods swept away and destroyed some of his boats over the rapids, and he was most unwillingly compelled to do that which explorers are so loath to do, viz., turn back.

In October 1884 I made two attempts to reach these caves, but was overpowered by the heavy rains which swelled the river, and over a cataract I lost part of my provisions, a rifle, and all my cooking-utensils. The time will come when roads laid out by the

British North-Borneo Company will give access to the Batu Timbang, Senobang, Ulu Sembakong, and Obang Obang Caves, which are all situated to the south of the Kinabatangan River, and then the real output of the caves will be ascertained, and the harvests of birds'-nests, collected, as in Java, under European supervision in proper seasons, will be enhanced in value.

No. 7. The Obang Obang Caves are situated on the Melikop River, a tributary of the Kinabatangan River, East Coast, about the centre of British North Borneo, and connecting the east and west coasts by the palæozoic zone of insular limestone mountains.

The aneroid, at the mouths of the caves, gave a reading of one thousand eight hundred and ten feet above sea-level. The last half-hour's walk was over limestone boulders, and the air was strongly impregnated with the odour of Bats' guano.

The first cave is the most valuable, but it can only be entered by experts in climbing.

The entrance is a small hole, about four feet by four, which is closed with a wooden grating, for the purpose of attracting attention to the spot.

Every two months this doorway is opened, and the climbers let themselves down into the caves by means of rattans, and gather all nests, both large and small.

The "take" or collection varies much in different seasons, this principal cave yielding from eighty to two hundred and fifty white nests, worth $16 a catty, per season.

One season lasts only two months, making six seasons in the year, the same periods of seasons are also observed at the Senobang cavern, Ulu Penungah. This is quite different from the duration of the seasons at Gomanton, Batu Timbang (river Quarmote), Madai, and Sigalong Caves, where there are only two or, at most, three seasons in the twelve months. The Tungaras agree that by collecting frequently they procure white nests in first-rate order, though some of the nests fetch a higher price from the Sulu traders than those of Batu Timbang.

I noticed a great scarcity of Swifts; this may be attributed to these frequent takings of nests, which prevent the birds from breeding, whereas in the other caves of North Borneo where the collections are less frequent, an immense number of birds are found.

On the other hand, where there are only two collections per annum, and especially during the rainy season, many of the nests are found to be half rotten, particularly that part of the nests that adheres to the wall, and full of feathers and containing eggs, from having been left too long on the walls before collection.

The "Obang Obang" range, which contains the caves of that name, runs about north and south and is half a mile in length.

There are seven entrances ("lobang") from the top of the hill, and they are all close together. Five of the caves do not contain any nests, no Swifts, but only Bats, inhabiting them.

The first I have already alluded to, and the last was the only one

that could be entered. This is a small cave, the chamber itself only about fifty feet high, and containing both Bats' and Swifts' nests.

I visited these caves in October 1884 and found that only ten Swifts' nests had been gathered that season.

The Bats' nests are similar in form to those of the Swifts, but are made of moss only, which the Bats pick off the limestone boulders outside.

I had Malini with me, the man who had successfully scaled the interior of the Gomanton Caves; he went down to No. 1 of these Obang caves, but unfortunately could only find a few young nests just being formed in the crannies and cracks of the vault, the season's nests having already been gathered.

The tribes who inhabit this part of Borneo have a certain specified law of succession as to the gatherers of the nests, and the honour is taken in turn by the chiefs and their several relatives.

It is probable that, with a little rest and freedom from intrusion, the Obang Caves might become very valuable to the colony. I was, I must own, somewhat disappointed with these caves after what I had heard about them. I proposed to the people that, inasmuch as the Government afforded them protection on the Kinabatangan River, which enabled them to trade and live in security, they should in return pay a tribute of one third of all birds'-nests taken out of the caves. This was cheerfully assented to.

I found the yield of the month previous to my visiting the district had been 150 nests, and of these 50 were at once handed over to me.

No. 8. THE TATALAHAN CAVES, on the Padas River, West Coast, are as yet unvisited by Europeans; but I have seen white birds'-nests of the best quality brought to Mempakol, the capital of Province Dent.

No. 9. BOD NARKIOW CAVES. This paper, relating, as it does, chiefly to the edible birds'-nest caves on the Kinabatangan River, will show that that river is very rich in caves. Amongst others I may briefly allude to those reported at Bod Narkiow. Though I did not visit them, there is every reason to suppose they exist. The formation of the country is favourable to the supposition, and the folklore of the natives alludes to the fact that at Narkiow such caves are found.

No. 10. BUTONG CAVES. Much the same kind of obscurity hangs over the history of the Butong Hill Caves. Time would not allow me to explore the district in their neighbourhood. So I contented myself with offering $100 to anyone who would bring me reliable information about them.

No. 11. BUKIT MALINGAI, a sandstone mountain, holds birds'-nest caves, but an entrance to them has not yet been discovered. There is a strong smell of guano near the summit.

No. 12. PIGTON, a limestone hill, Darvel Bay, is as yet unvisited.

No. 13. Bahalla Island, off Sandakan Harbour, contains both black and white nests, the collection of them being farmed out by Government. The apertures are in the face of a precipitous sandstone cliff, some 600 feet high, and are entered from the summit, the climbers being lowered down from the top by ropes.

No. 14. Ulu Sembakong Caves. Natives informed me of some valuable caves on the Sembakong River, which empties itself into Sebuco Bay, East Coast; these could only be visited by going through the country with an armed force, as some of the head-hunting tribes are hostile.

No. 15. Some caves at Waleigh-waleigh, Kinoram River, a tributary of the Bongon River, a part of the northern Kinabalu watershed; these were visited some years ago by the late Mr. Frank Hatton.

No. 16. Mantanani. These caves are situated in a group of uninhabited islands of that name, about 20 miles off the north-west coast of Borneo. Both white and black nests are taken, the collection being in the hands of two Borneo tribes who collect in alternate seasons.

I have now enumerated all those caves that are known at present. Doubtless this vast territory contains others perhaps richer than these, and in the course of time, when the country is more fully explored, we shall be able to fix their position definitely on the map of British North Borneo.

6. A Note on *Ornithoptera victoriæ*, Gray.

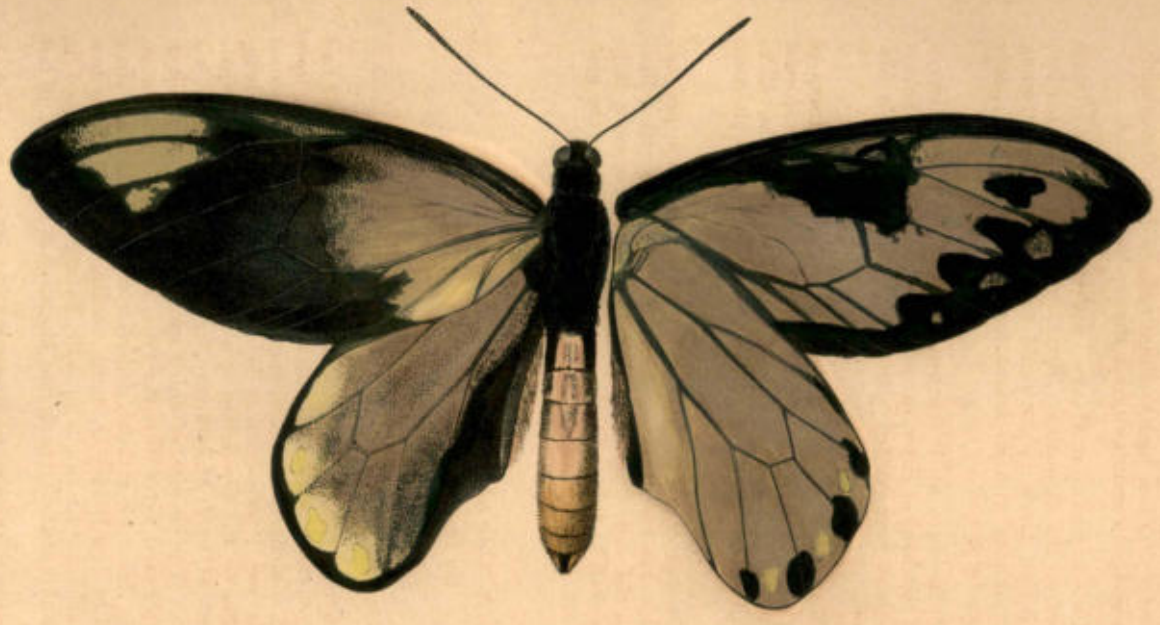
By Osbert Salvin, M.A., F.R.S.

[Received February 7, 1888.]

(Plate IV.)

At the meeting of the Society held on the 1st of March last I had the pleasure of exhibiting a male specimen of an *Ornithoptera*, from the island of Maleita, one of the Solomon group. This specimen Mr. Godman and I considered to belong to the male of the long-known *O. victoriæ*, the description of which was based upon a female example obtained by J. Macgillivray, but of which the locality was not recorded. The females, of which specimens were also exhibited, from Maleita Island agree with the type, hence our determination of the male. The male and the underside of the female have since been figured by Mr. Hedley G. Smith, on the first plate of his new work 'Rhopalocera Exotica,' the male having been described in the June number of the 'Annals and Magazine of Nat. Hist.' of last year (1887).

Mr. Woodford, the enterprising naturalist who captured these specimens, has since returned to England, bringing with him a large



W.Purkiss lith.

Hanhart imp.

ORNITHOPTERA VICTORIÆ.

collection from the Solomon Islands, made almost exclusively in the island of Guadalcanar. In it are examples of both sexes of an *Ornithoptera* closely allied to the Maleita insect; but on comparison we find that the males differ in several points, so much so that we considered it desirable that the Maleita and Guadalcanar forms should bear different names. The differences are not great, it is true; but that there should be any is only in conformity with what we find in a very considerable number of other species of Butterflies, all of which go to prove that the productions of Guadalcanar and Maleita are, to a large extent, modifications of one another. These differences I have pointed out below.

The females from each island hardly differ appreciably from one another, though the submarginal spots of both wings are perhaps larger in the Maleita form; it therefore becomes an important question where the typical female was obtained. Mr. Gray gave us little help upon this point, stating that it came from one of the islands of the South Pacific, mentioning the Solomon Islands as one of the places where it might have been taken. John Macgillivray was the naturalist who sailed in H.M.SS. 'Rattlesnake' and 'Herald,' and it was by him that the type was sent to the British Museum.

The 'Rattlesnake' did not visit the Solomon Islands, but the 'Herald,' commanded by Capt. Denham, was there in 1854–55. Through the kindness of Capt. Wharton, the Hydrographer to the Admiralty, I have had an opportunity of seeing the chart prepared by Capt. Denham on which the route of the 'Herald' is laid down. From this it appears that the ship touched at Wanderer Bay on the south coast of Guadalcanar, and at Makira on the south coast of San Cristoval, and that she never approached Maleita at all. Now, so far as we know, no species of *Ornithoptera*, not even the wide-ranging *O. urvilliana*, occurs on San Cristoval; hence it becomes practically certain that Macgillivray obtained the type of *O. victoriæ* at Wanderer Bay, Guadalcanar.

It thus follows that the males now brought us from Aola, on the north side of this island, are males of the true *O. victoriæ*, and that the Maleita form is the one requiring another name.

The two forms may be described as follows:—

1. Ornithoptera reginæ, sp. n.

Ornithoptera victoriæ, Salv. & Godm. P. Z. S. 1887, p. 190 (1st March), ♂; H. G. Smith, Ann. & Mag. N. H. 1887, xix. p. 445, ♂; id. Rhop. Ex. Ornithopt. pl. i. ♂ ♀ (nec G. R. Gray).

♂. Wings deep black; base of the primaries, except the costa, with a large patch of golden green, the outer margin of which is irregular and ill defined and reaches to within a quarter of an inch of the end of the cell; towards the apex is a large subtriangular golden patch; parallel to the inner margin and near the anal angle is an elongated stigma similar to that of *O. priamus* and its allies. The secondaries, almost from the costal margin to beyond the cell, are rich golden green, the distal part of the cell being black, though the nervures closing it are green. There are also three contiguous

submarginal golden-green spots, whereof the two nearest the anal angle have a large central patch of golden yellow. Beneath, the wings are shining golden green, with the nervures, margins, a large subtriangular patch over the end of the cell of the primaries, a series of submarginal spots at the end of each secondary nervure, and two lunate spots on either side of the lower radial of the primaries black.

The antennæ and prothorax are black; the abdomen ochraceous grey, with a double row of spots on either side and a ventral median line black.

The primaries are narrow, with hardly any perceptible anal angle, the outer and inner margins meeting in a continuous regular curve. The secondaries are elongated and narrow, and the inner margin deeply incised; the elongated hairs of the inner margin are pale yellow.

♀. Like that of *O. victoriæ*, the submarginal spots on both wings, especially those of the secondaries, being apparently rather larger, rounder, and not so lunate.

Egg: nearly spherical, the surface finely rugose, like that of an orange, diam. 4 millim.

Hab. N.W. Bay, Malcita Island (*Woodford*), Solomon Group.

Mus. Godman & Salvin; H. Grose Smith.

The peculiar neuration of the male is described in our former note (P. Z. S. 1887, p. 190).

2. ORNITHOPTERA VICTORIÆ. (Plate IV. ♂.)

Ornithoptera victoræ, G. R. Gray, P. Z. S. 1856, p. 7, pl. 39 (♀).

Similar to *O. reginæ*, but the wings of the male broader, the subapical spot of the primaries smaller and divided into three parts by the nervures, and the green of the base of the wings more restricted: the secondaries are almost entirely suffused with green, except the inner and outer margins; on the distal half are a few black scales, where, in *O. reginæ*, the wings are chiefly black: beneath, the discal green portion of the primaries is broken up by a series of broad black lunules, of which there are only two in *O. reginæ*, and there is a black spot between the subcostal and its fourth branch.

Larva (half-grown) dark brown; spines carmine; urticating process pale yellow. The head bears four spines (two long and two short); the first and second segments eight each, 3–5 six each, 6–11 four each, 12 two (Mr. Woodford's notes).

Hab. Wanderer Bay (*Macgillivray*), Aola (*Woodford*), Guadalcanar Island; Florida Island (*Woodford*)?: Solomon group.

Mr. Woodford's collection contains a female example from Florida Island, which, in the absence of the male, I am unable to determine with certainty. Judging from the other Butterflies from this island, I notice that their affinity to those of Guadalcanar is great, and it is most probable that the *Ornithoptera* found there is the same as that of Guadalcanar; but an examination of the male is necessary to determine the point with certainty. The only difference between

this female and the series of the same sex from Guadalcanar is that the submarginal spots are very small.

Mr. Woodford informs me that both *Ornithoptera victoriæ* and *O. urvilliana* are very fond of frequenting the sweet-smelling white flowers of *Cerbera odollam*[1], a plant common in the Solomon Islands, and also in the Fiji islands.

EXPLANATION OF PLATE IV.

Fig. 1. *Ornithoptera victoriæ*, ♂. Imago, upper and under sides.
2. —— ——, half-grown larva; from a drawing by Mr. C. M. Woodford.
3. *Ornithoptera reginæ*, egg, natural size, and a portion of surface magnified.

February 21, 1888.

Prof. W. H. Flower, C.B., LL.D., F.R.S., President, in the Chair.

Mr. Arthur Thomson exhibited a series of Insects reared in the Insect-house in the Society's Gardens during the past year, and read the following Report on the subject:—

Report on the Insect-house for 1887.

The following is a list of the Insects exhibited in the Insect-house during 1887:—

Silk-producing Bombyces and their Allies.

Indian.

Attacus atlas.
—— *pernyi.*
—— *cynthia.*
Actias selene.
Antheræa mylitta.
Cricula trifenestrata.

American.

Samia cecropia.
Telea polyphemus.
* —— *angulifera.*
—— *promethea.*
Actias luna.
Dirphia tarquinia.
Hypochera io.

African.

Antheræa cytherea.

[1] *Cerbera odollam*, Mr. Hemsley tells me, is closely allied to the Oleander, and similar in aspect. It is common on the sea-shores of India, Ceylon, Malaya, North Australia, and throughout Polynesia, even as far eastwards as Pitcairn Island, though it does not reach the American coast. The seeds will bear long immersion in the sea without injury, and the plant is one of the early inhabitants of coral islands.

* Exhibited for the first time.

Diurnal Lepidoptera.

European.

Papilio machaon.
—— *podalirius.*
Thais polyxena.
Parnassius apollo.
Euchloë cardamines.
Vanessa antiopa.
—— *io.*
Vanessa levana.
Argynnis euphrosyne.
Limenitis sibylla.
Melanargia galathea.
Apatura iris.
Aporia crataegi.
Lycæna corydon.

African.

Papilio porthaon.
—— *policenes.*
Papilio nireus.
—— *morania.*

American.

Papilio ajax.
—— *asterias.*
Papilio troilus.
—— *turnus.*

Nocturni.

Smerinthus populi.
—— *tiliæ.*
Sphinx ligustri.
—— *pinastri.*
Deilephila euphorbiæ.
—— *galii.*
Chærocampa oldenlandiæ (Japan).
——*-elpenor.*
**Otus myron.*
**Philampelus achemon.*
**Hemaris cynoglossum.*
**Deiopeia pulchella.*
Callimorpha dominula.
Bombyx quercus.
Boarmia repandata.
**Demas coryli.*
Notodonta ziczac.
Eacles imperialis.
**Composia olympia.*

Of the silk-producing Bombyces, one species, *Telea angulifera*, was exhibited for the first time. I had, altogether, six cocoons of this interesting species, three belonging to the Society and three to the Hon. Walter Rothschild. All of them produced moths, the Society's producing two fine males and one poor female, and Mr. Rothschild's three fine females. It is curious to note that the *males* of this species so much resemble the *females* of *Telea promethea*.

Whilst speaking of the silk-producing Moths, I wish to say that on the 8th of September last I received twelve cocoons of a Silk-Moth from Mr. Gerald Dudgeon, of Darjeeling, which he had found wild near that place, but of which he did not know the name. These cocoons, which are very curious and unlike any other cocoons I have seen, I regret to say, have not produced any moths.

Mr. Dudgeon, in a letter he wrote at the time he sent the cocoons, gives a description of the larvæ. Of the cocoons (which I now exhibit) he says, the larva "about the middle of June constructs a curious hanging-cocoon, with an aperture all along the top. The lower extremity of the cocoon is pointed and encloses a well-formed *drain*. This drain consists of a small cell made of hardened silk,

* Exhibited for the first time.

and perforated interiorly with ten or twelve small holes, and having a larger hole outside.

"The necessity of this drain is evident, for owing to the aperture at the top, the rain, which falls very heavily here at times, would be apt to fill the cocoon, and thus drown the pupa; therefore the larva constructs for itself a perfect drain, by which the water runs out as fast as it comes in."

I forwarded two of these cocoons to Mr. F. Moore, asking if he knew them. Mr. Moore, in his letter to me, replied:—"They are, for a certainty, those of the Moth named *Rhodia newara*, described by me in the Proc. Zool. Soc. 1872, p. 578, from specimens collected in Nepal by the late General Ramsay, who also gave me a description of the cocoon."

The pupæ of four species of African Papilios were brought to England in September 1886 by Mrs. Monteiro. Some of these emerged soon after their arrival, and others continued to emerge up to October 15 of that year; the remainder, viz. 13 *Papilio porthaon*, 5 *P. policenes*, 1 *P. nireus*, and 29 *P. morania*, passed the winter in the Insect-house, and commenced to emerge again on the 2nd of April last year. The first to appear was *Papilio porthaon*, followed by *P. morania* on the 5th and 7th, *P. policenes* on the 10th, and *P. nireus* on the 11th.

I succeeded in getting a pairing of *Papilio ajax*, but I am sorry to say that the female died without depositing any eggs, although I procured the food-plant (*Asimina triloba*).

In consequence of the great heat and continued dry weather experienced last summer, I was not able to rear many larvæ, although I had fertile ova of most of the silk-producing Moths. Amongst the few that I did rear, it may interest entomolgists to know that I reared easily some larvæ of *Deopeia pulchella* upon the common Forget-me-not (*Myosotis arvensis*), of which there is an abundant supply growing on the banks of the canal. I wrote to Mr. J. C. Warburg in May last, who was at Cannes at the time, asking him if he could send me some living specimens of this insect by post; this he was good enough to do, and, as I anticipated, a few eggs were laid *en route*, and a few in the case on arrival. These eggs I collected, and reared about sixteen perfect insects from them, and from these I obtained a second brood, and I have the honour to exhibit specimens of each brood this evening. Two of the larvæ were taken by Lord Walsingham (who had not before seen them) to add to the collection which he has presented to the Natural History Museum.

In August last Mrs. Blake, who had just returned from the Bahamas, sent three pupæ of a Moth to the Insect-house. Two Moths emerged from these, and proved to be the very beautiful *Composia olympia*. The larva feeds upon *Stephanotis*.

Mrs. Blake was also good enough to send at the same time a specimen of a *Mygale*, of which I do not at present know the specific name. This specimen I regret to say died in December, and I exhibit it this evening set in the position which these creatures assume if irritated.

In June last Major Cassel presented to the Society two Trap-door Spiders from Natal. These are still living, but up to Saturday last I had not seen either of them out of their cells; on that day I, after some trouble, got one out, and, as well as I was able, made a sketch of it.

I wrote to the Rev. O. P. Cambridge respecting these Spiders, asking him if he could tell me anything about them; he replied, saying, that he "confidently expected the S.-African Trap-door Spiders would be new to science, as he did not, at that moment, remember anything of the kind of the size I mentioned."

These Spiders have fed principally upon Cockroaches, and the one I had out on Saturday was in splendid condition.

The following papers were read:—

1. Note on the Azygos Veins in the Anurous Amphibia. By G. B. Howes, F.Z.S., F.L.S., Assistant Professor of Zoology, Normal Sch. of Science and R. Sch. of Mines.

[Received February 7, 1888.]

It is customary to regard the presence of the vena cava inferior as a special characteristic of the air-breathing Vertebrata, and the view most generally accepted and taught holds this vessel to be a late development, which replaces the posterior-cardinal veins of fishes. Indeed, some authorities would regard its presence and absence as distinctive of the air-breathing and water-breathing series respectively. Balfour wrote of it[1]:—"The venous system of Amphibia and Amniota always differs from that of fishes in the presence of a new vessel, the vena cava inferior, which replaces the posterior cardinal veins, the latter only being present, in their piscine form, during embryonic life."

Chief amongst recent researches into the morphology and development of the venous system are those of Parker[2,3], Hochstetter[4,5], Meyer[6]. The work of the second-named author will become little short of revolutionary, should his deductions hold good. He claims, as the chief result of his investigations, to have shown that the vena cava inferior, instead of being throughout its whole extent a primarily independent vessel, is a compound structure—the product of a fusion

[1] Comp. Embryology, vol. ii. p. 538.

[2] "On the Venous System of the Skate," Trans. New-Zealand Instit. vol. xi. 1880, p. 49.

[3] "On the Blood-vessels of *Mustelus antarcticus*," Phil. Trans. vol. 177. 1886, p. 685.

[4] "Beitr. zur vergleichend. Anat. und Entwicklungsgesch. d. Venensyst. der Amphib. und Fische," Morpholog. Jahrb. vol. xiii. 1887, p. 119.

[5] "Ueb. die Bildung d. hinteren Hohlvene b. d. Säugethieren," Anat. Anzeiger, vol. ii. 1887, p. 517.

[6] "Ueb. d. Entwicklung des Herzens und d. grossen Gefässstämme b. d. Selachiern," Naples Mittheilungen, vol. vii. 1887, p. 338.

between a late-formed hepatic vessel and one or both of the posterior cardinal veins. To that portion which is derived from the cardinal veins, and which receives the venæ renales revehentes, he applies the term "*urniere Abschnitte*"; it is represented, in the adults of the higher forms, by all behind and including the renal veins. He further asserts that whereas in Amphibia the two posterior cardinals become confluent to form this, in Mammalia[1], on the other hand, the cardinal vein of the right side also gives origin to it.

On the completion of the above-named developmental processes the anterior or prerenal portions of the posterior cardinal veins either become modified, to form the azygos and hemi-azygos veins of human anatomy, or, for the most part, disappear. Hochstetter has worked out the steps in the development in *Bombinator*, *Pelobates*, *Rana*, and *Salamandra* among Amphibia. So far as *Bombinator* is concerned, he fully confirms the classical researches of Goette, except for the fact that that author failed to observe the persistence of the entire posterior cardinals in the adult. Hochstetter has shown that in *Bombinator igneus* their anterior portions (morphological azygos veins) not only persist for life, but that with their confluence posteriorly, to form the hinder part of the vena cava inferior, their original continuity is not destroyed. There thus result two well-defined veins (*c.p.* of fig.), which pass upwards and forwards, side by side with the arches of the aorta, putting, as in some *Urodeles*, the fully formed vena cava inferior into direct communication with the veins of the anterior extremities.

In *Rana*, according to Hochstetter, the anterior segments of the posterior cardinals atrophy during metamorphosis. An individual example of the Common Frog (*R. temporaria*, adult ♀) has, however, recently come into my hands[2], in which the vessel persisted for its entirety on one side (see fig., p. 124)[3]. Not only so, but its development had continued *pari passu* with that of other related parts—in excess of that seen even in *Bombinator*. The drawing speaks for itself as to detail, and it must suffice to point out that, except as concerned the presence and relations of this vein, no noteworthy difference could be detected between the distribution of even the smaller vessels in this animal and those of the ordinary adult. The least normal among the veins were the ovarian ones (*ov.*), which, as will be seen, were strikingly asymmetrical. There was not the remotest trace of the corresponding portion of the right posterior cardinal.

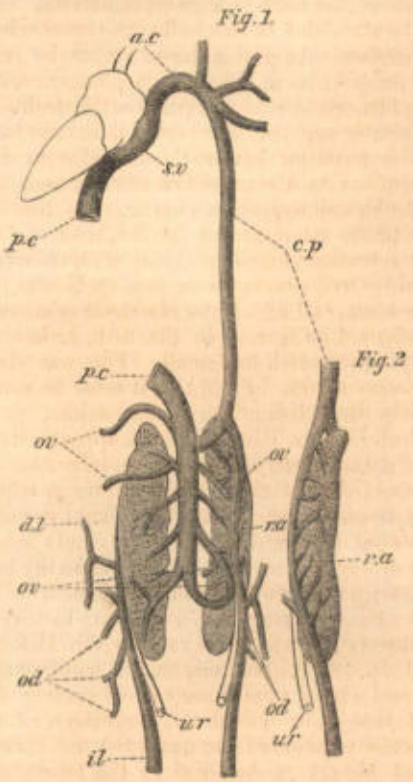
The persistence of this vein in one of the Ranidæ is, in itself, deserving of record; but careful comparison with *Bombinator* has revealed an interesting difference between the two. Hochstetter confirms and extends Goette's discovery that the main trunks of the venæ renales advehentes are primarily continuous with the posterior cardinals, forming trunks (Jacobson's veins) the lower ends of which, subsequently receiving the iliac veins, become the renal portals

[1] Anat. Anz. vol. ii. 1887, p. 519.

[2] Thanks to the diligence of my pupil, Mr. W. F. Hume.

[3] As these sheets were passing through the press I met with the same condition in a male of *Bombinator bombinus*.

of the adult. In *Bombinator*, however, despite the persistence of both renal portal and azygos veins, this continuity is eventually lost. In the specimen of the Common Frog under consideration it persisted,



The venous system of an adult of *Rana temporaria* (♀), showing a persistent azygos (posterior cardinal) vein.

Fig. 1. Ventral aspect.

The vena cava inferior in part removed, and the left kidney turned slightly inwards to display its external dorsal border.

Fig. 2. Left kidney, dorsal aspect. Magnified 1½ times.

a.c, Vena cava superior; *c.p*, azygos (posterior cardinal) vein; *d.l*, dorso-lumbar vein; *il*, iliac vein; *od*, oviducal veins; *ov*, ovarian veins; *p.c*, cut ends of vena cava inferior; *r.a*, venæ renales advehentes; *s.v*, sinus venosus; *ur*, ureter.

and the anastomosing trunk received (or gave off) renal branches. This fact is the more surprising, in that in *Pelobates* the separation takes place before metamorphosis, at a period when the anterior segment of the cardinal vein is but feebly developed[1].

[1] Hochstetter, iv. p. 162.

Hochstetter has examined *Bombinator*, *Hyla*, *Rana*, and *Bufo*, and in none but the former has he found a persistence of the vessels above named. He was not in a position to discuss the morphological significance of the fact, as a guide to affinity. The researches of Cope[1], Boulenger[2], and others point to the conclusion that the Discoglossidæ, rather than the Aglossa, are to be regarded as the least modified of all living Anura. Boulenger writes[3], "in the presence of ribs and opisthocœlian vertebræ the members of this very natural family closely approach the higher tailed Batrachians." The retention of the posterior cardinal (azygos) vein in *Bombinator* can only be regarded as a sign of low affinity, and, mindful of the well-known osteological and other characters of this family, I have been led to examine other genera thereof, with the view of ascertaining if this retention is common to all its members. I find the veins of both sides well developed in two specimens (♂ and ♀) of *Bombinator bombinus*. Of five *Alytes obstetricans* examined (three ♂, two ♀), four showed no traces; in the fifth, however (a ♀), both veins were fully represented, but small. This was also the case in a ♂ of *Discoglossus pictus*. From this it must be assumed that the character is fairly distinctive of the Discoglossidæ.

Thanks to Prof. Huxley, I have had the opportunity of examining adults of *Pipa* (♂) and *Dactylethra* (♀). In neither of these could I observe a trace of the vessels in question; the specimens had been previously very much dissected, but should subsequent investigation upon fresh material (which I hope to carry out) substantiate this, the deductions of the afore-named authors as to the lowliness of the Discoglossidæ will receive striking confirmation.

These facts are, in themselves, sufficient to invest any Anura with a fresh interest, whose affinities with the Discoglossidæ have been suggested or called into question. Conspicuous among such is *Pelodytes*; and for an opportunity of examining this and other genera my best thanks are due to Mr. Boulenger, who has, with his customary generosity, afforded me unstinted aid. *Pelodytes* is held by Günther and Mivart[4] to be allied to the Discoglossidæ, and by others (Cope, Lataste, Boulenger) to the Pelobatidæ[5]. As I am unable to find any traces of the vein in two adult males of *Pelodytes* and one of *Pelobates*, I can but give my support to the latter view.

Finally, Hochstetter, in his earlier paper, describes an anastomosis between the hepatic sinus and the posterior cardinal veins in Elasmobranchs[6], which he holds to be tantamount to the formation of a vena cava inferior. This deduction is far too revolutionary to merit immediate adoption; the probability of its accuracy is, however, cer-

[1] Nat. Hist. Review, 1865; also Journ. of Acad. Nat. Sci. Philadelphia, vol. vi. 1866, p. 67.

[2] Catalogue of Batrachia Salientia, British Museum, 1882.

[3] *Ibid.* p. 444.

[4] P. Z. S. 1869, p. 280 *et seq.*

[5] For references, see Cat. Batr. Salientia.

[6] *Cf.* Jourdain, Ann. des Sci. Nat. 1859, series 4, vol. xii. Also quoted by Parker, of whose papers Hochstetter does not appear to have been cognizant. This is to be regretted, as the two differ on points of considerable interest.

tainly not lessened by current advance, for Boas has lately shown most conclusively[1] that the pulmonary artery is homologous throughout the vertebrate series.

2. Palæontological Contributions to Selachian Morphology. By A. Smith Woodward, F.G.S., F.Z.S., of the British Museum (Natural History).

[Received January 17, 1888.]

I. *On the Lateral Line of a Cretaceous Species of* Scylliidæ.

It has long been known that the canal investing the sense-organs of the "lateral line" in Selachian fishes attains, as a rule, to a considerably higher stage of development than in the Chimæroids. While in the latter the canal is merely an open groove, supported by a series of incomplete ring-like dermal calcifications, in the former it assumes a tubular character, opening externally by a row of small orifices, either in its own roof, or through short secondarily developed diverticula.

Only two undoubted exceptions to this rule appear to have hitherto been placed on record. The living *Echinorhinus* is shown by Solger[2] to have the lateral line in the form of an open groove, though this apparently is not supported by any minute calcifications; and very similar is the lateral line of *Chlamydoselachus*, as described by Garman[3]. The supposed Liassic Selachian, *Squaloraja*, may also be assumed to have exhibited a similar condition of this organ, the small half-rings originally supporting it being very clearly seen in several fossils recently described before this Society[4], and agreeing in every respect with those met with in *Ischyodus* and *Chimæra*. Both of the first-named genera, however, are of a comparatively primitive character, and *Squaloraja* shows several other marks of resemblance to the Chimæroids, so that the fact is not unexpected. But I have lately observed suggestive traces of a similarly embryonic lateral line in a most specialized modern type of Selachian; and as this appears to be an unlooked-for novelty, it may be deemed worthy of a brief note.

The Shark in question is a small fossil species, discovered in the Upper Cretaceous strata of Mount Lebanon, Syria, and provisionally assigned by Pictet and Humbert[5] to the genus *Scyllium*, under the

[1] "Ueb. d. Arterien bogen der Wirbelthiere," Morpholg. Jahrb. vol. xiii. 1887, p. 115. See also *ibid.* vol. vii. p. 488, and vol. viii. p. 169.

[2] B. Solger, 'Neue Untersuchungen zur Anatomie der Seitenorgane der Fische,' Archiv mikr. Anat. vol. xvii. (1880), p. 96.

[3] S. Garman, "*Chlamydoselachus anguineus*, Garm., a living species of Cladodont Shark," Bull. Mus. Comp. Zool. Harvard Coll. vol. xii. no. 1 (1885), p. 3.

[4] Smith Woodward, 'Note on the Lateral Line of *Squaloraja*,' P. Z. S. 1887, p. 481.

[5] F. J. Pictet et A. Humbert, 'Nouv. Rech. Poiss. Foss. Mont Liban,' p. 111, pl. xviii. figs. 2–4.

name *S. sahel-almæ*. It is an undoubted member of the Scylliidæ; the vertebral centra are distinctly asterospondylic; the body is much depressed, so that all the fossils display either the dorsal or ventral aspect; the tail is very long; the teeth are of the ordinary type; and some other distinctive features are shown. In one respect, however, it seems to differ from all known Scylliidæ. It is destitute of dermal shagreen; and on this account the peculiarity to be here noted is very conspicuous in the impressions upon the limestone.

On either side of the trunk and tail, at a short distance from the vertebral column, there is a delicate longitudinal streak, which, upon close examination, is found to consist of a series of minute ringlets, in their crushed state overlapping one another. Though in some parts obscure, these are very distinctly shown to be incomplete half-rings, and they are thus precisely similar to those already described by Leydig in *Chimæra*, and by myself in *Squaloraja*. They occupy the position of the lateral line in the fossil, and they are of the usual proportions, so that there can be no doubt as to the correctness of their identification. They are especially evident in one specimen in the British Museum, numbered 48107; but neither in this, nor in any other, have I observed an extension of the rings upon the cephalic region, a circumstance perhaps indicating that, as in *Chimæra*, the groove of the lateral line was partially closed in its anterior portion.

Whatever may be the significance of the facts just detailed, they are worthy the attention of biologists having the opportunity of examining the anatomy of recent Selachians. It is quite possible that the supports of the lateral line of *Scyllium sahel-almæ* are a surviving mark of affinity with the Chimæroids; it is equally possible that they may relate only to analogous mechanical contingencies. Further observations upon the characters of the "lateral-line" structures in Selachians with naked skins are much to be desired.

II. *On the Pelvic Cartilage of* Cyclobatis.

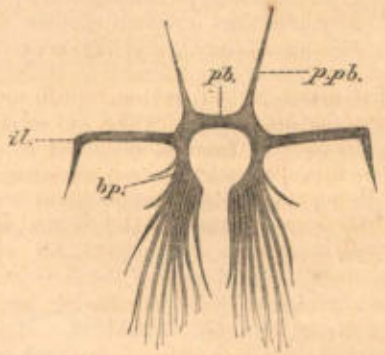
One of the most remarkable endoskeletal structures presented for consideration among extinct Selachians, is the pelvic cartilage of a small Sting-Ray (*Cyclobatis*), from the prolific Cretaceous fish-beds of Mount Lebanon. This does not appear to have been hitherto correctly interpreted, and as it may eventually prove to have a not unimportant bearing upon certain theoretical considerations, a brief description and separate figure will doubtless be acceptable to biologists. The fish was originally described as a fossil Torpedo by Egerton[1], but I have lately determined that it is almost certainly referable to the Trygonidæ[2].

As shown in the accompanying woodcut (p. 128) the transverse

[1] Sir P. Egerton, "Description of a Fossil Ray from Mount Lebanon (*Cyclobatis oligodactylus*)," Proc. Geol. Soc. vol. iv. pp. 442–446, pl. v.

[2] Smith Woodward, "Note on the Affinities of the so-called 'Torpedo' from the Cretaceous of Mount Lebanon," Geol. Mag. [3] vol. iv. 1887, pp. 508–510.

pubic cartilage in its median portion is straight and narrow, but becomes slightly broader and is angularly bent backwards at about one fourth of its total length from either extremity. From each angulation in front there projects forward a very long tapering prepubic process, rightly interpreted as such by Sir Philip Egerton in his original description of the fossil; and immediately in advance of the point of attachment of the basal cartilage of the pelvic fin on each side another larger process is seen to extend laterally. This is almost or quite as broad as the median portion of the pubic cartilage itself, and is directed outwards, without apparent tapering, to a distance equal to the entire transverse extent of the complete pubic element, when it bends backwards almost at right angles, and is half



Pelvic cartilage of *Cyclobatis oligodactylus*, from the Chalk of Mount Lebanon, Syria. *bp*, basal cartilage of pelvic fin; *il*, iliac process; *pb*, pubic cartilage; *p.pb*, prepubic process.

as long again, though rapidly narrowed to a point. This remarkable process was described by Egerton as the "proximal digit" of the pelvic fin, while Mr. J. W. Davis has recently[1] hazarded the suggestion that it "may have been the basal portion of a clasper." As, however, no sutural line can be observed at the origin of the cartilage, and as it is sometimes seen to be *dorsally* placed with respect to the other structures, there cannot be much doubt that it is the homologue of the well-known process named the iliac.

The enormous proportions of these processes in *Cyclobatis* appears at present inexplicable, the prepubic equalling no less than one sixth the entire length of the disk. No known Selachian, so far as I am aware, exhibits pelvic-arch processes of equal relative size, and in the living *Trygon* these are comparatively insignificant or absent[2].

[1] J. W. Davis, "Fossil Fishes of Chalk of Mount Lebanon," Trans. Roy. Dublin Soc. [2], vol. iii. 1887, p. 492.

[2] In the figure of the skeleton of *Trygon* given by Agassiz ('Rech. Poiss. Foss.' vol. iii. pl. n. fig. 1), a large ascending process is shown connecting the pelvic cartilage with the vertebral column. This must be an artist's error.

Professor Howes, however, has suggested to me that the great iliac prominences may have supported the metapterygium of the pectoral fin in the same manner as the antorbital (post-palatine) cartilage is related to the propterygium. The reflected tapering extremities are certainly best explained upon this hypothesis; and although the crushing to which the fossils have been subjected prevents the possibility of decisive proof, I venture to adopt this interpretation of the structures as at present the most plausible.

3. List of Mammals obtained by Mr. G. F. Gaumer on Cozumel and Ruatan Islands, Gulf of Honduras. By Oldfield Thomas.

[Received January 26, 1888.]

Mr. Salvin has asked me to put on record the names of the Mammals collected by Mr. G. F. Gaumer, (1) on Cozumel Island, situated off the east coast of Yucatan in 20° 30′ N. lat.; and (2) on the Bay Islands—*i .e.*, Ruatan with its companion Bonacca, off the north coast of Honduras, 16° 25′ N. lat., and 86° 25′ W. long. The specimens have been presented to the Natural History Museum by Messrs. O. Salvin and F. D. Godman, for whom they were collected.

I. *Cozumel Island.*

1. Nasua nasica, L.
2. Nyctinomus gracilis, Wagn.
3. Chilonycteris rubiginosa, Wagn.
4. Artibeus perspicillatus, L.
5. Didelphys marsupialis, L.[1]

II. *Ruatan and Bonacca Islands.*

1. Saccopteryx bilineata, Temm.	Ruatan.
2. Molossus obscurus, Geoffr.	Ruatan.
3. Glossophaga soricina, Pall.	Ruatan.
4. Artibeus perspicillatus, L.	Ruatan.
5. Sigmodon hispidus, S. & O.	Bonacca.
6. Dasyprocta punctata, Gray.	Ruatan.

A squirrel from the Island of Meco, on the north coast of Yucatan, was also obtained, and proves to be referable to *Sciurus hypopyrrhus colliæi*, Rich.

[1] As will be shown elsewhere, I consider this name applicable to all the large, long-haired Opossums hitherto known as *D. virginiana*, *D. cancrivora*, *D. aurita*, &c.

4. On a new and interesting Annectant Genus of *Muridæ*, with Remarks on the Relations of the Old- and New-World Members of the Family. By Oldfield Thomas, Natural History Museum.

[Received February 10, 1888.]

(Plate V.)

By the kindness of Prof. Alphonse Milne-Edwards I have been entrusted with the description of a specimen which has been in the Paris Museum for some years, where it has borne the unpublished name of "*Malacomys ferrugineus*," a name by which it has been incidentally referred to in print, and which therefore, so far as the species is concerned, I now retain in order to avoid confusion.

The genus may be termed

Deomys[1], g. n.

General external form as in *Mus*. Pollex with a narrow nail. Hind feet elongate.

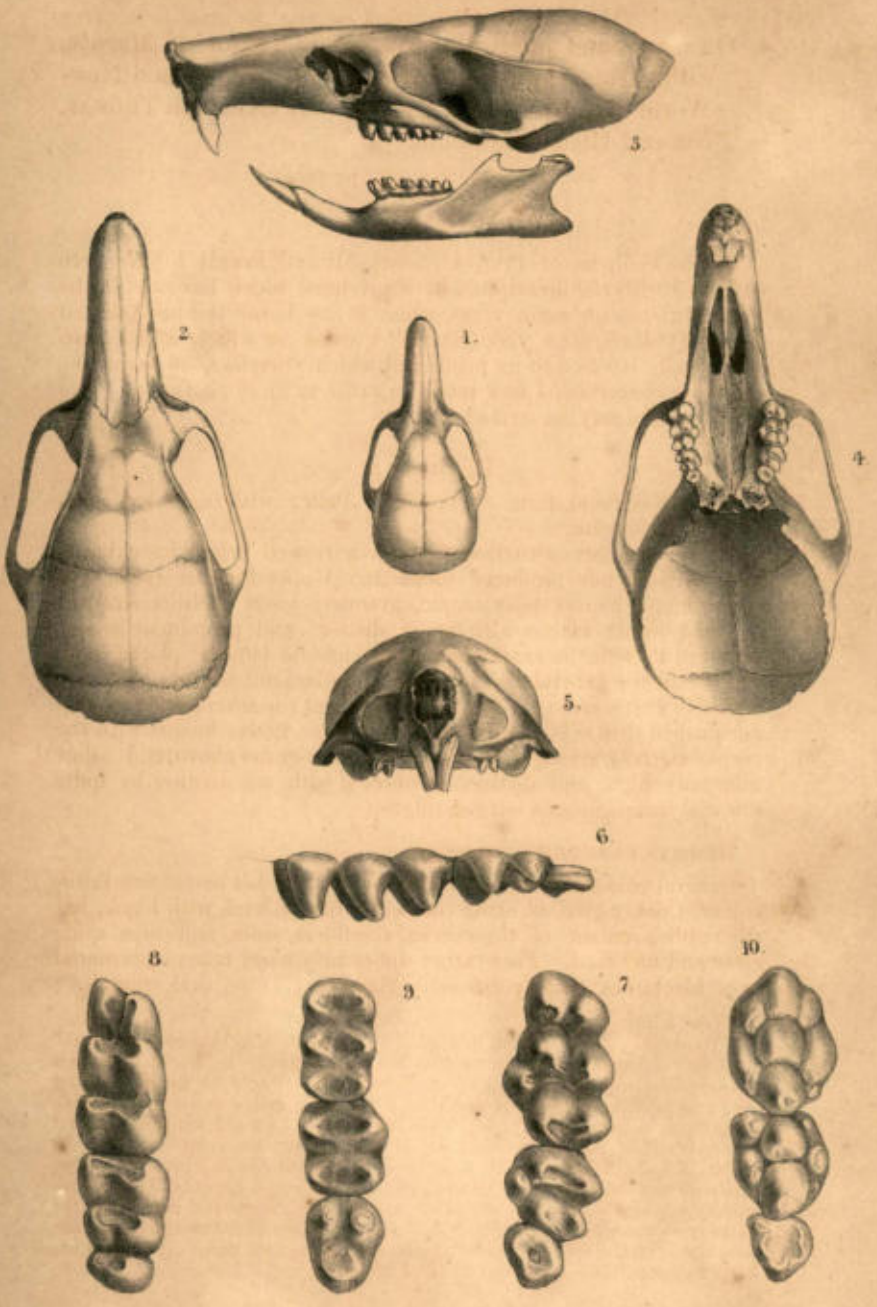
Infraorbital foramen triangular, not narrowed below, its external plate slender, not produced forwards. Upper incisors each with two minute, almost microscopic, grooves; lower incisors smooth. Anterior upper molars with seven distinct and prominent cusps, arranged 2–3–2, the extra one on the middle lamina[2] placed quite internal to the general series. Second molars not placed obliquely; with five cusps arranged 3–2, as in *Mus*, but the antero-internal cusp not pushed forwards in front of the others. Lower molars with the cusps biserially arranged as usual. All the cusps above and below unusually high and distinct, connected with one another by quite low and inconspicuous enamel ridges.

Deomys ferrugineus, sp. n.

General colour of head and body a clear pale red or reddish fawn-colour, thickly grizzled along the centre of the back with black, but the reddish colour of the cheeks, shoulders, sides, and hips quite clear and unmixed. Face rather duller in general tone; area round eyes black, not sharply defined. Ears very large, oval, rounded;

[1] δέω, I link.

[2] To avoid the too frequent use of such terms as the "anterior internal" cusp, or "central cusp of the middle lamina," it would be useful to have a simple formula for the naming of each cusp. This might be done by calling the three laminæ of m^1 A, B, and C, and their respective cusps 1, 2, and 3, counting from outside inwards. Thus the cusps just quoted would be A 3 and B 2 respectively, while one would say of *Deomys* that the cusp-formula of its m^1 was A 1, 2; B 1, 2, 3; C 1, 2, since it is without the A 3 present in *Mus*, and possesses the B 3 absent in the *Cricetі*. The same formula is of course equally applicable to m^2 or any other tooth. The reason for numbering the cusps from the outside inwards is that *Deomys* shows that the third cusp has been added on the inner side, and therefore that the two cusps of *Cricetus* are homologous with the two outer cusps of *Mus*.



Peter Smit. del. et lith.

Mintern Bros. imp.

DEOMYS FERRUGINEUS.

laid forward (in spirit-specimens), they would no doubt reach to or beyond the anterior canthus of the eye. Hairs of back nearly white at their bases, then slate-coloured, their tips reddish, or, along the centre, black. Whole of underside and inner sides of limbs pure sharply defined white, the back of the lower leg, however, slaty grey. Hands- and feet white. Feet long and slender; fifth hind toe (without claw) barely reaching to the base of the fourth; hallux reaching about to the level of the middle of the fifth. Soles quite naked, smooth, the pads small, rounded, prominent, only five in number, the postero-external one of the complete Murine set of six absent. Tail very long, slender, finely and distinctly scaled, the scales about 12 or 13 to the centimetre; its proximal half almost naked, with just a few minute hairs between the scales; these gradually increase in numbers, the terminal half being sufficiently thickly clothed for the scales to be nearly or quite hidden; colour of tail sharply bicolor from base to tip, above slaty grey, below white, the hairs and scales both so coloured.

Skull (Plate V. figs. 1–5) very light, slender, and delicate, with a very long narrow parallel-sided muzzle. Nasals not tapering backwards, but as broad behind as in the middle, their posterior margin directly transverse; frontal process of premaxilla not reaching to the level of the back of the nasals. Interorbital space broad, smooth, evenly convex, its edges with a slight but distinct beading. Zygomata but little expanded, very thin and weak, their two anterior roots, upper and lower, about equal both in thickness and length; the zygomata, therefore, commencing at a much lower level than in *Mus*, and the lower root entirely without the broad external projecting plate so characteristic of the typical *Mures*. Infraorbital foramen large, open, and rounded, not at all narrowed below. Palate narrow, its edges square and sharp-edged, continued behind the level of the last molar for about two millimetres; palatal foramina short, ending some distance in front of $\underline{m^1}$. Lower jaw unusually low, light, and slender.

Incisors orange above, yellow below, the upper ones narrow, flat in front, not bevelled; with two minute vertical grooves down the face of each. Molars with their pattern as already described; their cusps very high, pointed, and sharply defined; $\underline{m^1}$ as long as $\underline{m^2}$ and $\underline{m^3}$ together.

Dimensions of the type, an adult specimen, stuffed:—

Head and body 125 millim.; tail 172 (extreme tip imperfect); hind foot 33·8; ear (dried) 17; heel to tip of hallux 23, of fifth toe 25·5; to front of last foot-pad 17·8; to point between bases of third and fourth toe 26·6.

Skull:—basal length (c.) 29·0; greatest breadth 16·0; nasals, length 14·0, greatest breadth 4·0; interorbital breadth 6·7; interparietal, length (c.) 4·5, breadth 9·2; lower anterior zygoma-root, diameter 1·8; infra-orbital foramen, height 3·2, breadth (c.) 1·9; distance from outer corner of one foramen to that of the other 9·6; palate, length 18·5, breadth outside m^1 8·1, inside m^1 4·1; diastema, length 9·9; palatal foramina, length 5·2; length of whole upper

molar series 5·6, of m^1 3·5, of m^2 1·9, of m^3 1·0; lower jaw, length (bone only) 20·0, (to incisor tips) 22·0; vertical diameter of ramus below m^1 3·0, just behind symphysis 1·7; angle to tip of coronoid process 8·0; length of lower molar series 5·6.

Hab. Lower Congo (*M. Petit*).

The very special and unusual interest that this new genus possesses lies in the fact that it represents a "missing link" in the phylogeny of the Muridæ, as it is intermediate between the two great groups of that family, the *Mures* and *Criceti*[1]. The distinction between these two groups is, broadly, that the upper molars of the latter have their cusps arranged biserially, while in those of the former they are triserially placed. (Plate V. figs. 9 and 10.)

Deomys therefore (Plate V. fig. 7), with its bicuspidate anterior and tricuspidate middle lamina of $\underline{m^1}$, shows an intermediate condition between the two, and probably represents an early stage in the evolution of a triserially from a biserially arranged dentition. That it is not a later specialization of the Murine group through the loss of the cusp A 3 is shown by the very primitive characters present both in $\underline{m^3}$ and in the formation of the infraorbital foramen. In the complete systematic arrangement of the Muridæ, therefore, we shall have to look upon *Deomys* as forming by itself a special section, the *Deomyes*, intermediate between the *Mures* and *Criceti*.

From the distribution of the two latter groups, and the characters of their fossil allies, it has long been recognized by students of the subject that the *Criceti*, with their comparatively simple teeth, represent the original Muridæ, once spread over nearly the whole world[2], but now, owing to the competition of the more highly specialized *Mures*, almost confined to America and Madagascar, in each of which places they still form the only Muridæ. It has frequently been stated or assumed that they are *entirely* confined to these two parts of the globe, and on this assumption, without reference to the palæontological history of the group, great and altogether disproportionate stress has been laid upon their distribution as affording evidence of the more or less direct connection of the American and Madagascar faunæ[3]. As a matter of fact, no instance can better support Mr. Wallace's views[4] on the derivation, and especially on the undoubtedly American relationships, of the Madagascar fauna, since the three conditions on which his views are based—viz.: (1) the lowly nature and therefore considerable antiquity of the Madagascar forms, (2) their former wider distribution, and (3) their powerlessness to resist the competition of rival forms now paramount in Africa—are all conspicuously present in the *Criceti*, the group to which the

[1] This group has been called the "Sigmodontes" by most English and American authors; but that name should give way to "Criceti" for reasons shown below. See also Winge, Vid. Medd. 1881, pp. 25 and 54; E Museo Lundii, iii. p. 109 (1887).

[2] There is as yet no evidence of the former presence of any Cricetine form in the Australian region.

[3] *Cf.*, for example, Kolbe (SB. Nat. Freund. 1887, p. 147), whose remarks are based on Peters's account of *Nesomys* (*op. cit.* 1870, p. 54).

[4] 'Island Life,' p. 383 *et seqq.* (1880).

Madagascar Muridæ wholly belong. Thus Cricetine Muridæ, now at their highest development in America, were certainly paramount at one time in Africa, where the intermediate *Deomys* now occurs, as in other parts of the Old World, and have only recently (since the separation of Madagascar) been supplanted by the more highly specialized *Mures*. This supplanting, however, has never been quite completed, since in the Old World there still survive several Cricetine genera, mostly much modified (e. g. *Arvicola* and its allies), but in some cases with scarcely any appreciable changes at all (e. g. *Mystromys*, *Cricetus*, and, so far as its teeth are concerned, *Lophiomys*).

And this brings me to the second part of the subject, a part that for reasons of nomenclature is much to be regretted, but which obviously has to be investigated, namely, as to the amount of generic distinction actually existing between the Old-World *Cricetus* and the New-World *Hesperomys*. So far as I know, they have hardly ever been properly compared, being always presumed to be distinct in the absence of proof to the contrary. On trying to tabulate the differences, however, and keeping in mind at the same time the extent of variation found in the American species, I find that one by one they vanish into thin air, leaving no distinctive character whatever. The large cheek-pouches of *Cricetus* are commonly looked upon as a marked characteristic of the genus, but, although small, they occur, distinct and well developed, in many species of *Hesperomys*, especially in those from the extreme north [1]. The teeth of *Cricetus*, again, are very like those of many of the species of *Hesperomys*, especially if those of a "*Cricetulus*" (e. g. *C. phæus*) be compared with those of some of the species of "*Oryzomys*" [2], having similarly six paired cusps, while those of "*Vesperimus*" [3] have only five, the cusp A 2 being here obsolete or united with A 1. A still closer re-emblance, amounting in fact almost to identity, exists between the structure of the teeth in *Cricetus* and in the Dormouse-like subgenus *Rhipidomys* [4]. In the skull the shape of the infraorbital foramen, of the supraorbital ridges, and of the palate may be equally easily matched among the numerous and widely varying species of "*Hesperomys*." Finally the peculiar shortness of tail characteristic of *Cricetus* is almost, if not quite, equalled in the North-American subgenus *Onychomys* [5].

The inevitable conclusion is thus forced upon us that the genus *Hesperomys* must be abolished altogether, and the species united

[1] In the widely spread white-footed Field-Mouse of N. America (*Cricetus leucopus*, as it will now have to be called), northern specimens have deep and distinct cheek-pouches, while in southern ones they are, at least in spirit-specimens, almost inappreciable. See Allen, Bull. Mus. Comp. Zool. i. p. 229 (1869), and Coues, Mon. N. Am. Rod. p. 67 (1877).

[2] E. g. *Cricetus palustris* or *longicaudatus*.

[3] Among which are included *Cricetus leucopus*, *californicus*, *aureolus*, *taylori*, *michiganensis*, *truei*, *azteeus*, and *mexicanus*.

[4] See, for example, the teeth of *Cricetus* (*Rhipidomys*) *leucodactylus*, *latimanus*, *sumichrasti*, *mastacalis*, or *sclateri*.

[5] Of which the species are *Cricetus leucogaster* and *C. torridus*.

with the Old-World Hamsters under the name of *Cricetus*, the latter group, however, forming itself a subgenus, equal in rank to those now commonly admitted among the American Vesper-Mice.

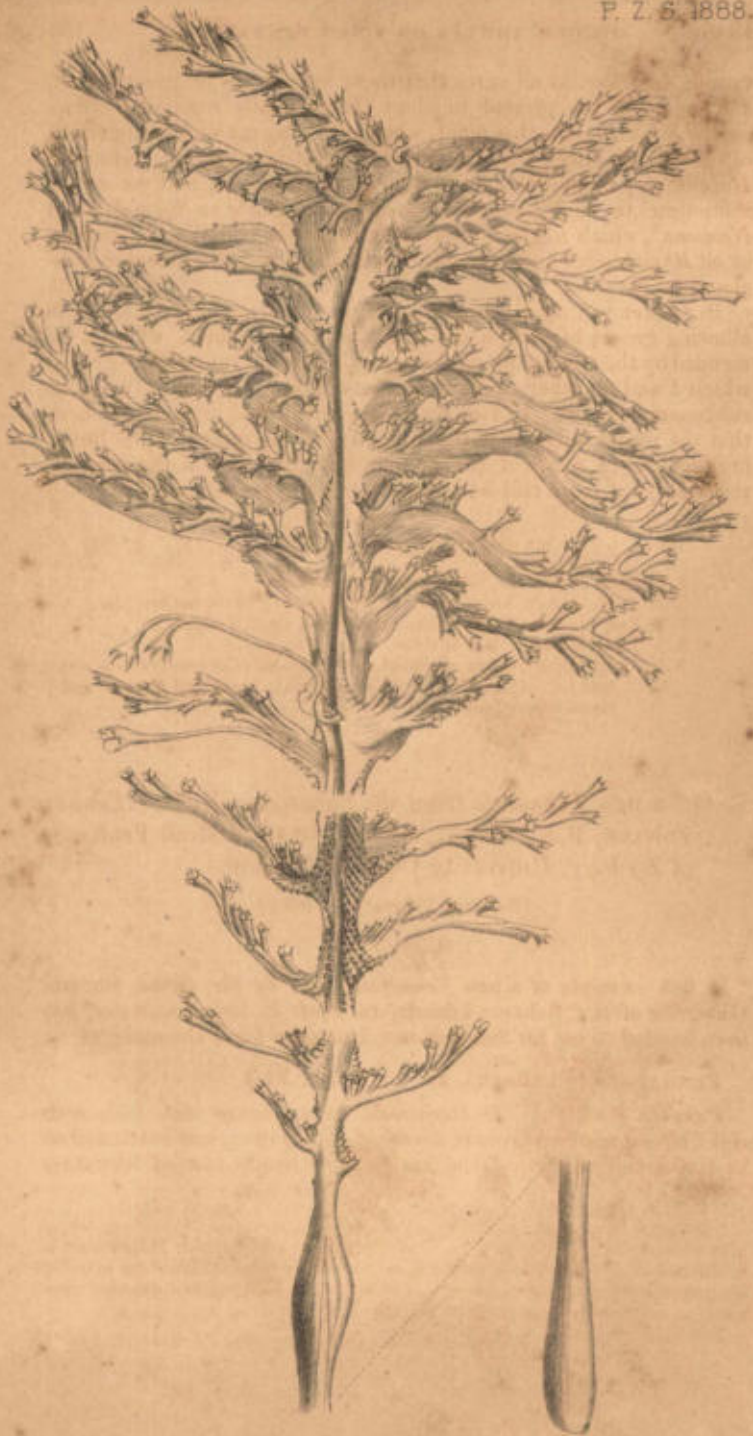
This change, large as it is, will be rendered rather less unacceptable by the consideration that the name *Hesperomys* [1] has itself, by the strict laws of nomenclature, no possible claim to adoption, being antedated not only by *Calomys* [2], Waterh., and the other earlier names of the same author, and by *Eligmodontia*, F. Cuv. [3], but also by *Akodon*, Meyen [4], founded on a now almost unrecognizable specimen belonging to Waterhouse's subgenus "*Habrothrix*." That this name would have been brought up and forced into use may be looked upon as certain, and in fact the first step in this direction has been taken by the substitution of *Akodon* for *Habrothrix* in Trouessart's list of Rodents [5]. From the point of view of nomenclature, therefore, the junction of *Cricetus* and *Hesperomys* is not so wholly a misfortune as it otherwise might have been.

As to changes in specific names, it fortunately happens that those used in the two genera have for the most part been different, the two species mentioned in the subjoined footnote [6] representing apparently all the necessary alterations.

Then as to the geographical distribution of the two forms, nothing is more natural than that a genus ranging all over America, from British Columbia to Cape Horn, should also be found, like the majority of the most typical North-American genera, in Siberia, China, and the Eastern Palæarctic Region generally.

With regard to the opinions of other authors on the relations of *Cricetus* to *Hesperomys*, it is interesting to find that in Dr. Winge's, recent careful and elaborate work [7] on the Rodents of Lagoa Santa, Brazil (a work in which the whole interrelations of the Rodents are freshly considered and described), the differences between *Cricetus* and *Hesperomys* are shown to be almost *nil* [8], and that in the Synopsis of the Muridæ he has had to separate the genera merely into those from the Old World and those from the New [9]. He does not, however, notice the necessity for actually uniting *Cricetus* with *Hesperomys*, no doubt because of the very different standard of generic rank he adopts. Thus he recognizes the well-known subgenera *Habrothrix*, *Oxymycterus*, *Scapteromys*, *Calomys*, and *Rhipidomys* all as full genera, and therefore naturally admits *Cricetus* also. I

[1] Zool. Voy. 'Beagle,' Mamm. p. 75 (1839).
[2] P. Z. S. 1837, p. 21.
[3] Ann. Sci. Nat. vi. p. 168 (1837).
[4] N. Act. Ac. Leop. xvi. p. 600 (1833).
[5] Bull. Soc. Sci. Anvers, 1880, p. 140.
[6] *Cricetus obscurus*, M.-Edw., nec *Hesperomys obscurus*, Waterh., may stand as *C. mongolicus*.
Cricetus longicaudatus, M.-Edw., nec *Hesperomys longicaudatus*, Benn., as *C. chinensis*.
Cricetus cinereus, Gerrard, Cat. Bones Mamm. B.M. p. 172 (1862), appears never to have been described, and does not therefore invalidate the specific name of my *Cricetus* (*Thomasomys*) *cinereus*, P. Z. S. 1882, p. 108.
[7] E Museo Lundii, vol. iii. 1887.
[8] *L. c.* p. 11. [9] *L. c.* p. 125.



A. Sterne ad. nat. del. J. Smit lith.

Mintern Bros. imp.

PENNATULA BELLISSIMA, sp n

cannot, however, at all agree that these groups are of generic rank, and prefer for the present to adopt the generally recognized views on the subject. On this point, when criticising my own arrangement of the Vesper-Mice[1], Dr. Winge writes[2]: "It is not right to recognize *Habrothrix*, *Oxymycterus*, and others as *subgenera*, and yet at the same time to admit *genera* of such a low grade as *Sigmodon* and *Neotoma*[3], which might almost be united to the Old-World *Cricetus*, or as *Rheithrodon* and *Ochetodon*, which do not even deserve subgeneric distinction."

In answer to this, I can only say that my error, if error it be, in allowing genera of such a low grade as these quoted, will not be mended by the recognition of more groups, of lower rank still,—groups which I and all other previous authors have only looked upon as subgenera at most. In fact on this point I feel, with Dr. Coues[4], that the proper way out of the difficulty will be rather by the lumping together of many of the present low-grade genera than by the recognition of more still less strongly marked generic groups.

EXPLANATION OF PLATE V.

Fig. 1. Skull of *Deomys ferrugineus*; natural size.
2–5. Ditto, upper, lower, side and front views; twice natural size.
6–7. Left upper molars of ditto; magnified about 7 times.
8. Right lower molars of ditto.
9–10. Left upper molars of one of the Cricetinæ (*Cricetus frumentarius*) and one of the Murinæ (*Mus mettada*); magnified about 5 and 7 times respectively.

5. On a new *Pennatula* from the Bahamas. By G. Herbert Fowler, B.A., Ph.D., Assistant to the Jodrell Professor of Zoology, University College, London.

[Received February 14, 1888.]

(Plate VI.)

A fine example of a new *Pennatula*, sent by Mr. Blake, the late Governor of the Bahama Islands, to Prof. E. Ray Lankester, has been handed to me for description: I propose for it the name of

Pennatula bellissima, sp. n. (Plate VI.)

Pennatula with 25–29 autozooids on a mature leaf, each with eight strong marginal spines, arranged in 2–3 rows, and continued on to the dorsal surface of the rachis as a single row of immature

[1] P. Z. S. 1884, p. 448.
[2] *L. c.* p. 144.
[3] I do not think that Dr. Winge can have had a specimen of *Neotoma* before him when writing this remark, as of all the groups of American *Cricetí* none is so distinct or so absolutely different from the rest as this is. The form in which his disparagement of *Sigmodon* and *Neotoma* is put, however, is a singular comment on the results of the present paper.
[4] Mon. N. Am. Rod. p. 32 (1877).

autozooids, which are devoid of tentacles. Siphonozooids richly set all over the ventral surface of the rachis except in the median ventral groove, one row running from this surface halfway up the concave borders of the leaves, while a second row passes dorsally and anteriorly between the leaves to meet with the row of immature autozooids on the latero-dorsal surface. Leaves triangular in outline, charged with long, fusiform, salmon-pink spicules.

The colony, as is so frequently the case with Pennatulida, is imperfect above, the top presumably having been bitten off and the wound scarred over. The dimensions given below are therefore in some points unreliable.

The *colour* of the greater part of the colony is of a beautiful salmon-pink, shading off to a whitish yellow on much of the stalk and rachis, and also in the centres of the leaves—parts where the spicules, to which the colour is due, are more thinly scattered.

The *stalk*, which expands slightly below, is on its upper third expanded into the bulbous enlargement so constantly met with in the genus, and is here of the same brilliant salmon-pink tint as the polyps and leaves. The *rachis* is marked both dorsally and ventrally by a deep groove which is entirely free both from siphonozooids and immature autozooids.

The *siphonozooids* (fig. 1) are placed mainly on the ventral surface of the rachis, where they are roughly arranged in oblique ventro-dorsal rows. They are especially massed at the bases of the leaves, from which points start two rows of siphonozooids, the one running about halfway up the concave (lower) border of the leaf itself; while

Fig. 1.

A young leaf showing the triangular shape, the dorsal row of immature autozooids, and the ventral row of siphonozooids appearing as small spikes. Natural size.

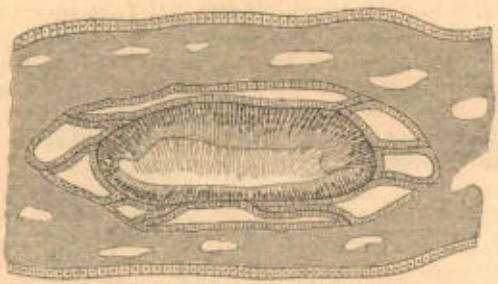
the other passes upwards on the rachis between the leaves, and, bending still further upwards, generally meets the line of immature autozooids at an acute angle on the latero-dorsal surface of the rachis, close to the line of attachment of the leaf next above. The siphonozooids are not separable into two types by size or other character, and are indistinguishable from the immature autozooids at the point

where the two meet. No lateral stripe of siphonozooids is to be found below the lowermost leaves. In transverse section the siphonozooids agree with that figured by Hickson (Phil. Trans. vol. 174, pl. li. fig. 10), and exhibit a strong siphonoglyphe (ciliated groove) at the abaxial end of the stomatodæum.

The *leaves* are placed very obliquely on the rachis, the line of attachment being dorso-ventral. They are approximately triangular in outline, the free sides of the triangle being slightly curved in the usual manner. While the lowermost leaves are placed slightly opposite to each other, those in the middle alternate, and the uppermost are again opposite. There are fourteen pairs of leaves in all, in the sole specimen; of these only the two lowest are rudimentary, that on the left side being less advanced in development than the corresponding one on the right. All the leaves are much contorted, a result probably due to death-struggles.

The *autozooids* (fig. 2) are borne on the uppermost (convex) edge,

Fig. 2.



Transverse section through an immature autozooid. The leaf is bounded above and below by ectoderm, underneath which lies the thick layer of mesoglœa (mesoderm), containing spaces filled by spicules previous to decalcification. The stomatodæum, suspended by the usual eight mesenteries in the cœlenteron, is lined internally by invaginated ectoderm, of which the lower (abaxial) three fifths are formed of long columnar cells, bearing stout cilia, and constituting a siphonoglyphe (*vide* p. 138). × 210.

and in a well-grown leaf are 25–29 in number, arranged in three rows, a median and two lateral. In a less mature leaf, such as that figured, they are fewer in number and form 1–2 rows only. They are 4–7 millim. in length, richly charged with the characteristic spicules, and surmounted by eight strong marginal spines, which may be 2 millim. long. Along the dorsal end of the convex border of the leaf they are continued as a row of *immature autozooids* of varying number, of which the foremost are placed on the rachis, and may even extend to the base of the leaf next above. As has been already stated, they generally meet at an acute angle with the row of siphonozooids which runs upwards from the ventral surface between the leaves.

The appearances seen in a transverse section of the immature autozooids are of some interest, and bear out the conclusions of Hickson (*loc. cit.*) and of Wilson ("Development of *Renilla*," Phil. Trans. vol. 174, p. 723). These immature polyps are not as yet provided with tentacles, but possess stomatodæa and the usual eight mesenteries. Of these latter, the two axial (dorsal) mesenteries, in the youngest autozooids, as in the mature siphonozooids, alone exhibit mesenterial filaments of the characteristic bilobate shape; the cells of which the lobes are constituted contain deeply staining nuclei, and histologically agree with the ectoderm of the stomatodæum from which they are derived. As was shown by Hickson, no siphonoglyphe is recognizable in the mature autozooids of *Pennatula*; but in the youngest autozooids, which are much compressed at right angles to the usual direction (*i. e.*, in an axial-abaxial plane), I find that the whole of the abaxial side of the stomatodæum is clothed by very long columnar cells, with numerous deeply staining nuclei, and bearing long stout cilia, these appearances being entirely characteristic of a siphonoglyphe; this region is marked off from the remaining three fifths of the stomatodæum by a ridge on either side, and constitutes indisputably a true siphonoglyphe. The somewhat older autozooids, which are nevertheless hardly mature, exhibit filaments on the lower six, as well as on the axial two, mesenteries; these filaments are of endodermic origin, and consist merely of an aggregation of pyriform cells, resembling those figured by Wilson (*l. c.* pl. lx. figs. 145, 146), but more swollen. Proportionately to their age and development, the siphonoglyphe of the autozooids becomes less and less marked, till in the fully mature polyps no trace of it is to be recognized.

This occurrence of a siphonoglyphe in the ontogeny of the autozooids is a point of some considerable interest. Knowing so little as we do of the stimulus that causes a developing ovum to recapitulate its ancestral history, we should hardly be justified in asserting that such recapitulation might not also occur in asexual reproduction. The colonial ancestor of the Octactiniæ (Alcyonaria) resembled the existing *Alcyonium* in the absence of dimorphism and the possession of a siphonoglyphe; morphological differentiation, correlated with division of labour, resulted, among such descendants as the *Pennatulida*, in the production of autozooids (nutritive and sexual polyps, devoid of a siphonoglyphe) and of siphonozooids (circulatory or respiratory polyps, incapable of generation and of nutrition, but provided with a strong siphonoglyphe in order to effect the circulation of "chylaqueous fluid" through the colony). If then, as appears to me to be the case, the very considerable size and number of the siphonozooids contrasted with the paucity of the immature autozooids, together with the loss of the siphonoglyphe as maturity is attained, point to the functional uselessness of this organ in the young buds, we are driven to the conclusion that we have here to deal with a case in which asexual ontogeny is repeating phylogeny.

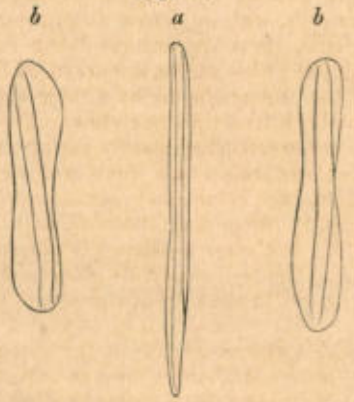
As was described by Wilson (Mitth. Zool. Sta. Neapel, v.) in the buds of *Renilla*, the two axial mesenterial filaments appear before

the remaining six, and supply the young polyp with nutritive fluid from below; this possible function of the siphonoglyphe is therefore forestalled. Further observations on similar conditions—gemmation, fission, reproduction of lost parts, &c.—are much to be desired.

The *spicules* in the polyps, leaves, and rachis, are long and fusiform, and apparently triradiate in section (fig. 3 *a*); they are very long, measuring from ·8 to 1·5 millim. Those which colour the bulbous swelling on the stalk (fig. 3 *b*) are dumbbell-shaped, and apparently surmounted by a strong ridge; they measure about ·14×·01 millim., and are less strongly tinted than those of the feather. The *axis*, which is less hard than is generally the case, is triangular in section and bent in a hook below.

Of *Pennatulæ* previously described, the present species comes

Fig. 3.



a. Fusiform spicule, distributed over the feather and rachis, × 47; *b*. Dumbbell-shaped spicules from the bulbous swelling of the stalk, × 210.

nearest to *P. naresii* (Kölliker, 'Chall.' Rep. Zool. vol. i. p. 2, pl. i. figs. 1, 2). From this, however, it differs in the number of the rudimentary leaves, the absence of wart-like protuberances on the concave border of the leaf, the freedom of the mid-dorsal line of the rachis, as also in several other points; while the row of immature zooids is characteristic of both forms.

At two points easily recognizable on the left-hand side of Plate VI., parts of two leaves have apparently been nibbled away, producing a marked hypertrophy of the remaining polyps.

The dimensions are given in tabular form:—

	millim.
Total length (incomplete)	178
Length of rachis	118
Diameter of rachis	9
Breadth of feather	70
Length of stalk	60
Diameter of stalk	4

	millim.
Diameter of bulbous swelling	7
Length of leaf	45
Width of leaf at base	12

The specimen will be deposited in the British Museum, for purposes of reference.

EXPLANATION OF PLATE VI.

The figure, which is about one sixth larger than the specimen, is from the dorsal aspect, except for an intercalated fragment near the base of the feather, which represents a ventral view. For the drawing I am indebted to the skill of Miss Stone.

March 6, 1888.

Professor Flower, C.B., LL.D., F.R.S., President, in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of February 1888:—

The total number of registered additions to the Society's Menagerie during the month of February was 104. Of these 9 were by birth, 74 by presentation, 12 by purchase, 4 by exchange, and 5 were received on deposit. The total number of departures during the same period, by death and removals, was 117.

The most noticeable additions during the month were:—

1. A second specimen of Griffith's Fox (*Canis griffithi*), from Bussorah, deposited by Mr. H. Hannaer, F.Z.S.

This specimen is rather smaller than the example from Afghanistan, received from Sir O. B. St. John in December last (see *suprà*, p. 1), but is otherwise nearly similar.

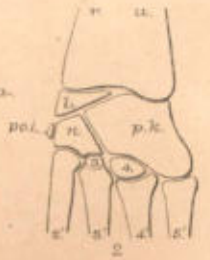
2. Four examples of a small and very beautiful Finch (*Erythrura psittacea*) from New Caledonia, purchased February 15th. This species is new to the collection, although we have previously had examples of an allied form, the Fire-tailed Finch (*Erythrura prasina*) from Java.

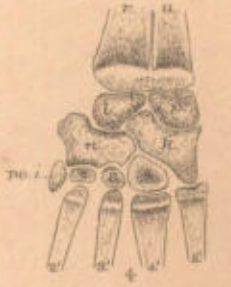
3. Five examples (two cocks and three hens) of the fine Pheasant which I have described and figured in the Society's 'Proceedings' (1885, p. 322, pl. xxii.) as *Phasianus principalis*, presented by Major W. Peacocke, R.E., of the Afghan Frontier Commission, and received February 27. Major Peacocke's specimens were captured at Akcha in Afghan-Turkestan, on the 25th January last, and were brought home at the special request of Sir Peter Lumsden, F.Z.S., who had called Major Peacocke's attention to the desirability of introducing living examples of this splendid Pheasant into Europe.

The Secretary exhibited, on behalf of Lt.-Col. H. M. Drummond-Hay, a specimen of the Desert Wheatear (*Saxicola deserti*), killed near Arbroath, in Scotland, on the 28th of December, 1887, being the third instance of the occurrence of this bird in Great Britain.

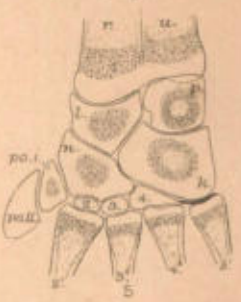
The following papers were read:—

Pipa americana.

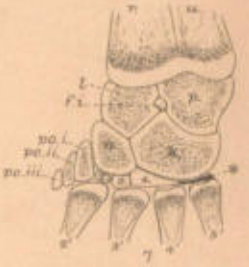




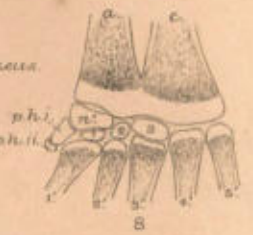
Xenopus lævis.

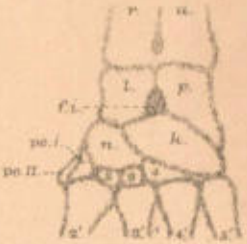


Discoglossus pictus.

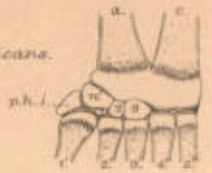


Bombinator igneus.





Alytes obstetricans.

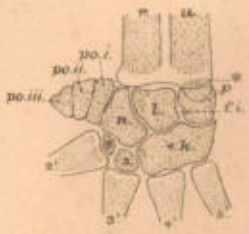


W. Ruxwood del. ad nat.
Parker & Coward lith.

West, Newman & Co imp.

Carpus & Tarsus of Aglossa & Discoglossidæ.

Pelodytes punctatus.



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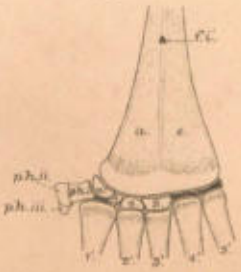

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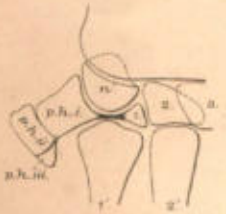

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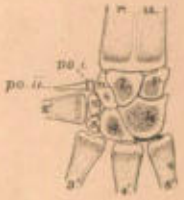
Xenophrys monticola.



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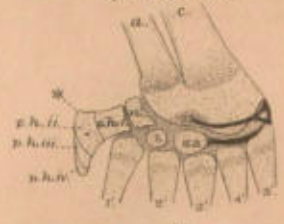
16

Hyla caerulea.



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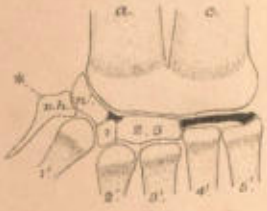
Pelobates fuscus.

18

Phyllomedusa dacnicolor

19 a.

Xenophrys monticola.



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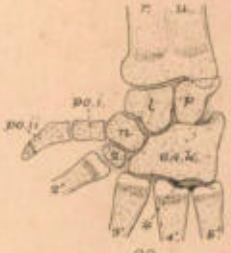
Hyla caerulea.



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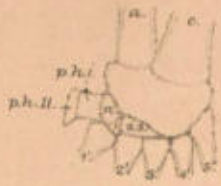
W. Ridewood del. ad nat.
Parker & Coward lith.

Hyla arborea.



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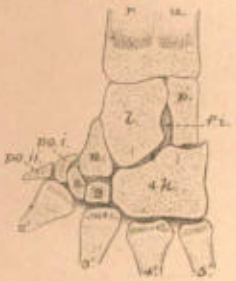
Pseudophryne bibronii.



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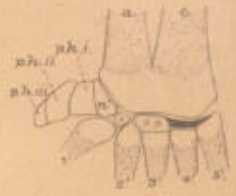
West, Newman & Co. imp.

Carpus & Tarsus of Pelobatidæ, Hylidæ, & Bufonidæ (Pseudophryne)

Leptodactylus pentadactylus.

Bufo calamita.



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Ceratophrys ornata.

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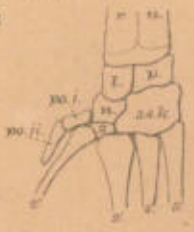

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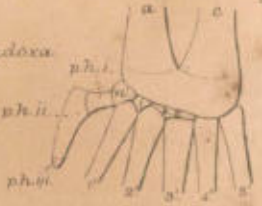
Pseudis paradoxa.



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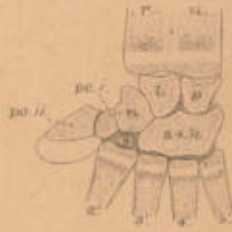

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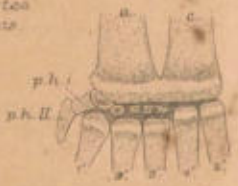
Limnodynastes Tasmaniensis.



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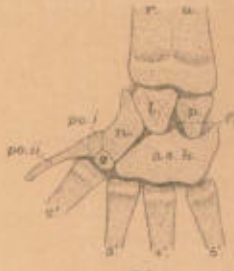

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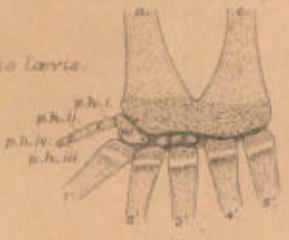
Physiaulus lævis.



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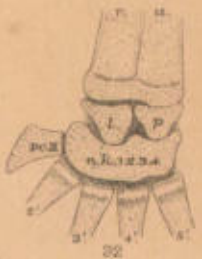

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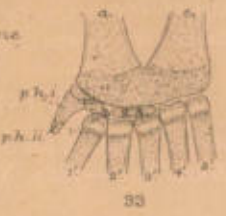
Rhombophryne testudo.



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W.Rideout del.et lith.
Parker & Coward, Imp.

West, Newman & Co. imp.

Carpus & Tarsus of Bufonidæ, Cystignathidæ, & Engystomatidæ.

1. On the Carpus and Tarsus of the Anura.

By G. B. Howes, F.Z.S., F.L.S., Assistant Professor of Zoology, Normal School of Science and R. School of Mines, and W. Ridewood.

[Received March 6, 1888.]

(Plates VII.–IX.)

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I. INTRODUCTION.

a. General.—While, during the last few years, the researches of

Wiedersheim and his pupil Kehrer, and of Baur (1), have added considerably to our knowledge of the limb-skeleton of the Urodela, that of the Anura has received much less attention. The most important investigations recorded since the classic of Gegenbaur (18) are those of Born (3, 5). Brühl has published (11) figures of a somewhat extraordinary character, pertaining to some seven or eight genera; but concerning these we have little to say, except that we fully endorse Born's criticisms and corrections of them (6, pp. 4 *et seq.*).

Born's latest communication purports to be somewhat revolutionary, so far at least as the carpus is concerned (6, p. 62). It will be seen, however, in the sequel, that we are unable to accept his determinations; and as the discovery of new elements and relationships has led us to differ from most of our predecessors, in our estimate of the morphological value of leading elements of both carpus and tarsus, it is binding upon us to preface this paper with an account of those observations upon which our dissensions are based. In accordance, then, with the exigencies of the case, we shall divide the paper into two sections: viz.:—firstly, a *general part*, in which will be given a review of the morphology of the carpal and tarsal elements, together with a detailed account of those hitherto unrecognized structures, whose discovery has necessitated a redetermination of the value of any one or more constituents; and, secondly, a *special part*, in which the leading families will be taken successively, the characters of the carpus and tarsus of each being noted in the light of the preceding section, and special peculiarities dealt with.

b. *Nomenclature.*—Our investigations do not profess to be exhaustive; they leave much to be settled, and we have accordingly refrained from introducing a nomenclature which might embody a premature expression of homological relationships with the limbs of other animals. In dealing with elements whose morphological value remains in the least degree doubtful, we have, for these reasons, adopted the nomenclature of Ecker (17) as being the more empirical and better suited to our purpose than the alternative one of Dugès (16).

In describing the pre-hallux (calcar), we have, in order to facilitate comparison with the works of our predecessors, adopted the older system of nomenclature, calling the outermost digit the fifth, the innermost one the pre-hallux or calcar, and that next to it the hallux or first digit.

New terms have been introduced only where unavoidable; and some of these are, for reasons already given, purely empirical.

c. *Material.*—It will be seen, from the second part of the paper, that we have examined the limbs of 37 genera and 60 species—adequate representatives of all the leading families as defined by Boulenger (7), with the exception of the *Dyscophidæ*, *Dendrophryniscidæ*, *Amphignathodontidæ*, and *Hemiphractidæ*. For these specimens our grateful acknowledgments are due mainly to Prof. Huxley, and to Mr. G. A. Boulenger of the Natural History Museum. To the last-named gentleman we are indebted for further

aid and advice always most cheerfully given; while we have to tender thanks to Prof. W. K. Parker for useful specimens, to Prof. Wiedersheim of Freiburg for the limbs and a larva of *Pipa*, to Prof. W. N. Parker for some exquisitely preserved tadpoles of the Common Frog, and to Dr. G. Baur, of New Haven, Conn., for suggestions and advice.

Some of our best results have been obtained from feet in which ossification was just commencing (ex. fig. 5). At this stage the outlines of the cartilages are more clearly defined than at the earlier ones (*cf.* fig. 9), while there is a total absence of any distortion or displacement consequent upon complete ossification (*cf.* figs. 5 & 6). Identification of this stage by external appearances is very difficult; absolute size, moreover, gives no clue to it, for while in a *Xenophrys* measuring 27 millim. from mouth to vent (fig. 14) all expectations were realized, in a *Brachycephalus* of 20 millim. ossification was found to be complete.

d. *Methods.*—We early discarded the section-cutting method employed by Born (3, 6), chiefly because the results finally arrived at were less satisfactory than those obtainable from clarified preparations. Clarification in potash solution (kindly suggested to us by Prof. Wiedersheim) was tried, but relinquished, chiefly on account of the difficulties experienced in mounting the preparations. Better results were arrived at by clarifying in a mixture of glycerine and potash, and mounting permanently in glycerine jelly; but our best results were all obtained by the use of clove oil, which offers additional advantages in allowing the preparations to be stained. Borax-carmine solution proved most serviceable as a dye; less successful preparations were, however, obtained with picro-carmine, hæmatoxylin, and bismarck-brown.

Our method of procedure was generally as follows:—The limb having been carefully skinned, the larger muscles were dissected off, in order to facilitate staining. The preparation was next immersed for about ten minutes in borax-carmine, and then transferred to acid alcohol (75 parts alcohol, 3 parts HNO_3, and 22 parts water), in order that superfluous stain might be removed; after dehydration in absolute alcohol, it was allowed to remain in oil of cloves. The final process consisted in carefully picking away the soft parts, little by little, with two pairs of small forceps under a simple microscope, while the preparation was still immersed in a glass trough of clove oil. The smaller preparations were ultimately mounted in Canada balsam.

The above method admits of an examination of all parts in the undisturbed state, and consequently of an accurate determination of the relationships of apposed surfaces, such as is not possible with any other. Moreover, in that ossific centres, lines of fusion, furrows, or outstanding processes are rendered equally obvious, it is manifestly not open to objections which might conceivably arise out of exclusive reliance upon the section-cutter's art.

II. GENERAL PART.

Hind Foot.

a. *Metatarsals and Phalanges.*—Setting the pre-hallux aside, the 1st, 2nd, 3rd, 4th, and 5th digits bear, in most genera (*cf.* footnote on p. 178) respectively 2, 2, 3, 4, 3, phalanges, the 4th, or outermost digit but one, being the longest. *Pipa* is alone exceptional, for in it the 3rd exceeds the 4th in length.

b. *Astragalus* (*a.*) *and Calcaneus* (*c.*).—These two elements were already greatly elongated in the youngest specimens in which their presence could be detected. When fully formed, the two bones are generally uniform in length; they are relatively longest in the Tree-Frogs, shortest in *Pelobates*. When of unequal length, the pre-axial bone, or astragalus, is the shorter.

Wiedersheim has shown[1], in *Rana esculenta*, that the arteria interossea perforates the membrane passing between these two bones, dorso-ventrally, to reach the plantar surface of the foot. *Pelodytes* is alone exceptional, among all the genera which we have examined, in the fact that its astragalus and calcaneus have become greatly elongated subsequent to complete fusion (Plate VIII. fig. 12), in a manner strikingly suggestive of the tibia and fibula. The above-named artery, however, remains true to its original relationships, a small foramen (*f.i.*, fig. 12) being left for its transmission. In this, as in all other genera, neither the astragalus nor calcaneus (however much modified) ever undergo any sort of rotation; they lie side by side, invariably complanate with the tibia and fibula.

Wiedersheim has shown further[2] that in the Urodela (*Ranodon, Salamandrella, Cryptobranchus*) a blood-vessel perforates the tarsal region apparently, at first sight, in the manner of the above-named artery of the Frog. Baur has more recently recorded the same fact for *Necturus* (1, pl. i. figs. 12 & 17). Hyrtl, describing the vascular system of *Cryptobranchus*, says of the crural artery[3]:—"horum ossium bina, cui nulla articulatio intercedit, et quae potius textu fibroso in unum quasi corpus conjungitur, arteriae nostrae commodam praebet occasionem, trajecta syndesmosi intertarsea, *ad dorsalem tarsi regionem emicandi*, quo territorio semel potita, illico in duas, paullo post in quatuor arterias digitales communes dorsales dilabitur, binorum digitorum interstitiis destinatas." There can be little doubt but that this description applies to the vessel noted by Wiedersheim. In that it passes ventro-dorsally, however, it differs *in toto* from that of the Frog, but in this it agrees just as closely with the arteria brachialis of the fore limb of that animal (*cf.* p. 156). These facts tend to show that the perforation in question (*foramen intertarsi*, [auct.]) is probably not homologous with either that of the Urodele hind foot, or that of the fore foot in the Frog itself; if

[1] Anatomie des Frosches, Ecker and Wiedersheim, Part II., Brunswick (1881), p. 86.

[2] "Die ältesten Formen des Carpus und Tarsus d. heutigen Amphibien," Morph. Jahrb. vol. ii. (1876), pp. 421–435.

[3] Cryptobranchus Japonicus, Schediasma anatomicum. Vindobonae, 1865, p. 113.

so, the arteria interossea will not help us in the least in estimating the morphological value of the astragalus and calcaneus.

Wiedersheim asserts (36, p. 211) that in the astragalus we have "ein vereinigtes Tibiale und Intermedium." Gegenbaur (18) and Born, on the other hand, are inclined to regard the tibiale as its sole representative. Proof of the former statement is not forthcoming; and in spite of the most diligent researching, we have been unable to discover, at any stage, the remotest trace of anything at all comparable to a third proximal tarsal. Future research may, perhaps, demonstrate its existence; but, mindful of the elongation of the earliest rudiments of these elements, we incline to the belief that the missing one (? intermedium) has disappeared beyond all recognition, even during the embryonic period.

c. *Tarsalia* 4 *and* 5.—In no Anuran foot hitherto described have there been recognized more than three distal tarsal elements (tarsalia). Examination of the Plates will show that when these remain distinct they are directly associated with the hallux and the two next digits (ex. Plate VII. figs. 8 and 10). The tarsalia of the two outermost digits (4th and 5th) would thus appear to be absent. Gegenbaur first drew attention to the existence, in certain genera, of a ligament (figs. 10, 17, and 19) which passes between the tarsal of the third digit and the head of the fifth metatarsal. He described its relations minutely (18, p. 61), and concluded that "er repräsentirt in ligamentösem Zustande Theile, die unter anderen Verhältnissen als Knorpel gebildet sind." This structure has been recorded in *Hyla*, *Rhinoderma* (Gegenbaur), *Pelobates* (Gegenbaur, 18; Bayer, 2), *Discoglossus* (Wiedersheim, 36, p. 211), and others, and to the list we are able to add (*cf.* Part II.).

Born says of *Phryne* (*Bufo*[1]) *vulgaris* (3, p. 444) "im Bandpolster unter der Basis von Metatarsale IV. traf ich einmal einen deutlichen Rest von Knorpelgewebe, was die Gegenbaur'sche Deutung dieses Bandes als Homologon eines Tarsale IV. durchaus bestätigt." We find that in the adult of *Alytes obstetricans* this ligament (fig. 10) carries a well-marked nodule of cartilage, which lies between the applied heads of the 4th and 5th metatarsals. That this represents one of the missing tarsals is hardly to be doubted from its relationships, but, from its position, it is difficult to say which. Gegenbaur goes on to assert (p. 61), "wenn man das auf ein blosses Ligament reducirte Tarsusstück einem der bei den übrigien Amphibien nachgewiesenen Elementarstücke vergleichen will, so kann man in ihm nur nach Massgabe der Betheiligung des Metatarsus das Tarsale 4 und 5 erkennen, welches bei den Tritonen schon durch ein einziges Stück dargestellt war." In *Bufo*, *Hylodes*, and *Hyla* (Plate VIII. fig. 19) the ligament enters into an extensive connection with the head of the fifth metatarsal, like that originally figured by Gegenbaur (18, pl. 4. fig. 13) for the first-named genus. It fuses (fig. 23) with the postaxial articular border of this bone, and the head of the same is seen to be obviously enlarged as the result of its attachment[2]. It becomes a question of considerable interest, therefore,

[1] See Boulenger (7, p. 303).

[2] Cf. *Xenophrys*, Plate VIII. fig. 17.

whether this enlargement may or may not represent a coalesced 5th tarsal (as, indeed, Gegenbaur was inclined to believe, pp. 64–65). We have failed to detect any trace of segmentation of the cartilage at this point. In the *Hylidæ*, however, a second ligament is present, which passes (fig. 19) from the postaxial wall of the capsule of the tarso-metatarsal joint, upwards and inwards, for attachment to the epiphysial cartilage of the astragalus and calcaneus. This ligament carries at its outer end a wedge-shaped cartilage, and that we at first took to represent the fifth tarsal. Upon reconsideration, however, we are disposed to regard it as an ordinary intra-articular cartilage of none but physiological significance (for further details see p. 168). Reflection upon these facts has led us to the belief that while the ligament which passes between the third tarsal and the head of the 5th metatarsal is the degraded representative of the 4th and 5th tarsalia, the cartilaginous nodule occasionally carried by it is exclusively a vestige of the 4th one. Gegenbaur records the presence of this ligament in *Rana esculenta*, in addition to the other genera named, and we can confirm his statement. In *R. temporaria*, however, we find no trace of it in the adult, and but a feeble one in the larva. This fact, while lending additional support to Gegenbaur's original deduction, shows how completely the vestige is, as it were, disappearing under our eyes.

d. *Tarsalia 2 and 3 (Os cuboideum)*.—We have already stated that three tarsal elements may exist; on the other hand, the outermost two of these may not unfrequently be replaced in a long bone (cuboideum), represented in its typical condition at $^{2\ 3}$ in figs. 17, 24, 27, 29, 31, & 33. It will be observed in all these cases that this structure overlies, more or less completely, the metatarsalia of the 2nd and 3rd digits; comparison of the same with those forms in which the three tarsalia are found (*Bombinator* or *Alytes*, figs. 8 & 10) leaves little doubt but that the bone represents a confluence of the tarsalia of the 2nd and 3rd digits, as asserted by all recent authorities.

In some cases, however, examination of the adult limb would appear to render this questionable. For example: in *Hyla cærulea* (fig. 19), in which two tarsalia are alone present, the larger one is little, if at all, related to the 2nd metatarsal—the head of which is in apposition with the second and smaller element. Comparison of this tarsus with that possessed of the three tarsalia (figs. 8 & 10) renders it hard, indeed, to say which two elements are represented in the Tree-Frog. Born has already experienced this difficulty in dealing (6, p. 443) with the adults of *Phryne vulgaris* and *Bufo variabilis*, and he admits his inability to settle the question, for want of embryological material.

On turning to the larva of *Hyla* (fig. 21), we find that the outer of the two elements has (unlike that of the adult) more than twice the bulk of its fellow, while it agrees in every detail with the cuboideum in its most typical form (cf. *Xenophrys*, fig. 17). Examination of this element side by side with that of the adult limb (fig. 19) shows that its growth is arrested early in development: it shows,

further, that the connection between the innermost tarsal (1) and the head of the second digit is purely secondary, and that the first-named is really the tarsal of the hallux, displaced, as it were, in sympathy with its dwarfed neighbour.

Ecker speaks (17, p. 61) of the cuboideum in *Bufo* as consisting of two pieces. We find that in that genus, as in *Leptodactylus*, a similar shortening up of this bone takes place (*cf.* fig. 23); there can be little doubt therefore that Ecker was misled by that, precisely in the manner indicated above.

The cuboideum, then, must be held to represent the confluent tarsalia 2 and 3. We have to record its presence in the *Ranidæ*, *Dendrobatidæ*, *Engystomatidæ*, *Cystignathidæ*, *Bufonidæ*, *Hylidæ*, *Dactylethridæ*, and *Pipa*.

e. *Tarsale* 1 (*Hallux tarsal*) (1).—This element is of very constant occurrence. Its relations in the *Discoglossidæ* are exceptional and, as will be shown below (figs. 8 & 10), interesting; it lies in them under cover of the naviculare (*n'*), interposed between it and the 1st metatarsal. Gegenbaur appears, in dealing with *Bombinator*, to have mistaken the naviculare for the first tarsal (18, pl. 6. fig. 11); but this is not to be wondered at, in consideration of the small size of the latter. It is wanting as a distinct element in old specimens of *Nannophrys* and *Phryniscus*, and we have found that it fuses in both genera with the naviculare. Born has described and figured it accurately in *Rana esculenta*. Concerning *R. temporaria* he says (3, p. 441) that it "immer in Laufe der Ontogenese bis auf unerhebliche Spuren schwindet." Strictly speaking, this is not the case, for we are in possession of old examples in which it had persisted as a distinct element (woodcut, p. 176, fig. C, *1*). We are inclined moreover to believe that instead of undergoing suppression, as Born imagines, it more probably fuses with the naviculare as in the two above-named genera.

f. *Naviculare and Pre-hallux tarsal.*—Ecker regarded the naviculare of these animals as analogous (17, p. 61) with the element so named (centrale) in the tarsi of the higher animals. Gegenbaur, on the other hand, who, as before stated, confused it with the hallux-tarsal, sums up his conclusions in the words (18, p. 67), "ein Centrale fehlt." Born adopts this view; but he differs from Gegenbaur in that he regards the naviculare as the basal segment (tarsale) of the pre-hallux. He writes (3, p. 448), "von diesen [segments of the pre-hallux] liegt der erste in einer Reihe mit den Tarsalknorpeln, welche Metatarsusträger sind, ahmt dieselben in Form und Structur nach und ist von den Autoren auch, wie erwähnt, immerals 'typischer' Tarsalknorpel aufgefasst worden." Born's determination has been adopted by all subsequent writers. It will thus be seen that the two views entertained as to the morphological value of the naviculare are diametrically opposed, and that a settlement of their differences is indispensable to the full determination of the value of the distal preaxial elements. We have already drawn attention to the fact that the naviculare of the *Discoglossidæ* (ex. *Bombinator*, fig. 8, *Alytes*, fig. 10) is wedged in

between the first tarsal and the astragalus, being in fact absolutely central and in a position which cannot, by any stretch of imagination, be said to be "in einer Reihe mit den Tarsalknorpeln." It would be more correct to say that the 1st metatarsal, 1st tarsal, and naviculare are here disposed lineally.

Examination of the Plates will show that the relative size of the naviculare is in no way proportionate to that of the pre-hallux, as might be expected were Born's hypothesis tenable (*cf.* figs. 3, 10, 12, & 17); it is rather the reverse. Choice appears to lie between two alternatives: the naviculare has either grown in and displaced the hallux tarsal proximally (as the *Discoglossidæ* would suggest, figs. 8 & 10, in which case the condition of the latter would, in this family, be secondary) or it has undergone a reduction proportionate with an increase in size of the same. Recent observers are agreed as to the lowly position of the *Discoglossidæ*[1], and it therefore becomes a question of first importance as to how far the arrangement just described in them is primary.

In the youngest *Discoglossidæ* examined by us (*cf.* p. 164), no appreciable difference could be detected in the relative proportions of the two elements under consideration as compared with the adult; we have here, then, strong reason for regarding the condition exemplified in them as really primary. The matter, however, presses still more closely. Examination of those forms in which the pre-hallux is regularly segmented (fig. 19), shows that that segment which Born regards as its metatarsal (*ph.* i.) is generally disposed in a line with the naviculare, n^1 (*cf.* figs. 13 & 19). In *Pelodytes*, however (fig. 13), and less conspicuously in *Alytes* (fig. 10) and *Hyla*, the first-named element is intimately connected with the adjacent hallux-tarsal (1) by means of a well-defined ligament, which runs distally to the naviculare. Comparison of this ligament with that previously referred to as the representative of the 4th and 5th tarsalia, leaves little room for doubting, if argument from analogy is worth anything, that Born's metatarsal of the pre-hallux is, in reality, its tarsal. If this be admitted, there can no longer be any doubt of the homology of Ecker's naviculare (n^1) with the os centrale tarsi.

This determination brings the tarsus of the Anura into closer harmony with that of the other and, especially, the higher Vertebrata than is now generally admitted, while it sets at rest further doubt as to the value of the hallux-tarsal.

Finally, Ecker has shown (17, p. 128) that the tendon of the adductor longus digiti primi muscle (*m.a.l.* of woodcut, fig. C, p. 176) is inserted into the naviculare. We have found this to be invariably the case whether the hallux-tarsal is present or absent. It follows, therefore, that all possible source of confusion between that element and the naviculare is at an end.

g. *Pre-hallux* (*Calcar*).—The skeleton of the pre-hallux was first figured by Rosenhof (32); he described it (*Pelobates*, p. 84) in the words "tandem etiam in sceleto hoc notari meretur singularis quidam

[1] *Cf.* Cope (12, p. 104) and Boulenger (7, p. 444).

spurisque unguis." It has been likened by some anatomists to a single element in the tarsus (ex. entocuneiform, Owen, 31, p. 184); it is, however, unnecessary to recapitulate these comparisons in detail.

All recent writers are agreed as to the variable nature of the pre-hallux, but the range of this has not yet been fully recorded. As will be seen from an examination of our figures, it is very inconstant in size, shape, and detailed characters. For example: in the adult *Xenophrys* (fig. 17), it consists of a single elongated cartilage which ossifies very late in life, whereas in *Hyla* (fig. 19) it attains a much greater development, and is segmented into four pieces. Disparity in size is by no means confined to members of different families, for in *Pelobates*—the type of the family to which *Xenophrys* belongs—the calcar, while consisting of a single piece, attains enormous proportions and ossifies very early [1]. In this burrowing genus the calcar supports the well-known horny blade, by means of which the animal is enabled to shovel up the earth. This being so, its early ossification is distinctly associated with the functional requirements of the case.

Born at first ascribed (3, p. 448) four segments to this structure in *Rana*, *Bufo*, and others. In his later researches, however, he records considerable variation in the same, stating (6, p. 61), "wechselt doch die Stückzahl v. *Rana esculenta*, zwischen zwei und vier, bei *Bufo variabilis*, zwischen drei und fünf." Our figs. 19 & 19 *a* agree very well with his description, while they represent the maximum segmentation into lineally disposed elements observed in any specimen. We have already shown reason for regarding Born's basal pre-hallux segment as the centrale (naviculare), whence it follows that in no known Anuran does the calcar, as defined by us, ever consist of more than four true segments. This maximum number is reached in *Bufo* [2] (?), *Hyla*, *Hylarana*, *Leptodactylus*, *Nototrema*, and *Rana*—representatives, that is to say, of four distinct families.

Incident upon the foregoing there arises the question as to whether the unsegmented condition of the pre-hallux is the more primitive one, or *vice versâ*. If the latter be the case, traces of segmentation ought to be forthcoming in the larvæ of those forms possessed of the single piece. Born accords to *Rana esculenta* a maximum of three pieces. In old Tadpoles of *R. temporaria*, however, we have detected the presence of four distinct segments of hyaline cartilage: the terminal one of these early degenerates and becomes eventually fibrous, and not until then can that fusion of the parts which Born describes [3] take place. The facts recorded by this author alone for *Hyla* and *Bufo* (*Phryne*) (6, pl. 1. figs. 2 & 3) are, in themselves, sufficient to show that the lineally segmented condition is most probably the primitive one.

We are doubtful as to how far the one or two pieces, met with in

[1] Born makes the assertion (6, p. 59) that it here bears originally two phalanges: this we cannot confirm.

[2] Born (6, p. 61). We have not observed it.

[3] p. 56. We have not observed this.

adults of certain species, may or may not arise by confluence or suppression of individual segments (*cf.* fig. 8); future research must decide this question.

There remain two most important questions. 1, If the segmented condition be the more primitive, may not the whole pre-hallux represent a shortened-up digit? and 2, May not this supposed sixth digit represent a lost ray of the ichthyopterygium?

In *Nannophrys*, *Phyllomedusa* (fig. 19 *a*), *Rhombophryne*, and especially in some species of *Hyla*, the pre-hallux has quite a digitiform aspect, comparing, at first sight, very favourably with the reduced pollex of the fore limb, the homology of which with the other digits nobody disputes (*cf.* Plate VIII. figs. 19 *a* & 20).

That the pre-hallux may, in a sense, resemble the pollex is clear from the preceding; but it must not be forgotten that this resemblance is most marked in the specialized Tree-Frogs. Its segments[1] are, in the embryo, more digitiform than in the adult; and taking all facts into consideration, we incline to a belief in a preponderance of the resemblances over the differences between this structure and a normal digit.

The second difficulty is not easily to be met. That the pre-hallux takes on certain of the essential relationships of a digit is beyond dispute. That it really represents one is another question.

The tarsal of the pre-hallux is, in most cases, in definite articulation with the head of the naviculare (cf. *Pelodytes*, fig. 13). In many forms its second segment is the largest (ex. fig. 27); when this is the case, that may be disposed parallel with the metatarsals, in a manner strikingly suggestive of a serial homology (cf. *Xenopus*, fig. 3, and *Pseudis*, fig. 27). In *Xenophrys*, *Hyla* (figs. 17 and 19), and other genera, this supposed metatarsal sends forwards (backwards *in situ*) a small retral lobe (*); in *Ceratophrys* (fig. 24) this attains a considerable development, and in individuals of this genus it may exceed in size the body of the segment from which it takes its origin.

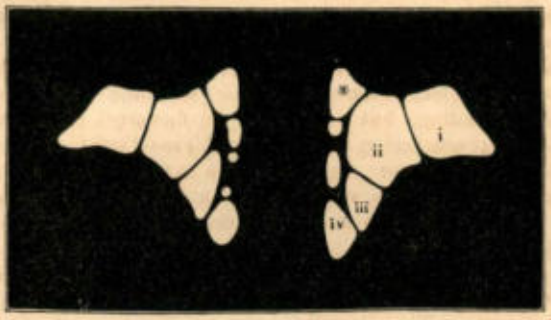
Meckel (29) and Cuvier (15) held, and Born (3), Kehrer (24), and others still hold the pre-hallux to be a sixth digit. Leydig (25), attacking it from a totally different standpoint, argues to the contrary. Gegenbaur at first took a similar view, holding (18) it to be a secondary structure peculiar to the Anura, and his words are echoed by Hofmann (21); subsequently however to the publication of Born's paper, Gegenbaur accepted that author's position, confessing to the same in his well-known text-book. Finally, Born asserts, in his latest paper (6, p. 61) "Ubrigens bin ich jetzt geneigt in der starken Variabilität der Gebilde der sechsten Zehe . . . nicht bloss mehr eine Eigenthümlichkeit zu sehen, die derselbem als rudimentärem Organ anhaftet, sondern ich sehe in der häufigen Verschmelzung ein Bestreben ein immer festeres Skelettstück als

[1] Van Deen records (34) an instance in which, in *Rana esculenta*, these lay in a line with the hallux and supported the web. His specimen was, unfortunately, a monstrous one, with four hind legs.

Unterlage für den Fersenhöcker, der vielfach als Grab-Instrument benutzt wird, zu gewinnen."

We have already called attention (p. 150) to the development of a retral process from that which we regard as the hallux-metatarsal. In *Hyla lichenata* this is completely segmented off (* in woodcut, fig. A), forming one of a series of marginal elements,

Fig. A.



The pre-hallux of opposite sides in *Hyla lichenata*. Dorsal aspect. × 6.

which skirt the outer face of the calcar and are, moreover, roughly symmetrical on opposite sides. Comparison of this figure with that of the more normal pre-hallux of *H. cærulea* (Plate VIII. fig. 19) renders it tolerably certain that these nodules are dismemberments of the main mass.

It would be superfluous here to recapitulate the well-known speculations and discussions which turn on the supposed ancestral condition of the pentadactyle limb [1]; it is more pertinent to point out that the evidence against the supposition that all living Amphibia and Amniota have directly inherited a pentadactyle member, is, to no inconsiderable extent, based upon the discovery of fragmentary cartilages in no way indistinguishable from these now under consideration. Such fragments have been discovered flanking both pre- and postaxial borders of the one member or the other in even Man himself [2]; and in the fertile imaginations of Bardeleben, Kehrer (24), and others, we find them exalted to the dignity of lost rays. The last-named author writes (p. 14) "so hätten wir also bei der Beurtheilung des Hand- und Fuss-skeletes der Wirbelthiere künftighin nicht mehr von einer pentadactylen, sondern von einer heptadactylen Urform auszugehen, und von diesem Gesichtspunkte aus

[1] For details and *résumé* see Gegenbaur (19), and Wiedersheim (36), pp. 204–207 and 229–230; also "Zur Urgesch. d. Gliedmassen d. Wirbelth," 'Humboldt,' vol. 5, 1886.

[2] Bardeleben, 'Jenaische Zeitschr. für Naturwiss.' Bd. 19, N.F. xii. Supplem.-Heft 3, 1886. *Cf.* Wiedersheim, 'Lehrbuch,' p. 224, and 'Humboldt,' *cit.*

betrachtet, werden auch fürderhin die 'überzähligen' Finger und Zehen . . . . sondern als atavistische Bildungen angesehen werden dürfen."

Baur is, of all later writers, the one who has done most to combat this doctrine. He advances (1, p. 68 *et seq.*) equally good arguments for regarding these so-called supernumerary digits as purely secondary and adaptive structures, laying, at the same time, great stress upon their late appearance, especially in the case of the pre-hallux itself. The advocates of the opposite belief[1] seek shelter under the stronghold of the *Enaliosauria*, but recent investigation at least suggests that the paddles of those beasts were specialized derivatives of pentadactyle predecessors[2].

We trust to have already shown satisfactorily that the naviculare can no longer be regarded as the hallux-tarsal, as Born supposes; and that admitted, it follows that the pre-hallux conforms to the structural requirements of a sixth digit. More than this cannot be said at present, and further speculation would be useless until the connecting link between the cheiropterygium and its piscine predecessor shall have been discovered. For this we look to the palæontologist.

Setting aside further discussion as to the exact significance of the pre-hallux itself, we cannot refrain from regarding that fragmentary dismemberment of its outer free border, above represented, as an additional argument for the views of Leydig and Baur. If the converse one be justifiable, we should have ample ground for pleading the cause of an octodactyle "Urform," and this would be *primâ facie* no advance at all.

There is a growing tendency to attach too much importance to gristly fragments such as those now under consideration, and it is binding on those who may yet deal with these supposed vestiges (especially as manifested in the higher Vertebrata), that they shall determine at the outset, with greater accuracy than has hitherto been done, what precise relationships they bear to the soft parts. If not, the question bids fair to be reduced ere long to the condition of a *reductio ad absurdum*.

Fore Foot.

a. *Metacarpals and Phalanges.*—The pollex of the Anura under-

[1] Parker writes (P. R. S. vol. 42 (1887), p. 57), "I have frequently noticed that aborted parts, like overshadowed plants, are late to appear, and soon wither, or are arrested in their growth."

[2] Baur, "Bemerkungen über Sauropterygia und Ichthyopterygia," Zool. Anzeiger, 1886, pp. 245–252; also "Die Abstammung d. Amnioten Wirbelth.," Biolog. Centralbl. Bd. 7 (1887), pp. 481–493. See also "On the Phylogenetic Arrangement of the Sauropsida," 'Journal of Morphology,' Boston, vol. i. no. 1 (1887), pp. 93–104; the discovery by Gadow and Baur (herein recorded) of supernumerary phalanges in the manus of *Halicore* and *Manatus* is most welcome at this juncture. See also Baur, "Ueber den Ursprung d. Extremitäten der Ichthyopterygia," Bericht u. d. xx. Versammlung des Oberrheinischen Geolog. Vereins, 1887.

goes, as will be shown later, a by no means insignificant range of modification. In no case, however, is it ever segmented into more than three pieces exclusive of its carpal; it thus never bears more than two phalanges. The other four digits bear each, in order of succession from within outwards, 2, 2, 3, 3 phalanges, certain Ranidæ excepted (*cf.* footnote, p. 178).

The inner border of the metacarpal of the second digit becomes, in the males of certain Anura, as is well known in the case of the Common Frog, variously crested or tuberculated in connection with the overlying "thumb-pad" (2′. fig. 6), or for support of the horny clasper as in *Leptodactylus* (** fig. 25). Leydig has recently described these modifications with great accuracy (26), so far as they concern the indigenous European forms.

b. *Distal Carpal Elements* (*Carpalia*).—In the more specialized forms certain of these unite with each other or with adjacent elements (ex. *Hyla*, fig. 20, *Rhombophryne*, fig. 32); and for the present we shall exclude such from consideration, dealing only with those feet in which the elements remain permanently distinct.

All previous writers are agreed that in such forms five carpalia are represented. While we admit that such *may* be the case, we doubt, as the sequel will show, the homology of that element which our predecessors, not excluding Born (6), interpret as the carpal of the 5th digit.

Carpale 2 (*Trapèze* of Dugès; *Trapezoides* of Ecker).—This element ((2) of our figures) is never more than insignificantly displaced. Examination of any one drawing will show that it lies in a line with the head of the 2nd metacarpal (2′); and comparison of *Alytes* tadpole (fig. 9) shows this to be its primitive position.

It is usually of fair size, becoming well ossified. In the *Discoglossidæ* it undergoes a slight reduction (figs. 6 & 7), and this reaches its maximum, amounting to insignificance in the ♂ of *Leptodactylus* (fig. 25). Comparison of this carpus with the adult *Discoglossus* (fig. 6) and the larval *Alytes* (fig. 9) is sufficient to show that this partial atrophy is to no small extent associated with the specialization and enlargement of its metacarpal.

We have found this element to be free in all but *Brachycephalus*, *Pipa*, and *Rhombophryne*.

Carpalia 3 *and* 4.—In certain forms these two elements become confluent, constituting the nucleus of a large bone (3, 4 *k*, figs. 25, 26, 28), called by Ecker (17, p. 53) the "capitato-hamatum." In the *Discoglossidæ*, *Pelobatidæ*, and *Aglossa*, however, carpalia 3 and 4 are distinct. Considering the general affinities of these three families, and that there are combined among them all the lowest terms of structural detail met with in the whole Order, this point of agreement is the more welcome and suggestive.

Examination of the figs. which we append will show that in the two first-named families there is a tendency towards an increase in size of the 4th carpal and consequent displacement of the 3rd one (*cf.* figs. 5, 7, and 18). The two, however, lie, in all, practically in a line with the 3rd and 4th metacarpals—absolutely so in the

Aglossa. The representatives of that family retain then, in this feature of their organization, a more primitive condition than do any other living Anura. Further comment is needless.

Carpale 5.—All writers have, up to the present, regarded the large element marked *k* as the fifth carpal. In the *Discoglossidæ*, *Pelobatidæ*, and in *Xenopus*, this is large and distinct; and seeing that in the last-named genus the head of the 5th metacarpal (5', fig. 4) is especially excavated to receive it, the above-named determination would appear to be unassailable.

In the two first-named families (*Discoglossidæ* and *Pelobatidæ*) this element has no connection with the metacarpal, for in them there runs, from the postaxial border of the 4th carpal to the epiphysial cartilage of the 5th metacarpal, a ligamentous band (* figs. 5, 7, and 15). This structure courses ventrally to the distal face of the supposed 5th carpal (*k*), excluding that from direct connection with the adjacent metacarpal.

The absolute identity of this band with the ligament in the hind foot, admitted by all to represent the missing tarsalia 4 (? 5), is irrefutable; and, if argument from analogy is to be trusted, this structure may justly be looked upon as a 5th carpal. If so, the older determination falls to the ground, and the element *k* can no longer be regarded as distal. We are in a position to substantiate this, for the ligament in question carries, in *Xenophrys*, a well-defined nodule of hyaline cartilage which ossifies as age advances (5, fig. 16). This ligament is early differentiated, and comparison of the higher forms suggests that it represents something which, in them, has been lost.

We trust thus to have shown that the 5th carpal is practically absent in the Anura as an order, but that a vestige of it exists in the adults of the *Discoglossidæ* and *Pelobatidæ* (in precisely those forms, that is, in which we might have expected to find it), becoming ossified and attaining its most full development, so far as is at present known, in the genus *Xenophrys*.

c. *Carpale* 1 *and Pollex*.—The pollex is, in all known Anura, relatively small and unimportant. It attains its maximum length in certain American Tree-Frogs (*cf.* Cope, 14, and Boulenger, 7, pp. 338, 339), and among the *Cystignathidæ* (*cf.* p. 170); in other forms, again, it is very short. Born says of it in *Bombinator* (6, p. 62), "einmal fehlte sie ganz, ein andermal waren sogar zwei Phalangen vorhanden;" Gegenbaur omits it in his well-known figure of *Bufo* (18, pl. i. fig. 11), while Brocchi denies its existence in *Hemiphractus* (10, p. 16). We strongly doubt the assertion of the first-named author, and we can only attribute it to the fact that he relied exclusively upon microscopical sections. Small the pollex may be, but absent rarely, so far as our experience goes.

In all but some few forms the body of the pollex is in articulation with a proximal cartilage, *po* i. (the "trapezium" of Ecker, 17, p. 53), of somewhat variable character. In its predominant shape, this element may be fitly compared with the bowl of a very thick spoon.

In *Pseudis* tadpole and *Hyla* (figs. 26 & 20), less conspicuously in *Bufo* and others, it is elongated in the manner of a finger-joint. With the exception of Dugès, who first regarded it (16) as a metacarpal, all investigators have looked upon it as the carpal of the pollex. Examination of its detailed relationships and consideration of its embryological condition (*Alytes*, fig. 9, *po.* i.) leave no room for doubting the accuracy of the latter determination.

Assume what form it may, the pollex usually ossifies more early in the males than in the females. In the *Ranidæ*, for example, it remains in the females for a considerable time simple and unossified (woodcut, fig. B, p. 174). This precocious ossification in the male sex is clearly the result of its connection with the well-known "thumb-pad," for it supports that more or less extensively in different genera and species. In some forms there is a great tendency for it to enter into direct connection with the 2nd metacarpal, either by simple apposition or by fusion with the warted crest of the same. In the male *Discoglossus*, however, the reverse is the case, for it there appears (fig. 6) to have undergone an increase in breadth directly proportionate to its diminution in length. Examination of the living animal shows that this change is an accompaniment of one undergone by the "thumb-pad;" for that is, as it were, duplicated, its lesser representative being alone supported by the pollex.

In the youngest individuals examined by us (e. g. *Ranidæ* and *Alytes*) the pollex had the form of one elongated unsegmented cartilage. It ossifies as a single element in all *Ranidæ*, *Bufonidæ*, and *Discoglossidæ* which we have manipulated. On the other hand, the like is true only of certain genera in the *Cystignathidæ*, *Pelobatidæ*, and *Hylidæ*.

In all forms examined by us, not cited above, it had become more or less thoroughly segmented into two or three pieces (*po.* ii. to *po.* iv. of figs.). These, in some of the Tree-Frogs especially, take on the characters of a metacarpal twice as long as broad and two short phalanges. In them and certain other forms it undergoes an elongation at the same time; in yet others the reverse is the case. It must not, however, be imagined that a converse line of modification is here set up, for *Leptodactylus* (fig. 25), *Pelodytes* (fig. 11), *Ceratophrys*, and *Callula* all show that, while shortened up, it is still segmented into distinct joints; and these, moreover, subsequently undergo complete and independent ossification.

When ossification sets in without previous segmentation, it does not spread from one or more definite centres, but it is diffuse and irregular.

In the males of *Rhombophryne* (fig. 32) and *Lymnodynastes* (fig. 28) the pollex is quite calcariform. The characters of the rest of the member are, in both genera, such as to show, beyond doubt, that we have here to deal with extremely specialized forms.

d. *Ulnare* (*Pyramidale*).—Wiedersheim has shown[1] that in *Rana*

[1] 'Anat. d. Frosches,' Abth. ii. p. 79.

esculenta the arteria brachialis sends up a branch, which perforates the carpus ventro-dorsally, for distribution to the integument and parts adjacent. In some forms (ex. *Discoglossus*, figs. 5, 6, *f.i.*) the bones of the proximal row become definitely notched at this point, enclosing that which we would term [1] a *foramen intercarpi* for passage of the artery. Born has demonstrated the same fact for certain Lacertilia (4, pp. 2–3); while Wiedershiem [2], Baur (1, pl. i. fig. 4), and others have done so, less conspicuously, for the Urodela. Examination of the several descriptions and figures shows that the perforation invariably takes place between the postaxial (ulnare) and central (intermedium) elements of the proximal series.

In certain Urodeles a confluence takes place between these skeletal units; and when this is the case the ulnare and intermedium are invariably those which fuse, and in some of these cases the artery in question perforates the confluent mass. Taking this fact into consideration it is clear that the ulnare is the only element which, under all circumstances, can lie postaxially to the blood-vessel. Seeing, moreover, that the artery agrees in all investigated cases in every known detail of distribution, it is obvious that, in it, we have a convenient landmark by which to estimate the morphological value of the proximal carpals. This said, further arguments are unnecessary in order to show that the so called "pyramidale" of Dugès and Ecker is the ulnare, as Gegenbaur showed and as all subsequent writers admit.

e. *Lunatum* (*l.*)—The extraordinary position in which the fore foot of many living Anura is carried has resulted in a rotation of the parts of the same upon the coalesced radius and ulna, of such a nature that the distal extremity of the ulna comes to be directed towards the palmar surface of the fore foot itself. This rotation is most marked in *Dactylethra*, *Hyla*, *Pelobates*, *Pseudis*, and *Rana*; and it is instructive to find that the tadpoles of these genera do not exhibit it. The distortion resulting from it is such, that we often found it impossible (ex. *Pelobates*, fig. 18) to obtain a comprehensive view of the carpus without first disarticulating the radius. The importance of this observation is by no means slight, for there can be little doubt but that we are to seek the clue to the remarkable delineations of some authors, to displacement of these parts, consequent upon their having flattened them out.

From what we have said (*suprà*) concerning the course of the *arteria brachialis*, it will be clear that the lunatum can only represent the radiale or the intermedium—one or both—of the less modified forms. Gegenbaur was unable to make up his mind (18, p. 13) as to whether this bone represents a confluence of these two elements or a persistent radiale—the intermedium having disappeared. He further suggested the possibility that the last-named may have been absorbed by the radius and ulna during coalescence.

Born puts forward, in his latest communication (6, p. 62), the startling supposition that the lunatum is the intermedium. He bases

[1] Uniformly with the *f. intertarsi* of the hind foot (p. 144).

[2] Morph. Jahrb. vol. 2. (1876).

his deduction upon appearances presented to him in sections of two "vierbeinigen Alyteslarven." On p. 158 will be found a full statement of our reasons for refusing to accept the main observation upon which this view it based; consideration thereof will show that even if that be reliable, there are still insufficient grounds for assuming *e vestigio* that the lunatum is the intermedium.

When, to the above, we add that all attempts to discover at any stage, in its proper place, a trace of a third proximal carpal element, have failed us, there is nothing left us but to record our belief that the lunatum represents the radiale alone, and that all traces of the intermedium have vanished from even the ontogenetic record (*cf.* hind foot, p. 145).

f. Postaxial Centrale (5th carpal of earlier observers.) (*k*).—We have discussed this element sufficiently under the head of "carpal 5" (p. 154) to render further details needless. It is present as a distinct element only in the lower families; its great size and comparative uniformity are its most striking features. If the morphological value claimed by us (p. 154) for that new element which we interpret as the 5th carpal be accepted, this one, looked at from all possible standpoints, can only represent a centrale. We propose therefore to term it, in accordance with its position, the postaxial centrale, by way of distinction from the element next to be dealt with.

g. *Naviculare* ("scaphoïde" of Dugès) (*n*.).—This element is by far the most troublesome in the whole carpus, if not in carpus and tarsus taken collectively. It may fuse with others in a manner to be described later, but in all the lower representatives of the Order it is permanently distinct. In position it is extremely variable, except for the fact that it is preaxial: in *Leptodactylus* (fig. 25) and *Ceratophrys*, for example, it lies in the proximal row and articulates directly upon the radius; in the *Discoglossidæ* and *Aglossa*, on the other hand, it is invariably central, being disposed, in the former family, side by side with the postaxial centrale (figs. 4, 5, and 7), with which it seems to vie in size.

Born states (6, p. 62) that in the two "vierbeinigen Alyteslarven" previously alluded to he found "inmitten des Carpus ein freies, wohl abgegrenztes Knorpelchen von halbmondförmiger Gestalt;" he regards this as the centrale, and adds "bei zwei anderen Carpen war dasselbe mit carpale 5 verwachsen und bildete an demselben einen deutlich abgesetzten, zungenförmigen Fortsatz?" He relied, as we have before remarked, upon the section-cutter's method alone, and considering that he makes this "wichtige Fund" the basis of a revolutionary redetermination of the morphological value of certain leading constituents of the carpus (coming to regard the naviculare as a displaced radiale, and the lunatum as the intermedium), he ought, in justice to himself, to have given drawings of a complete series of sections, in place of the solitary and somewhat diagrammatic one proffered (pl. 1. fig. 5).

Born's figure shows that ossification of the metacarpals had set in, and, from the circumstances of the case, it is logical to expect that, if

his observation be reliable, this supposed centrale ought to be forthcoming in younger specimens as a distinct element. We have examined a large series of specimens, many of which were much younger than any which passed through Born's hands, and they showed without exception that the position of his "centrale" was occupied by the preaxial third of that element regarded by us as the postaxial centrale (*k*, fig. 9). We can confidently assert that in no carpus under our hands does this show a trace of either segmentation into two, chondrification from two centres, or confluence of distinct elements [1].

In one specimen we have been able to detect a linear depression on the under surface of the cartilage, near the point at which Born's dismemberment appears to have occurred [2]; and we are strongly of opinion that this groove was present in his specimen, and that the section represented [3] by him passed through it. Indeed, his second assertion above cited seems, in itself, to confirm this belief.

In the adults of certain forms the naviculare may lie, as already said, more or less completely in the proximal row, preaxially to the lunatum and in more or less definite articulation with the radius (*cf.* figs. 6, 18, 30). In others it may be as fully removed from the latter (figs. 1, 5, 7). It therefore becomes a question of vital importance as to which of these two conditions is the more primitive.

In examining a large series of larvæ of the Edible Frog, measuring each about 20 mm. from snout to vent, we were not a little surprised to find that the naviculare varied greatly in the extent to which it thus embraces, as it were, the lunatum. In the adult it comes to lie in the proximal row, nearly meeting the radius (*n*, woodcut fig. B, p. 174). In a young *Bufo* of about 20 mm. it was already in direct apposition with this bone. In *Pipa* (Plate VII. fig. 1), *Xenopus* (Plate VII. fig. 4), and most *Hylidæ* (Plate VIII. fig. 20) it is strictly central; in one member of the last-named family however (*Nototrema*) it shows a tendency to become proximal in the adult.

In the adult of *Bombinator* (Plate VII. fig. 7), and still more so in that of *Discoglossus* (fig. 6), it sends up a spur which approaches but does not nearly reach the radius. Appeal to development shows (figs. 5 & 9) that this spur is a late growth.

The condition of the parts in the *Pelobatidæ* is deserving of special note. It will be seen that in those Anura in which the naviculare is most central in position the distal carpals are relatively small and reduced; in *Xenophrys* (fig. 14) and *Pelobates* (fig. 18) these are, on the contrary, larger and more nearly uniform in size with the other elements of the carpus, so much so in the latter genus that the carpus has quite a Salamandrine aspect. Here too the naviculare is proximal

[1] Ossification of this element invariably proceeds from one centre.

[2] This becomes still more marked in certain forms in which our postaxial centrale is confluent with other elements (*cf.* p. 160).

[3] There are other exceptional peculiarities about this carpus, for which we find no parallel in our own specimens.

(not strictly so in *Pelobates*), and, at the first glance, we appear to be dealing with the least modified term in the series; comparison of which with the opposite one (ex. fig. 7) would appear to show that the naviculare was primarily proximal, and that its central position has been assumed as the accompaniment of a reduction of the distal carpals.

The problem is a very perplexing one. If we admit that the Pelobatoid fore foot is the more primitive, we are forced to the conclusion that the naviculare belongs to the proximal series; if we hold the Discoglossid foot to be the more ancestral, we imply that the suppression of the carpalia is not a specialized feature[1]. In all those cases in which we have obtained sufficiently young larvæ, the naviculare is central to begin with and free of the radius, its ascending process being of secondary origin (cf. *Discoglossus*, larva and adult, figs. 5 & 6). We regard this as conclusive evidence that the naviculare does not belong morphologically to the proximal series, and hold that the condition of the Pelobatoid limb is a modified one, its naviculare having become displaced, in all likelihood at a very early stage. Nor must the possibility be overlooked that, in those forms in which the naviculare is most completely in articulation with the radius, it may have been to a large degree displaced as the direct result of enlargement of the second metacarpal (*Leptodactylus*, fig. 25), or carried up with the enlarging pollex (*Pelodytes*, fig. 11) (*cf.* p. 171). These are our reasons for regarding the naviculare as a central element, and we propose to term it, in accordance with its position, the *preaxial centrale*.

The carpus of the Anura would appear, from the foregoing, to possess two enormous centralia. Duplication or triplication of the centrale is well known in many living Urodeles. Wiedersheim[2] and Baur (1) have paid most attention to this question, and the latter has adduced weighty arguments (1, pp. 68–69) in support of the view that such duplication is purely secondary. The existence of but a solitary centrale in the lowest representatives of the Class (*Amblystoma*, Baur, p. 40), the great variation in the characters and assumed relationships of the superadded one, the occasional absence of the same (*Necturus*, *Cryptobranchus*, and others, pp. 20–29), all point to the conclusion that in this duplication we have to deal with extreme specialization. Turning now to the Anura, we make bold to assert that the hind foot of these animals is, except for its great elongation and changes incident thereon, if anything, less considerably modified than the anterior member. What, we ask, could be more extraordinary than the position in which the living *Xenopus* carries its fore foot? and may not the appearance of the second centrale have been originally associated with some such specialization? Taking all facts into consideration, we submit that, as an

[1] It is interesting to observe here that, whereas in *Alytes*, *Bombinator*, and *Discoglossus*, the ossification of the naviculare precedes that of the carpalia, in *Xenophrys* cp. 4 is the first to ossify.

[2] "Ueber die Vermehrung des Os centrale im Carpus und Tarsus des Axolotls," Morph. Jahrb. vol. vi. (1880) pp. 581–583. For other references see Baur.

Order, the Anura would appear to be unique among all living animals in that they possess, without exception, a double centrale carpi.

h. *Compound structures resulting from the fusion of two or more Carpal elements.*—Under this head we have designated certain large bones, met with only in the adults of the more specialized families and in some few isolated genera.

There can be little doubt but that the great development of our postaxial centrale (*k*) is associated with the peculiar "tread" of the fore foot of the Anura and with the remarkable distortion which the parts of this limb have undergone. In the compound structures now to be dealt with, this postaxial centrale forms as it were a central nucleus, towards which one or more adjacent elements become drawn and with which they amalgamate. The fact that the resulting compounds may occur independently in different families is sufficient to show that they are, for the most part, of nought but physiological significance.

Capitatum.—We suggest this term [1] for the simplest of the above-named structures. It occurs in *Pelodytes* (fig. 11) and *Pseudophryne* (fig. 22) (4 *k*), being formed, as shown, by the confluence of the postaxial centrale and the 4th carpal.

Capitato-hamatum.—This term was applied by Ecker (see *infrà*) to a large bone which, in the Edible Frog (3. 4. *k*, fig. B, woodcut, p. 174), carries the 3rd, 4th, and 5th digits. It is formed by the confluence of our capitatum with the third carpal.

We have observed it in the *Ranidæ*, *Dendrobatidæ*, *Engystomatidæ*, *Cystignathidæ*, *Bufonidæ*, *Hylidæ*, and certain others; it is not present in either the *Discoglossidæ*, *Pelobatidæ*, or *Aglossa*. It often sends up, especially in old individuals, a process along the outer face of the ulna (ex. *Leptodactylus*, fig. 25) for muscular attachment. This lobe is absent in the tadpole, and, from its function, it need hardly be said that it has nothing to do with articulation upon the forearm [2].

There sometimes runs along the under surface of this bone a longitudinal groove, which terminates posteriorly, in a line with the interspace between metacarpals 3 and 4. In old specimens this becomes converted into a tubular perforation, which will admit a bristle and transmits the ramus lateralis of the ulnar nerve [3].

On examination of the adult carpus, doubts might be reasonably entertained as to whether both third and fourth carpalia were incorporated in this piece. Apart, however, from the fact that in the young animal their boundary lines are definable, there is a feature of some interest in its mode of attachment. In *Hyla cærulea* (fig. 20) and *Nototrema* there still remains that ligament which, in the simpler forms, passes between the 4th carpal and the head of the 5th metacarpal; true to its relationships, it arises on a level with the head of metacarpal 4 (cf. *Xenophrys*, fig. 14), and it differs from

[1] Uniformly with Ecker's capitato-hamatum (17, p. 53).

[2] As might at first be imagined, from Wiedersheim's fig. of *Bufo* (36, pl. 211. fig. 177), in which this feature is grossly exaggerated.

[3] *Cf.* Ecker and Wiedersheim, 'Anat. d. Frosches,' part ii. p. 40 and fig. 14.

that of this genus only in that it holds the heads of metacp. 4 and 5 in apposition.

In its mode of ossification the capitato-hamatum is variable; in the Frog it ossifies in a diffuse manner, similarly to the unsegmented pollex; in some *Cystignathidæ* ossification proceeds from one definite centre.

In *Rhombophryne* (fig. 32) a still further fusion had taken place in both fore feet of the solitary specimen which we examined. This consisted, as will be seen, of a coalescence of all the central and distal elements, the two proximal ones alone remaining free. It will be shown in the sequel (p. 172) that we have observed in *Phryniscus* an unexpected range of individual variation in the fusion of adjacent elements, and we accordingly refrain from proposing a distinctive mane for this bone in *Rhombophryne*, one individual only having been at our disposal.

Postaxiale.—We propose to institute this term for an anomalous compound observed only in *Pipa* (fig. 1, *pk*). Its ascending process and all detailed relationships show that it can only be the product of a fusion between the postaxial centrale and the ulnare. With respect to this fusion *Pipa* stands alone among all known Anura whose feet we have examined[1]. The lunatum (? radiale) (*l.*) has undergone reduction consequent upon it, but we do not know sufficient of the habits of the animal to hazard a guess as to its functional significance.

III. SPECIAL PART.

A. AGLOSSA.

a. Pipidæ.

Examined :—

Pipa americana: large ♂; feet of a second adult; a young specimen 19 mm. from mouth to vent.

Fore Foot (Plate VII. figs. 1 & 2).

The radius and ulna are flat with knife-like edges, and the disposition of these bones is exceptional, in that, unlike what is seen in nearly all other Anura, the outer edge of the ulna is directed dorsally. As the result of this, the radius comes to lie in the plane of the extended hand, while the ulna lies above it.

The limb-skeleton of this genus was first described and figured by Breyer (9). Later C. Mayer, who confirmed Breyer's observations, working (28, p. 533) with wet specimens, offered certain criticisms upon the observations of Meckel (29) and showed (p. 532), with perfect accuracy, that there are six elements in the carpus. The later researches of A. J. C. Mayer and others have added but little to his description. Carpalia 3 and 4 are perfectly distinct, and it is impossible to examine these and other elements without being struck

[1] Born figures (6, pl. 1. fig. 5) a similar but incomplete fusion in the larva of *Alytes*. This we have never observed.

with the absence of that definiteness of articulation between them, met with in nearly all other Anura. *Pipa* stands alone, as before stated (p. 161), with respect to the fusion of the postaxial carpal elements; the resulting bone (*pk*) certainly includes the postaxial centrale and the ulnare, but we are unable to say whether our 5th carpale is or is not embodied. We incline to the belief that it is not. Comparison of the young and adult feet (fig. 2, *h*) shows that this compound undergoes a shortening up during development. Its postaxial lobe (* of fig. 1) is of purely physiological significance and late in origin.

Ventrally to the lunatum there is present a large lenticular bone (indicated by a dotted line in fig. 1). Baur has shown that, in the Urodele hind foot, an element of the tarsus[1] may be thus visible only on one surface, and hence we have studied with care the relationships of this element. It lies wholly out of the plane of the true carpal elements and is surrounded by tendinous tissue, while it is totally absent in the young specimen at our disposal. We regard this combination of characters as proof that it is a sesamoid.

The element marked *po.* i. is somewhat interesting. In the adult it is lenticular, and in articulation with both the naviculare (*n*) and the head of the 2nd metacarpal (2′). It might therefore appear, from its relationships, to be the carpal of the second digit. In the young specimen, however, it is exceedingly small (fig. 2) and wholly destitute of connection with the metacarpal; on comparison with *Xenopus* (fig. 4), in which the carpal of the 2nd digit is distinct, it is clear that it can only represent the carpal of the pollex[2], carpal 2 having, in all probability, become confluent with the naviculare. Examination of the young specimen (fig. 2) renders this doubtful, for the head of the 2nd metacarpal bears an enlargement, such as might conceivably have resulted from a confluence with its carpal. Upon this point we have been unable to obtain decisive evidence.

Hind Foot.

The most complete observations hitherto made upon the tarsus of this genus are those of Mayer (28). The hind foot is, like its fellow in front, very anomalous. The astragalus and calcaneus are widely separated and fused at their ends, leaving an elliptical hole in the middle; the compound thus arising is only twice as long as broad. The outer edges of the two bones—*i. e.* the preaxial border of the astragalus and the postaxial one of the calcaneus—are ridged in such a manner that each bone is T-shaped in transverse section.

The 4th and 5th metatarsals articulate directly upon the epiphysial end of the calcaneus, while the remaining three are as it were shut out from that of the astragalus by thin lamellæ of bone. These lamellæ are seen to be continuations of two out of three bones which lie on the ventral side of the tarso-metatarsal joint, and would appear

[1] Centrale 2 of *Necturus* (1, p. 20).

[2] The adult limbs at our disposal were skinned before they reached us, hence we are unable to make any definite statements concerning the pollex itself.

at first sight to be sesamoids (they were described as such by Mayer 28). The postaxial one lies altogether free of the tarsus, and it is beyond doubt, as Gegenbaur has asserted (18, p. 66), a sesamoid. The lamina of bone derivative of the middle one has all the relations of a reduced cuboideum of such an animal as the Frog; and we can only interpret the bone which gives origin to it as that structure, thrust out of position by the great development of the astralagus and calcaneus, probably as an accompaniment of the great elongation of the metatarsals.

The third or preaxial bone of the above-named series is clearly the naviculare. Firstly, it gives insertion to the tendon of the add. longus digiti I. muscle, which feature we have shown (p. 148) to be characteristic of that element; secondly, it carries a diminutive calcar of two short but ossified segments.

The young specimen examined shows no trace of distinct hallux-tarsal, nor have we been able to obtain any clue to its whereabouts.

b. Dactylethridæ.

Examined :—

Xenopus lævis: three adults; young tadpole.
Xenopus calcaratus: hind half of a late tadpole.

Fore Foot (Plate VII. fig. 4).

This carpus presents fewer anomalies than that of *Pipa*. The ulnare (*p*) is quite distinct and in no sort of fusion with the post-axial centrale (*k*). Our fifth carpal is wanting, but those of the four remaining digits are large and distinct. The naviculare (*n*), is in its large size and in the possession of a preaxial spur, quite unlike that of *Pipa*.

As in *Pipa*, the metacarpals are greatly elongated; this genus is exceptional, however, in the great expansion of the head of the 4th one (4′) and the excavation of that of the 5th for the reception of a special peg of the postaxial centrale (*k*).

The lenticular sesamoid (indicated in a dotted line) lies, in this genus, in the line of junction between the radius and ulna, instead of being preaxial as in *Pipa*.

Hind Foot (Plate VII. fig. 3).

The astragalus and calcaneus are much more normal than in *Pipa*, their extremities are very broad (fig. 3), and the distal epiphysial cartilage ossifies from three independent centres (see fig. 3).

There overlies the head of the second metatarsal a small bone (1) which is wedged in between it and the centrale (naviculare *n*′); we regard this as the tarsal of the *hallux*, for reasons already given (p. 146) in dealing with the same condition in *Bufo* and the Tree-Frog. The bone marked $^{2\,3}$ we accordingly hold to represent the fused tarsalia of the 2nd and 3rd digits.

The metatarsals are much elongated and the head of the third one (3′) is exceptional for its great breadth; seeing that the tarsals are com-

planate with these and not displaced ventrally, it follows that the hind foot is here, like its fellow in front, much more normal than that of *Pipa*.

The calcar consists of three slender elements, the proximal one of which can only represent a tarsal.

B. PHANEROGLOSSA.

a. Discoglossidæ.

Examined :—

Discoglossus pictus : adult ♂, a young specimen, and a tadpole.
Alytes obstetricans : } large series of adults and tadpoles.
Bombinator igneus : }

Fore Foot (figs. 5, 6, 7, 9).

Born's latest communication upon the fore foot in *Alytes* (6) would be little short of revolutionary could his deductions be substantiated. We have already fully discussed these (p. 157), giving our reasons for rejecting them *in toto*.

The general plan of the carpus in these three genera is very similar ; in all, the largest element of the series is our postaxial centrale (*k*), and it is in this that ossification first commences. Gegenbaur has already called attention to the fact that in *Bombinator* it is " nicht gar schwer " to see in the naviculare (*n*) the centrale of the Urodela ; we have already given our reasons for regarding this element as a preaxial centrale (p. 159).

Gegenbaur says that in *Bombinator* (18, p. 17) all the carpal elements are distinct ; we, however, interpret the 5th carpale of all our predecessors as a postaxial centrale (p. 157). Concerning the remaining carpalia we are at variance with Born ; he figures an individual *Alytes* larva in which carpale 4 appears to have fused, while still cartilaginous, with cp. 5 (our postaxial centrale)—this we have never observed. He also states that in *Bombinator* a similar confluence may occur between carpalia 2 and 3 while still cartilaginous ; and he remarks that these variations " auf eine Neigung zum Uebergang in die für *Rana*, *Bufo* u. s. f. characteristische Carpüsform schliessen lassen." We have searched most carefully for traces of any such fusion, with negative results ; carpalia 1, 2, 3, and 4 being throughout distinct in all our specimens. These elements remain for a long time unossified in *Alytes* (fig. 9), they ossify in order 1, 4, 3, 2 ; in the interval, however, between the ossification of our postaxial centrale and these carpalia, the naviculare, ulnare, and lunatum ossify in the order named. The following is the formula for the whole series :—

k. n. p. l. 1, 4, 3, 2.

The carpal of the 5th digit is represented in all three genera by the ligamentous band previously described (p. 154) ; in *Alytes* this carries a tolerably large cartilaginous nodule, which we regard as the vestige of the 5th carpale of the Urodela.

According to Born (6, p. 62) the rudimentary pollex may, in *Bombinator*, either bear two phalanges or be wholly absent. In all our specimens we find that it bears two segments (*po.* ii. & iii.), irrespective of its carpal (*po.* i.). In *Discoglossus* and *Alytes* there is but one segment other than the carpal present; in the male *Discoglossus* this becomes fully ossified and expanded.

During ossification of the leading elements in *Discoglossus*, a central deposit takes place in each (*l. n.* fig. 5); soon, however, a differentiation of the ossific centre into a superficial spongy annulus and a central denser core takes place (*pk*, fig. 5), leading up to the curious condition of the adult bones (fig. 6) already noted (p. 143).

Hind Foot (figs. 8 & 10).

Gegenbaur was in error in asserting (18, p. 60) that in *Bombinator* the separation between the astragalus and calcaneus is complete. In even the youngest larva examined by us these two elements had already become confluent, bearing a common expanded epiphysial cartilage.

Born claims for the same genus (6) a range of individual variations in the tarsalia far exceeding anything which we have observed. In all our specimens the tarsalia of digits 1, 2, & 3 are distinct, that of the third being invariably the largest. Tarsalia 4 & 5 are represented by a ligament, which in *Alytes* alone carries a nodule of hyaline cartilage (p. 145).

The naviculare (centrale, *n'*) is, in all, large, and so placed as to separate the hallux-tarsal (1) from the astragalus, the epiphysial end of which is excavated so receive it. This element is always the first to ossify, the calcar follows, tarsalia 1, 2, 3 remaining for a considerable time unossified.

The calcar never consists of more than two segments, and is in all small. Born, in opposition to Leydig, regards the solitary piece present in *Alytes* (fig. 10, *ph.* i.) as the metatarsal (our tarsal) + the phalanx of the sixth toe. We have been unable to detect the presence, at any stage, of a second segment; we hold, therefore, that the element in question is really the hallux-tarsal.

b. Pelobatidæ.

Examined:—

Xenophrys monticola: 3 specimens measuring respectively 70, 40, and 26 mm.
Pelodytes punctatus: 3 adults and a tadpole.
Pelobates fuscus: an adult ♂ and one very young specimen.

Fore Foot (figs. 11, 14, 15, 16, 18).

That which most characterizes the carpus in this family is the relatively large size of the four carpalia (*cf.* p. 158). The 5th carpal is represented in a ligament, the detailed relationships of which have been already described (p. 154). This, as will be seen in fig. 15, becomes suddenly constricted at its point of insertion into

the head of the outermost metacarpal, especially in *Xenophrys*, in the adult of which it carries a distinct bony element (5, fig. 16), regarded by us as a 5th carpal (p. 154). It is worthy of remark that in its mode of ossification this element conforms in every detail to that observed for the other capalia.

Born asserts that he found (6, p. 63) in a *Pelobates* larva a centrale carpi, identical with that figured by him in the young of *Alytes*; and he expresses his doubts as to whether the same does or does not regularly fuse with the 5th carpal (our postaxial centrale, *k*) in the adults of both genera. It must suffice to point out that we have not here observed the presence of that cartilage which he calls the centrale, and the statements already made by us for *Alytes* (p. 158) apply equally to this genus.

This preaxial centrale (naviculare, *n*) may or may not reach the radius in individuals of a species. In the *Pelobates* figured (fig. 18) it is represented as nearly touching that bone, but in the other carpus it did not extend more than halfway towards it. We have already stated (p. 159) our reasons for regarding this ascending lobe of the naviculare as purely secondary.

Extremes of modification of the pollex are met with within the limits of this small family. In *Pelobates* and *Xenophrys* it consists, excluding its carpal (*po.* i.), of a small styliform structure which is quite unsegmented; in *Pelodytes*, on the other hand, it is very large and swollen (fig. 11, *po.* i.–iii.) and definitely segmented. In all three genera the rotation of the hand upon the fused radius and ulna is very marked; and in *Pelodytes* this reaches its maximum, having gone on through more than a right angle (fig. 11). Comparison with the other two genera suggests that the great development of the pollex may be in some way associated with this distortion; and we are inclined to ascribe to the same cause a distinct ossification of the distal extremity of the ulna here met with (* of fig. 11)[1].

In *Pelodytes* the carpus is exceptional among those of this family, owing to the fusion of the postaxial centrale and fourth carpal to form one bone, the capitatum (4. *k*, fig. 11).

Hind Foot (figs. 12, 13, 17).

It is interesting, in the light of the facts concerning the fore foot, to note that the extremes of modification undergone by the astragalus and calcaneus in the Anura are exemplified in this family. In *Pelodytes* (fig. 12) they are confluent for their whole lengths, much elongated and slender in the middle; in *Pelobates* they are relatively shorter than in any Frog which has come under our notice. *Xenophrys* is, in respect to relative length, intermediate between the two.

The calcar (pre-hallux) attains, as is well known, its maximum development in this family. Rosenhof first described and figured

[1] This is not received by the ulnare, as might appear on examination of the figure; it lies, in life, ventrally to the line of junction between that bone and the lunatum. It breaks away with great readiness, so much so that we originally imagined it to be a distinct element.

its skeleton (32), and Gegenbaur, Born, and Bayer (2) have more recently redescribed it. Born states that in the larva of *Pelobates* it possesses two phalanges (6, p. 59)—that is to say, there was originally a second segment added to that which we regard as its metatarsal. While we have not seen this ourselves we are able to record the presence of such a phalanx in *Pelodytes* (*ph.* iii. fig. 13), attached at right angles to the metatarsal (*p.h.* ii.). In *Xenophrys* the pre-hallux is relatively small, consisting of a single piece (fig. 17, *p.h*) which ossifies late.

The calcar of *Pelobates* is set on at right angles to the plane of the foot, and, in displacing it for examination side by side with adjacent parts, most observers have hitherto dislodged tarsalia 1 and 2 from their natural connexions. Born first described the hallux-tarsal in this animal (3, p. 446); and we have already shown (p. 148) that its relationships to the basal segments of the pre-hallux in *Pelodytes* necessitate a revival of the older view concerning the morphology of the naviculare. In *Xenophrys* the hallux-tarsal is very large and lozenge-shaped, being wedged in (fig. 17, 1) between the heads of the 1st and 2nd metatarsals.

With respect to the remaining tarsalia we find, in this family, as with the carpalia, an inconstancy. While in *Pelodytes* and *Pelobates* tarsalia 2 and 3 are quite distinct, in *Xenophrys* (fig. 17, $^{2\,3}$) they unite to form the "cuboideum" so well known in the Common Frog. In young specimens this bone is in articulation with the outer half of the head of metatarsal 2, but in the adult it becomes shortened up in a manner suggestive of *Hyla* (p. 146 & fig. 19).

The ligamentous representative of the 4th and 5th tarsals is well marked in all three genera. We are unable to reconcile the description and figures of this and the third tarsal given by Bayer (2), either with each other or with the feet at our disposal.

c. Hylidæ.

Examined:—

Hyla peronii; *H. freycineti*; *H. lichenata*; 2 *H. ewingii*; 5 *H. cærulea*; *H. albopunctata*; 5 *H. arborea*, tadpoles.
Nototrema marsupiatum.
Phyllomedusa hypochondrialis: small specimen.
Phyllomedusa dacnicolor: large specimen.

Fore Foot (fig. 20).

The characters of both fore and hind feet are very constant throughout this family. The rotation of the fore foot upon the fused radius and ulna is, in all, very marked. The naviculare is central in position in all but *Phyllomedusa* and *Nototrema*, in which two genera it sends up a radial spur which we have shown to be secondary (p. 159).

The carpalia 3 and 4 have coalesced with the postaxial centrale to

form a capitato-hamatum as in the common Frog (3, 4, *k*, fig. 20), upon which digits 3, 4, and 5 articulate. This family is unique in respect to the retention, subsequent to the incorporation of the 4th carpal in this bone, of that ligament (* fig. 20) which, in the simple forms, represents the 5th carpal (*cf.* p. 160). In *Xenophrys* (fig. 15) it will be seen that the fourth carpal is wedge-shaped postero-externally, extending over the inner half of the head of the fourth metacarpal: it is from this point that the ligament in question arises in both *Xenophrys* and *Hyla*, and we hold this as proof conclusive that the 4th carpal is, in the latter, represented in the manner described.

Carpalia 1 and 2 are both distinct, the carpal of the pollex being elongated and slightly constricted in the middle (*po.* i. fig. 20).

The pollex itself varies in degree of development; its topographical value has been discussed by Cope and others (14, p. 200). Structurally it consists essentially of one piece (excluding its carpal) which may show traces of differentiation or constriction into two segments (*po.* ii., fig. 20). In the American Tree-Frogs with "external pollex" (*Hyla albopunctata*) the parts differ only in being very broad.

Hind Foot (figs. 19, 21).

As previously pointed out (p. 146), examination of the adult tarsus (fig. 19) would lead to the supposition that the tarsal of the hallux is absent, and that the two bones which are nearest related to the heads of the metatarsalia 2 and 3 represent their tarsals alone. In fact Gegenbaur (18, pl. 6. fig. 9) was led into this belief. Comparison of the larva shows that this is not the case, but that the outer of the two elements, when it first appears, has all the characters and relationships of the "cuboideum"[1] previously described in the *Pelobatidæ*. This bone is present in all the *Hylidæ* which we have examined, and it is characteristic of this and all the succeeding families.

The astragalus and calcaneus are greatly elongated (*cf.* Hofmann, 21, pl. 14. fig. 10) in all, and their epiphysial cartilage is generally enlarged for special articulation of the 4th metatarsal (*cf.* fig. 19); as the result of this, these bones come to be inclined at a considerable angle to the metatarsals.

The central portion of the epiphysis is ossified near the astragalar border (fig. 19) at the point of attachment of a powerful ligament, which is inserted at its outer end into the wall of the articular capsule and carries at its point of insertion a cartilaginous nodule. In old specimens this may become ossified, and we believe, for reasons previously given (p. 146), that it is an adaptive structure of no morphological importance, having nothing whatever to do with the missing 5th tarsal. There is no trace of it in the tadpole.

The naviculare is present as a distinct element in all (*n'*, figs. 19, 19 *a*), lying in a line with the pre-hallux tarsal (*ph.* i.). In *Phyllomedusa* it is unusually small, being barely larger than the tarsal of the hallux.

[1] *Cf.* p. 146.

The pre-hallux is present in all specimens examined by us [1], and it consists in them of four segments—a proximal larger one or tarsal (*ph.* i.), a smaller metatarsal, and two diminutive phalanges [2]. The retral process of the second or metatarsal segment (* of fig. 19) is absent in *Phyllomedusa* (fig. 19 *a*). In an old specimen of *Hyla lichenata*, on the other hand, it was completely segmented off on either side, forming (woodcut, fig. A, p. 151) the largest of a series of nodules which fringed the free border of the pre-hallux fold. We have already discussed the probable significance of these.

d. Bufonidæ.

Examined :—

Bufo vulgaris.
Bufo viridis: large specimen.
Bufo calamita: 8 young.
Bufo variegatus: young.
8 *Pseudophryne bibronii.*

Fore Foot (fig. 22).

The limb-skeleton of *Bufo* has been described by various authors; it was first figured by Brandt and Ratzeburg (8), and subsequently by Mayer (27). Gegenbaur, Owen, Born, and Wiedersheim have in turn dealt with this skeleton, and upon some of their observations we have already commented.

Pseudophryne (fig. 22) is exceptional among the members of this family in the characters of its carpus: in *Bufo* the naviculare (*n*) articulates directly with the radius, and lies in the proximal row, here it is comparatively small and central: in *Bufo* the 3rd and 4th carpalia and our postaxial centrale coalesce to form a capitato-hamatum, as in the Common Frog. In *Pseudophryne* there are three carpals lying to the inner side of the large capitatum (4 *k*), whence it follows that cp. 3 is distinct as in *Pelodytes*. The carpus of *Pseudophryne* approximates more nearly towards that of *Pelodytes* than any other genus yet examined; and considering that the *Bufonidæ* are, with respect to the confluence of their distal and postaxial central elements, a stage in advance of the *Pelobatidæ*, *Pseudophryne* is to them what *Pelobates* is to the latter.

Hind Foot (fig. 23).

We can confirm Born's statements concerning the tarsalia in this family (3, p. 443) regarding the homology of the element marked (2, 3) with the tarsalia of the second and third digits, and we find that in old specimens this may become shortened-up in a manner suggestive of the Tree-Frogs. We have nothing to add to what we have already stated in confirmation of Gegenbaur's observations concerning the ligamentous 4th tarsal (*cf.* p. 145).

[1] Leydig states that he was unable to find its cartilages in *H. arborea* (25, p. 181).

[2] Born has described and figured the details of ossification of these, subsequent to fusion, in a very old specimen of *H. arborea* (6, pl. 1. figs. 1 and 2).

Born records (6, p. 55) individual variations in the constitution of the pre-hallux; we agree with him only so far as concerns the presence of three segments irrespective of our tarsal one (*cf.* p. 149). The terminal one of these is never recognizable in the adult (fig. 23), and we have failed to find it in *Pseudophryne*.

e. Cystignathidæ.

Examined:—

5 *Limnodynastes tasmaniensis*; *L. dorsalis*.
Leptodactylus pentadactylus: 140 mm.
Leptodactylus albilabris: 23 mm.
Ceratophrys ornata: 140 mm.
Ceratophrys americana.
Chiroleptes australis.
Crinia varia.
3 *Pseudis paradoxa*, tadpoles.
2 *Hylodes martinicensis*.
Telmatobius jelskii, tadpole.
Paludicola bibronii.
4 *Heleioporus albopunctatus*.

Fore Foot (figs. 25, 26, and 28).

Gegenbaur (18) and Hofmann (21) have alluded casually to the limb-skeleton of one or two genera of this family; but the most complete account yet published is that of Mayer (27).

The skeleton of the fore foot resembles, in its general aspect, that of the Frog; and in a family where three of the eight carpal elements are invariably fused together (capitato-hamatum, 3, 4 *k*) there is little room for modification of any morphological importance. The carpus of *Limnodynastes* (fig. 28) may be conveniently taken as a type of the whole family. The naviculare (*n*) lies well towards the radius, being prolonged forwards into a thin edge. The pollex carpal is free and little modified, carrying the pollex (*po.* ii.). This consists of a single element which is, in the male, shovel-shaped and beset by a horny investment, much in the manner of the calcar in *Pelobates* or *Heleioporus*.

The following are the more important departures from the above that we have observed in the genera recorded:—

Pseudis (fig. 26).—The second digit is remarkable for its slenderness, while it is closely related to the pollex, and, with it, opposable. This change is accompanied by a corresponding increase in calibre of the head of the 3rd metacarpal (3′). The carpal of the pollex is greatly elongated, in excess even of that which is seen in the *Hylidæ*.

Ceratophrys.—The naviculare here lies in the proximal row, and offers a broad surface for articulation with the radius. The carpal of the pollex is stouter than that of the second digit, and it bears two short, but well-defined and fully ossified, segments[1].

Leptodactylus.—The naviculare is here in full articulation with

[1] This is also the case in *Paludicola*.

the radius (fig. 25). The pollex consists of two short segments, borne upon an equally insignificant carpal (*po.* i.–iii.), the whole standing out at a right angle to the long axis of the fore foot. In the male the head of the second metacarpal is, as Mayer has shown (27), immensely enlarged for support of the horny clasper (** fig. 25).

It would appear, at first sight, that the displacement of the naviculare might have been the direct outcome of this enlargement; but if so, the reduction of the 2nd carpal to the condition of an absolutely insignificant nodule (2) becomes unintelligible, for it certainly would appear that that must have resulted from the same cause. We find, in the young specimen at our disposal, that this is really the case, for in the absence of the clasper the 2nd metacarpal is relatively larger. It is interesting to note further, that while, in this specimen, the naviculare does not quite reach the radius, the pollex is proportionately much stouter than in the adult. On consideration of these facts we incline to the belief that the displacement of the naviculare was originally associated with the enlargement of the pollex, in a manner similar to what is seen in *Pelodytes* (fig. 11), and that with the reduction of the pollex its connection with the radius became lost, only to be resumed again on the great enlargement of the 2nd metacarpal.

In the male of *Limnodynastes* the preaxial border of the second metacarpal bears an irregular bony crest, like that of the Common Frog. We find, however, that the pollex never here fuses with this, as it may do in the last-named genus.

Hind Foot (figs. 24, 27, and 29).

The typical condition of the Cystignathid hind foot is exemplified in *Cystignathus* and *Limnodynastes* (fig. 29), and, as the figure shows, it is, in general, Frog-like—*i. e.* tarsalia 2 and 3 are fused to form a single cuboideum ($^{2\ 3}$). In *Leptodactylus* this splint is shortened up, so that the hallux-tarsal nearly equals it in size.

In *Ceratophrys* the hallux-tarsal is absent, having either fused with the naviculare or disappeared, as believed by Born (3, p. 441) for *Rana*.

The calcar is, like the pollex, subject to no inconsiderable variation, as might indeed be expected of a family whose members lead such diverse modes of life. In *Ceratophrys* (fig. 24), *Cystignathus*, and *Limnodynastes* (fig. 29), we have only been able to recognize two segments, the basal one of which represents the tarsal (*ph.* i.), while in *Leptodactylus* the full complement of four pieces is reached.

Pseudis (fig. 27) bridges over the interval between these two conditions, in that a small first phalanx is present (*p.h.* iii.). In this animal the middle or metatarsal segment greatly exceeds the basal one in length, and its proximal outer border is enlarged; in *Limnodynastes* this enlargement becomes more obvious, leading up to the condition seen in *Ceratophrys ornata* (fig. 24), where it assumes the form of a retral spur[1].

[1] This is very feeble in a smaller specimen of *C. americana* examined.

In *Cheiroleptes* the proximal segment is by far the stronger; while in *Heleioporus* the second one is robust and forcibly reminds one of the calcar in *Pelobates*.

f. Engystomatidæ.

Examined :—

Rhinoderma darwini.
Phryniscus lævis, varians, and *cruciger,* several.
Brachycephalus ephippium.
Callula picta ; *C. baleata.*
Microhyla, ? sp., 2.
Rhombophryne testudo.

Fore Foot (figs. 30, 32).

The carpus in this family stands boldly out from that of all other Anura, with respect to the extraordinary tendency towards fusion of more or fewer of its elements with each other or the adjacent metacarpals.

The naviculare shows a tendency to become proximal in all; in *Phryniscus* (fig. 30) its ascending spur is strongly marked, nearly meeting the radius[1]. This bone is implicated in the simplest fusion observed (*Microhyla*), becoming confluent with the lunatum. If our determinations of the morphological value of the carpal elements are sound, it follows that in this almost unparalleled feature we have the precise converse of the unique phenomenon encountered in *Pipa* (p. 162)—there, our postaxial centrale is in confluence with the proximal postaxial element; here, the preaxial one enters into similar relationship with the proximal preaxial bone.

Brachycephalus[2] stands alone, among all forms examined by us, in that carpale 2 early unites with its corresponding metacarpal.

The above simple cases fade into insignificance beside that of *Rhombophryne*[2] (fig. 32). Here, all four carpalia and our two centralia have become welded into one great mass, interposed, as it were, between the lunatum and ulnare and the heads of the metacarpals. The boundary lines of its originally distinct constituents may be, for the most part, followed.

Remarkable indeed is the condition met with in *Phryniscus*, for here the variations are not even generically constant. In the two specimens of *P. lævis* examined, all the parts were free (fig. 30), while in *P. varians* carpale 2 had fused with the naviculare. In *P. cruciger* we found a unique state of affairs, carpals 1 & 2, metacarpals 1 & 2, and the naviculare all being firmly anchylosed together. It will be observed that here, as in *Microhyla* and less conspicuously in *Brachycephalus*, the whole tendency is towards imparting rigidity to the preaxial limb-border; it is not surprising, therefore, to find the naviculare sending up a radial spur, and, in doing this, appearing to become proximal.

[1] As already pointed out by Gegenbaur (18, p. 17).
[2] One specimen only examined.

Attention has already been called by one of us[2] to the existence of unexpected specific and even individual variations in the larynx of certain Anura; and we anticipate that a similar range will sooner or later be demonstrated for those in the carpus of this family, if of none other.

The pollex consists, in all specimens with which we have dealt, of one piece, irrespective of its carpal. In *Phryniscus lævis* this structure recalls (*po.* ii. fig. 30), as does the 'hand' generally, the condition of the Common Frog. In *Rhombophryne* (fig. 32) it is broad and calcariform.

Hind Foot (figs. 31 & 33).

In this we meet with variations little less surprising than those of the fore foot. The astragalus and calcaneus are in *Phryniscus lævis* widely separated (*a.*, *c.*, fig. 31); in *P. cruciger* and *P. varians* they lie close together as in the Tree-Frogs.

The hallux-tarsal is variable in the extreme in its relationships. In *Brachycephalus*, *Microhyla*, and *Rhombophryne* (fig. 33[1]) it is distinct and of fair size; in *Phryniscus cruciger* it had fused with the naviculare; while in the solitary specimen of *P. varians* examined it was confluent with the os cuboideum (tarsalia 2 and 3).

The calcar consists, in its simplest condition (*Brachycephalus*, *Microhyla*, *Phryniscus varians*, *Rhinoderma*, *Rhombophryne*, fig. 33) of two elements. In *Phryniscus cruciger* these had anchylosed, but in the young of *P. lævis* figured (fig. 31) four distinct elements were discernible.

It is worthy of remark that the anterior of the two ligaments which we record for the *Hylidæ* (p. 168, Plate VIII. fig. 19) reappears here with its contained sesamoid cartilage.

g. Dendrobatidæ.

One specimen of *Dendrobates tinctorius* was examined, but its carpus and tarsus correspond so closely with those of the Frog that it is needless to describe them separately.

h. Ranidæ.

Examined:—

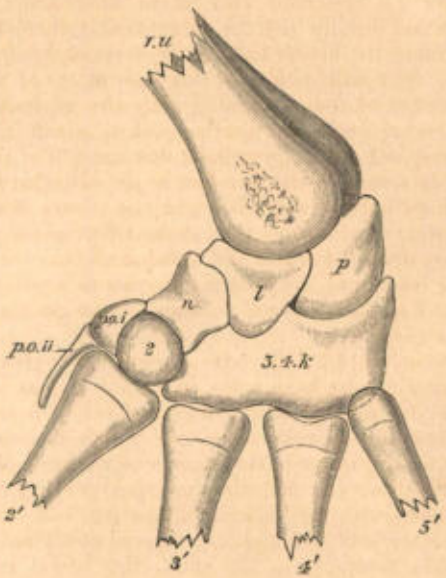
Rappia marmorata.
Nannophrys ceylonica.
Rhacophorus maculatus; *R. eques.*
Ixalus leucorhinus.
Cornufer vitianus.
Megalixalus madagascariensis.
Rana alticola; *R. cyanophlyctis*; *R. arvalis.*
Rana esculenta; *R. temporaria*: a large series of specimens at all stages.

There is a marked constancy in the carpus and tarsus of this

[2] P. Z. S. 1887, pp. 491–501.

family, and with the exception of a broadening of the pollex in *Cornufer* and *Rhacophorus*, and an increase in size of the proximal end of the pre-hallux metatarsal segment in the first-named genus, we have met with no important departure from what is seen in the Common Frog. As this animal is so largely in demand for ordinary class use[1], we append a somewhat detailed description of its limb-skeleton, in the light of our preceding observations.

Fig. B.



Rana temporaria, ♀, 54 mm. in length.

Left fore foot, dorsal view, × 12. The coalesced radius and ulna (*r. u*) are represented in the natural position. For references see p. 182.

Fore Foot (*Rana temporaria*).

In the adult carpus of this animal, six bones may be recognized, all of which are in their original positions with the exception of the naviculare (*n*). This has, as already remarked (p. 158), undergone elongation and displacement radially. We were not a little surprised to find that there is considerable variation in the position of this element in young Frogs, whose carpus and tarsus were still unossified. In a large series of specimens examined, measuring at

[1] The descriptions given in the students' manuals (Huxley & Martin's 'Elem. Biology,' Marshall's 'Frog,' and Mivart's 'Common Frog') are for the most part compilations, and we deem it unnecessary to criticise them in detail.

most 18 to 20 mm. in length, it flanked from one-third to three-fourths of the preaxial border of the lunatum. In these, as in the adult (fig. 2), it is four-cornered as seen from the dorsal aspect; in old Frogs it becomes triangular and it may fuse with the lunatum, in the manner already described (p. 172) for *Microhyla*.

The *lunatum* (*l.*) articulates proximally with the epiphysial border of the radius, preaxially with the naviculare by a concave or flattened surface, and postaxially with the proximal half of the inner border of the ulnare (pyramidale)—between it and the distal half of this bone the foramen intercarpi is enclosed (*cf.* p. 156).

The *ulnare* (*pyramidale*) (*p.*) is in articulation proximally with the ulna and distally with the large capitato-hamatum (3, 4 *k*) of the distal row; the hinder half of its preaxial border is free, as above stated. The articulations of this element are of a loose order with the exception of that associated with the capitato-hamatum; this bears antero-ventrally a projecting socket, which is excavated to receive a corresponding and prominent downgrowth of the ulnare.

Looked at *in situ*, with the fore foot in the extended position, the lunatum is most dorsally extended, and the ulnare most ventrally so. Examination of the parts thus shows that, while the rotation of the fore foot upon the radius and ulna has affected the articulation between these bones and the proximal carpals as a series, it has also brought about a less conspicuous rotation of the proximal upon the distal carpal elements.

Capitato-hamatum (3 4 *k*).—It is needless to recapitulate the grounds upon which we have come to regard this as a compound of the 3rd and 4th carpalia of previous workers with our postaxial centrale. Postaxially it sends up a lobe which embraces the free border of the ulnare, much in the manner of the secondary relationship assumed between the naviculare and lunatum. Proximo-internally it articulates with the naviculare, lunatum, and ulnare, distally so with the metacarpals 3, 4, and 5, by special condyles. This compound transmits ventrally, in the adult, the lateral ramus of the ulnar nerve; the foramen through which that passes is, in young animals, represented by an open groove (*cf.* p. 160).

Carpal of 2nd digit.—This element (²) varies considerably in shape, being sometimes rectangular, at others convex on all sides and approximately spherical.

Carpal of the pollex (¹).—This is more fully represented than might be imagined, on a knowledge of the great reduction of the pollex itself. It is strongly convex externally, and concave internally, for articulation upon the carpal of the second digit and the naviculare respectively.

Pollex.—This is invariably in a vestigial condition, consisting in the adult (see woodcut, fig. B) of a single piece, excluding its carpal, with which it is in definite articulation by a facet. Applying arguments previously adduced (p. 149), we regard this structure as representative of the entire first digit, rather than of its metacarpal alone as is more generally and empirically asserted.

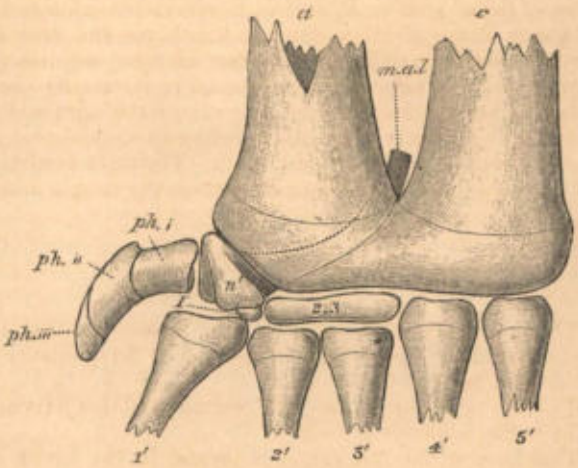
Metacarpals.—In the male the metacarpal of the second digit

becomes modified preaxially in connection with the thumb-pad. We have nothing to add to Leydig's account of this feature (26). The heads of the 2nd, 3rd, and 4th metacarpals are expanded and more or less considerably excavated, for articulation upon the carpalia and the capitato-hamatum. The head of the 5th metacarpal is, like its shaft, comparatively very slender, while it is so modified as to embrace the postero-external angle of the capitato-hamatum in the manner of a pincers apparatus.

Hind Foot (*Rana temporaria*).

The astragalus and calcaneus (*a.*, *c.*) are much elongated, confluent at their extremities, concave internally, and either circular or elliptical in section. Their internal borders bound the limits of origin of the adductor longus digiti primi muscle, the tendon of which (*m.a.l.*)

Fig. C.



Rana temporaria, ♀, 54 mm. in length.
Left hind foot, dorsal view, × 12. *m.a.l.* tendon of the adductor longus digiti primi muscle. Other references as at p. 182.

is inserted into the naviculare (*n'*). With the full development of this there arises from the epiphysial cartilage of the astragalus a prominence which overlies the tendon[1], and which ossifies with age; in old individuals there passes between it and the calcaneus an annular ligament.

Tarsalia 4 *and* 5.—Represented in ligament, which is not recognizable in adult specimens.

Tarsalia 2 *and* 3.—Invariably united to form the splint-like

[1] *Cf.* Ecker (17, p. 128, and fig. 91).

"cuboideum" (2, 3). This compound is interposed between the astragalus and the heads of metatarsals 2 and 3.

Naviculare (*centrale*), *n'*, and *hallux-tarsal*.—The former articulates obliquely upon the epiphysial cartilage of the astragalus; its outer face bears two convexities of nearly equal size, which are separated by a shallow groove. The ventral convexity furnishes the main articulation for the pre-hallux (see woodcut, fig. C).

The hallux-tarsal (*l*) is generally, though not invariably, present; when recognizable as a distinct element it assumes the form of a small nodule of cartilage, lying buried up in a confused mass of ligamentous tissue, in the interspace between the postaxial hinder border of the naviculare, the head of the hallux-metatarsal, and the os cuboideum (*cf.* p. 147). In the Bull Frog (*R. pipiens*) this cartilage ossifies, but we have never observed that to be the case in *R. temporaria*.

Pre-hallux (*calcar*).—Born admits the existence of from 2 to 4 pieces in this structure (*cf.* p. 149), while he records (5, p. 233) the presence of three[1] such in *R. arvalis*, in contradistinction to Leydig.

In young Frogs of 20 millim. in length we find four distinct segments of hyaline cartilage. The first or tarsal segment (*ph.* i.) articulates with the naviculare; the second or metatarsal one is the largest, and bears a small retral process; of the third and fourth or phalangeal segments, the latter undergoes degradation and is represented only in ligament in the adult. The three persistent segments ultimately undergo ossification and usually remain distinct.

IV. Conclusions.

Fore Foot.

1. That the pyramidale represents the ulnare, and that there is insufficient evidence upon which to base a final determination of the morphological value of the lunatum.

2. That the naviculare is a preaxial centrale, and that its connection with the radius is always secondary.

3. That a vestigial 5th carpal is present in the adults of the *Discoglossidæ* and *Pelobatidæ*.

4. That that element hitherto regarded as the 5th carpal is a postaxial centrale, and that the living Anura are unique, as an Order, in the invariable possession of two large centralia carpi.

Hind Foot.

5. That no traces of a third proximal tarsal element are forthcoming at any stage in development; and that the morphological value of the astragalus and calcaneus has yet to be settled.

6. That while the tarsalia of the 4th and 5th digits are often represented in ligament, skeletal vestiges of the fourth one are forthcoming in the *Discoglossidæ*.

[1] Four actually; but it will be remembered that he regards our centrale (naviculare) as the pre-hallux tarsal.

7. That the naviculare is a centrale and not the basal segment of the pre-hallux.

8. That the pre-hallux never consists of more than four pieces, and that it conforms to the structural requirements of a sixth digit.

9. That the outer free border of the pre-hallux may undergo a process of fragmentation, giving rise to insignificant nodules of cartilage indistinguishable from those for which, in certain other Vertebrata, the value of lost rays has been claimed; and that the grounds upon which this claim is based are unsatisfactory.

10. That there is a tendency towards loss of independence of the hallux-tarsal in the *Discoglossidæ*, *Pelobatidæ*, and some *Ranidæ*, that element in them remaining cartilaginous and small, or fusing with one of the adjacent elements.

11. That *Pipa* is alone exceptional among living forms, in that the third digit exceeds the fourth one in length.

Perusal of the body of this paper will show that in all the higher families of Anura there is a general tendency towards confluence of three or more of the carpal elements, but consideration of the fact that such modifications by fusion may not be even generically constant, shakes our faith in them as guides to affinity. The fact which stands out most conspicuously is that the least modified conditions of both fore and hind feet are most nearly combined in the *Discoglossidæ*. Hochstetter has recently shown (20) that in *Bombinator* the posterior cardinal veins are retained for life, in a slightly modified form, and his observation has been supplemented by one of us and extended (22) to *Alytes* and *Discoglossus*. Adding these facts to those so well known concerning the vertebral and other characters of this family, there can no longer be any doubt that its members are, by far, the least modified of all living Anura.

The digital formula of the Anura is[1]:—

Fore.	Hind.
Ph. 2, 2, 3, 3.	Ph. 2, 2, 3, 4, 3.

The only other Amphibia of which we have any knowledge whose phalanges approach this in order of arrangement are the Stegocephalia of the Permian. We unfortunately know nothing of their carpus and tarsus. Baur has lately tabulated (1, p. 64) the digital formulæ of all known Urodela, and perusal of his tables will show how completely all the members of that order are, in this respect, modified as compared with the Anura. Thus it is seen that while the limb-skeleton of the Frogs and Toads is specialized in the extreme for physiological purposes, there is retained in it a leading morphological feature which carries us back to some of the oldest known representatives of the class Amphibia; and we must look to the Stegocephalia themselves or to some closely allied forms for the ancestors of these familiar creatures.

[1] During the passage of these pages through the press, Mr. Boulenger has called attention (see below pp. 204–206) to the fact that in certain *Ranidæ* a supernumerary phalanx is intercalated between the penultimate and terminal ones of each digit in both fore and hind feet. The formula of these animals is thus: 3, 3, 4, 4. 3, 3, 4, 5, 4.

Walterstorff has recently published (37, 38) an exhaustive account of certain fossil frogs, and of the Palæobatrachidæ in particular. He claims to have discovered a series of connecting-links between the Arcifera (*Pelobatidæ*) and the Aglossa. He has pointed to the equality in length of the 3rd and 4th digits of the hind limb in certain of his specimens, and his deductions receive additional support from the fact that in some of those the third digit appears to have even exceeded the fourth in length, as we have shown to be the case in the living *Pipa*.

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VI. EXPLANATION OF THE PLATES.

In order to facilitate comparison, all the figures are drawn in the same relative position. Each represents the dorsal surface of the left member.

Unless otherwise stated, all the preparations are represented as transparent objects. In drawing them, we have stippled ossified parts and left the cartillages clear; the effect thus obtained is more natural than that expressed in the more orthodox custom of stippling the latter.

Ligaments are indicated in black.

Plate VII.

Fig. 1. *Pipa americana*, adult ♂. Left fore foot, from above. Drawn as an opaque object. × 2½.

2. *Pipa americana*, very young specimen. Left fore foot. Ossification has not yet begun. × 30.

3. *Xenopus lævis*, adult ♀. Left hind foot. × 4.

4. *Xenopus lævis*, adult ♀. Left fore foot. Elements slightly disarticulated. × 5.

5. *Discoglossus pictus*, young specimen. Left fore foot. × 10.

6. *Discoglossus pictus*, adult ♂, 42 mm. in length. Left fore foot. All the elements are completely ossified. The white areas represent compact bone, the dark ones spongy bone. × 4.

7. *Bombinator igneus*, adult ♀, 37 mm. in length. Left fore foot. × 7.

8. *Bombinator igneus*, adult ♀, 26 mm. in length. Left hind foot. × 7.

9. *Alytes obstetricans*, tadpole, 24 mm. in length from mouth to vent. Left fore foot. × 20.

10. *Alytes obstetricans*, adult ♀, 40 mm. in length. Left hind foot. The astragalus and calcaneus and the metatarsals have alone begun to ossify. × 4.

Plate VIII.

11. *Pelodytes punctatus*, length 30 mm. Left fore foot. The hand is rotated upon the radius and ulna through more than a right angle; to facilitate comparison with the other figures, the fused radius and ulna are represented as completely disarticulated and flattened out. × 7.

12. *Pelodytes punctatus*, length 30 mm. Left hind foot. × 8.

13. *Pelodytes punctatus*, outline sketch of preaxial portion of the tarsus of the above preparation, to show the course of the ligament connecting the tarsalia of the hallux and pre-hallux. × 16.

14. *Xenophrys monticola*, young specimen, 27 mm. in length. Left fore foot. × 5.

15. *Xenophrys monticola*, enlarged drawing of the postaxial distal portion of fig. 14. The element *k* has been slightly displaced, in order to show more fully the vestigial 5th carpal. × 16.

16. *Xenophrys monticola*, adult of 40 mm. length. To show ossification of the vestigial 5th carpal. × 18.

17. *Xenophrys monticola*, length 27 mm. Left hind foot. × 12.

18. *Pelobates fuscus*, adult ♂, 54 mm. in length. Left fore foot. The fused radius and ulna have been disarticulated from the hand and laid flat; during life the radius articulates in the concavity seen at the proximal end of the lunatum (*l.*). × 7.

19. *Hyla cærulea*, adult ♀, 75 mm. in length. Left hind foot. × 3½.

19*a*. *Phyllomedusa dacnicolor*. Calcar, showing absence of the proximally directed process of its second segment. × 4.

20. *Hyla cærulea*, adult ♀, 75 mm. in length. Left fore foot. × 4½.

21. *Hyla arborea*, late tadpole. Left hind foot. Ossification has not yet begun. × 14.

22. *Pseudophryne bibronii*, ♂, 22 mm. in length. Left fore foot. × 12.

PLATE IX.

23. *Bufo calamita*, young specimen, 18 mm. in length. Left hind foot. × 12.
24. *Ceratophrys ornata*, young ♀, 140 mm. in length. Left hind foot. × 1½.
25. *Leptodactylus pentadactylus*, large ♂ specimen, 140 mm. in length. Left fore foot. Drawn as an opaque object. Nat. size.
26. *Pseudis paradoxa*, tadpole, length of tail 110 mm. Left fore foot. Ossification has not yet begun. × 6.
27. *Pseudis*, tadpole. Left hind foot. × 3¾.
28. *Limnodynastes tasmaniensis*, young ♂, 38 mm. long. Left fore foot. × 6.
29. *Limnodynastes tasmaniensis*, young ♂, 38 mm. in length. Left hind foot. × 6.
30. *Phryniscus lævis*, ♀, 45 mm. in length. Left fore foot. × 5.
31. *Phryniscus lævis*, ♀, 45 mm. in length. Left hind foot. × 5.
32. *Rhombophryne testudo*, ♂, 38 mm. in length. Left fore foot. × 5.
33. *Rhombophryne testudo*, ♂, 38 mm. in length. Left hind foot. × 4½.

Reference Letters.

References marked * all apply to special allusions in the text.

FORE FOOT.—*f. i.*, foramen intercarpi. *k*, postaxial centrale. *l.*, lunatum (radiale). *n.*, naviculare (preaxial centrale). *p.*, ulnare (pyramidale). *po.* i., carpal of pollex. *po.* ii., metacarpal of pollex. *po.* iii., *po.* iv., phalanges of pollex. *po.* II., unsegmented element probably representing *po.* ii., *po.* iii., & *po.* iv. *r.*, radius. *u.*, ulna. 2, 3, 4, 5, carpals of second, third, fourth, and fifth digits. 2′, 3′, 4′, 5′, metacarpals. 4 *k*, element (*capitatum*) formed by the fusion of the carpal of the fourth digit with our postaxial centrale. 3, 4 *k*, element formed by the fusion of the third and fourth carpals with our postaxial centrale (*capitato-hamatum* of Ecker). *nk*, 1 to 4, element (*carpo-centrale*) formed by the fusion of the distal and central carpal elements. *pk*, element formed by the fusion of the ulnare with the postaxial centrale.

HIND FOOT.—*a.*, astragalus (tibiale?). *c.*, calcaneus (fibulare?). *n′.*, naviculare (centrale). *ph.* i., first segment (tarsal) of pre-hallux. *ph.* ii., second segment (metatarsal) of pre-hallux. *ph.* iii., *ph.* iv., third and fourth segments (phalanges) of pre-hallux. 1, 2, 3, tarsals of the first, second, and third digits. 2, 3, *cuboideum*, formed by fusion of second and third tarsalia. 1′, 2′, 3′, 4′, 5′, metatarsals of the first, second, third fourth, and fifth digits.

2. Descriptions of some new Species of Birds from the Island of Guadalcanar in the Solomon Archipelago, discovered by Mr. C. M. Woodford. By R. BOWDLER SHARPE, F.L.S. &c.

[Received January 18, 1888.]

The Accipitres brought by Mr. Woodford from Guadalcanar are extremely interesting, and no less than three new species of *Astur* are represented in his collection.

I propose to call them :—

ASTUR HOLOMELAS, sp. n.

Adult male. Entirely black, with a slaty-grey gloss on the back, rump, wings, and tail, and decidedly more slaty on the under surface of the body ; " bill slaty black ; cere and orbital skin yellow ; iris

red" (*C. M. Woodford*). Total length 12·5 inches, culmen 0·95, wing 8, tail 5·7, tarsus 2·25.

Hab. Aola, Guadalcanar.

This might possibly be a melanotic form of *Astur woodfordi* described below, but I cannot imagine that melanism would remove all trace of the vinous half-collar which is seen on the last-named species. It can in no case be a melanism of *Astur albigularis*, of which Mr. Woodford procured a male specimen with the wing 11·5 inches.

ASTUR WOODFORDI, sp. n.

Adult male. General colour above dark slate-colour, slightly darker on the mantle and lesser wing-coverts; quills and tail-feathers blackish, externally dark slate-colour, the latter with numerous indistinct dusky bars on the inner web; crown of head, ear-coverts, and cheeks blacker than the back, with a wash of slaty-grey, lighter on the latter; sides of cheek deep vinous chestnut, extending backwards round the hind neck, which is strongly washed with dark slaty grey, so that only a half-collar of chestnut is formed: entire under surface of body pure white, the sides of the fore neck washed with vinous chestnut; under wing-coverts and axillaries pure white; quills slaty grey below, blacker towards the ends, white at the base freckled with grey: "bill black; cere and legs yellow; iris red" (*C. M. Woodford*). Total length 14 inches, culmen 0·95, wing 8·5, tail 5·8, tarsus 2·4.

Hab. Aola, Guadalcanar.

It will be noticed that the specimen of *A. woodfordi* is of about the same size as the type of *A. holomelas*, and if the latter should ultimately be proved to be only a melanism of the white-breasted Goshawk, I wish the species to be known by the name of its discoverer.

ASTUR SHEBÆ, sp. n.

Adult male. Similar to *Astur dampieri* of New Britain, and of the same pale pearly-grey colour, but easily distinguished by its white under wing-coverts, very pale reddish-white thighs, and white under tail-coverts: "bill black: cere and legs yellow; iris brown" (*Woodford*). Total length 12·5 inches, culmen 1, wing 7·3, tail 5·4, tarsus 2·2.

Mr. Woodford also sends a female, which is rather larger than the male (wing 8·5 inches), but the specimen is not fully adult.

Fam. BUBONIDÆ.

NINOX GRANTI, sp. n.

Adult male. General colour above uniform chocolate-brown on the mantle and upper back, the upper tail-coverts slightly mottled with dull white or rufous-white bars, and again on the upper mantle and scapulars; lesser wing-coverts uniform chocolate-brown; median and greater coverts dusky brown, with a large rounded spot of white on the outer web; bastard-wing like the wing-coverts; primary-coverts uniform chocolate-brown; quills dark brown, externally

spotted with white, the spots larger on the primaries; tail-feathers dark brown, with seven bars of white or reddish brown; crown of head and hind neck dark brown, the former spotted, the latter barred with white or reddish white; base of forehead and lores white, the latter with black shaft-lines; ear-coverts brown, barred across with reddish white; cheeks and throat white; remainder of under surface of body white, the fore neck and breast chocolate-brown with reddish-white bars; the sides of the body and flanks white, with bars of reddish brown; thighs brown in front, white behind; under tail-coverts white, with spots of reddish brown; under wing-coverts white with a rosy tinge, mottled with brown near the edge of the wing; axillaries and lower primary-coverts uniform chocolate-brown; quills dusky brown, barred with white towards the base, which is marked with rosy: "bill pale olive; legs yellow; iris yellow" (*C. M. Woodford*). Total length 10 inches, culmen 0·95, wing 7·2, tail 3·6, tarsus 1·4.

Adult female. Differs from the male in having the breast and abdomen broadly banded with pale rufous brown. Total length 10 inches, wing 7·1, tail 3·5, tarsus 1·3.

This species most nearly resembles *Ninox punctulata* of Celebes, but it has the mantle uniform brown, not spotted, the bars much more distinct on the under surface, and the fore part of the thighs brown, whereas they are white in the Celebean bird.

Fam. Campophagidæ.

Graucalus holopolius, sp. n.

Adult female. General colour above blue-grey, the head like the back; wing-coverts slightly clearer grey than the back, especially on the greater series; bastard-wing, primary-coverts, and quills black, externally ashy grey, lighter on the edges of the inner secondaries, which resemble the greater coverts; tail-feathers black, the centre ones ashy grey towards the base; lores rather duller ashy, with a few white spots above the upper margin; ear-coverts rather darker ashy, flecked with small white shaft-streaks; cheeks and entire under surface of body clear blue-grey, with a few indications of whitish margins on the feathers of the breast and abdomen; thighs and under tail-coverts uniform blue-grey; under wing-coverts paler blue-grey, slightly varied with ashy-whitish cross-bars; quills dusky blackish, ashy towards the base, and edged with white along the inner web: "bill and feet black; iris black" (*C. M. Woodford*). Total length 9 inches, culmen 0·75, wing 4·3, tail 3·6, tarsus 0·85.

Mr. Woodford has pointed out to me that the iris in this species is black, thus showing that it cannot be *G. pusillus*, with which I was inclined to unite it. It is no doubt closely allied to *G. pusillus*, but differs in having no black on the forehead and lores, and also in having the ear-coverts streaked minutely with white.

Edoliisoma erythropygium, sp. n.

Adult male. Similar to the male of *E. remotum*, but darker grey: "bill black; legs black; iris dark brown" (*C. M. Woodford*). Total length 9 inches, culmen 0·95, wing 4·55, tail 3·35, tarsus 0·9.

W. Hart del. et lith.

Mintern Bros. imp.

1, 2. NASITERNA AOLÆ, ♂, ♀.
3. MYZOMELA SHARPEI.

Adult female. Similar to the female of *E. remotum*, but distinguished by its entirely chestnut tail, the whole of the lower back, rump, and upper tail-coverts being light rufous: "bill, legs, and iris black" (*C. M. Woodford*). Total length 8 inches, culmen 0·85, wing 4·4, tail 3, tarsus 0·9.

The specific name is founded on the characters of the female, which in this genus of *Campophagidæ* possesses the most strongly marked distinctions.

Fam. Muscicapidæ.

Pomarea erythrosticta, sp. n.

Pomarea castaneiventris (nec Verr.), Grant, P. Z. S. 1887, p. 331.

Adult female. General colour purplish black; lesser and median wing-coverts like the back; greater coverts, primary-coverts, quills, and tail-feathers black, with a slight purplish gloss on the edges of the feathers; sides of head, throat, and chest glossy purplish black like the back; in front of the eye a spot of bright cinnamon; breast, abdomen, sides of body, flanks, and under tail-coverts deep chestnut; thighs chestnut with black bases; under wing-coverts and axillaries chestnut, the former with black bases; edge of wing black; lower primary-coverts ashy; quills dusky below, ashy along the edge of wing towards the base: "bill grey; legs black; iris brown" (*C. M. Woodford*). Total length 5·6 inches, culmen 0·7, wing 3·15, tail 2·2, tarsus 0·75.

Hab. Fauro.

There is no doubt that this species is distinct from *P. castaneiventris*, the rufous spot in front of the eye distinguishing it at a glance.

3. Second List of the Birds collected by Mr. C. M. Woodford in the Solomon Archipelago. By W. R. Ogilvie-Grant[1].

[Received February 21, 1888.]

(Plate X.)

In the Proceedings of this Society, 1887, pp. 328–333, I had the pleasure of giving a list, with some notes on the first collection, of Birds made by Mr. C. M. Woodford at Fauro, Alu, Shortland Island, and other localities in the Solomon Archipelago, which contained examples of 35 species, two (*Macrocorax woodfordi* and *Monarcha erythrosticta*) being new to science.

The second collection made by the same gentleman, and described in the present paper, is much more extensive, and contains representatives of 66 species, of which the majority were obtained at Aola and Rovatu, in the Island of Guadalcanar, between the months of April and July 1887; while a few were got at the little island of Rubiana in March of the same year.

[1] See P. Z. S. 1887, p. 328.

Of these 66 species no less than 11 are new to science. Six of these have been described in a separate paper by my colleague Mr. Bowdler Sharpe, to whom I am much indebted for kind help and advice, while full descriptions of the remaining 5 will be found below.

Besides the new birds, a number of specimens represent rare and little-known forms, such as *Carpophaga brenchleyi* of Gray.

Mr. Woodford has taken every care in giving notes on the life-colours of the "soft parts" of each bird, and all particulars regarding its sex, locality, and the date when it was obtained: also a list of the native names in use on the various islands he visited, whenever these could be obtained.

There is a fine series of specimens of the new Crow (*Macrocorax woodfordi*) previously described, which differ little from one another, and all show the striking peculiarities of this species.

The Flycatcher (*Monarcha castaneiventris*), from Guadalcanar, is an interesting form to which two specimens from Fauro were erroneously referred in my previous paper. These now prove to belong to a species very distinct, both from the former and from the smaller *M. rufo-castanea* of Ramsay, from San Christoval. The fact of these three neighbouring islands each possessing a distinct species of their own clearly shows that these birds do not migrate.

The first new species is a Pigmy Parrot (*Nasiterna aolæ*), and probably the smallest representative of that genus. The nearest ally is the larger *N. finschi*, found in San Christoval, from which it may be at once distinguished by having the top of the head in both sexes washed with azure-blue, and by the adult male having no orange-red stripe down the centre of the abdomen.

The second is a dull olive-yellow Honey-sucker, which I have named *Myzomela sharpei*, in honour of my colleague Mr. Sharpe. Only one adult male was obtained, but this is entirely unlike anything hitherto described.

The third is a Ground-Pigeon, which I have called *Phlogœnas solomonensis*. This bird is perhaps hardly entitled to specific rank, and might perhaps be more correctly regarded as another insular race of Mr. Sclater's species *P. johannæ*, from New Britain. But it is altogether darker than the latter species, and has the upper surface washed with purple instead of olive.

The fourth is a very fine Heron, which I have named *Ardeiralla woodfordi*, after the collector. It appears to stand remote from anything hitherto known, being only distantly related to *A. flavicollis*.

The last new species is a Night-Heron (*Nycticorax mandibularis*), which was obtained by Mr. Ramsay from the same locality, but confounded by him with *N. manillensis*, Vigors. It holds a somewhat intermediate position between this species and *N. caledonicus*, but is considerably smaller than either, as the comparative table of measurements given below will clearly show. Of the two it is most closely allied to the latter, but is easily recognized by its dark rufous breast and the absence of the white superciliary streak so strongly marked in *N. caledonicus*.

At Aola, Guadalcanar.	Manu	=a bird.	Tolua =an egg.
At Rubiana.	Kuru-kuru	= „	Vovoto = „
At Alu, Shortland Isl.	Maraka	= „	Erun = „

The following is a list of the native names for each species as far as could be obtained. Mr. Woodford is responsible for the names marked * :—

	In Alu, Shortland Island.	In Aola, Guadalcanar.	In Rubiana.
Haliaëtus leucogaster	Manua.	Polui.	
Astur pulchellus	Gebetchemanea.		
Astur sheba *	.....	Arokapusaqui.	
Astur woodfordi	.....	Kulekule.	
Astur albigularis?	Ourisiara.		
Baza guadalcanarensis	.....	Kiso.	
Pandion leucocephalus	Manuellei.	Mavu.	Manuwai.
Haliastur girrenera	Nena.		
Ninox granti	.....	Kuru.	
Cacatua ducorpsi	An-a-a.	Merako.	Kakea.
Geoffroyius heteroclitus	Keaka.	Kina.	
Eclectus polychlorus	Karo.	Kalau.	
Lorius chlorocercus	.....	Lauru.	
Eos cardinalis	Oulisili.	Kolusiri.	
Trichoglossus massena	Dimoro.	Rokovigan.	Uilisuru.
Cacomantis tymbonomus	.....	Thariande.	
Nesocentor milo	.....	Thenge.	
Rhytidoceros plicatus	Popo.	Bina.	
Halcyon leucopygia	.....	Tumbunavua.	
Halcyon saurophaga	Keo-keo-la-leite.	Thetheutha.	
Halcyon sancta	Koro-koro-opoulu.	Kitoto.	
Eurystomus crassirostris	Kekewaka.	Kerau.	
Macropteryx mystacea	Siru.	Uvekeviu.	
Hirundo tahitica	Kinkina.		
Monarcha rufonotata	Sisio.		
Rhipidura tricolor	Piriti.	Vuvugo.	Pitikole.
Graucalus pusillus	Biu-biu.		
Graucalus elegans	Goreala.		
Graucalus sclateri	.....	Kuira.	
Pachycephalus astrolabi	.....	Pöisau ?	
Calornis metallica	Ouririri.		
Lamprocorax grandis	Sikootoo.	Tomi.	
Mino kreffti	Tigeno.		
Macrocorax woodfordi	.....	Kau.	
Ptilopus lewisi	Bubueka.	Kavuku ?	
Globicera rufigula	Uru-on.	Marui.	Baruku.
Macropygia rufo-castanea	Bio ?		
Phlogœnas solomonensis	.....	Muluka.	
Colœnas nicobarica	Kokorako.		
Megapodius brenchleyi	I-on.	Kolao.	
**Gallus domesticus*	Kokole.	Kokoroko.	Kokorako.
**Porphyrio melanopterus*	.....	Bulake.	
Numenius variegatus	.....	Vutemila.	
Demiegretta sacra	So-o.		
Butoroides javanica	No-kea.	Rou.	
**Anas superciliosa*	.....	Tharanga.	
Sterna longipennis	.....	Ndei-ndei.	
*Frigate-bird	Pore-ei.	.....	Belama.

1. HALIAËTUS LEUCOGASTER.

Cuncuma leucogaster (Gm.); Salvad. Orn. Papuasia, i. p. 7.

a. ♂ imm. Aola, Guadalcanar; 21. 6. 87. Bill black; legs dirty grey; iris brown. Food putrid fish.

b. ♀ imm. Aola, Guadalcanar; 10. 8. 87. Bill slaty blue; legs dirty grey; iris brown.

2. ASTUR WOODFORDI.

Astur woodfordi, Sharpe, *suprà*, p. 183.

3. ASTUR HOLOMELAS.

Astur holomelas, Sharpe, *suprà*, p. 182.

4. ASTUR SHEBÆ.

Astur shebæ, Sharpe, *suprà*, p. 183.

5. ASTUR ALBIGULARIS.

Astur albigularis (Gray); Sharpe, *suprà*, p. 183.

5*a*. BAZA GURNEYI.

Baza gurneyi, Salvad. *t. c.* iii. App. p. 506.

6. PANDION LEUCOCEPHALUS.

Pandion leucocephalus, Gould; Salvad. *t. c.* i. p. 11.

a. ♀ ad. Aola, Guadalcanar; 17. 7. 87. Bill black; legs white; iris yellow.

7. HALIASTUR GIRRENERA.

Haliastur girrenera (Vieill.); Salvad. *t. c.* i. p. 15.

a. ♀ ad. Aola, Guadalcanar; 20. 4. 87. Bill yellow; legs yellow; iris red-brown.

b. ♂ ad. Aola, Guadalcanar; 14. 5. 87. Bill yellow; legs yellow; iris red-brown.

c. ♂ ad. Aola, Guadalcanar; 27. 5. 87. Bill yellow; legs yellow; iris brown. Food, Orthoptera.

8. NINOX GRANTI.

Ninox granti, Sharpe, *suprà* p. 183.

9. CACATUA DUCORPSI.

Cacatua ducorpsii, Jacq. & Pucher; Salvad. *t. c.* i. p. 104; Sharpe, in Gould's Birds N. Guinea, pt. xix. pl.

a. ♀ ad. Rubiana; 7. 3. 87. Bill blue; legs black; iris red; skin round eyes pale blue.

b. ♀ ad. Aola, Guadalcanar; 21. 4. 87. Bill blue; legs grey; iris red; skin round eyes pale blue.

c. ♀ ad. Aola, Guadalcanar; 30. 4. 87. Bill pale blue; legs grey; iris dark brown.

d. ♂ ad. Aola, Guadalcanar ; 1. 5. 87. Bill pale blue ; legs grey ; iris nearly black.

Mr. Woodford was of opinion that the red-eyed birds might prove different from the black-eyed, but I cannot find any difference whatever.

10. NASITERNA AOLÆ, sp. n. (Plate X. figs. 1, 2.)

a. ♀ ad. Aola, Guadalcanar ; 14. 4. 87. Bill black ; legs grey ; iris red.

b. ♂ ad. Aola, Guadalcanar ; 1. 6. 87. Bill black ; legs grey ; iris orange.

c. ♂ ad. Aola, Guadalcanar ; 5. 6. 87. Bill black ; legs grey ; iris orange.

This bird is at once distinguishable from the larger *N. finschi*, Ramsay, which it otherwise resembles, by having the top of the head in both sexes washed with azure-blue, and by having the whole under surface yellowish green, without any stripe of orange-red down the centre of the abdomen in the male. As shown by the above specimens, the blue feathers round the lower mandible are a character of the male, while the reddish-orange distinguish the female. The only specimen of *N. finschi* in the Natural-History Museum is a female :—"Iris dark hazel. Bill and feet ash. San Christoval, August 10th, 1880.—*G. E. R.*" And this has the feathers round the mandible reddish orange, and the head uniform green, like the back.

	Total length.	Culmen.	Wing.	Tail.	Tarsus.	1st toe (s. u.).	Short hind toe (s. u.).
	in.	in.	in.	in.	in.	in.	in.
♂	..	0·3	2·25	1·05	0·32	0·5	0·27
♀	..	0·3	2·3	1·01	0·33	0·5	0·25

11. GEOFFROYIUS HETEROCLITUS.

Geoffroyius heteroclitus (Hombr. & Jacq.) ; Salvad. *t. c.* i. p. 194 ; Sharpe, in Gould's Birds of New Guinea, pt. viii. pl.

a. ♂ ad. Aola, Guadalcanar ; 22. 4. 87. Bill above grey, below black ; legs grey ; iris pale yellow.

b. ♀ ad. Aola, Guadalcanar ; 4. 7. 87. Bill black ; legs grey ; iris pale yellow.

c. ♂ ad. Aola, Guadalcanar ; 4. 7. 87. Bill yellow above, black below ; legs grey ; iris pale yellow.

d. ♀ ad. Aola, Guadalcanar ; 11. 8. 87. Bill yellow above, black below ; legs grey ; iris straw.

12. ECLECTUS POLYCHLORUS.

Eclectus pectoralis (P. L. S. Müll.) ; Salvad, *t. c.* i. p. 197.

Eclectus polychlorus (Scop.) ; Sharpe, *t. c.* pt. viii. pl.

a. ♂ ad. Aola, Guadalcanar ; 9. 4. 87. Bill above yellow, below black ; legs black ; iris red. Food, fruit.

b. ♀ ad. Aola, Guadalcanar; 14. 4. 87. Bill black; legs black; iris red. Food, fruit.

c. ♂ ad. Aola, Guadalcanar; 30. 5. 87. Bill yellow above, black below; legs black; iris yellow.

d. ♂ ad. Aola, Guadalcanar; 1. 6. 87. Bill yellow above, black below; legs black; iris red.

e. ♀ ad. Aola, Guadalcanar; 1. 6. 87. Bill black; legs black; iris yellow.

13. Lorius chlorocercus.

Lorius chlorocercus, Gould, Salvad. *t. c.* i. p. 239.

a. ♀ ad. Aola, Guadalcanar; 1. 6. 87. Bill orange; legs black; iris red.

b. ♀ ad. Aola, Guadalcanar; 9. 6. 87. Bill orange; legs black; iris red.

c. ♂ ad. Aola, Guadalcanar; 10. 7. 87. Bill orange; legs black; iris orange.

d. ♀ ad. Aola, Guadalcanar; 10. 7. 87. Bill orange; legs black; iris red.

e–h. 4 ♂ ad. Aola, Guadalcanar; 14. 7. 87. Bill orange; legs black; iris orange.

i–m. 3 ♀ ad., 1 ♀ imm. Aola, Guadalcanar; 14. 7. 87. Bill orange; legs black; iris orange.

n. ♂ ad. Aola, Guadalcanar; 17. 7. 87. Bill orange; legs black; iris orange.

o. ♂ ad. Aola, Guadalcanar; 25. 7. 87. Bill orange; legs black; iris orange.

The young female has not got the black patch of feathers which lie on either side and in front of the yellow crescent on the breast. The red on the throat, cheeks, back of the neck, belly, &c. is mixed with yellow, and the yellow zone on the breast is not clearly defined, many of the feathers being tipped or broadly edged with red. The red on the inner webs of the primaries is suffused with yellow towards the extremities. The black on the head is mixed with green similar to that on the wing.

14. Eos cardinalis.

Eos cardinalis (Gray), Salvad. *t. c.* i. p. 249.

a. ♀ ad. Rubiana; 7. 3. 87. Bill yellow; legs black; iris red. Food, flower of cocoa.

b. ♂ ad. Aola, Guadalcanar; 15. 5. 87. Bill red-orange, black on top; skin black, with a yellow band at lower mandible; legs black; iris red.

c, *d*. ♂ ♀ ad. Aola, Guadalcanar; 10. 7. 87. Bill orange; legs black; iris red.

e–g. 2 ♂, 1 ♀ ad. Aola, Guadalcanar; 11. 7. 87. Bill orange; legs black; iris red.

h. ♀ ad. Aola, Guadalcanar; 12. 7. 87. Bill orange; legs black; iris red.

i. ♂ ad. Aola, Guadalcanar; 14. 7. 87. Bill orange; legs black; iris red.

k–m. 1 ♂, 2 ♀ ad. Aola, Guadalcanar; 17. 7. 87. Bill orange; legs black; iris red.

15. TRICHOGLOSSUS MASSENA.

Trichoglossus massena, Bp., Salvad. *t. c.* p. 288.

a–c. 2 ♂, 1 ♀ ad. Aola, Guadalcanar; 14. 7. 87. Bill orange; legs grey; iris orange.

16. CACOMANTIS TYMBONOMUS.

Cacomantis tymbonomus (S. Müll.), Salvad. *t. c.* i. p. 340.

a. ♀ imm. Aola, Guadalcanar; 18. 4. 87. Bill brown; legs yellow, toes black; iris brown. Food, beetles and flies.

17. LAMPROCOCCYX BASALIS.

Lamprococcyx basalis (Horsf.), Salvad. *t. c.* i. p. 349.

a. ♀ ad. Aola, Guadalcanar; 24. 4. 87. Bill black; legs dark grey; iris brown. Food, beetles.

b. ♂ ad. Aola, Guadalcanar; 3. 5. 87. Bill black; legs black; iris brown.

c. ♂ ad. Aola, Guadalcanar; 4. 5. 87. Bill black; legs grey; iris brown.

d. ♀ ad. Aola, Guadalcanar; 6. 5. 87. Bill black; legs black; iris brown.

18. EUDYNAMIS CYANOCEPHALA.

Eudynamis cyanocephala (Lath.), Salvad. *t. c.* i. p. 365.

a. ♀ ad. Aola, Guadalcanar; 6. 6. 87. Bill black above, grey below; legs olive; iris orange-red.

19. URODYNAMIS TAITIENSIS.

Urodynamis taitiensis (Sparrm.), Salvad. *t. c.* i. p. 370.

a. ♂ imm. Aola, Guadalcanar; 20. 4. 87. Bill brown above, yellow below; legs yellowish grey; iris yellow.

b. ♂ imm. Aola, Guadalcanar; 20. 5. 87 Bill olive; legs olive; iris yellow.

20. NESOCENTOR MILO.

Nesocentor milo (Gould), Salvad, *t. c.* i. p. 385.

a. (♂) ad. Aola, Guadalcanar; 14. 4. 87. Bill black; legs black; iris red.

b. Imm. Aola, Guadalcanar; 4. 5. 87. Bill brown; legs bluish grey; iris brown. Food, beetles and grasshoppers.

c. ♀ ad. Aola, Guadalcanar; 6. 5. 87. Bill brown; legs slate; iris dark grey.

d. ♂ ad. Aola, Guadalcanar; 15. 5. 87. Bill black; legs grey; iris brown.

21. Rhytidoceros plicatus.

Rhytidoceros plicatus (Penn.), Salvad. *t. c.* i. p. 392.

a. ♂ ad. Aola, Guadalcanar; 14. 4. 87. Bill white, reddish at base; legs black; iris red. Food, fruits and seeds.

b. ♀ ad. Aola, Guadalcanar; 14. 4. 87. Bill white, reddish at base; skin of throat chalk-white, round eye blue; legs black; iris red.

c. ♂ imm. Aola, Guadalcanar; 22. 4. 87. Bill yellowish white, base reddish; throat chalk-white, skin of eye blue; legs black; iris reddish brown.

d. ♂ ad. Aola, Guadalcanar; 26. 4. 87. Bill dirty white, reddish at base; throat chalk-white, skin round eye blue; legs black; iris reddish yellow.

e. ♂ imm. Aola, Guadalcanar; 27. 4. 87. Bill white, base red; skin of throat chalk-white, round eye blue; legs black; iris reddish brown.

f, *g*. ♂ ad., ♂ imm. Aola, Guadalcanar; 30. 4. 87. Bill white, base red; skin of throat chalk-white, round eye pale blue; legs black; iris reddish yellow.

h. ♀ imm. Aola, Guadalcanar; 10. 5. 87. Bill white, base red; skin of throat and eyes white; legs black; iris dull yellow.

i. ♀ imm. Aola, Guadalcanar; 13. 5. 87. Bill dirty white, base red; skin of throat and eyes pure white; legs black; iris dull yellow.

k. ♂ ad. Aola, Guadalcanar; 14. 5. 87. Bill dirty white, base red; skin of throat white, round eye pale blue; legs black; iris reddish yellow.

l. ♀ ad. Aola, Guadalcanar; 29. 5. 87. Bill dirty white, base red; skin of throat and round eye chalky white; legs black; iris brown.

This series shows the interesting and curious development with age of the horny plates on the upper mandible. The youngest specimens have merely a raised lump, while the oldest has no less than seven plates, and the bill is longer and stronger than in the younger birds.

The young male (spec. *c*) has a black spot on the extremity of each of the tail-feathers, which is absent in the rest of the series, and Mr. Woodford assures me it is the only specimen in which he ever observed this peculiarity.

22. Alcedo ispidoides.

Alcedo ispidoides, Less., Salvad. *t. c.* i. p. 408.

a. ♂ ad. Aola, Guadalcanar; 20. 4. 87. Bill black; legs dark red-brown; iris brown. Food, shrimps.

b. ♀ imm. Rovatu River; 22. 5. 87. Bill black; legs red; iris brown.

c. ♂ ad. Aola, Guadalcanar; 1. 7. 87. Bill black; legs red; iris brown.

23. CEYX SOLITARIA.

Ceyx solitaria, Temm., Salvad. *t. c.* i. p. 420; Sharpe, in Gould's Birds of New Guinea, pt. iii. pl.

a. ♂ ad. Aola, Guadalcanar; 27. 6. 87. Bill red; legs red; iris red.

24. HALCYON LEUCOPYGIA.

Cyanalcyon leucopygia, Verr., Salvad. i. p. 457.

Halcyon leucopygia, Sharpe, in Gould's Birds of New Guinea, pt. xviii. pl.

a. ♂ ad. Aola, Guadalcanar; 11. 4. 87. Bill black; legs grey; iris brown. Food, lizards and grasshoppers.

b. ♀ ad. Rovatu, Guadalcanar; 15. 4. 87. Bill black; legs black; iris brown. Food, beetles &c.

c. ♂ ad. Aola, Guadalcanar; 8. 5. 87. Bill black; legs black; iris dark brown.

d. ♂ imm. Aola, Guadalcanar; 12. 5. 87. Bill black; legs black; iris brown.

e, *f*. ♂ ♀ ad. Aola, Guadalcanar; 14. 7. 87. Bill black; legs black; iris brown.

Only the adult males have the white rump; in the young male it is purplish and undefined, and the neck and breast are pinkish buff.

25. HALCYON SAUROPHAGA.

Sauropatis sauropliaga (Gould), Salvad. *t. c.* i. p. 469.

a. Ad. Rubiana; 4. 3. 87. Bill black; legs black; iris brown.

26. HALCYON TRISTRAMI.

Sauropatis tristrami (Layard), Salvad. *t. c.* iii. App. p. 524.

Halcyon tristrami, Layard, Sharpe, in Gould's Birds of New Guinea, pt. xix. pl.

a. Ad. Aola, Guadalcanar; 8. 5. 87. Bill black, white below; legs black; iris dark brown.

27. HALCYON SANCTA.

Sauropatis sancta (Bodd.), Salvad. *t. c.* i. p. 470.

a. Imm. Rubiana; 20. 3. 87. Bill black; legs black; iris brown.

b. ♂ imm. Aola, Guadalcanar; 21. 4. 87. Bill black; legs grey; iris brown.

c. ♀ imm. Aola, Guadalcanar; 24. 4. 87. Bill black; legs grey; iris brown.

d. ♂ ad. Aola, Guadalcanar; 30. 4. 87. Bill black; legs grey; iris brown.

e. ♂ imm. Aola, Guadalcanar; 14. 5. 87. Bill black; legs dark grey; iris brown.

f. ♂ ad. Aola, Guadalcanar; 26. 6. 87. Bill black, white below; legs grey; iris dark brown.

g. ♀ ad. Aola, Guadalcanar; 4. 7. 87. Bill black; legs grey; iris brown.

28. EURYSTOMUS CRASSIROSTRIS.

Eurystomus crassirostris, Sclater, Salvad. *t. c.* i. p. 510.

a. ♂ ad. Aola, Guadalcanar; 4. 4. 87. Bill red; legs red; iris brown. Food, beetles.

b. ♂ ad. Aola, Guadalcanar; 7. 4. 87. Bill red; legs red; iris brown. Food, beetles.

c. ♀ ad. Aola, Guadalcanar; 15. 4. 87. Bill red; legs red; iris brown. Food, beetles.

d. ♀ ad. Aola, Guadalcanar; 30. 5. 87. Bill red; legs red; iris red-brown.

e. ♂ ad. Aola, Guadalcanar; 1. 6. 87. Bill red; legs red; iris red-brown.

29. MACROPTERYX MYSTACEA.

Macropteryx mystacea (Less.), Salvad. *t. c.* i. p. 537.

a. ♂ ad. Rovatu, Guadalcanar; 20. 5. 87. Bill black; legs black; iris black.

b, *c*. ♂ ♀ ad. Aola, Guadalcanar; 24. 6. 87. Bill black; legs black; iris black.

30. COLLOCALIA SPODOPYGIA.

Collocalia spodopygia (Peale), Salvad. *t. c.* i. p. 546.

a. ♂ ad. Aola, Guadalcanar; 2. 5. 87. Bill black; legs black; iris black.

31. HIRUNDO TAHITICA.

Hirundo tahitica, Gm., Salvad. *t. c.* ii. p. 5.

a. ♀ ad. Rovatu River, Guadalcanar; 14. 5. 87. Bill black; legs black; iris black.

32. MONARCHA CASTANEIVENTRIS.

Pomarea castaneiventris (Verr.), Salvad. *t. c.* ii. p. 11; Sharpe, *t. c.* part xviii. pl.

a. ♂ ad. Aola, Guadalcanar; 12. 4. 87. Bill blue; legs blue; iris black.

b. ♀ ad. Aola, Guadalcanar; 22. 4. 87. Bill blue; legs blue; iris black.

c. ♀ ad. Aola, Guadalcanar; 2. 5. 87. Bill slate-blue; legs slate-blue; iris black.

d. ♂ ad. Aola, Guadalcanar; 20. 5. 87. Bill slate; legs slate; iris black.

e. ♀ ad. Aola, Guadalcanar; 7. 7. 87. Bill slate; legs slate; iris black.

There is no doubt about the correctness of the above identification, as I have Verreaux's type before me. The *Monarcha rufo-castanea* of Ramsay (see Sharpe, in Gould's Birds of New Guinea, part xviii. pl.) is stated to come from Lango, *Guadalcanar*; but the three specimens in the Natural-History Museum were obtained by Mr. G. E. Richards in *San Christoval*, and I think it almost certain that Mr. Ramsay's type specimens must also have come from that island.

The specimens obtained by Mr. Woodford in *Fauro*, and doubtfully referred by me in my paper (P. Z. S. 1887, p. 331) to *M. castaneiventris*, now prove to be a well-marked and distinct species (see Sharpe, above, p. 183). I think the following localities will be found correct for the three species:—

Monarcha castaneiventris (Verr.), hab. Guadalcanar.
—— *rufo-castanea*, Ramsay, hab. San Christoval.
—— *erythrosticta*, Sharpe, hab. Fauro.

33. PIEZORHYNCHUS BRODIEI.

Monarcha brodiei, Ramsay, Salvad. *t. c.* ii. p. 26.
Peizorhynchus brodiei, Sharpe, in Gould's Birds of New Guinea, pt. xviii. pl.

a. ♂ ad. Aola, Guadalcanar; 30. 4. 87. Bill slate-blue; legs slate-blue; iris black.
b. ♂ ad. Rovatu River, Guadalcanar; 21. 5. 87. Bill slate; legs slate; iris black.
c. ♂ ad. Aola, Guadalcanar; 3. 7. 87. Bill slate; legs slate; iris black.
d. ♀ ad. Aola, Guadalcanar; 4. 7. 87. Bill slate; legs slate; iris black.
e. ♂ ad. Aola, Guadalcanar; 6. 7. 87. Bill slate; legs slate; iris black.

If Mr. Woodford has sexed these birds correctly, the ♀ is identical with the ♂, and the bird figured by Mr. Sharpe (*op. cit.*) as the adult ♀ must be immature.

34. RHIPIDURA COCKERELLI.

Saulopocta cockerelli, Ramsay, Salvad. *t. c.* ii. p. 53.
Rhipidura cockerelli, Sharpe, in Gould's Birds of New Guinea, pt. xvii. pl.

a. Ad. Aola, Guadalcanar; 20. 4. 87. Bill black; legs black; iris black. Food, flies.
b. ♀ (?) ad. Aola, Guadalcanar; 21. 4. 87. Bill black; legs black; iris black.
c. ♀ ad. Aola, Guadalcanar; 30. 4. 87. Bill black; legs black; iris black.

35. RHIPIDURA RUBROFRONTATA.

Rhipidura rubrofrontata, Ramsay; Salvad. *t. c.* ii. p. 68; Sharpe, in Gould's Birds of New Guinea, pt. xxi. pl.

a. ♂ ad. Aola, Guadalcanar; 14. 4. 87. Bill black; legs grey; iris black.

36. MYIAGRA FERROCYANEA.

Myiagra ferrocyanea, Ramsay, Salvad. *t. c.* ii. p. 79; Sharpe, in Gould's Birds of New Guinea, pt. xvii. pl.

a. ♀ ad. Aola, Guadalcanar; 21. 4. 87. Bill black; legs black; iris black.

b. ♂ ad. Aola, Guadalcanar; 4. 5. 87. Bill slaty blue; legs black; iris black.

c. ♀ ad. Aola, Guadalcanar; 4. 7. 87. Bill black; legs slate; iris black.

The sexing of these specimens shows that Mr. Sharpe is correct in regarding *M. pallida*, Ramsay, as merely the female of the black-and-white species *M. ferrocyanea*.

37. GRAUCALUS SCLATERI.

Graucalus sclateri, Salvad.; Salvad. *t. c.* ii. p. 136.

a. ♂ ad. Aola, Guadalcanar; 5. 4. 87. Bill black; legs black; iris black.

b. ♀ ad. Aola, Guadalcanar; 20. 4. 87. Bill black; legs black; iris dark grey, almost black.

38. GRAUCALUS HOLOPOLIUS.

Graucalus holopolius, Sharpe, *antea*, p. 184.

a. ♀ ad. Aola, Guadalcanar; 21. 4. 87. Bill black; legs black; iris black.

39. GRAUCALUS PUSILLUS.

Graucalus pusillus, Ramsay; Salvad. *t. c.* ii. p. 140; Sharpe, *t. c.* pt. xvii. pl.

a. ♀ ad. Aola, Guadalcanar; 13. 4. 87. Bill black; legs black; iris yellow.

b. ♀ ad. Aola, Guadalcanar; 30. 4. 87. Bill black; legs black; iris yellow.

40. EDOLIISOMA ERYTHROPYGON.

Edoliisoma erythropygium, Sharpe, *antea*, p. 184.

41. PACHYCEPHALA ASTROLABI.

Pachycephala astrolabi, Bp.; Salvad. *t. c.* ii. p. 215.

a. ♂ ad. Aola; 11. 4. 87. Bill black; legs brown; iris brown.

b. (♂ imm.) Aola; 15. 4. 87. Bill brown; legs grey; iris black. Food, insects.

c. ♂ juv. Aola; 15. 4. 87. Bill brown; legs grey; iris black. Food, insects.

d. ♂ juv. Aola; 15. 4. 87. Bill brown; legs grey; iris black. Food, insects.

e. ♂ juv. Aola; 22. 4. 87. Bill brown; legs grey; iris black.

f. ♀. Aola; 17. 4. 87. Bill brown; legs grey; iris black.

g. ♂ ad. Aola; 17. 4. 87. Bill black; legs brown; iris black. Food, seeds.

h. juv. Aola; 2. 5. 87. Bill brown; legs brown; iris dark grey. Food, grasshoppers.

i. ♂ juv. Aola; 2. 5. 87. Bill pale brown; legs pale brown; iris dark grey.

k. ♂ ad. Aola; 3. 5. 87. Bill black; legs grey; iris dark grey.

l. ♂ ad. Aola; 5. 6. 87. Bill black; legs grey; iris black.
m. ♂ ad. Aola; 4. 7. 87. Bill black; legs grey; iris black.
n. ♀ ad.? Aola; 7. 7. 87. Bill black; legs grey; iris brown.
o. ♂ ad. Aola; 11. 7. 87. Bill black; legs light brown; iris black.

The young male resembles the adult female, but has the yellow of the outer axillaries indistinct or absent and the yellow of the under tail-coverts and flanks much paler.

As the young male becomes adult the whitish colour of the throat, lower breast, and belly becomes yellow and the pectoral zone becomes of a deeper brown and more defined.

42. CINNYRIS FRENATUS.

Cyrstostomus frenatus (S. Müll.), Salvad. *t. c.* ii. p. 265.

a. ♂ ad. Aola, Guadalcanar; 20. 6. 87. Bill black; legs black; iris black.

43. MYZOMELA SHARPEI, sp. n. (Plate X. fig. 3.)

a. ♂ ad. Aola, Guadalcanar; 4. 7. 87. Bill black; legs olive; iris black.

Forehead dull black; occiput, neck, and back olive-yellow; rump and upper tail-coverts rufous olive. Wing-coverts, quills, and tail-feathers blackish edged with olive-yellow, primaries with the upper half of the inner web edged with white. Cheeks and throat dull black; neck and upper breast same as back; rest of the under surface yellowish buff. Quills below grey edged with white, tail-feathers grey.

This species is quite unlike anything hitherto described, and I have named it in honour of my colleague Mr. Bowdler Sharpe.

Total length 5·1 inches, culmen 0·85, wing 2·5, tail 1·8, tarsus 0·9.

44. DICÆUM ÆNEUM.

Dicæum æneum, Jacq. & Pucher.; Salvad. *t. c.* ii. p. 280; Sharpe, *t. c.* pt. xvii. pl.

a. ♂ ad. Aola, Guadalcanar; 5. 7. 87. Bill black; legs black; iris black.

45. ERYTHRURA TRICHROA.

Erythrura trichroa (Kittl.), Salvad. *t. c.* ii. p. 442.

a. ♂ imm. Aola, Guadalcanar; 9. 6. 87. Bill black; legs pale brown; iris dark brown.
b. ♀ ad. Aola, Guadalcanar; 30. 6. 87. Bill black; legs light brown; iris dark brown.
c–e. ♂, 2 ♀ ad. Aola, Guadalcanar; 5. 7. 87. Bill black; legs light brown; iris black.
f. ♀ ad. Aola, Guadalcanar; 6. 7. 87. Bill black; legs light brown; iris black.

The adult male differs from the young male and females in having the forehead and cheeks brighter azure-blue and the whole upper and under surface much brighter green.

46. LAMPROCORAX GRANDIS.

Lamprocorax grandis, Salvad. ; Salvad. *t. c.* ii. p. 462.

a. ♂ ad. Aola, Guadalcanar ; 30. 5. 87. Bill black ; legs black ; iris red.

b. ♀ ad. Aola, Guadalcanar ; 14. 7. 87. Bill black ; legs black ; iris red.

c. ♀ ad. Aola, Guadalcanar ; 28. 7. 87. Bill black ; legs black ; iris red.

L. minor has been accidentally figured by Mr. Sharpe (*t. c.*) under the name of *Lamprocorax grandis*.

47. MINO KREFFTI.

Mino kreffti (Sclater) ; Salvad. *t. c.* ii. p. 469.

a. ♂ ad. Aola, Guadalcanar ; 16. 4. 87. Bill and skin round eye yellow ; legs yellow ; iris yellow.

b. ♀ ad. Aola, Guadalcanar ; 20. 6. 87. Bill and skin round eye yellow ; legs yellow ; iris yellow.

48. MACROCORAX WOODFORDI.

Macrocorax woodfordi, Grant, P. Z. S. 1887, p. 332.

a. ♀ ad. Aola, Guadalcanar ; 18. 4. 87. Bill white with black tip ; legs black ; iris greyish brown.

b. ♀ ad. Aola, Guadalcanar ; 19. 4. 87. Bill white with black tip ; legs black ; iris greyish brown. Food, fruit and seeds.

c. Ad. Aola, Guadalcanar ; 3. 5. 87. Bill white with black tip ; legs black ; iris dark grey. Food, fruit and insects.

d. ♀ ad. Aola, Guadalcanar ; 7. 5. 87. Bill white with black tip ; legs black ; iris dark grey.

e. ♂ ad. Aola, Guadalcanar ; 16. 5. 87. Bill white with black tip ; legs black ; iris dark grey.

f. ♂ ad. Aola, Guadalcanar ; 25. 5. 87. Bill white with black tip ; legs black ; iris dark grey.

g–h. ♂ ♀ ad. Aola, Guadalcanar ; 4. 6. 87. Bill white with black tip ; legs black ; iris dark grey.

i. ♂ ad. Aola, Guadalcanar ; 6. 6. 87. Bill white with black tip ; legs black ; iris dark grey.

k. ♂ ad. Aola, Guadalcanar ; 17. 7. 87. Bill pinkish ; legs black ; iris dark grey.

l. ♀ ad. Aola, Guadalcanar ; 10. 8. 87. Bill white with black tip ; legs black ; iris grey.

m. ♀ ad. Aola, Guadalcanar ; 12. 8. 87. Bill white with black tip ; legs black ; iris grey.

n. Ad. Aola, Guadalcanar ; 25. 8. 87. Bill white with black tip ; legs black ; iris grey.

o. ♀ ad. Aola, Guadalcanar ; 31. 8. 87. Bill pink with black tip ; legs black ; iris dark grey.

All the series agree well with the type and the sexes are entirely similar.

49. PTILOPUS SOLOMONENSIS.

Ptilopus solomonensis, G. R. Gr. ; Salvad. *t. c.* iii. p. 50 ; Sharpe, in Gould's Birds of New Guinea, pt. xix. pl.

a. ♀ imm. Aola, Guadalcanar ; 6. 5. 87. Bill black ; legs red ; iris yellow.

This bird is almost identical in every particular with Gray's type, which is also an immature female. The general colour is entirely green, except parts of the belly, flanks, and under tail-coverts, which are yellow, and the tail and primaries, which resemble those of the adult.

50. PTILOPUS LEWISI.

Ptilopus lewisi, Ramsay ; Salvad. *t. c.* iii. App. p. 556 ; Sharpe, in Gould's Birds of New Guinea, pt. xvii. pl.

a. ♀ juv. Aola, Guadalcanar ; 6. 5. 87. Bill black ; legs red ; iris yellow.

b. ♀ ad. Aola, Guadalcanar ; 8. 5. 87. Bill yellow ; legs red ; iris yellow.

c. ♂ ad. Rovatu, Guadalcanar ; 20. 5. 87. Bill yellow ; legs red ; iris orange.

d, *e*. ♂ ♀ ad. Aola, Guadalcanar ; 30. 5. 87. Bill black ; legs red ; iris yellow.

51. PTILOPUS SUPERBUS.

Ptilopus superbus (Temm.), Salvad. *t. c.* iii. p. 6.

♂ ad. Aola, Guadalcanar ; 4. 6. 87. Bill black ; legs red ; iris yellow.

52. GLOBICERA RUFIGULA.

Carpophaga rufigula, Salvad. ; Salvad. *t. c.* iii. p. 79.

a. ♂ ad. Aola, Guadalcanar ; 25. 5. 87. Bill black ; wattle red ; legs red ; iris red.

53. CARPOPHAGA BRENCHLEYI.

Carpophaga brenchleyi, G. R. Gr. ; Salvad. *t. c.* iii. p. 90.

a. Ad. Aola, Guadalcanar ; 1. 6. 87. Bill black ; legs carmine ; iris carmine.

A specimen of this little-known species was obtained and agrees well with Gray's type in the Natural-History Museum. Mr. Woodford says that this is the common species of the island.

54. TURACŒNA CRASSIROSTRIS.

Turacœna crassirostris, Gould ; Salvad. *t. c.* iii. p. 131.

a. ♀ ad. Aola, Guadalcanar ; 11. 5. 87. Bill and skin round eye carmine ; legs bright red ; iris bright red.

b. ♂ ad. Aola, Guadalcanar ; 30. 5. 87. Bill carmine ; legs carmine ; iris reddish brown.

55. MACROPYGIA RUFOCASTANEA.

Macropygia rufocastanea, Ramsay; Salvad. *t. c.* iii. p. 149.

a. ♀ ad. Aola, Guadalcanar; 5. 6. 87. Bill black; legs red; iris orange.

b. ♀ imm. Aola, Guadalcanar; 10. 6. 87. Bill black; legs red; iris brown.

c. ♀ ad. Aola, Guadalcanar; 24. 6. 87. Bill black; legs dull pink; iris reddish brown.

These specimens agree well with Ramsay's description of the species, the adults exhibiting the curious bifid feathers of the upper breast and sides of the neck and reminding one of certain species of *Ptilopus*. The young birds do not exhibit this peculiarity, and as the black bases of the feathers are hidden, the breast is a uniform deep cinnamon-rufous, instead of having the appearance of being spotted with black. The male which came in Mr. Woodford's first collection (see P. Z. S. 1887, p. 332) is not an adult but a young bird.

56. PHLOGŒNAS SOLOMONENSIS, sp. n.

a. ♂ ad. Aola, Guadalcanar; 17. 8. 87. Bill black; legs carmine; iris brown.

Forehead dark ashy grey; back and sides of the neck ashy black; occiput, middle of the neck (paler), back, rump, greater wing- and tail-coverts, and outer secondary quills dark chocolate washed with purple. Lesser and median wing-coverts dark glossy purple. Rest of the quills dark brown and tail-feathers dark brown washed with chocolate-maroon, except the outer three on each side, which are darker and terminated by a light reddish band. Cheeks, throat, and breast dull ashy grey, becoming lighter towards the belly and succeeded by a zone of iridescent dark brown feathers. Rest of the belly and under tail-coverts chalky reddish brown. Axillaries and under wing-coverts dark brown, the latter with a few light red feathers. Quills and tail-feathers below dark brown; the upper edge of the inner web of the primaries and the ends of the tail-feathers reddish.

This species, though nearly allied to *P. johannæ*, Sclater (P. Z. S. 1877, p. 112, pl. xvi.), is altogether a darker bird, the latter having the breast whitish grey, and the occiput, back, &c. washed with olive instead of purple.

No doubt Mr. Ramsay is correct in his supposition that *P. johannæ*, the types of which are before me, comes neither from the Solomon Islands nor New Hebrides, but was obtained by the Rev. G. Brown in New Britain, whence specimens have since been brought.

		Culmen.	Wing.	Tail.	Tarsus.
		in.	in.	in.	in.
P. solomonensis	♂	·75	4·5	2·4	1·1
P. johannæ, types	♂	·68	4·4	2·8	1·0
	♀	·67	4·35	2·8	1·0

57. PHLOGŒNAS, sp. inc.

a. ♂ juv. Aola, Guadalcanar; 30. 5. 87. Bill brown; legs brown; iris brown.

b. ♂ juv. Aola, Guadalcanar; 30. 5. 87. Bill brown; legs brown; iris dark brown.

c. ♂ juv. Aola, Guadalcanar; 26. 6. 87. Bill dark brown; legs brown; iris light brown.

These young birds probably represent an unknown species nearly allied to the *P. jobiensis*, from the young of which they differ in lacking the white superciliary streak. They are evidently of the species referred with doubt by Mr. Ramsay (P. L. S. N. S. Wales, i. p. 374) to *Chalcophaps margarithæ*, D'Alb., Salvad.

58. CHALCOPHAPS STEPHANI.

Chalcophaps stephani (Pucher. et Jacq.); Salvad. *t. c.* iii. p. 178.

a. ♀ ad. Aola, Guadalcanar; 6. 5. 87. Bill yellow; legs red; iris brown.

b. ♂ ad. Aola, Guadalcanar; 31. 5. 87. Bill yellow; legs red; iris brownish red.

c. ♂ ad. Aola, Guadalcanar; 27. 6. 87. Bill yellow; legs red; iris brown.

The female differs from the male only in having the frontal half of the head dark ash-grey instead of white.

59. MEGAPODIUS BRENCHLEYI.

Megapodius brenchleyi, G. R. Gr.; Salvad. *t. c.* iii. p. 240.

a. ♀ ad. Aola, Guadalcanar; 9. 4. 87. Bill yellow; legs black; iris brown.

b, *c*. 2 ♂ ad. Aola, Guadalcanar; 19. 4. 87. Bill yellow; legs black; iris reddish brown.

d. Pull. Rovatu, Guadalcanar; 24. 5. 87. Bill brown; legs brown; iris brown.

e. Ad. Aola, Guadalcanar; 27. 5. 87. Bill gamboge; legs olive-brown; iris reddish brown.

f. ♂ ad. Aola, Guadalcanar; 7. 7. 87. Bill yellowish brown; legs olive; iris reddish brown.

60. ESACUS MAGNIROSTRIS.

Orthorhamphus magnirostris (Geoffr.); Salvad. *t. c.* iii. p. 290.

a. ♀ ad. Aola, Guadalcanar; 9. 6. 87. Bill black; legs yellow; iris yellow.

61. NUMENIUS VARIEGATUS.

Numenius variegatus (Scop.), Salvad. *t. c.* iii. p. 332.

a. ♂ ad. Aola, Guadalcanar; 26. 4. 87. Bill black; legs grey; iris dark brown.

b. ♂ ad. Aola, Guadalcanar; 14. 5. 87. Bill black; legs olive; iris black.

c. ♀ ad. Aola, Guadalcanar; 13. 7. 87. Bill black; legs pearl-grey; iris dark brown.

62. DEMIEGRETTA SACRA.

Demiegretta sacra (Gmel.), Salvad. *t. c.* iii. p. 345.

a. ♂ ad. Rubiana; 10. 3. 87. Bill grey; legs yellow; iris yellow. Food, fish.

A very fine adult male, with the crest and dorsal plumes long and well developed, the latter extending beyond the wings, and the bill seems unusually large and strong, the culmen measuring 3·6; post-femoral powder-down patches largely developed.

63. BUTORIDES JAVANICA.

Butoroides javanica (Horsf.), Salvad. *t. c.* iii. p. 359.

a. ♂ juv. Aola, Guadalcanar; 19. 4. 87. Bill black and yellow; legs olive; iris yellow. Food, fish.

b. ♂ imm. Aola, Guadalcanar; 6. 5. 87. Bill black and yellow; legs grey; iris yellow.

64. ARDEIRALLA WOODFORDI, sp. n.

a. ♀ nearly ad. Aola, Guadalcanar; 5. 7. 87. Bill straw-colour, with black streak on tip; legs olive; iris yellow.

b. ♂ imm. Aola, Guadalcanar; 15. 7. 87. Bill above black, below grey; legs light brown; iris yellow.

c. ♀ ad. Aola, Guadalcanar; 30. 8. 87. Bill above brown, below yellow; legs grey-brown; iris yellow.

	Total length.	Culmen.	Wing.	Tail.	Tarsus.
	in.	in.	in.	in.	in.
a	18·4	3·1	7·4	2·7	2·7
b	18·5	3·1	7·5	2·7	2·7
c	18·4	3·1	7·6	2·6	2·7

CHAR. *Adult female* (spec. *c*). Head ashy black, fading gradually into the dark chestnut-rufous of the neck, back, and wing-coverts. Rump and upper tail-coverts dusky, fringed with cinnamon-rufous. Quills and tail-feathers ashy black, like the head. Superciliary streak and cheeks chestnut. Throat and neck flecked with dark shaft-spots. Whole under surface of the body cinnamon-rufous, becoming more cinnamon and less rufous below the breast. Axillaries whitish buff, under wing-coverts cinnamon and chestnut. Quills below ashy black. The long loose upper wing-coverts exceed the length of the wings by one inch.

Specimen *a* differs from the above in the following particulars only:—Some of the feathers of the head have still light transverse margins; the upper wing-coverts are light cinnamon, with dusky V-shaped subterminal markings; the quills are still edged with buff, and the outer secondaries are light red with a subterminal dark brown spot edged with buff.

Young male (spec. *b*). Head ashy black, rest of the upper surface dark reddish brown and blackish, all the feathers being fringed with pale buff. Basal half of the wing-coverts ashy black, each feather terminating with three parallel bars of cinnamon-rufous,

dark brown, and pale buff. Rump and upper tail-coverts dark ash, fringed with white. Quills and tail-feathers ashy black, with buff margins. Cheeks and under surface of the body cinnamon, paling into dirty white below. The feathers on the throat and neck streaked and spotted with dark brown. Axillaries whitish, under wing-coverts dark grey mixed with buff. Quills below ashy black.

So far as I have been able to ascertain, this species stands remote from anything that has hitherto been described, and the most nearly allied species appears to be *A. flavicollis*. The adult male probably resembles the female described above, but is of a somewhat darker colour on the upper surface.

65. NYCTICORAX MANDIBULARIS, sp. n.

Nycticorax manillensis, Ramsay, Proc. Linn. Soc. N. S. Wales, vii. p. 39 (nec Vigors).

a. ♂ imm. Aola, Guadalcanar; 20. 4. 87. Bill above black, below yellow; legs yellowish green; iris yellow. Food, fish.

b. ♂ imm. Aola, Guadalcanar; 2. 5. 87. Bill above black, below yellow; legs olive; iris yellow.

c. ♀ imm. Aola, Guadalcanar; 8. 5. 87. Bill above black, below yellow; legs olive; iris yellow.

d. ♀ ad. Aola, Guadalcanar; 25. 5. 87. Bill black, base of lower mandible and skin of eyes yellow; legs yellow; iris yellow.

CHAR. *Female adult* (specimen *d*). Head and crest black; rest of the upper surface, quills, and tail-feathers dull chestnut. Rump and upper tail-coverts rather brighter. An indistinct chestnut superciliary streak. Cheeks, neck, breast, and flanks bright chestnut; throat, belly, and under tail-coverts white. Axillaries chestnut, edged with pale chestnut. Quills and tail-feathers below light rufous grey. The crest is as yet unadorned with white feathers (see Ramsay's description).

Young male (specimen *a*). Head black, each feather with a longitudinal shaft-streak of buff; rest of the upper surface reddish brown, each feather darker towards the extremity and ending in a rufous-buff coloured spot. Cheeks, neck, breast, and flanks dirty cinnamon; throat, belly, and under tail-coverts whitish, each feather with a dark brown longitudinal band down one or both edges, most strongly developed on the throat and upper breast. Quills and tail-feathers below light rufous-grey, shading into darker and terminating in a dull buff spot.

This species occupies a somewhat intermediate position between *N. manillensis* and *N. caledonicus*, being perhaps most nearly allied to the latter. It is easily distinguished from both by its smaller size and much smaller bill. It resembles the former in having the breast and neck chestnut, but differs in having the throat white. It is at once distinguished from the latter by the absence of the white superciliary streak so strongly developed in *N. caledonicus*. Even the young of these two species may be readily distinguished, for the new bird is generally darker and has the shaft-streaks and

spots on the feathers of the upper surface rufous-buff instead of whitish yellow.

		Total length.	Culmen.	Wing.	Tail.	Tarsus.
		in.	in.	in.	in.	in.
N. mandibularis	♀ ad. ..	18·5	2·9	9·9	3·7	3·3
	♂ imm...	18·0	2·10	9·7	3·6	3·1
N. caledonicus,	♂ ad.	19·5	3·5	11·5	4·1	3·3
N. manillensis	.....	21·0	3·6	12·6	4·8	3·8

66. STERNA LONGIPENNIS.

Sterna longipennis, Nordm.; Salvad. *t. c.* iii. p. 439.

a. ♂ ad. Rubiana; 4. 3. 87. Bill black; legs black; feet black. Food, fish.

March 20, 1888.

Henry Seebohm, Esq., F.Z.S., in the Chair.

The following papers were read:—

1. Note on the Classification of the *Ranidæ*.

By G. A. BOULENGER.

[Received February 10, 1888.]

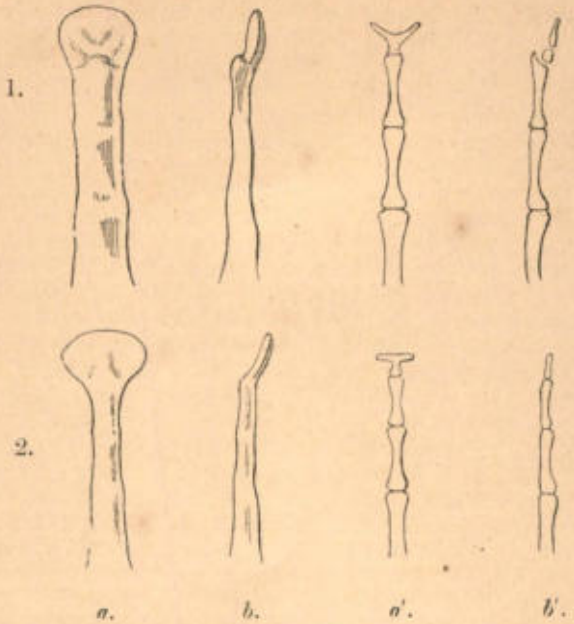
When revising the arrangement of the tailless Batrachians for the second edition of the British Museum Catalogue (1882), I had very great difficulty in dealing with the subdivision of the large family *Ranidæ*. I had to abandon the Platy- and Oxydactyle character as a generic one, finding that, to say nothing of the complete intergradation which destroys its usefulness as an artificial character, it did not, by itself, express affinity, and that in consequence satisfactory series could not be formed upon the degree of dilatation or acumination of the digits. As an instance, I may refer to *Ranæ malabarica, galamensis, macrodactyla,* and *lateralis,* which are unquestionably very intimately related to such forms as constitute the platydactyle group *Hylorana* of certain authors (*R. erythræa, temporalis, chalconota,* &c.), and yet are more 'oxydactyle' than *Ranæ macrodon, kuhlii,* and many others which have by all authors, and very justly, been regarded as true *Ranæ*. I cannot see that the union of all these species, however numerous, under one genus, *Rana,* presents any serious inconvenience. On the contrary, the systematist should form well-defined genera, regardless of the

number of species they may embrace ; by so doing he firstly facilitates identification, for the student has a right to expect, when using a synoptic work, to get at the name of the genus before that of the species; and secondly, he more correctly expresses the continuity and breaks in the series of forms as exist in Nature at the present period. This mode of treatment has therefore both a practical and a philosophical bearing.

My arrangement has not met with general acceptance. As for myself, I have not lost sight of the question during the six years that have elapsed since the publication of my classification, and I have, on different occasions, taken up the matter again in the hope of finding characters upon which to subdivide the genus *Rana*, but without success; and I am now more than ever convinced that it is a natural association. This conviction has been confirmed by a discovery published by Peters (Reise n. Mossamb. iii. 1882), shortly after the issue of the British Museum Catalogue. He found that the digits of most of his *Polypedatinæ* differ from those of the *Raninæ* by the presence of a small additional phalanx between the ultimate and what is normally the penultimate; the number of phalanges being 3, 3, 4, 4 in the fore limb, and 3, 3, 4, 5, 4 in the hind limb, instead of 2, 2, 3, 3 and 2, 2, 3, 4, 3. After testing the constancy of this character, I fully endorse Peters's view as to its taxonomic importance; it affords a far better character for separating *Rhacophorus* from *Rana* than does the presence of a web between the fingers. And I find, with satisfaction, that all the species referred by me, from autoptic examination, to the genus *Rana* have the normal phalanges, irrespective of the presence or absence or size of the digital expansions. Two species which were formerly unknown to me, but of which specimens are now in the Museum, viz. *Hyla buergeri*, Schleg., and *Theloderma leprosum*, Tsch. (= *Polypedates leprosus*, Gthr.), must, in spite of their free fingers, be referred to *Rhacophorus*. I also find that *Cassina*, though oxydactyle, and therefore placed by Peters in his *Raninæ*, has the additional phalanx like its close ally *Hylambates*; and that the genus *Ixalus*, as hitherto defined, is unnatural, the species *opisthorhodus*, Gthr., *silvaticus*, Blgr., *fuscus*, Blgr., *saxicola*, Jerd., and doubtless also *sarasinorum*, F. Müll., all from Southern India and Ceylon, standing in the same relation to *Rana* as the typical *Ixali* to *Rhacophorus*. For these species, characterized by the normal number of phalanges, I propose the generic name *Micrixalus*. Considering the importance of the character discovered by Peters, I would suggest the division of the *Ranidæ* into two groups, that which is characterized by the additional phalanx embracing the following genera :—

Cassina, Gir., *Hylambates*, A. Dum., *Rappia*, Gthr., *Megalixalus*, Gthr., *Rhacophorus*, Kuhl, *Chiromantis*, Ptrs., *Ixalus*, Tsch., and *Nyctixalus*, Blgr.

The following figures show that the character upon which these two groups are based is readily ascertainable.

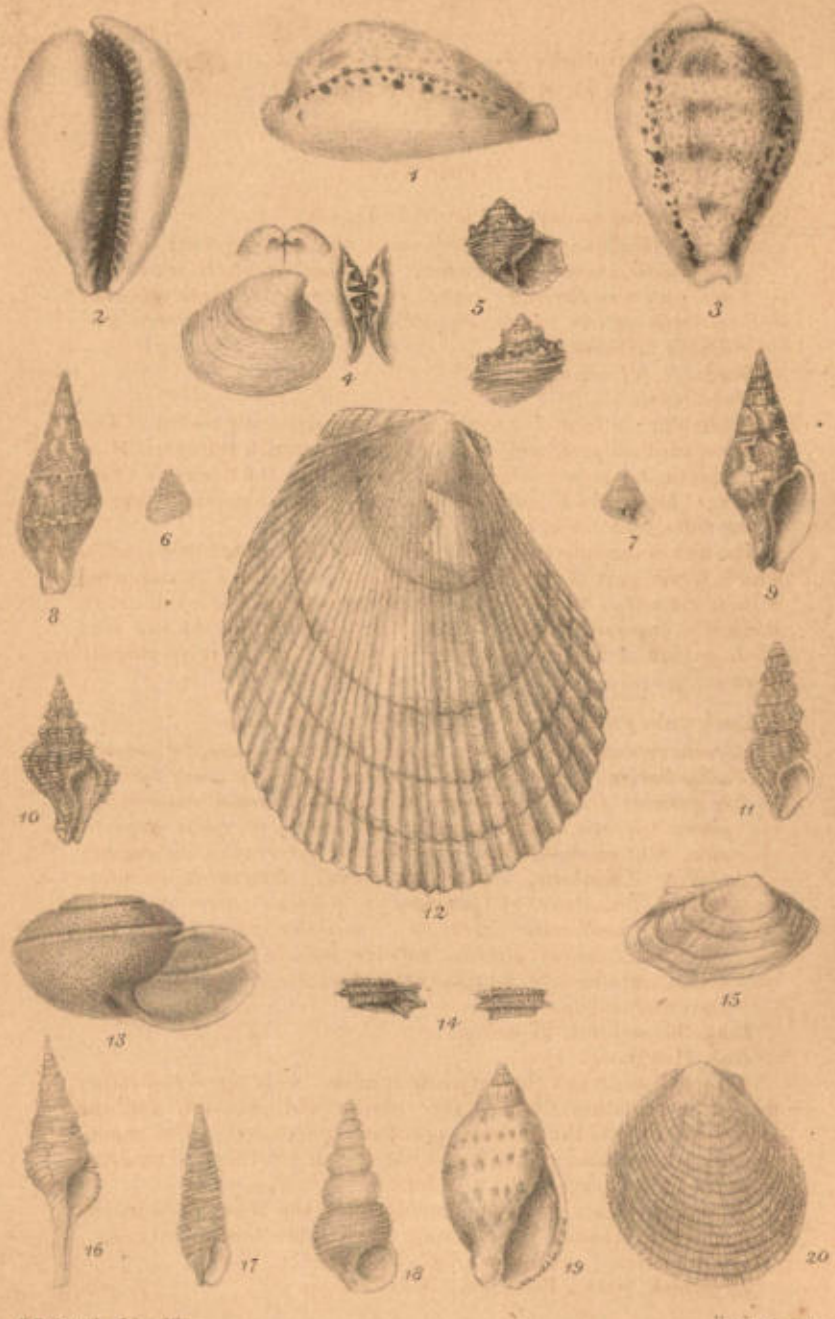


1. Finger of *Rhacophorus maximus*.
2. Finger of *Rana afghana*.

a. Upper view. *b*. Side view. *a'*, *b'*. Skeleton.

I seize this opportunity to remark that the genus *Phyllobates*, Bibr., is a Ranoid, closely allied to and intermediate between *Hylixalus*, Espada, and *Prostherapis*, Cope—differing from the former in the free toes, and from the latter in the notched tongue. The pectoral girdle of the type specimen of *Phyllobates bicolor*, Bibr., as well as of a specimen of *P. melanorhinus*, Berth., has been kindly examined at my request by Dr. Mocquard. That genus includes the following five species:—*P. bicolor*, Bibr., *limbatus*, Cope, *melanorhinus*, Berth., *trinitatis*, Garm., and *trilineatus*, Blgr.

There probably exists, however, a group of Cystignathoids answering to Cope's definition of *Phyllobates* (Journ. Ac. Philad. vi. 1866, p. 96)—that is, *Hylodes* without vomerine teeth, which would bear the name *Syrrhopus*, Cope (Am. Nat. 1878, p. 253), and include *Malachylodes*, Cope, and *Hypodictyon*, Cope. Not having seen examples of any of the following species, I only suggest that they may be united provisionally under the term *Syrrhopus*, and with the generic definition given on p. 195 of my Catalogue:—*S. marnockii*, Cope, *leprus*, Cope, *cystignathoides*, Cope, *verrucipes*, Cope, *guttulatus*, Cope, *hylæformis*, Cope, *ridens*, Cope, *chalceus*, Ptrs., and *verruculatus*, Ptrs.



G. B. Sowerby del. et lith.

Hanhart imp.

NEW SHELLS.

2. Descriptions of sixteen new Species of Shells.

By G. B. Sowerby, F.Z.S., F.L.S.

[Received February 6, 1888.]

(Plate XI.)

Lima smithi, sp. nov. (Plate XI. fig. 12.)

L. *testa suboblique ovata, leviter inflata, tenuis, alba; costis circ.* 40, *rotundatis, mediocriter elevatis, levissime undulatis instructa; area antica mediocriter elongata, leviter excavata, rugoso-plicata; auriculis anticis parvis, declivibus, posticis magnis; area cardinalis excavata.*

Long. 63, *lat.* 51 *millim.*

Hab. Japan.

Resembling in form *L. excavata*, but very decidedly ribbed. The auricles, cardinal area, and anterior lunule are much the same as in the gigantic Japanese species described by me in the Society's 'Proceedings' for 1883 (*L. goliath*), but that species is smooth, excepting at the sides, and not so inflated.

The size of the only specimen known of this interesting new species, which forms part of our National Collection, is small as compared with *L. excavata*; but although it has much the look of a full-grown shell, it is impossible to say that it might not attain to the size even of *L. goliath*. I have, however, no doubt that it is specifically distinct.

Lima concentrica, sp. nov. (Plate XI. fig. 20.)

L. *testa rotunde flabelliformis, obliqua, lata, compressa, tenuiuscula, subpellucida, cæruleo-alba, concentrice fusco multifasciata, epidermide ferruginea induta; laminis numerosis, concentricis, parum elevatis, fusco anguste marginatis, et costis angustis circ.* 80, *confertissimis, complanatis, interruptis, subrugosis, partim divaricatis, superne attenuatis, interstitiisque minutissime crenulatis et puncturatis sculpta; area cardinalis angusta, mediocriter excavata; auriculis parviusculis, fere æqualibus, anticis plicatis, rotunde inflexis; pagina interna nitida, cæruleo-alba, margine externo minute crenulata, tenuiter fusco circumdata.*

Long. 30, *maj. lat.* 27 *millim.*

Hab. Hongkong.

A very distinct and characteristic species. It is broad and rather flat; the radiating ribs are very narrow and close-set, and the interstices towards the umbones peculiarly punctured. The numerous concentric laminæ are but little raised, but they are rendered conspicuous by being edged with brown.

Since the publication of the monograph of the genus *Lima* in the 'Conchologia Iconica,' the following species have been added:—

L. zealandica, Sowb., Proc. Zool. Soc. 1876, p. 754.

L. goliath, Sowb., Proc. Zool. Soc. 1883, p. 30.

L. lata, Smith, Rep. on the Lamellibr. of the 'Challenger.'
L. tahitensis, Smith, ibid.
L. torresiana, Smith, ibid.
L. confusa, Smith, ibid.
L. laminifera, Smith, ibid.
L. dunkeri, Smith, =*japonica*, Dunker, not of A. Adams, Sowerby, Conch. Icon. 1872.

MALLETIA ANGULATA, sp. nov. (Plate XI. fig. 15.)

M. *testa oblonga, compressiuscula, valde inæquilatera, epidermide cornea, nitida induta; antice breviuscula, postice elongata. Margo dorsi posticus rectus angulatus, auriculatus. Margo ventralis antice oblique arcuatus, postice sinuatus. Umbones leviter prominentes, acutiusculi. Cardine rectilineo, angusto, dentibus numerosis minutis instructo. Ligamentum longum angustissimum, nigro-fuscum.*
Diam. antero-post. 26, *umbono-marg.* 14 *millim.*
Hab. Bay of Bengal, 200 fath.

Of the few species known of this rare genus, the present is one of the most striking. It is distinguished from its congeners chiefly by the remarkable sinuosity of the posterior side, forming an angular auricle at the dorsal margin, and a broad lobe at the posterior extremity. The hinge is the same as in other species of the genus.

CYPRÆA HUNGERFORDI, sp. nov. (Plate XI. figs. 1–3.)

C. *testa pyriformi, solida, lata, depressiuscula, politissima, in parte dorsali griseo interruptim trifasciata, maculis minutis, pallidis, fuscis, confluentibus lentiginosa; spira immersa, concaviuscula, inconspicua; lateribus latis, basibusque flavescente lacteis, maculis fuscis, numerosis, rotundatis, superne marginatis; basi concaviuscula; margine columellari* 20, *concoloribus, parvis, tenuiter productis, basalibus majoribus, obliquis, instructo; margine externo superne incurvo, dentibus* 24, *brevibus, regularibus munito.*
Long. 39, *diam.* 24, *alt.* 19 *millim.*
Hab. Japan?

This shell (which is in perfect condition) was purchased in Japan some years ago by Dep.-Surgeon-General R. Hungerford, but he had no guarantee that it was taken in Japanese waters, and, so far as I know, no other specimen has been discovered. It is a species not likely to be confounded with any other. It is pyriform but rather depressed, and quite unlike *C. pyriformis*; the greyish bands crossing the back give the idea of a young shell that has not got its full colouring, but its sides are thickly enamelled, showing it to be thoroughly adult. The spots bordering the lateral enamel are unusually high towards the back of the shell, leaving the margins and base of a plain cream-colour.

COLUMBELLA FILBYI, sp. nov. (Plate XI. figs. 8, 9.)

C. *testa fusiformi, fusca; maculis albidis irregulariter aspersa;*

zona angusta, albida, interrupta, infra medium cincta. Spira elata, acuminata; sutura impressa; anfractus 11, *leviter convexi; primi* 2½ *politi, simplices; sequentes* 4, *costis lævigatis, rotundatis instructi; cæteri lævigati, subtilissime striati et oblique malleati; ultimus vix ventricosus, spiram leviter superans, infra medium valde contractus, oblique sulcatus, in caudam brevem recurvam desinens, et canalem aperturalem formans. Apertura ovato-oblonga, spiram subæquans, fauce pallide violacea; columella polita, albida, fusco tincta, superne plica unica, minuta, curvata munita, ad medium angulata; labrum acutum, extus leviter incrassatum, intus subobsolete liratum.*

Long. 30, *maj. lat.* 12 *millim.*

Hab. South Sea?

A fine handsome species, one of the largest of the genus, and entirely different from any hitherto known or described. I found two perfect specimens of this species in the collection of the late Mr. D. Filby of Hamburg with a label "South Sea," but even this indefinite locality is not to be relied on. The largest of the two, which I have taken for the type, forms part of the gift made by Mrs. Filby to the Hamburg Museum. The second specimen is about 27 millim. in length, and of the same form, proportions, colour, and markings as the type.

CORALLIOPHILA TURRITA, sp. nov. (Plate XI. fig. 11.)

C. *testa elongata, turrita, albida, pallide roseo tincta. Spira perelata; anfractus* 9, *lente accrescentes, convexi, obscure angulati, subobliqué plicati (plicis rotundatis, confertiusculis), ubique spiraliter dense squamoso-lirati; anfr. ultimus parvus, rotundatus, infra medium contractus, et aliquanto productus. Apertura ovata; columella infra medium acute angulata; canali brevissimo; labrum crenulatum.*

Long. 23, *maj. diam.* 9, *apert. long.* 6, *lat.* 4 *millim.*

Hab. Mauritius.

A very narrow turreted species, with a small mouth, long spire, and ribbed, scabrous, slightly angular whorls.

TROCHUS (GIBBULA?) PONSONBYI, sp. nov. (Plate XI. fig. 5.)

T. *testa subglobosa, anguste umbilicata, tenuiuscula, pallida, ad basin fusco maculata. Anfractus* 5, *convexi celeriter accrescentes; primi* 2 *læves; cæteri angulati, ad angulum serie tuberculorum coronati; supra angulum spiraliter trisulcati; infra obscure lirati. Anfr. ultimus inflatus, superne serie tuberculorum (circ.* 12) *coronatus; infra corona uniliratus; ad basin convexus, ventricosus, rotundatus, liris (circ.* 8) *acutiusculis instructus. Apertura semilunaris; columella tenuiter callosa, superne contracta, infra medium turgidula.*

Alt. 13½, *diam.* 14, *apert. long.* 9, *maj. lat.* 7 *millim.*

Hab. Port Elizabeth, South Africa.

In the absence of the operculum it is impossible to say with certainty to what genus or section this species belongs, although I

have little doubt it will prove a *Gibbula*. The base is unusually convex and ventricose, the spire rather shortly conical, and the upper angle coronated with rounded tubercles. The mouth is rather wide, and the umbilicus narrow. The spiral ridges on the base are rather close, and the upper ones distant.

I have only seen a single dead specimen of this somewhat remarkable shell, which has been lent to me for description by Mr. J. Ponsonby.

TROCHUS (ZIZIPHINUS) EXQUISITUS, sp. nov. (Plate XI. figs. 6, 7.)

T. *testa conica, convexiuscula, profunde umbilicata, pallide aureo-fusca, fusco multilineata. Anfractus* 6½, *declives, levissime convexi; cingulis numerosis, fuscis, parum elevatis ubique ornati; sutura distincta, planato impressa; anfr. ultimus inferne obtuse angulatus; basi convexiuscula. Apertura subquadrata; columella rectiuscula, leviter obliqua.*

Alt. 4½, *lat.* 4 *millim.*

A beautiful little species, encircled throughout with numerous raised brown ridges.

ENGINA ANGULATA, sp. nov. (Plate XI. fig. 10.)

E. *testa acuminato-fusiformi, albida, fulvo-fasciata; spira turrita, acutissima; anfractus* 8, *acute biangulati, rugoso-plicati et spiraliter lirati; ultimus spiraliter valide liratus, irregulariter plicatus, varicibus acutis muricatis hic illic irregulariter munitus, superne angulatus, supra angulum leviter concavus, infra convexiusculus, infra medium valde contractus, in caudam brevissculem desinens, et canalem aperturalem formans. Apertura parviuscula, angulata, intus dentato-costata; columella uniplicata; labrum acutum, crenulatum.*

Long. 22, *maj. diam.* 12½ *millim.*

Hab. Hongkong.

Distinguished by its crisply ridged angular whorls, and raised, rather sharp longitudinal ribs.

PLEUROTOMA FULTONI, sp. nov. (Plate XI. fig. 17.)

P. *testa elongata, anguste turrita, pallide grisea, longitudinaliter fusco irregulariter sparsim strigata, utrinque nigro-fusco tincta. Spira elongatissima, acuta; anfractus* 11, *planato-declives, minutissime cancellati, spiraliter conspicue albo tricarinati, interdum lira inconspicua interviente; sutura vix impressa, linea fusca notata; anfr. ultimus leviter convexus,* 7–8 *carinatus, ad basin mediocriter attenuatus, et aliquanto productus. Apertura elongato-ovata, parva; labrum haud profunde sinuatum; canali brevissimo.*

Long. 25, *maj. diam.* 7, *apert. long.* 7, *lat.* 2½ *millim.*

Hab. Port Elizabeth, South Africa.

Of this characteristic species I received some years ago several specimens in very worn condition from the Cape of Good Hope.

They were too imperfect satisfactorily to describe. Mr. Bairstow has now sent me a specimen in very fair condition, which, though not absolutely perfect, shows all the essential characters of the species.

PLEUROTOMA BULOWI, sp. nov. (Plate XI. fig. 16.)

P. *testa elongato-fusiformi, utrinque attenuata, pura alba. Anfractus* 13, *primi* 2 *rotunde convexi, politi; cæteri acute carinati, ubique dense spiraliter lirati; spira acutissima. Anfractus ultimus leviter convexus, ad basin valde contractus et multo productus. Apertura ovata, sinu elongato, angusto emarginata; canali gracili, elongato.*

Long. 35, *maj. diam.* 10.

Hab. China Sea.

A pure white, keeled, and closely ridged species of the typical form of *P. babylonica*.

TURRITELLA ROBUSTA, sp. nov. (Plate XI. fig. 18.)

T. *testa curta, solida, albida; anfractus* 10, *modice accrescentes, convexi, rotundati, spiraliter regulariter* 7 *lirati; liris acutis; sutura impressa; anfr. ultimus subventricosus, rotundatus, liris* 16, *ad basin minoribus. Apertura subcircularis; peristoma crenulata; columella percrassa.*

Long. 29, *maj. diam.* 13, *apert. long.* $6\frac{1}{2}$, *lat.* 6 *millim.*

Hab. ?

A remarkably short, solid, sharply lirate species. Specimen at present unique.

CASSIS CERNICA, sp. nov. (Plate XI. fig. 19.)

C. *testa ovato-oblonga, lævis, polita, fulvescente lactea; maculis fuscis pallidiusculis, oblongo-quadratis, sex-fasciatim dispositis picta. Spira elata, ad apicem acutiuscula, fusca; sutura impressa; anfractus* 6, *convexi, rotundati; ultimus elongatus. Apertura oblonga; fauce lævi; labrum arcuatum, mediocriter incrassatum, antice dentatum; margine externo leviter reflexo, fusco vivide notato; columella callosa, polita, basin versus plicata.*

Long. 32, *maj. lat.* 17 *millim.*

Hab. Mauritius.

Among several specimens of this pretty little species recently received from Mauritius there is some variation in form, one or two of them being stouter than the type. The smallest specimen is 23 millim. in length. There is but little variation in the colouring.

HELIX BOXALLI, sp. nov. (Plate XI. fig. 13.)

H. *testa globoso-depressa, anguste sed profunde umbilicata, fusca, fascia nigra pallido marginata ad peripheriam cincta; spira depressa; anfractus* $5\frac{1}{2}$, *primi* $2\frac{1}{2}$ *rotunde convexi, politi; cæteri planato-convexi, granulis minutis, aculeatis, et pilis erectis regulariter et dense scabrati; sutura impressa; anfr. ultimus subacute angulatus, supra angulum planato-convexus, infra subinflatus. Apertura latiuscula, subrotundata, vix obliqua, intus*

violacea, polita, zona externa transmeante et limbum attingente; peristoma expansum; margine dextro tenue, leviter reflexum; columellari leviter incrassatum, rotunde reflexum, umbilicum partim obtigente.

Diam. 32, *alt.* 15, *apert. long.* 15, *lat.* 13 *millim.*

Hab. Mindanao.

A species of very distinct character. The whole surface (excepting that of the nuclear whorls) is covered with prickly granules, surmounted by short, erect bristly hairs. Otherwise the shell is somewhat like *H. succincta* (H. Adams) of the Isle of Formosa, but with a more depressed spire and ventricose base.

A single specimen was brought by Dr. Hungerford from the Island of Mindanao. The shell is in perfect condition.

HELIX CYCLOSTREMOIDES, sp. nov. (Plate XI. fig. 14.)

H. *testa late et perspective umbilicata, depressa, sordide alba, ubique corrugata; spira concavo-depressa; anfractus* 5, *celeriter accrescentes; primi* 2 *læves, fusco tincti; cæteri concavi, carina elevata serrulata marginati; ultimus acute tricarinatus; carina mediana maxima. Apertura hexagonalis; peristoma acute triangulatum.*

Diam. 11, *alt.* 6 *millim.*

Hab. M'tul, between Morocco and Mazagan.

A very remarkable little species submitted to me for description by Mr. J. Ponsonby, who suggested the name "*cyclostremoides*" from its resemblance to some of the species of the marine genus *Cyclostrema*. The three keels are very conspicuous, especially the centre one. The whole surface of the shell is curiously corrugated.

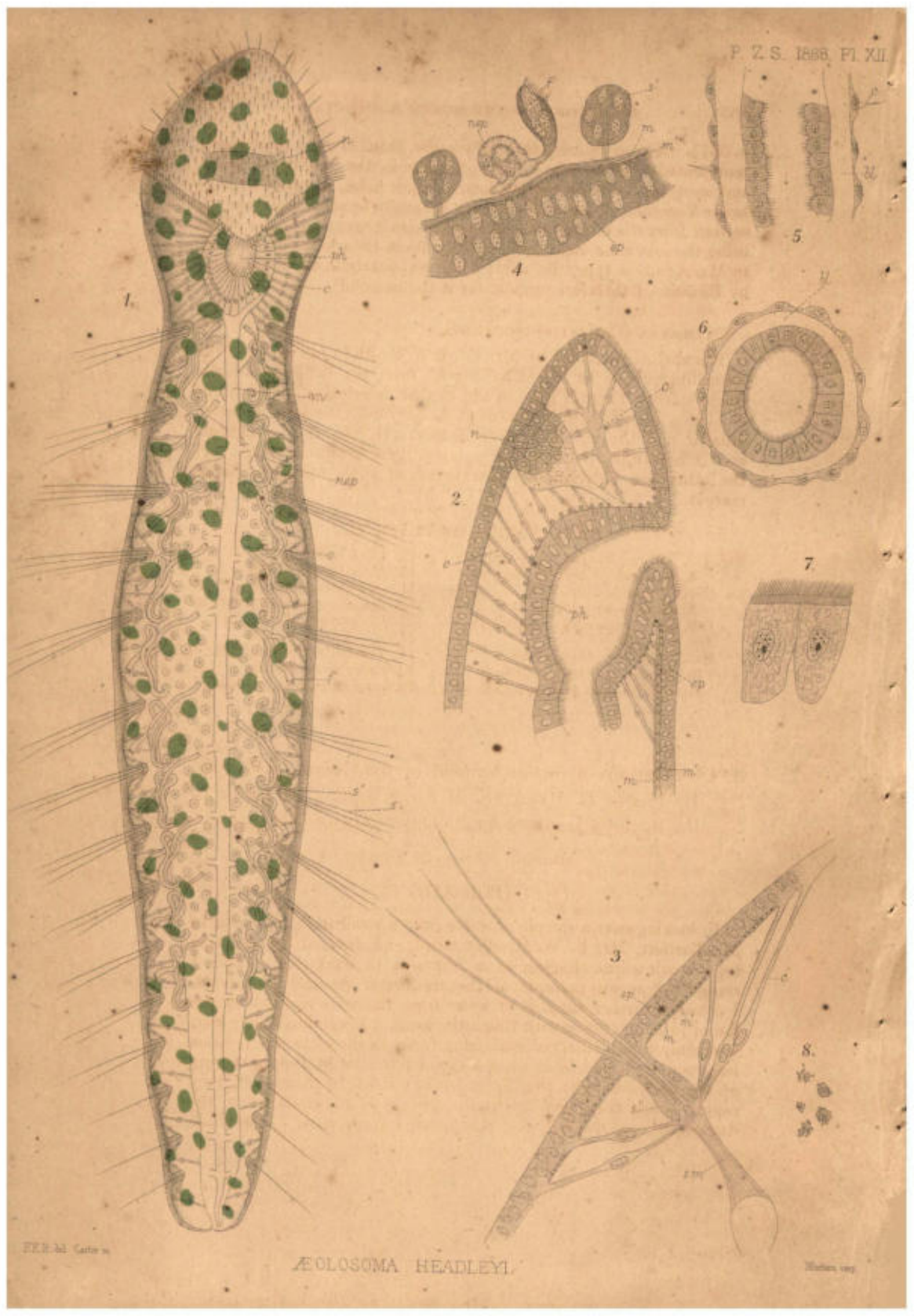
CYTHEREA (CARYATIS) HUNGERFORDI, sp. nov. (Plate XI. fig. 4.)

C. *testa cordata, valde inæquilateratis, tenuis, leviter inflata, alba, antice concentrice sulcata, deinde obscure irregulariter rugata. Umbones prominentes, incurvati, subspirali. Margo dorsalis anticus brevis, leviter arcuatus; posticus elongatus, declivis, vix arcuatus, obtuse angulatus; ventralis arcuatus. Lunula lata, vix impressa. Area postica elongata, leviter concava. Ligamentum anguste elongatum. Dentes cardinales valvæ sinistræ duo, inæquales; antico valde prominente, acutiusculo, postico lato, lamellari, fossa lata et profunda, subtrigona diviso, fovea excavata antice et postice instructo. Cardo in valva dextra, dentibus duobus approximatis, acutissimis valde prominentibus, antice lamina marginali angulato-elevata, postice lamina obliqua, elevata, sinuosa, partim divisa munitus; profunde interfossatus.*

Diam. antero-post. 20, *umbono-marg.* 17, *crass.* 14 *millim.*

Hab. Hongkong (Dep.-Surg.-Gen. Hungerford).

A single specimen in perfect condition of this interesting species was found by Dr. Hungerford at Hongkong, together with two perfect specimens of a somewhat similar shell, with the same *Isocardia*-like incurved umboes, which I found to be Arthur Adams's *Callocardia guttata* (Ann. & Mag. Nat. Hist. 1864, ser. 3, xiii.



ÆOLOSOMA HEADLEYI.

p. 307). The so-called genus *Callocardia*, founded upon this species, represented hitherto only by a single valve in the British Museum, and supposed to belong to the family Isocardiidæ, certainly belongs to the Veneridæ, and cannot with any propriety be separated from the section *Caryatis* of the ancient Lamarckian genus *Cytherea*. This being the case it becomes necessary to change the specific name given to Mr. Adams's type, the name *Cytherea guttata* being preoccupied by Römer. I therefore propose for it the name of

CYTHEREA (CARYATIS) ISOCARDIA.

The shell is described by Mr. Edgar A. Smith in his report of the Lamellibranchiata of the 'Challenger,' from the before-mentioned single valve. There is little to add to that description. The hinge is almost identical with that of *C. hungerfordi*, the shell is more inflated and the umbones more distant. Of the two specimens, one is beautifully painted with squarish light brown markings, and the other has only angular markings and spots about the dorsal margin.

EXPLANATION OF PLATE XI.

Fig. 1–3. *Cypræa hungerfordi*, p. 208.
4. *Cytherea (Caryatis) hungerfordi*, p. 212.
5. *Trochus ponsonbyi*, p. 209.
6–7. —— *exquisitus* (magnified), p. 210.
8–9. *Columbella filbyi*, p. 208.
10. *Eugina angulata*, p. 210.
11. *Coralliophila turrita*, p. 209.
12. *Lima smithi*, p. 207.
13. *Helix boxalli*, p. 211.
14. —— *cyclostremoides*, p. 212.
15. *Malletia angulata*, p. 208.
16. *Pleurotoma bulowi*, p. 211.
17. —— *fultoni*, p. 210.
18. *Turritella robusta*, p. 211.
19. *Cassis cernica*, p. 211.
20. *Lima concentrica*, p. 207.

3. Observations upon an Annelid of the Genus *Æolosoma*.

By FRANK E. BEDDARD, M.A., F.R.S.E., Prosector to the Society, Lecturer on Biology at Guy's Hospital.

[Received February 15, 1888.]

(Plate XII.)

In looking over a sample of water from a small tank belonging to Mr. Bartlett, Mr. F. W. Headley noted, and directed my attention to, a small worm clinging to a fragment of duckweed. This I recognized as an example of the freshwater Annelid *Æolosoma*. I obtained further supplies of water from the same tank which was found to be swarming with this little worm. The animals, however, were only rarely observed swimming freely in the clear water, but a large number could be at once brought into view by simply stirring up the duckweed with the dipping-tube; if left to themselves, they rapidly made their way up to the surface of the water where the duckweed was floating, and disappeared from view. Individuals

placed in a drop of water upon a slide moved about with a rapid steady motion, resembling, as Vejdovsky has pointed out, that of a Planarian. Occasionally the movements were more sudden, the worm rapidly twisting itself to one side or to the other. Examined under a lens of moderately high magnifying-power, it was evident that the movements of the animal were caused by the contractions of the muscular layer of the parietes.

The muscular pharynx is used by the animal as a sucker; it attaches itself so firmly by this, that a comparatively violent disturbance of the water is requisite to detach it. When placed upon a slide in a drop of water and covered by a cover-glass, the worms nearly always attached themselves to the latter; I found it, indeed, almost difficult to study the living worm from the dorsal surface. This habit is probably due to the fact that the worm crawls about on the under surface of the flattened branches of the duckweed. As Vejdovsky has pointed out, the oral segment and the procephalic lobe are the most contractile portions of the animal's body, though it can shorten itself and increase its length within rather wide limits. The individuals were in a state of active division, but I did not discover the sexual organs. Such are the most striking facts with regard to the habits of the present species of *Æolosoma* that have come under my observation.

Our knowledge of the structure of this genus is summed up in Vejdovsky's recent work upon the Oligochæta[1], where there is also to be found a critical account of the described species. Since the publication of that work, Vejdovsky has added a new species[2], *Æolosoma variegatum*, to the three which have been sufficiently characterized to admit of an adequate definition (*Æ. quaternarium*, *Æ. ehrenbergi*, and *Æ. tenebrarum*); the species which I have investigated comes nearest to *Æ. variegatum*, but is, I believe, not identical with that species.

The worm agrees with *Æ. variegatum* in the green colour of the oil-globules. Zacharias[3] has lately investigated an *Æolosoma*, which may be identical with *Æ. variegatum* or with my own species, supposing that they are distinct, and has suggested that these green bodies may be *Algæ*; they were observed in course of division. I can, however, confirm Vejdovsky's statement that these bodies are coloured black by osmic acid, which is strong evidence of their being of a fatty nature; furthermore, a careful observation of the living worm under a high power shows that these green droplets change their form, as the animal moves about, quite after the fashion of an oil-globule; in the third place, staining with iodine showed no trace whatever of the starch reaction. The green oil-globules were of different sizes, and showed almost every tint of green from a pale yellowish to a dark blue-green; there appeared, however, to be no special relation between the size and the colour. They were far more abundant than Vejdovsky's figures show them to be in

[1] System und Morphologie der Oligochaeten: Prag, 1884.
[2] Sitzungsb. böhm. Gesellsch. f. Wissensch. 1885.
[3] Zeitschr. f. wiss. Zool. 1885.

Æ. variegatum. Very frequently the epidermic cells contained masses of a yellow substance (Plate XII. fig. 8) which was not blackened by osmic acid, and which may, perhaps, be an excretory product of the same nature as that which occurs in the cells of the peritoneum which clothe the dorsal blood-vessel and the gut. These yellow masses appeared to be most frequent upon the prostomium. Vejdovsky has suggested[1] that Leydig's *Æ. niveum* may be identical with his *Æ. variegatum*. The former species, however, has colourless oil-globules; but, as Leydig[2] pointed out, d'Udekem[3] has stated that in *Æ. quaternarium* the *red* oil-drops are recognizable in the embryo, and Maggi's figures[4] of a very closely allied, if not identical, species show the same thing. Still *Æ. variegatum* is so far like *Æ. niveum* in that it possesses colourless in addition to coloured oil-globules, and it agrees in other particulars to be referred to presently. In the species described in the present paper I also found colourless oil-bodies.

The anterior margin of the prostomium is furnished with delicate chitinous processes as in *Æ. variegatum*; and the under surface (Plate XII. fig. 2) of the prostomium is ciliated as in that and other species.

The number of setæ in the bundles of *Æ. variegatum* is stated to vary[5], but the approximate number per bundle tabulated in Vejdovsky's memoir upon that worm is less than in the present species. My species *may* differ as to the number of setæ per bundle; except in the last few segments the number ranged from 4–6. Their shape is perfectly similar to that of the setæ in *Æ. variegatum*.

The accompanying drawing (Plate XII. fig. 3) shows the two seta-bundles of one side of the body highly magnified; each bundle is implanted in a cellular sac which is plainly continuous with the epidermis, and is no doubt derived from it; the sac is made up of 8–10 nucleated cells; it is attached to the body-wall by numerous unicellular muscular fibres, each with a single nucleus at about the middle of its length. The two seta-bundles are attached to each other by a flat band of muscular tissue (*sm*), which is wider at its attached extremities than in the middle; this muscular band is longitudinally striate, and is of a totally different appearance from the unicellular muscular fibres above mentioned.

I recognized the *nerve-ganglion* in the prostomium and the *ciliated pits*, which lie on either side in the furrow which separates the prostomium from the peristomial segment. The ciliation of the prostomium extends as far as the ciliated pit.

The *alimentary tract* shows but little difference from that of other species; observation of the living worm as well as of transverse sections (fig. 6) show that in my species the whole of the intestine is ciliated.

The *vascular system* calls for no comment; the contained blood

[1] System u. Morph. &c. p. 113, footnote.
[2] Müller's Arch. 1865. [3] Bull. Acad. Belg. 1861.
[4] Soc. Ital. Sci. Nat. 1865.
[5] I am indebted to Prof. Vejdovsky for a German translation of a part of his memoir upon *Æ. variegatum*, which is in Bohemian.

is colourless as in all the other species except *Æ. ehrenbergii*, where, according to Lankester[1], it is of a pinkish colour.

There are a large number of pairs of nephridia present, while in *Æ. variegatum* there are only three pairs, occupying segments 4–6. They are very readily visible, and the terminal aperture into the cœlom is extremely obvious, lying midway between two successive seta-bundles. The cœlomic aperture can hardly be termed a "funnel," as it is only just perceptibly wider than the rest of the tube. The external orifice of the nephridium is placed close to the median ventral line. Although the segmentation of *Æolosoma* does not affect the cœlom, there being no mesenteries present, it is clear that the position of the nephridia is such that, were mesenteries to make their appearance, each nephridium would be entirely contained in a single segment; the external orifice is in fact in advance of the cœlomic aperture (fig. 1). This is of some little importance, inasmuch as in *Ctenodrilus*[2], undoubtedly a near ally of *Æolosoma*, the single pair of nephridia are entirely contained within the first segment of the body. Again, in *Polygordius*[3] the funnels of the nephridia, although they come into close contact with the septum which divides the segment containing the nephridium from the one in front, do not actually perforate it. *Polygordius* is certainly a very primitive Annelid; and since the same conditions obtain in the Capitellidæ and other Chætopods, there are some reasons for believing that the restriction of a nephridium to a single segment is primitive. On the other hand, it is almost universally the case among the Oligochæta that the funnel lies in the segment in front of that which bears the external aperture of the nephridium. Again, the nephridia of *Æolosoma* are, as has been pointed out by Vejdovsky, attached to the parietes by simple unicellular muscle-fibres. This is perhaps to be looked upon as a primitive arrangement, since the embryonic nephridium of *Allolobophora* is, according to Lehmann, attached in a similar fashion[4]. The characters of the funnel are important; so far as I can ascertain from a single fortunate section (fig. 4) it is composed of only two cells; there are at any rate only two nuclei present, and one of these is rather in advance of the other. It is a fact which favours some views which I have put forward elsewhere[5], as to the origin of the Annelid from the Platyhelminth excretory system, that in this primitive segmented worm the nephridial funnel should be, at most, two-celled. As to the structure of the nephridia, they consist, as in all Oligochæta, of "drain-pipe cells."

The difference in the number of the nephridia between the individuals which I have examined and those which Vejdovsky has

[1] Linn. Trans. vol. xxvi. 1869.

[2] The most recent paper known to me on this worm is by Dr. Scharff. Q. J. M. S. vol. xxvii. n. s.

[3] Fauna und Flora des Golfes von Neapel, xiv. Monograph of *Polygordius*, by L. J. Fraipont.

[4] Jen. Zeitschr. 1888, pl. xx. fig. 7.

[5] Q. J. Micr. Sci. 1888, pt. i.

termed *Æ. variegatum* leads me to believe that the individuals from the Society's Gardens belong to a distinct species; the fact also that the first nephridium is situated in the first setigerous segment, distinguishes my species from *Æ. variegatum*. I may fairly lay stress upon this point of difference, as it furnishes a useful character in distinguishing the remaining species of the genus. Leydig's observations upon *Æ. niveum* support Vejdovsky's belief that this species may be identical with his *Æ. variegatum*, as in both there are no nephridia in the œsophageal region.

The accompanying drawing (Plate XII. fig. 2) shows all the remaining points in the structure of *Æolosoma* to which I wish to direct attention. The cavity of the prostomium is traversed by numerous unicellular muscular fibres, which, when seen on a dorsal or ventral view of the animal, have the appearance of being frayed out at their point of insertion on to the body-wall, forming a star-like figure [1]. Besides these, the head-cavity is partly occupied by a network formed by the anastomosis of similar fibres, as in *Dinophilus* [2], &c.; elsewhere the cœlom is only traversed by the unicellular fibres. Beneath the epidermis there is a single row of circular muscular fibres, which is continued over the pharynx. Beneath the circular fibres is a single row of longitudinal fibres of a somewhat greater thickness than the last; these do not appear to be continued over the pharynx.

The nerve-ganglion is half cellular and half fibrous (fig. 2, *n*); it appears to be wholly cellular in other species.

The number and disposition of the nephridia appear to me sufficient to distinguish this species, which I have great pleasure in associating with the name of my friend Mr. F. W. Headley, Assistant Master at Haileybury College.

EXPLANATION OF PLATE XII.

Fig. 1. *Æolosoma headleyi*, highly magnified, from the ventral aspect.
2. Longitudinal section through prostomium and first segments.
3. Section through seta-sac.
4. Section to show nephridial funnel.
5, 6. Transverse and longitudinal sections through intestine.
7. Ciliated cells from intestine, highly magnified, to show striate free border.
8. Granular masses, colourless or yellow, contained in epidermis cells of prostomium.

Reference Letters.

bl. Blood-space. *v.v.* Ventral blood-vessel. *n.* Nerve-ganglion. *m.* Longitudinal muscular fibres. *m'.* Transverse muscular fibres. *ep.* Epidermis. *nep.* Nephridia. *o.* External orifice of nephridia. *f.* Funnel of nephridia. *c.* Intracœlomic muscular bands. *s.* Setæ. *s'.* Seta-sac. *sm.* Band of muscles uniting two seta-bundles. *ph.* Pharynx.

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[1] *Cf.* Vejdovsky, SB. böhm. Gesells. &c. fig. 3.
[2] Weldon, Q. J. Micr. Sci. 1886.

4. On *Chloridops*, a new Generic Form of *Fringillidæ* from the Island of Hawaii. By Scott Barchard Wilson. (Communicated by Alfred Newton, V.-P.)

[Received March 19, 1888.]

Chloridops[1], gen. nov.

Bill short and very thick, with culmen and gonys much arched; maxilla and mandible nearly equal in height, tomia of the former doubly sinuated and overhanging those of the latter, which are inflected.

Nostrils basal, supernal, nearly covered by the frontal feathers, and beset with a few hairs.

Wings moderate, first primary wanting, fourth slightly longer than third and fifth, which again exceed the second and sixth.

Tail short, slightly forked, rectrices acuminate.

Feet moderate.

Chloridops kona, sp. n. (♂ not procured.)

♀. Bill dull flesh-colour; lores dusky black. General colour above bright olive-green, passing into golden-green on the throat and belly; across the breast a band of olive-green; abdomen whitish; quill-feathers dusky black, edged outwardly with olive-green.

Total length 5·75 inches, wing from carpal joint 3·25; tail 2; bill —from gape to tip ·8, height from chin to forehead ·73; maxilla, width at base ·52; mandible, width at base ·59.

I obtained this bird, the only one which I have shot, 21st June, 1887, at an elevation of 5000 feet in the district of Kona on the west coast of Hawaii, in a great tract of forest, consisting principally of Koa-trees (*Acacia koa*); but there were also the Mamané (*Sophora chrysophylla*), the Alii (*Dodonæa viscosa*), the Sandalwood (*Santalum album*), and the Bastard Sandalwood (*Myoporum santalinum*). I think that as *Loxioides bailleui* feeds only, so far as I know, on the seeds of the *Sophora*, it is most probable that this big Finch feeds on them also. During my stay of four weeks I only saw three of these birds. The specimen shot was on a tall *Myoporum*. The species must be extremely rare, as I have since been collecting at almost similar elevations, where there are the same species of trees, but I cannot obtain there either of these Finches, neither do the natives know them, whence I conclude they are peculiar to the Kona district, as also is *Corvus hawaiiensis*.

The general appearance of this bird is that of an exaggerated Greenfinch (*Fringilla chloris*, Linn.).

[1] Chloridis *faciem habens*.

W. Purkiss lith. Hanhart imp.

HETEROCERA FROM FIJI.

April 17, 1888.

Dr. St. George Mivart, F.R.S., Vice-President, in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of March 1888:—

The total number of registered additions to the Society's Menagerie during the month of March was 34, of which 14 were by presentation, 4 by birth, 9 by purchase, 5 were received in exchange, and 2 on deposit. The total number of departures during the same period, by death and removals, was 99.

Mr. Charles Stewart exhibited a preparation showing the structure and development of the brood-pouch of *Nototrema marsupiatum*.

Mr. Boulenger exhibited the type specimen of a new species of marsupial Tree-Frog, *Nototrema fissipes*, Blgr., recently discovered by Mr. G. A. Ramage at Iguarasse, Pernambuco. This species agreed with *N. oviferum*, Weinl., in the dermo-ossification of the skull, but differed from all other species in the nearly free toes. The greatest interest attached to this specimen was its habitat, all previously known marsupial Frogs (*Nototrema* and *Amphignathodon*) being inhabitants of the Andes, from Central America to Peru.

A communication was read from Mr. T. D. A. Cockerell, containing some remarks on Atavism, with reference to a paper on the same subject read by Mr. J. Bland Sutton at a previous meeting of the Society.

The following papers were read:—

1. List of the Lepidoptera Heterocera collected by Mr. C. M. Woodford at Suva, Viti Levu, Fiji Islands, with the Descriptions of some new Species. By Herbert Druce, F.L.S., F.Z.S., &c.

[Received April 17, 1888.]

(Plate XIII.)

Examples of all the species enumerated in the following list were taken by Mr. Woodford during the months of February, March, and April 1886. This small collection is especially interesting on account of the exact localities being carefully noted, as well as for the new species it contains. Ninety-four species are represented, eight of which I have described as new. The specimens are all in my own collection.

Fam. Sphingidæ.

1. Hemaris cynniris.

Hemaris cynniris, Guérin, Iconographie, p. 495.

Also in my collection from New Caledonia.

2. Macroglossa, sp.

One specimen, in poor condition, not quite the same as any known to me; but without more material I think it better not to name it.

3. Chærocampa celerio.

Chærocampa celerio, Linn. Syst. Nat. i. 2. p. 800.

All the specimens have the silver streaks very heavily marked.

4. Chærocampa erotus.

Chærocampa erotus, Cram. Pap. Exot. ii. p. 12, t. 104. f. B.

Gonathothlibus erotoides, Wallgr. Wien. ent. Monat. iv. p. 43.

Deilephila eras, Boisd. Voy. de l'Astrolabe, Ent. p. 185; Feisthamel, Voy de la Favorite, Supp. vol. v. p. 19, t. 5. f. 2.

Chærocampa andamanensis, Kirby, Trans. Ent. Soc. Lond. 1877, p. 242; Waterhouse, Aid, t. 141. f. 1.

Mr. Woodford has brought a fine series of this species from Suva, which shows that all the forms that have been described as distinct species are in reality one. The specimens in my own collection are from the following localities:—North Australia; Loyalty Islands; Suva, Viti Levu; New Hebrides: Timor; and Andaman Islands. I do not see any characters whereby to separate them: the largest specimen is that from the New Hebrides with the widest dark margin to the secondaries; but every intermediate form to those from North Australia with the very narrow border to the secondaries is represented: the colour of primaries varies very much, a specimen taken by Mr. Woodford is almost green.

5. Protoparce convolvuli, var. distans.

Protoparce convolvuli, var. *distans*, Butl. Lep. New Zealand in Voy. 'Erebus' and 'Terror,' p. 30, t. 9. f. 11.

Also in my collection from New Guinea, New Hebrides, New Caledonia, and Western Australia; this species is always much smaller and darker in colour than the typical *P. convolvuli*.

Fam. Chalcosiidæ.

6. Heteropan dolens, n. sp. (Plate XIII. fig. 1.)

Primaries uniform slate-colour, secondaries dull glossy blue except along the costal and outer margins, which are brownish slate-colour. Underside of all the wings pale slate-colour, the costal margin of the secondaries shaded with blue. The upperside of the head, thorax, and abdomen dull black; the underside of the head, thorax, abdomen, and legs brownish bronze-colour. Expanse $\frac{3}{4}$ inch.

A pretty little species, not nearly allied to any known to me, but to some extent resembling *Chalcosia appendiculata*, Snell.

Fam. Lithosiidæ.

7. Hypsa woodfordi, n. sp. (Plate XIII. fig. 2.)

Primaries deep purple-brown, creamy white from the base to the middle of the costal and inner margins, but not extending so far from the base on the inner margin, the outer edge of the creamy white colour is formed into a series of half-circles edged with bluish black, four bluish-black spots close to the base, two on the costal margin and below the last spot on the costal margin, round the spots are some bright orange markings extending from the base, a small white dot beyond the end of the cell, and a large round cream-coloured spot close to the outer margin just above the anal angle. Secondaries creamy white, with a large black spot at the apex, a second round black spot on the outer margin nearest the anal angle, and a small dot close to the anal angle. Underside creamy white, with the dark markings as above, but not quite so much marked on the primaries, the basal spots being very indistinct. Head, thorax, and the abdomen bright orange, a bluish-black spot on each of the tegulæ, one at the base of the thorax, and a central row on the abdomen all black; the underside of the abdomen creamy white, with a row of bluish spots on each side; legs white banded with black; antennæ black; palpi bright orange tipped with black. Expanse 2½ inches.

I have much pleasure in naming this very fine species after its captor, Mr. C. M. Woodford; it is very distinct from any other known to me.

Fam. Leucanidæ.

8. Leucania inferens.

Leucania inferens, Walk. Cat. ix. p. 105.

Fam. Xylophasides.

9. Spodoptera nubes.

Spodoptera nubes, Guén. Sp. Gén. Lép. v. p. 155; Walk. Cat. ix. p. 186.

10. Prodenia infecta.

Prodenia infecta, Walk. Cat. ix. p. 196.
Prodenia insignata, Walk. *l. c.* ix. p. 197.
Prodenia permbuda, Walk. *l. c.* xi. p. 723.
Laphygma squalida, Walk. *l. c.* xxxii. p. 652.

11. Prodenia retina.

Prodenia retina, Guén. Sp. Gén. Lép. v. p. 163.

The specimens are identical with those from Madeira and Africa.

Fam. Noctuidæ.

12. Graphiphora compta.

Graphiphora compta, Walk. Cat. x. p. 404.

One specimen identical with Walker's type from New South Wales.

Fam. Acontiidæ.

13. Leocyma tibialis, Fabr.

Leocyma dianæ, Guén. Sp. Gén. Lép. vi. p. 213.
Chasmina cygnus, Walk. Cat. ix. p. 147.
Chasmina glabra, Walk. *l. c.* xxxii. p. 636.

With a large series of specimens before me I am quite unable to separate any of the above-named species as distinct. Indian specimens vary very much in size, but in no other respect are they different. Mr. Butler informs me that the type of Fabricius's species is in the Banksian Cabinet now in the British Museum.

14. Mesotrosta abyssa.

Mesotrosta abyssa, Snell. Tijds. v. Ent. xxiii. p. 56, t. 5. f. 1, 1*a*.

15. Acontia ritsemæ.

Erastria ritsemæ, Snell. Tijds. v. Ent. xxiii. p. 57, t. 5. f. 2.

A single specimen of this pretty little species was taken by Mr. Woodford.

16. Xanthodes intersepta.

Xanthodes intersepta, Guén. Sp. Gén. Lép. vi. p. 979.

One specimen identical with those from India, Ceylon, Timor, &c.

Fam. Erastridæ.

17. Erastria vermiculata.

Erastria vermiculata, Snell. Tijds. v. Ent. xxiii. p. 58, t. 5. f. 3.

Several specimens agreeing well with Snellen's figure.

Fam. Anthophilidæ.

18. Micra innocens, Butl.

19. Anthophila divergens?

Anthophila divergens?, Walk. Cat. xii. p. 803.

One specimen, very closely resembling Walker's type, but it is in poor condition.

Fam. Eriopidæ.

20. Callopistria exotica.

Callopistria exotica, Guén. Sp. Gén. Lép. vi. p. 294.

The light markings are whiter than they are in the Ceylon and Java specimens.

Fam. Eurhipidæ.

21. Penicillaria nugatrix.

Penicillaria nugatrix, Guén. Sp. Gén. Lép. vi. p. 303, t. 14. f. 7.

Two specimens, both of which are females.

Fam. Plusidæ.

22. Plusia verticillata.

Plusia verticillata, Guén. Sp. Gén. Lép. vi. p. 344.

Two specimens, identical with those from Java.

23. Plusia oxygramma.

Plusia oxygramma, Hübn. Exot. Schmett. f. 769, 770.

Identical with North-American specimens in my own collection.

Fam. Hyblæidæ.

24. Hyblæa puera.

Hyblæa puera, Cram. Pap. Exot. ii. t. 103. f. D, E.

Fam. Gonopteridæ.

25. Cosmophila xanthindyma.

Cosmophila xanthindyma, Boisd. Faun. Ent. Madagascar, p. 94 t. 13. f. 7.

26. Gonitis editrix.

Gonitis editrix, Guén. Sp. Gén. Lép. vi. p. 404, t. 2. f. 5.

I cannot distinguish the specimens caught by Mr. Woodford from those in my own collection from South America.

27. Gonitis vulpina.

Gonitis vulpina, Butl. Trans. Ent. Soc. Lond. 1886, p. 408.

28. Gonitis xanthochroa.

Gonitis xanthochroa, Butl. Trans. Ent. Soc. Lond. 1886, p. 409.

Fam. Catephidæ.

29. Cocytodes modesta.

Cocytodes modesta, Van der Hoeven, Lép. Nouv. t. 7. f. 8.

One specimen, identical with those before me from New Caledonia and the New Hebrides.

30. Steiria variabilis. (Plate XIII. figs. 3, 4, vars.)

Steiria variabilis, Moore, Descrip. Indian Lep. from the Coll. of the late Mr. Atkinson, p. 164.

Mr. Woodford took fifteen specimens of this extremely variable insect, no two of them being alike. The specimens vary from pale fawn-colour to dark blackish brown, and if they are separated at least ten of them would have to be named: this species varies much in the same way as *Diadema bolina* does from the same place. I believe it most likely this will prove to be another form of *Stictoptera cucullioides*, Guén.

31. Steiria subobliqua.

Steiria subobliqua, Walk. Cat. xiii. p. 1136.

One specimen, identical with Walker's type in the National Collection.

Fam. Hypocalidæ.

32. Hypocala plumicornis.

Hypocala plumicornis, Guén. Sp. Gén. Lép. vii. p. 75.

The black margins of the secondaries are rather wider in the Suva specimens than in the typical African form, but in other points are identical.

Fam. Ophideridæ.

33. Ophideres fullonica.

Ophideres fullonica, Linn. Syst. Nat. i. 2. p. 812; Clerck, Icon. t. 48. f. 1–4.

Fam. Erebidæ.

34. Oxyodes clytia.

Oxyodes clytia, Cram. Pap. Exot. iv. p. 238, t. 399. f. G.

Fam. Ommatophoridæ.

35. Sericia anops.

Sericia anops, Guén. Sp. Gén. Lép. vii. p. 1296.

The specimens are identical with those from India and Ceylon.

Fam. Ophiusidæ.

36. Lagoptera miniacea.

Lagoptera miniacea, Feld. & Rog. Reise Nov. Lep. t. cxvi. f. 8; Erkl. de Taf. no. 8.

One specimen, almost identical with Felder's figure.

37. Lagoptera magica.

Lagoptera magica, Hübn. Samml. exot. Schmett. f. 535, 536.
Noctua coronata, Fabr. ?

A very widely distributed and common species.

38. Ophisma lætabilis.

Ophisma lætabilis, Guén. Sp. Gén. Lép. vii. p. 241.
Noctua illibata, Fabr. ?

39. Achæ fasciculipes.

Achæ fasciculipes, Walk. Cat. xiv. p. 1400.

The specimens of this fine species are identical with Walker's type in the National Collection from Celebes, also with those in my own collection from New Caledonia.

40. Achæ melicerte.

Achæ melicerte, Drury, Ill. Exot. Ins. i. t. 23. f. 1.

This common species ranges over India, China, Java, Borneo, and various other islands to North Australia.

41. Ophiusa myops.

Ophiusa myops, Guén. Sp. Gén. Lép. vii. p. 265.

Identical with Javan specimens.

42. Ophiusa arctotænia.

Ophiusa arctotænia, Guén. Sp. Gén. Lép. vii. 272.

The specimens are in every way identical with those from Darjeeling.

43. Grammodes oculicola.

Grammodes oculicola, Walk. Cat. xiv. p. 1446.

44. Grammodes alcyona, n. sp. (Plate XIII. fig. 5.)

Primaries dark brown, bordered on the costal and outer margin with pale brown; two white lines running from the base to near the outer margin, where they are joined by a transverse narrow line forming a large triangle; the inner line is much the broadest of the three. Secondaries pale mouse-colour, darkest from the apex to the anal angle. Underside uniform pale whitish brown; head, thorax, and abdomen pale brown; antennæ and legs brown. Expanse 1½ inch.

This species is allied to *Grammodes delta*, Boisd., but it is at once distinguished from that species by the entirely different shape of the triangular mark on the primaries.

Fam. Euclididæ.

45. Trigonodes cephise.

Trigonodes cephise, Cram. Pap. Exot. iii. p. 59, t. 227. f. C.

One specimen, which is almost identical with Cramer's figure.

Fam. Remigidæ.

46. Remigia archesis.

Remigia archesis, Cram. Pap. Exot. iii. t. 273. f. F, G, H.
Remigia demonstrans, Walk. Cat. xiv. p. 1512.
Remigia discrepans, Butl.

With a very large series of specimens before me I am quite unable to separate Walker's and Mr. Butler's species; on the undersides they are all identical except in colour, some being slightly brighter than others, but in no locality are they constant in this respect.

47. Remigia congregata.

Remigia congregata, Walk. Cat. xv. p. 1847.
Remigia optatura, Walk. *l. c.* p. 1848.

A very variable species, Walker's *R. optatura* is only a female of his *R. congregata*.

48. Remigia frugalis.

Remigia frugalis, Fab. Ent. Syst. iii. 2. p. 138; Walk. Cat. xiv. p. 1507.

Fam. Thermesidæ.

49. Azazia rubricans.

Azazia rubricans, Boisd. Faune Lép. Mad. p. 106, t. 16. f. 1.

The specimens are slightly paler in colour than those from Madagascar.

50. Sonagara superior.

Sonagara superior, Butl. Ann. & Mag. Nat. Hist. ser. 5, vol. xix. p. 433.

The specimens obtained by Mr. Woodford are identical with Mr. Butler's type in the National Collection.

Fam. Hypenidæ.

51. Dichromia duplicalis.

Dichromia duplicalis, Walk. Cat. xvi. p. 16.

Two specimens, identical with those from Australia.

52. Hyamia, sp.

Very close to the South-American *Hyamia palpitatalis*, Walker; the specimens are not in good condition.

Fam. Herminidæ.

53. Bleptina funestalis.

Bleptina funestalis, Walk. Cat. xxxiv. p. 1163.

54. Bocana metisalis.

Bocana metisalis, Walk. Cat. xvi. p. 183.
Bleptina dimissalis, Walk. *l. c.* xxxiv. p. 116.

Walker described the sexes as distinct species.

55. Bocana? sypnoides.

Bocana? sypnoides, Butl. Trans. Ent. Soc. Lond. 1886, p. 416.

This species hardly belongs to the genus *Bocana*, the males having deeply pectinated anteennæ and long tapering palpi; Mr. Butler's description was taken from a female specimen.

Fam. Boarmidæ.

56. Boarmia samoana.

Boarmia samoana, Butl. Trans. Ent. Soc. Lond. 1886, p. 433.

This species varies considerably in colour; some specimens are much paler than others.

Fam. GEOMETRIDÆ.

57. IODIS CHEROMETA.

Iodis cherometa, Meyr. Trans. Ent. Soc. Lond. 1886, p. 203.

One specimen of this pretty species.

58. THALASSODES OPALINA.

Thalassodes opalina, Butl. Ann. & Mag. Nat. Hist. ser. 5, vi. p. 214; Ill. Lep. Het. Brit. Mus. pt. vi. p. 70, t. cxvii. f. 9.

Thalassodes saturata, Snell. Tijds. v. Ent. xxiv. p. 77, t. 8. f. 3.

This species appears to be very widely distributed.

59. THALASSODES TIMOCLEA, n. sp. (Plate XIII. figs. 6, ♂, 7, ♀.)

♂. Primaries and secondaries bright green, thickly speckled with very fine white lines, two narrow white lines crossing both the primaries and secondaries from the costal to the inner margin; underside of all the wings greenish white; the head, thorax, and abdomen greenish white. Antennæ and legs yellowish.

♀. The same colour as the male, but with the primaries crossed about the middle from the costal to the inner margin by a wide creamy white band, and the apical half of the secondaries creamy white; in all other respects it is identical with the male, excepting that the antennæ are simple and not pectinated as in the male. Expanse, ♂ 1¼ inch, ♀ 1½.

This species is quite distinct from any other known to me.

Fam. EPHYRIDÆ.

60. ANISODES SUSPICARIA.

Anisodes suspicaria, Snell. Tijds. v. Ent. xxiii. p. 80?, t. 5. f. 6, 6*a*–*c*.

Fam. ACIDALIDÆ.

61. ACIDALIA CERNEA, n. sp. (Plate XIII. fig. 8, ♂.)

Primaries and secondaries pure white, with three very fine waved black lines between the middle and the outer margins of all the wings. Underside uniform silky white, slightly yellowish along the costal margin of the primaries. The head, thorax, and abdomen white. Antennæ and legs brown. Male and female alike, excepting that the antennæ of the male are rather deeply pectinated, those of the female simple. Expanse, ♂ ♀, 1 inch.

A pretty little species; it is not closely allied to any known to me.

62. PYTHODORA RHIPISTIS, Meyr.

My specimens are identical with those so named in Mr. Mathew's collection now in the British Museum.

Fam. MICRONIDÆ.

63. MICRONIA HERMÆA, n. sp. (Plate XIII. fig. 9.)

Primaries and secondaries pure white, the primaries crossed from

the costal margin by three narrow pale mouse-coloured bands, a narrow line between the first and second, and a series of small mouse-coloured streaks extend from the apex along the outer margin; on the costal margin there are a number of small dots. Secondaries crossed by two mouse-coloured bands, the first about the middle, the second submarginal; the fringe of all the wings mouse-coloured. The head, thorax, and abdomen white. Legs white; antennæ mouse-coloured. The underside of all the wings pure white. Expanse 2 inches.

This species is allied to *Micronia hyemalis*, Butler.

64. Erosia conchiferalis, Moore.

65. Erosia, sp.

Two specimens, in very poor condition.

Fam. Larentidæ.

66. Larentia bosora, n. sp. (Plate XIII. fig. 10.)

Primaries and secondaries, the ground-colour white, thickly speckled with reddish-brown and olive-green dots. Two olive-green bands crossing the primaries from the costal to the inner margin, a reddish spot near the apex on the outer margin and one on the inner margin close to the anal angle. Secondaries crossed by one central band of reddish brown, and a large patch of reddish brown at the anal angle. The underside of all the wings bright reddish brown; the head, thorax, and abdomen greenish. Antennæ brown. Expanse 1 inch.

67. Pasiphila catastnepta.

Pasiphila catastnepta, Meyr. N. Z. I. Sci. 1883, p. 527.

Fam. Siculodidæ.

68. Siculodes anticalis.

Siculodes anticalis, Walk. Cat. xxxiv. p. 1238.

The specimens are identical with Walker's type in the National Collection from Mysol.

Fam. Pyralidæ.

69. Doththa mesenterialis.

Doththa mesenterialis, Walk. Cat. xvii. p. 285.

Fam. Hydrocampidæ.

70. Cataclysta drusialis.

Cataclysta drusialis, Walk. Cat. xvii. p. 450; Meyrick, Trans. Ent. Soc. Lond. 1885, p. 428, et 1886, p. 221.

Fam. Asopiidæ.

71. Rinecura nigrescens.

Rinecura nigrescens, Butl. Trans. Ent. Soc. Lond. 1886, p. 424.

72. HYMENIA RECURVALIS.

Hymenia recurvalis, Fabr. Ent. Syst. iii. 2. p. 237.
Hymenia fascialis, Stoll, Cram. Pap. Exot. v. p. 163, t. 36. f. 13.
This common species is found almost everywhere.

Fam. STENIADÆ.

73. STENIA ORNATALIS.

Stenia ornatalis, Dup. Lép. viii. 2. p. 207, t. 223. f. 8.

Fam. MARGARODIDÆ.

74. GLYPHODES STOLALIS.

Glyphodes stolalis, Guén. Sp. Gén. Lép. viii. p. 293, t. 3. f. 11.
The specimens are identical with those from India and Java.

75. MARGARONIA GLAUCULALIS.

Margaronia glauculalis, Guén. Sp. Gén. Lép. viii. p. 306.
Margaronia oceanitis, Meyrick, Trans. Ent. Soc. Lond. 1886, p. 222.
Mr. Meyrick's species is identical with Guénée's.

Fam. BOTYDÆ.

76. BOTYODES ASIALIS.

Botyodes asialis, Guén. Sp. Gén. Lép. viii. p. 321; Lederer, Wien. ent. Monatsch. viii. p. 394, t. 13. f. 8.
Lygropis sirioxantha, Meyr. Trans. Ent. Soc. Lond. 1886, p. 262.
Mr. Meyrick's species is identical with Guénée's.

77. PLATAMONIA STENOSOMA.

Platamonia stenosoma, Felder, Reise Nov. Lep. t. cxxxiv. f. 16; Erkl. de Taf. cxxxiv. no. 16.
One male of this fine species.

78. DRACÆNURA ASTHENOTA.

Dracænura asthenota, Meyr. Trans. Ent. Soc. Lond. 1886, p. 229.

79. DRACÆNURA AGRAMMA.

Dracænura agramma, Meyr. Trans. Ent. Soc. Lond. 1886, p. 229.

80. DRACÆNURA MYOTA.

Dracænura myota, Meyr. Trans. Ent. Soc. Lond. 1886, p. 230.
Three specimens of this pretty little species.

81. PLEONECTUSA METALEUCALIS.

Pleonectusa metaleucalis, Walk. Cat. xxxiv. p. 1372; Meyr. Trans. Ent. Soc. Lond. 1886, p. 231.

82. PLEONECTUSA PARALLELA.

Pleonectusa parallela, Meyr. Trans. Ent. Soc. Lond. 1886, p. 231.

83. Marasmia erilitalis.

Marasmia erilitalis, Feld. Reise der Nov. Lep. t. cxxxv. f. 26; Erkl. de Taf. cxxxv. no. 26.

84. Marasmia aurea, n. sp.

Wings pure white. The costal margin of the primaries golden yellow, with three small dots on the inner side, a golden yellow waved submarginal line crossing the wing from near the apex to the inner margin. Secondaries with a small waved yellow line extending from the costal to anal angle. Underside of all the wings pure white. The head, thorax, abdomen, legs, and antennæ white. Expanse $\frac{3}{4}$ inch.

This beautiful little species is very distinct from any I have seen.

85. Dolichosticha perinephes.

Dolichosticha perinephes, Meyr. Trans. Ent. Soc. Lond. 1886, p. 236.

86. Semioceros dactyloptila.

Semioceros dactyloptila, Meyr. Trans. Ent. Soc. Lond. 1886, p. 243.

Several specimens of this pretty species.

87. Erebangela melanauges.

Erebangela melanauges, Meyr. Trans. Ent. Soc. Lond. 1886, p. 246.

Several specimens of this dull-coloured species.

88. Diplotyla ochrosema.

Diplotyla ochrosema, Meyr. Trans. Ent. Soc. Lond. 1886, p. 247.

Many specimens.

89. Diplotyla cyclospila.

Diplotyla cyclospila, Meyr. Trans. Ent. Soc. Lond. 1886, p. 248.

The female is like the male, excepting that it is considerably paler in colour, and that the antennæ are quite simple.

90. Strepsimela signiferalis.

Isopteryx signiferalis, Wallgr. Wien. ent. Mon. iv. p. 175.

? *Ceratoclasis barbicornis*, Feld. Reise der Nov. Lep. t. cxxxvi. f. 1; Meyr. Trans. Ent. Soc. Lond. 1886, p. 250.

91. Botys abruptalis.

Botys abruptalis, Walk. Cat. xvii. p. 371.

One specimen of this species, agreeing well with specimens from Ceylon.

92. Notarcha, sp.

Two specimens in very worn condition.

Fam. GALLERIDÆ.

93. NEPHOPTERYX, sp.?

94. AURANA, sp.

Very close to *A. actiosella*, Walker, from Ceylon.

EXPLANATION OF PLATE XIII.

Fig. 1. *Heteropan dolens*, n. sp., p. 220.
2. *Hypsa woodfordi*, n. sp., p. 221.
3, 4. *Steiria variabilis*, Moore, vars., p. 223.
5. *Grammodes alcyona*, n. sp., p. 225.
6, ♂, 7, ♀. *Thalassodes timoclea*, n. sp., p. 227.
8, ♂. *Acidalia cernea*, n. sp., p. 227.
9. *Micronia hermæa*, n. sp., p. 227.
10. *Larentia bosora*, n. sp., p. 228.

2. Notes on the Gular Brood-pouch of *Rhinoderma darwini*.

By G. B. HOWES, F.Z.S., F.L.S., Assist. Prof. of Zoology, Normal Sch. of Science and R. Sch. of Mines, S. Kensington.

[Received April 17, 1888.]

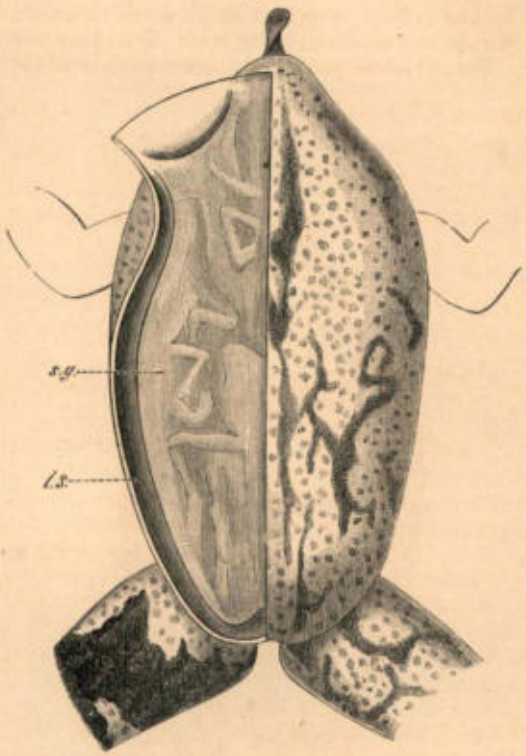
The Chilian Batrachian *Rhinoderma darwini* was among the most interesting finds of the voyage of the 'Beagle,' and its special interest lay in the fact that it was originally thought by Gay [1] to have been viviparous. Jiminez de la Espada disproved this in 1872, and brought to light [2] the remarkable fact that the gular sac of the male becomes greatly enlarged and modified, to form a brood-pouch, within which the larval metamorphoses of the young are undergone.

The specimen which furnished the subject-matter for these notes came into my hands quite recently [3], in the course of an inquiry into the skeleton of the Anura [4]. Finding that I was able to supplement the descriptions of Espada, and seeing that his paper was published without illustration, I thought it desirable to seize the opportunity of putting on record drawings of so rare an object. The specimen itself differs in no important external character from those hitherto described. It measures from snout to vent 30 mm., that being the length given by Espada; the length of the outstretched hind limb is 62 mm., and the greatest transverse diameter of the trunk 18 mm.[5] The cutaneous lobes of the fore limb ('epaulettes')

[1] Compt. Rend. vol. ii. p. 322 (1835).
[2] Anales d. l. Soc. Esp. d. hist. nat. Madrid, vol. i. pp. 139–151 (1872). German abstract by Spengel, Zeitsch. wiss. Zool. vol. xxix. pp. 495–501 (1877).
[3] Among some material generously placed at my disposal by my master, Prof. Huxley.
[4] See P. Z. S. 1888, p. 141.
[5] For good fig. see Gay, Hist. de Chile, Atlas, pl. 7, Erpetologia.

are somewhat smaller than usual. There appears to have been an exceptional inequality in the deposition of dark pigment on the under surface of the body and hind limbs; for with the exception of the right member, which was unusually dark, these parts were but little coloured (see fig. 1).

Fig. 1.



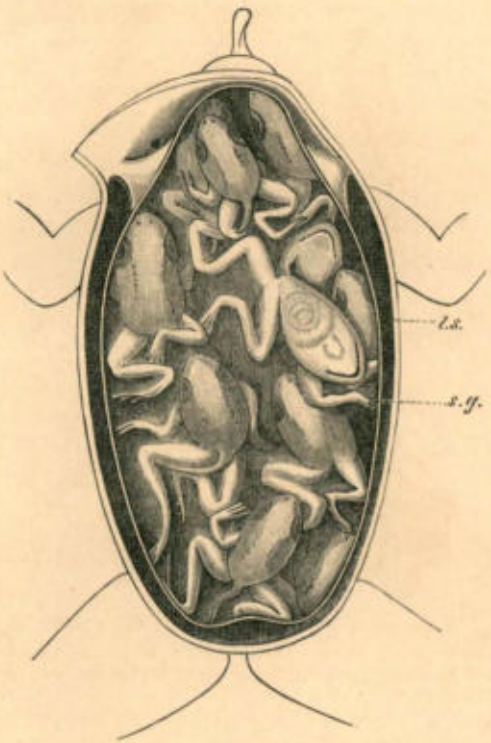
Gular sac of *Rhinoderma darwini*, adult male.

Ventral view of the trunk, the right half of the ventral integument having been removed to show the underlying gular brood-sac, *s.g*; multiplied two and a half times.

On slitting up the ventral integument, as shown in fig. 1, the immense gular sac was at once exposed for its whole length. It occupied, as will be seen, the interspace between the body-wall and ventral integument. Anteriorly it was rounded, extending forwards to near the mentum, while posteriorly it was prolonged backwards into two insignificant cornua. The entire sac was bilaterally symmetrical, and it appears to have equalled in capacity that of any specimen examined by Espada.

That author says, in describing its attachments (Spengel's translation, p. 499), "Sie fand sich stellenweise anliegend, stellenweise vollständig verwachsen mit der Innenfläche der Haut und mit der Aussenfläche der Brust- und Bauchmuskeln." In my specimen no such confluence with the abdominal muscles was discernible; such attachments, however, as were instituted were of a very definite order. Espada states that the sac bears at the shoulders 'Zipfeln'; and this might appear to imply that it is an irregular structure, bearing lateral diverticula and accommodating itself, as it were, to its surroundings. The only fusion with the inner surface of the integu-

Fig. 2.



The same as in fig. 1, the ventral integument having been wholly reflected, and the gular sac opened up to display its contents.

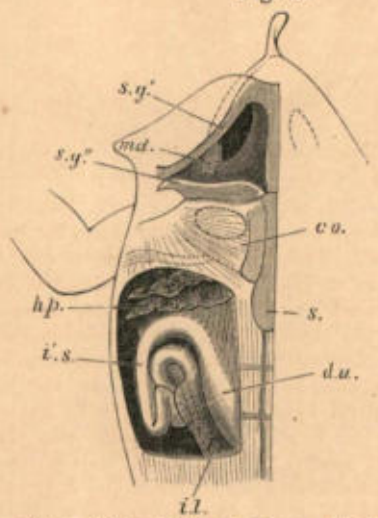
ment observable in my specimen is a bilaterally symmetrical one (figs. 1 & 2) set up near the angle of the lower jaw. The wall of the sac, elsewhere very thin and transparent, is at these points thickened, and, consequent upon its adherence to the integument, dragged out as it were laterally, to form two prolongations which answer very

satisfactorily to the aforenamed 'Zipfeln.' It will thus be seen that these outgrowths are forcible displacements, due to the mode of suspension of the gular sac, rather than casual outgrowths, as might be imagined at first sight.

Espada's statement concerning the attachment to the ventral muscles does not do justice to the facts. The brood-pouch of my specimen was found, on being raised, to hang free behind the line of attachment, and that was found to follow the anterior border of the bony clavicle. This fact is shown in fig. 3, where the greater part of the ventral wall of the sac (*s.g'*) had been removed and the small portion of its post-clavicular dorsal wall (*s.g''*) which remained turned forwards. Anteriorly to this point of attachment a complete confluence is established between the dorsal wall of the sac and the overlying floor of the mouth (see dotted line of fig. 5).

Examination of the parts *in situ* showed that all attachment is pre-clavicular, and that the main portion of the sac hangs free, the

Fig. 3.



A portion of the right half of fig. 2, dissected to show the intestine and liver, together with the mode of attachment of the gular sac.

co, coracoid; *du*, duodenum; *md*, angle of mandible; *s*, xiphisternum.

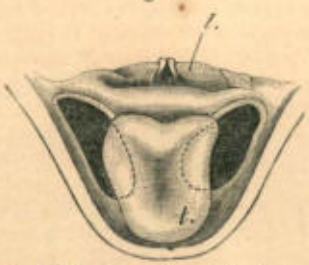
whole being suspended as it were from the floor of the mouth and adjacent lateral integument, and lying within the great subcutaneous lymph-space (*l.s.*, figs. 1, 2, 5).

Espada mentions the fact that in one of his specimens the hinder half of the tongue was "kürzer oder zusammengezogen, wie um die Ein- und Ausgangsöffnungen des Kehlsackes frei zu lassen." This was not the case in my specimen. The tongue is (*t*, fig. 4) somewhat

contracted and asymmetrical; the orifices of the gular pouch are less modified than might have been expected (each is 7 mm. long), and the whole floor of the mouth differs in no respect from that say of a normal *Cystignathus*. The larynx (*l*, fig. 4) is situated far back, immediately behind a deep fold of the lining membrane of the floor of the mouth. Its mucous membrane was slightly swollen around the aditus; but there were neither epiglottis nor other accessory folds present, as might have been expected [1].

The brood-pouch of my specimen contained 11 larvæ, that number having been exceeded (12 and 15) by two of the five specimens dissected by Espada. These little animals are represented in fig. 2

Fig. 4.



The floor of the mouth of *Rhinoderma darwini*, showing the tongue, larynx, and the orifices of the gular sac; multiplied two and a half times.

as they lay in life; and it will be seen that they were, for the most part, irregularly disposed. Espada asserts that in one of his individuals the larvæ (7 in number) were "einigermassen in zwei parallelen Reihen angeordnet"; he does not state, however, in what way the surfaces of the bodies of these or any of his specimens were disposed respecting those of the parent. Examination of fig. 2 shows that, with the exception of two individuals on the parent's left, all lay with their ventral faces in apposition with that of the adult which bore them; and it might appear from this that the larvæ are carried on their backs. These, it will be seen, were far advanced in development and, with two exceptions, disposed with their heads towards the neck of the sac, as though making their way towards the exterior. From the positions in which they lay it is tolerably certain that attempts were made by them to gain the latter in their death-struggles; and I imagine that the parent died on its back, and that a stampede ensued, in which two of the unfortunate 11 prisoners were overpowered before righting themselves.

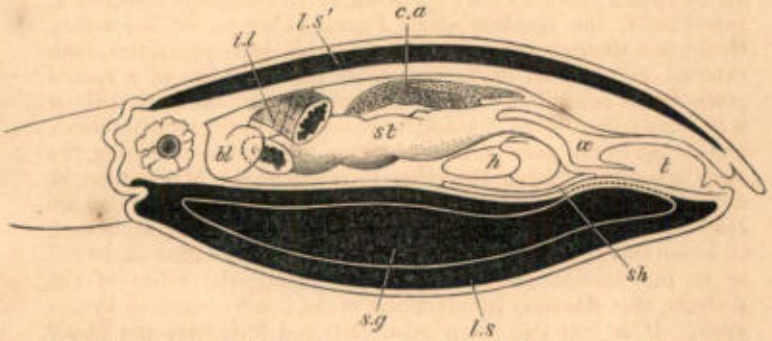
The larvæ were, as in one of Espada's examples, unequally advanced in development. In all, both fore and hind limbs were free, the latter being webbed in three instances. Five of the 11 were caudate; and it is worthy of remark that those whose metamorphosis was

[1] *Cf.* P. Z. S. 1887, p. 490, and Spengel, *op. cit.* p. 497.

least advanced lay (as in Espada's example) at the base of the sac (*cf.* fig. 2). The largest larva measured 8 mm. from snout to vent, 5 mm. across the trunk at its widest part. None were young enough to show the remotest vestiges of external gills, had such existed[1].

Espada found in one instance 15 young in the pouch. These were apparently in a somewhat similar condition to those of my own specimen; concerning the parent, he writes (Spengel, p. 499), "Die Eingeweide nahmem einen unglaublich kleinen (*inverosimil*!) Raum ein . . . . . bei genauerer Betrachtung stellte sich das Phänomen nicht als eine mechanische Wirkung [of the enlargement of the sac] dar, sondern als eine Rückbildung, ein Schrumpfen dieser Eingeweide,

Fig. 5.



Longitudinal section of *Rhinoderma darwini* entire, taken to one side of the middle line after removal of the embryos; to show the general relations and sectional area of the gular brood-sac (*s.g*).

bl, urinary bladder; *h*, heart; *l.s'*, dorsal subcutaneous lymph-sinus; *œ*, œsophagus; *sh*, shoulder-girdle.

welche wie abgezehrt erschienen. Das Thier muss ohne Zweifel, so lange seine Jungen in dem Brutraume sind, zum grossen Theil seine Ernährungsfunctionen einstellen, wenn auch nicht vollständig, wie bei den Winterschläfern." I accordingly examined, with no little interest, the condition of the parts in my specimen; and this with unexpected results. The small intestine (*i.s*, fig. 3) was perfectly normal and full of food-material in an assimilable condition, while the large intestine (*i.l*) was fully charged with excreta like that of a normal individual. The stomach (*st*, fig. 5) was much distended by small Beetles and Diptera; and, but that the liver (*h.p*, fig. 3) was shrunken and displaced, and that the gall-bladder had collapsed, the alimentary viscera were those of a healthy animal in full diet.

If Espada's final deduction were correct, we might fairly expect to find the fat-body in an insignificant condition[2]. This was, on

[1] Espada failed to find traces of these in still younger larvæ.

[2] *Cf.* Knappe, "Das Bidder'sche Organ," Morph. Jahrb. vol. xi. (1886).

the contrary, in my specimen, comparatively large (especially so upon the left side, *c.a*, fig. 5)—relatively larger, in fact, than in the healthy individual of the Common Frog prior to hibernation. In consideration of all the facts, I think it probable that Espada was mistaken, and that this extraordinary paternal instinct does not lead up to that self-abnegation which he supposed.

3. Description of a new Genus and Species of Rat from New Guinea. By OLDFIELD THOMAS.

[Received March 27, 1888.]

Among the collections recently brought from New Guinea by Mr. H. O. Forbes there occurs a specimen of Rat strongly resembling, superficially, the common small Papuan *Uromys*, *U. cervinipes*, Gould, but showing on a closer examination such characters, both external and cranial, as to necessitate the formation of a special genus for its reception: of these characters by far the most striking is its possession of a tail modified for prehension in the same fashion [1], and almost to the same extent, as in the Phalangers inhabiting the same country. Among the other members of the Myomorpha, so far as I know, the only ones that have a truly prehensile tail are *Dendromys* and the common Harvest-Mouse (*Mus minutus*), in each of which there is a tendency towards the same modification of the tail as in the present animal. Otherwise, among the whole of the Rodents, this character is only found in the South-American Porcupines. It is true that many other Rats and Mice have the power of twisting their tails round branches, and so helping themselves in climbing, but in none is this so far developed as to cause any important modification in the actual structure of the tail, as is the case in the animal now described.

The teeth, again, are remarkably complicated, and show a high degree of specialization, far more than is found in any other genus at all allied to the present one. This extreme specialization both of teeth and tail is especially remarkable in an animal inhabiting such a refuge for old and little-modified forms as New Guinea.

The following is a detailed description of the new form:—

CHIRUROMYS, g. n.

Externally like *Mus*, but with the terminal portion of the tail above without scales, quite naked, transversely wrinkled, and obviously prehensile. Scales of rest of tail (fig. 2, c) not, as is usual, square and arranged in distinct rings, but more or less pentagonal or lozenge-shaped, and set in diagonal slanting series, somewhat like the dorsal scales of a snake.

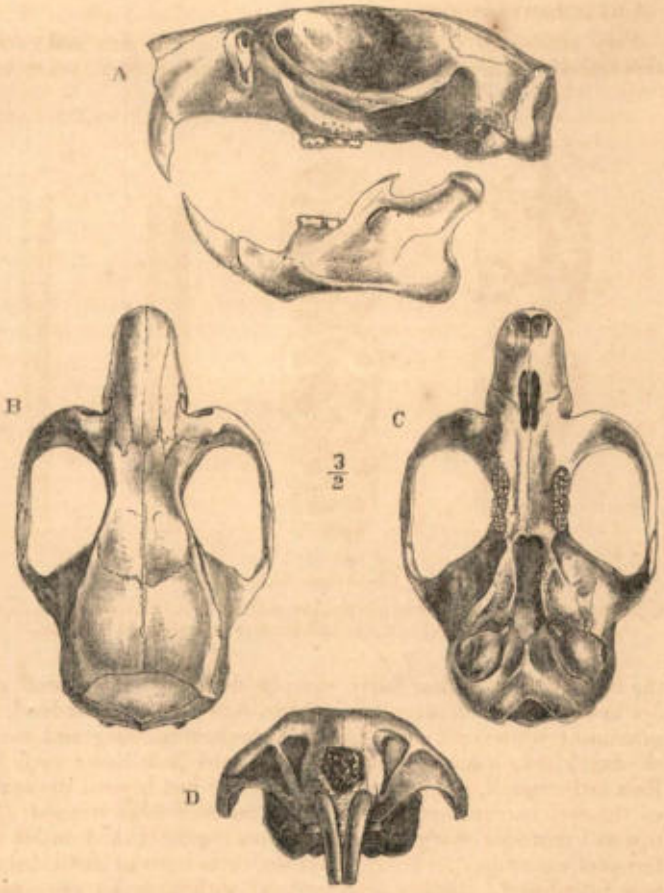
Skull (fig. 1, p. 238) with the infraorbital foramen typical in shape, but with its external wall narrow and not produced forwards as a projecting plate. Anterior part of zygomata projecting outwards

[1] Except that the curl is upwards instead of downwards.

nearly at right angles to the general line of the skull. Supra-orbital edges square and sharp, but not beaded. Palatine foramina short and narrow. Bullæ small.

Teeth.—Incisors smooth. Upper molars (fig. 2, A) very compli-

Fig. 1.



Skull of *Chiruromys forbesi*; once and a half the natural size.

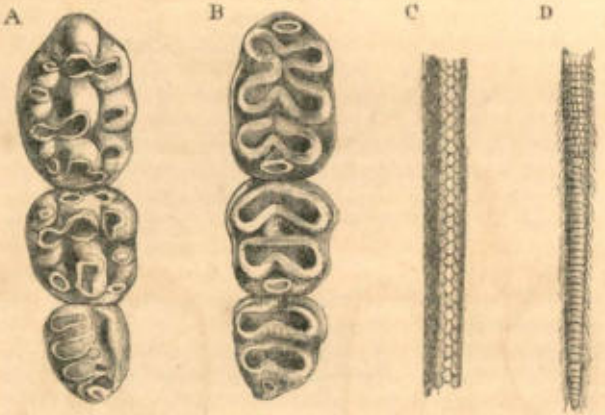
cated, the cusps low and the laminæ scarcely marked, so that the homologies between their cusps and those found in other genera are by no means clear. $\underline{M^1}$ with eleven cusps in all, namely three transverse sets of three each, and two extra solitary cusps; $\underline{m^2}$ with 10 cusps; $\underline{m^3}$ nearly as long as $\underline{m^2}$, apparently with seven cusps, but its

pattern too vague and little defined for exact description. Lower m^1 (fig. 2, B) with three pairs of transversely elongated cusps, an anterior and posterior central cusp, and a long extra external ledge running the whole length of the tooth; $\overline{m^2}$ with two pairs of similar cusps, a single posterior central one, and an external ledge; $\overline{m^3}$ with two pairs of cusps and an antero-external ledge.

CHIRUROMYS FORBESI, sp. n.

Very similar to *Uromys cervinipes*, Gould, in size and general appearance. Colour above a uniform dull rufous grey, below buff,

Fig. 2.



Chiruromys forbesi.

A, left upper, and B, left lower molars, magnified about 10 diameters; C, dorsal view of middle, and D, tip of tail to show arrangement of scales.

the line of demarcation fairly sharply defined; a ring round each eye nearly black; between eye and ear, rather above their level, is a prominent white spot; whiskers very numerous, long and coarse, shining black, a single bristle also inserted just above each eye. Ears rather small, laid forward they reach to just beyond the middle of the eye, narrow, not pointed, their anterior edge straight, their tips and posterior margins evenly convex; quite naked inside and terminally outside. Palate-ridges seven, three anterior undivided and four interdental. Hallux rudimentary, with a broad nail; palms with five broad smooth pads. Soles quite naked, smooth, with six large low pads, the posterior pads elongated; fifth hind toe reaching to the base of the last phalanx of the fourth. Tail (fig. 2, C and D) longer than the head and body, scaly, with minute hairs between the scales, its terminal inch or inch and a half quite naked and without scales above, the tip with a natural curl upwards and thus showing, as well as by its structure, the prehensile power it possesses; scales large, averaging rather more than a millimeter in diameter; arranged,

as above described. Mammæ six, one axillary and two inguinal pairs. Skull and teeth as described above.

Hab. Sogere, S.E. New Guinea; altitude 1750 feet.

Dimensions of the type, an adult female, in spirit:—Head and body 156 millim.; tail 222; hind foot 30; fore arm and hand 42·5; ear (above crown) 17; head 43; muzzle to eye 18·8, to ear 35·5; heel to front of last foot-pad 15; length of the pad 6·8.

Skull.—Basal length 34·0, greatest breadth 22·8; nasals, length 12·3; interorbital breadth 5·7; interparietal, length 4·8, breadth 9·3; infraorbital foramen, height 5·8, length of outer wall 4·0, distance from its outer corner to that of its fellow 11·0; palate, length 20·0, breadth outside $\underline{m^1}$ 7·0, inside $\underline{m^1}$ 4·0; palatal foramen, length 5·2; diastema, length 11·3; length of molar series 5·5, of $\underline{m^1}$ 2·5, of $\underline{m^2}$ 1·7, of $\underline{m^3}$ 1·5; basicranial axis 11·0, basifacial axis 23·0. Length of lower jaw (bone only) 23·8, (to incisor tips) 27·0.

4. On some Land-Mollusks from Burmah, with Descriptions of some new Species. By Lieut.-Col. H. H. Godwin-Austen, F.R.S., F.Z.S., &c.—Part I.

[Received March 23, 1888.]

The following list comprises the shells which have reached me since our late occupation of the above country. The first batch were collected and sent me by my former assistant in the Survey, Mr. M. Ogle, from the districts on the Kyeng-dwen, or Chindwen, east of Munipur. The second I have lately had placed in my hands by Mr. J. Ponsonby, who received them from Captain Spratt, R.A., from Upper Burmah, where that officer has been employed during the late military expeditions. The shells are not in a good state of preservation, and no doubt were collected under very considerable difficulties as regards leisure and deficiency of carriage. There are many new forms, showing what a rich harvest awaits the naturalists who could devote more time and care to the work. We trust that Captain Spratt (son of Admiral Spratt, a life-long worker at the Mollusca) will yet be able to add still more to our knowledge of the species to be found in our newly acquired territory.

I propose in this communication to describe the shells collected by Captain Spratt. Hlindet, where most of them were obtained, is situated on a tributary of the Irrawaddy, which, rising in the hills south of Mandalay, flows north to join that river at the sharp bend below that town. It is through this valley that the new line of railway is to run to the capital from Toungoo.

The late Mr. Francis Fedden, of the Geological Survey, visited this part of Burmah and the Salwin valley, in 1864–65, and brought back with him a good many specimens of land-shells, which were described by Mr. W. Theobald in the Journal of the Asiatic Society for 1870.

There will be also included two or three shells in Mr. Theobald's collection from this part of Burmah.

1. AUSTENIA? KHYOUNGENSIS, n. sp.

Locality. Shan Hills.

Shell globose, tumid, not umbilicated; sculpture covered with an epidermis, smooth; colour brown, but the specimen with epidermis still remaining is weathered, in life it is probably polished; spire low, apex rounded; suture shallow; whorls 3, the last ample and convex on periphery; aperture nearly circular; peristome thin, a strong callus on the body-whorl extending into the interior of the shell.

Largest specimen. Size: maj. diam. 20·5, min. 12·0, alt. axis 9·0.

Second specimen. Size: maj. diam. 18·0, min. 13·75, alt. axis 6·8, body-whorl 11·0 mm.

Animal not seen. It would be an interesting species to obtain alive. This is one of those forms which, without an examination of the animal, it is quite impossible to assign to its true generic or subgeneric position; it may be *Cryptosoma* or an *Austenia*.

2. AUSTENIA? ERRATICA, n. sp.

Locality. Pingoung, Shan Hills.

Shell depressedly globose, narrowly umbilicated, solid for size; sculpture none, surface quite smooth; colour white, shiny, but both specimens are bleached; it has evidently an epidermis when alive; spire flatly rounded, apex low; suture adpressed; whorls $3\frac{1}{2}$; aperture ovate, very oblique, very slightly descending at the peristome, this is thin, sinuate above; columellar margin oblique, reflected near the umbilicus.

Size: maj. diam. 8·2, min. 7·0, alt. axis 4 mm.

This shell was marked *Durgella levicula* by Mr. Ponsonby. It is not of that species, which has a very thin and glassy shell, is much more globose and with higher spire. I put it only provisionally in the present genus. The distinct umbilication is quite unlike any shell of this type I have seen. It has somewhat the outline of *Cryptosoma præstans* in miniature, but it is not the young of that species, with which I have compared it.

3. MACROCHLAMYS? CONSEPTA, Bs., small var.

This shell agrees exactly in all its characters and size with specimens from the Moolé-it range, Tenasserim, described and figured by me in 'Land and Freshwater Moll. Ind.' p. 110, the only difference being in its ruddy-brown colour, the more southern form being olivaceous ochre; coloration is very variable.

4. HEMIPLECTA? ZIMMAYENSIS, n. sp.

Locality. Zimmè, Siam territory (*coll. Godwin-Austen*, type).

Shell globosely turbinate, well umbilicated, solid; sculpture wavy broken longitudinal ribbing, crossed by the transverse lines of growth; colour pale umber-brown, merging into white on the periphery and underside; spire subconical, apex blunt; suture impressed; whorls

6, convex; aperture ovate, oblique; peristome simple; columellar margin suboblique, scarcely reflected.

Size: maj. diam. 60·5, min. 51·25, alt. axis 29·5, body-whorl 28·0 mm.

This fine shell seems to be nearest to *H. humphreysiana*, Lea. Mr. Theobald writes that the largest in his collection is 65 millim. in major diam.

5. Helix (Trachia) emensus, n. sp.

Locality. Hlindet, 1200 feet.

Shell subdiscoid, widely umbilicated; sculpture ill-defined irregular transverse striation; colour horny or pale ochraceous; spire subconoid, apex blunt; suture shallow; whorls 7, regular, flat, closely wound, the last descending suddenly, subangulate on periphery; aperture nearly circular, oblique; peristome much reflected below, the margins joined by callus on body-whorl.

Size: maj. diam. 13·5, min. 11·8, alt. axis 4·8 mm.

This species belongs to the widely distributed group in this part of India represented by *H. akontongensis*, *oldhami*, &c. This form is much smaller, and differs sufficiently from all the species I know, that I have considered it worthy of naming.

6. Helix (Trachia) clarus, n. sp.

Locality. Hlindet.

Shell subdiscoid, openly umbilicated; sculpture irregular, close transverse striation; colour white (but both specimens are bleached); spire depressedly conical, apex rounded; suture shallow; whorls 5, flat, subangulate on periphery, the last slightly descending; aperture oval, very oblique; peristome thin, slightly reflected.

Size: maj. diam. 9·5, min. 8·5, alt. axis 4·0 mm.

This species belongs to the *Helix huttoni* group of shells, but is quite distinct, especially in the shape of the aperture. Only two specimens are in the collection.

7. Helix (Genesella) hariola, Bs.

Localities. Khagan on Irrawaddy, and Hlindet, 1200 feet.

There are two specimens in the collection; one is like the type, the other is keeled—var. *carinata* of W. T. Blanford's collection.

8. Helix (Planispira) sculpturita, Benson.

Locality. Shan Hills.

9. Euplecta pingoungensis, n. sp.

Locality. Pingoung, Shan Hills.

Shell depressedly conoid, umbilicated, subangulate on periphery; sculpture well-defined and regular curving costulation, disappearing on the periphery, thence smooth to the umbilicus; colour pale horny; spire low, apex flat and rounded; suture moderately impressed; whorls 6, convex, rather closely wound, flatly convex below; aperture

oblique, semilunate; peristome strong; columellar margin very oblique.

Size: maj. diam. 12·25, min. 11·20, alt. axis 5·0, body-whorl 6·5 mm.

This shell belongs to a group common in Arakan &c. (*E. pansa*, *helicifera*, *ataranensis*, *mammillaris*), but is of a more depressed form and larger in size, smooth below and well sculptured above; *E. falcata* is a large representative of the group in the Khasi Hills.

10. Helix (Plectopylis) ponsonbyi.

Locality. Hlindet, Upper Burmah, 1500 feet.

Shell sinistral, widely umbilicated, discoid, solid; sculpture, wavy thread-like lines of growth; colour pale brown; spire flat, 2½ whorls at apex slightly raised above the succeeding whorls; suture very shallow; whorls 7, closely wound and flat; aperture very oblique, descending, horizontally ovate; peristome thickened, reflected, the margin connected by a well-developed ridge, and with slight notches at the inner angles.

Size: maj. diam. 17·5, min. 14·0, alt. axis 5 mm.

Palatal teeth 6, the 1st highest, long, thin, like a knife-edge, the 2nd and 3rd are short and rounded above, the 4th and 5th are united; the 6th, situated on the lower outer side of the body-whorl, is short, somewhat thickened and rounded on the free edge. The parietal vertical laminæ are two in number; the anterior situated about 10 millim. from the inner margin of the peristome. The anterior one is curved, solid, arched above, with two short buttresses above and below on the anterior side. The posterior one is obliquely set, is thin, and of nearly even height throughout.

The horizontal parietal lamina is only present as a short and narrow ridge 3 millim. in length, situated just within the aperture, but not connected with the apertural ridge of the peristome; a thread-like, free, narrow, horizontal lamina, commencing from below the posterior vertical lamina, extends forwards towards the aperture, gradually fining out but not extending to it.

To the ordinary observer the shell would only possess the one simple short ridge near the peristome, all the other complicated structure being out of view so far back within the aperture.

11. Helix (Plectopylis) perarcta, W. T. Blanford.

Locality. Hlindet, 1200 feet.

Size: maj. diam. 10·0, min. 8·0, alt. axis 3·5 mm.

The type of this species came from near Ava. In this specimen the horizontal lamina is continuous to the aperture, in others it is sometimes undeveloped for a short distance (*vide* P. Z. S. 1874, pl. lxxiv. f. 4).

12. Streptaxis thebawi, n. sp.

Locality. Pingoung, Shan Hills, 2500 feet.

Shell ovately globose, umbilicated, somewhat solid; sculpture finely costulated throughout; colour white; spire conical, apex

rounded; suture well defined; whorls 6, the last two the largest, the penultimate swollen and projecting beyond the body-whorls; aperture oblique, semi-oval, with one rather long parietal lamella fining out inwards and backwards; peristome white, sinuate above, somewhat thickened, regular throughout, the two margins united by a callus; columellar margin oblique.

Size: maj. diam. 10·0, min. 7·0, alt. axis 6·5 mm.

Compared with the Burmese species hitherto known this is nearest to *S. birmanica*, but is higher in the spire, and the second whorl is more tumid, the lamella is more strongly developed.

13. Pupa salwineana.

Pupa salwineana, Theobald, J. A. S. B. 1870, vol. xxxix. pt. 2, p. 400; figd. Conch. Ind. pl. c. f. 9.

Locality. Pingoung, Shan Hills, 2500 feet.

Size: maj. diam. 2·50, alt. axis 5·50 mm.

This is a very beautiful little shell. The only perfect specimen is bleached, but a smaller imperfect one shows that it is covered with a brown epidermis.

14. Clausilia (Pseudonenia) shanica, n. sp.

"*Testa breviter rimata, fusiformi-clavata, carneo-grisea, solidula; spira concavo-turrita, valde elongata; apex minutus, acutissimus. Anfr* 13½, *lentissime accrescentes, convexusculi, sutura impressa disjuncti, subtiliter striati, ultimus penultimo parum major, subtus leviter attenuatus, cervice rotundatus. Apert. parva, obliqua, late piriformis; perist. continuum, breviter solutum, expansiusculum. Lamellæ modicæ, compressæ, approximatæ; supera marginalis, parum alta, intus humillima, cum spirali ut videtur continua; infera sublimis, subhorizontaliter in mediam aperturam prosiliens, antice in denticulum desinens, a basi intuenti valde spiraliter torta; subcolumellaris subemersa, oblique intuenti distinctissima. Plica principalis profunda, lateralis, in apertura antice vix conspicua; palatales 2, altera supera, principali approximata et parallela, altera infera cum clausilio perspicuo lunellam lateralem, magis minusve distinctam, fingente.*"

Alt. 19½, diam. 4 mm.; alt. apert. 3⅝, lat. apert. 2¾ mm.

Hab. Shan Hills, near Pingoung, Burma, at a height of about 2500 feet. (*Boettger.*)

This description is somewhat amended by Mr. Ponsonby from one by Dr. Boettger, who considered it to be allied to *C. affinis* of the Naga Hills. On comparison it proves to be very different in every way.

15. Cyclophorus crassalabella, n. sp.

Locality. Shan Hills.

Shell similar in form to *C. fulguratus*, rather openly umbilicated; coloration, a distinct narrow dark brown band on the periphery, sharply defined above, giving off below a regular series of zigzag markings, like a fringe hanging from it; the whorls above are orna-

mented with similar zigzag bands at equal intervals, but which do not extend to the peripheral band; spire conical, apex fine; whorls 5; aperture subvertical; peristome of a pale yellowish tint, very much thickened to the extent of 4·5 millim.

Size: maj. diam. 41·5, min. 32·0, alt. axis 18·5 mm.

16. Cyclophorus, sp. inc.

Locality. Shan Hills.

Size: maj. diam. 31·0, min. 25·5, alt. axis 15·0 mm.

In form this shell is nearest to *C. excellens*, Pfr., from Moulmein, particularly as regards the umbilicus and height of spire; its markings differ, and the size is much smaller. I hesitate to name this single specimen; a series of examples in fresh condition is required for these shells, so variable in colour.

17. Pterocyclos albersi.

Locality. Hlindet, 1200 feet.

18. Alycæus (Dioryx) urnula, var.

Locality. Pingoung, Shan Hills, 2500 feet.

The only difference between this and the Assamese form is the greater length of the sutural tube in the Burmese shell.

19. Alcæus spratti, n. sp.

Locality. Pingoung, Shan Hills, 2500 feet.

Shell pyramidal, closely umbilicated; sculpture very fine close costulation, more distant between the sutural tube and the peristome; colour white, with pale lemon tinge, or horny; spire high, rapidly decreasing to apex, which is rather pointed; suture well impressed; whorls 5½, convex, the last swollen, slightly constricted at the sutural tube, which is very short and thick, less than one millim. in length; the whorl swells again to the aperture, this is circular, oblique; peristome double, slightly reflected; operculum not seen.

This species is quite new; it might be at first taken for a small variety of *A. pyramidalis*, Bs., from the Tenasserim valley, but the sutural tube is in that species very thread-like and nearly 3 millim. in length; the aperture is also very different in form, and not so simple and circular.

20. Paludomus ornatissima, Bs.

Locality. Between Myingyan and Hlindet.

21. Melania, sp. inc.

A specimen in bad broken condition.

22. Ampullaria paludinoides, Phil., var.

Locality. Khyang-nyat.

The present example agrees with a specimen in my collection from Pegu.

23. Ampullaria olea, Reeve.

Locality. Shan Hills.

5. Notes on Specimens in the Hume Collection of Birds. By R. Bowdler Sharpe, F.L.S., F.Z.S., &c.—No. 6[1]. On some Species of the Genus *Digenea*.

[Received April 3, 1888.]

When arranging the *Muscicapidæ* belonging to the Hume Collection, I laid aside a specimen belonging to the genus *Digenea*, which appeared to me to be new to science, but which I did not like to describe from a single skin. In the Tweeddale Collection, however, I have found another example, and it is so evidently distinct that I no longer hesitate to give a name to the species.

Digenea leucops, sp. n.

Adult. General colour above light olive-brown, with somewhat of an ashy tinge; wing-coverts like the back, the greater series somewhat more ruddy brown externally; bastard-wing, primary-coverts, and quills dusky brown, externally ruddy olive; upper tail-coverts rather more reddish brown than the back; tail-feathers dusky brown, externally reddish brown; crown of head like the back; a white line across the base of the forehead, widening into a large supraloral spot; feathers about the eye washed with ashy grey; lores ashy, as also the feathers round the eye; ear-coverts and cheeks ashy, washed with olive; throat white, the chin and a broad band on each side of the throat black, continued downwards and forming a collar on the fore neck; chest and breast pale ashy, with a slight tinge of olive-brown; abdomen white; sides of body and flanks olive-brown; thighs olive-brown; under tail-coverts white; under wing-coverts and axillaries white; quills below dusky brown, white along the inner web: "bill slaty brown; feet white, tinged fleshy; iris bright dark brown" (*R. G. Wardlaw-Ramsay*). Total length 4·3 inches, culmen 0·45, wing 2·5, tail 1·75, tarsus 0·8.

Hab. Shillong (*J. Cockburn*: *mus. A. O. Hume*); Karen-nee (*R. G. Wardlaw-Ramsay*: *mus. Tweedd.*).

At the time of writing the fourth volume of the 'Catalogue of Birds,' I had not seen a specimen of *Digenea submoniliger* of Hume, and I now propose to give a description of this species from the series in the Hume Collection.

Digenea submoniliger.

Adult. General colour above light olive-brown, a little more ruddy brown on the head; wing-coverts like the back, the greater coverts with a slight tinge of ruddy brown externally; bastard-wing, primary-coverts, and quills dusky brown, externally olive-brown, with a very slight ruddy tinge; upper tail-coverts rufous; tail-feathers dark brown, externally rufous; base of forehead, lores, eyebrow, and feathers round eye clear tawny buff; ear-coverts and

[1] See P. Z. S. 1887, p. 470.

cheeks olive-brown, washed with tawny buff, especially on the fore part of the latter; throat entirely white, the sides of it brown like the cheeks; the whole throat encircled by a narrow line of black, very indistinct on the sides of the throat, a little plainer on the fore neck; breast light olive-brown, as also the sides of body, flanks, and thighs; lower breast and abdomen white; under tail-coverts white; under wing-coverts white; axillaries olive-brown, edged with white; quills below dusky brown, ashy or buffy whitish along the inner edge. Total length 4·7 inches, culmen 0·5, wing 2·45, tail 1·6, tarsus 0·75.

I may at the same time take the opportunity of describing a second new species from Perak:—

DIGENEA MALAYANA, sp. n.

Adult male. Similar to *D. moniliger* in the rufous appearance of the wing, and deep olive-brown on the back like that species. It differs from it in having rufous cheeks and ear-coverts, and in the forehead, lores, and eyebrow being deep orange-rufous, almost chestnut in tint. Total length 4·5 inches, culmen 0·5, wing 2·65, tail 1·85, tarsus 0·75.

Hab. Mountains of Larut, Perak.

From *Digenea submoniliger* this species differs not only in the reddish colour of the wings, but in the rufous on the head and the orange of the lores and eyebrow.

The following is a revised "Key to the species" of *Digenea* (*cf.* Cat. B. iv. p. 458):—

a. Olive-brown above; breast and sides of body olive-brown.
  a'. Base of forehead tawny buff or rufescent.
    a''. Outer aspect of quills rufescent.
      a'''. Ear-coverts ashy olive-brown; eyebrow tawny buff ... *moniliger*.
      b'''. Ear-coverts rufous brown; eyebrow and lores orange-rufous ..... *malayana*.
    b''. Outer aspect of quills olive-brown, scarcely different from the back; lores and eyebrow tawny buff; ear-coverts brown, with a ruddy tinge ..... *submoniliger*.
  b'. Base of forehead and lores white ..... *albifrons*.
b. Rufous-brown above and also on the breast and sides of body; eyebrow and lores deep chestnut; sides of face also chestnut. *solitaria*.

The very peculiar coloration of these birds and their constant black necklace on the throat makes me doubt whether they should be united to *Digenea*, in which the mode of colour is so different. They might, perhaps, be fairly separated as *Anthipes*, in which case they would have to be called *A. moniliger*, *A. malayana*, *A. submoniliger*, *A. albifrons*, and *A. solitaria*.

May 1, 1888.

Professor Flower, C.B., LL.D., F.R.S., President, in the Chair.

Col. Irby, F.Z.S., exhibited, on behalf of Lord Lilford, a specimen of *Aquila rapax* from Southern Spain, being, as he believed, the first positively authentic specimen of this species of Eagle obtained within the limits of the Peninsula.

Prof. Flower, C.B., LL.D., F.R.S., exhibited and made remarks on a specimen of a Japanese Domestic Cock, with enormously elongated tail-coverts, the longest of which measured nine feet in length. The specimen had been presented to the British Museum by Mr. F. D. Parker.

The following papers were read :—

1. General Remarks on the Zoology of the Solomon Islands, and Notes on Brenchley's Megapode. By C. M. Woodford, F.Z.S.

[Received April 30, 1888.]

The Solomons are a group of large islands situated about 500 miles east of New Guinea, and are included by Wallace in his Austro-Malayan subdivision of the Australian Region. Zoologically they are most interesting, as they form the extreme eastern limit of the extension of Marsupials.

As might be expected, the group is not particularly rich in Mammals; but several species of frugivorous and insectivorous Bats occur. Many of these are peculiar to the group, my own collections having added three new genera and five species to the list, besides three new species of *Mus*. Marsupials are represented by one, and perhaps two, species of *Cuscus*, *Cuscus orientalis* being common. I was once told by a native, who had been to Queensland, and who consequently should have known Wallabies when he saw one, that Wallabies are to be found in the mountains of Guadalcanar; but I am inclined to doubt the information, and my offer of a very large amount of "trade" for the whole or any part of a Wallaby from that island met with no response.

The Birds of the Solomons are extremely interesting. Several species of fruit-eating Pigeons and of the smaller *Ptilopus* occur commonly. The wide-ranging Nicobar Pigeon (*Calœnas nicobaricus*) is frequently met with, and is not afraid to venture considerable distances from land. On my last visit to the group one flew on board and settled for some seconds, when we were distant forty miles to the westward of Renual Island—an outlying island that can

be hardly said to belong to the Solomon group at all. I have noticed, especially on the island of Malayta, that the Pigeons leave the mainland of the large islands and resort at night in thousands to roost on the small detached islands off the coast. I can only account for this fact by the supposition that they find themselves free from the attacks of the large Monitor Lizards, which would not be so plentiful there as on the mainland.

Among Parrots the wide-ranging *Eclectus polychloros* is common, and several Lories, the handsome *Lorius cardinalis* not being found elsewhere, while the minute *Nasiterna* of two or three species is occasionally met with. These most interesting little birds creep about on the trunks of the large trees like tree-creepers, their tails being furnished with pointed feathers for the purpose. It is an extremely interesting fact that the Cockatoo peculiar to the Solomons (*Cacatua ducorpsi*) does not extend to the island of San Christoval and smaller islands adjacent; and the same is the case with the Hornbill (*Buceros plicatus*), the island of Guadalcanar being consequently the most eastern limit of the extension of these two genera.

At a certain time of the year, when the bright red flowers of the coral-tree (*Erythrina*) are conspicuous among the bright green foliage of the forest, the Lories resort to them in large numbers, and the natives spreading fine nets near the trees catch them in considerable quantities. I have had as many as fifty of different species brought me in one day, the neck being invariably broken by their struggles in the net.

On Guadalcanar I was fortunate enough to discover a new Crow (*Macrocorax woodfordi*), but I believe it to be extremely local, and confined to a part only of that island. I did not meet with it or hear of it at other places that I visited, nor have other collectors met with it. At Aola, on Guadalcanar, where I made my headquarters for six months, it was extremely plentiful.

One of the most interesting birds I met with was the *Megapodius brenchleyi*—a bird allied to the mound-building Talegalla of Australia. This species was first described from a fresh-hatched specimen brought home by the late Julius Brenchley, and figured in his 'Voyage of the Curaçoa.' This bird, although only about the size of a large pigeon, lays an egg bigger than that of a duck. It is commonly distributed throughout the group, and allied species are, I believe, found on the groups to the east and south-east; but it is upon the island of Savo that it is found in the greatest abundance. Here the eggs form an important item in the daily food-supply of the natives, and I have bought, when calling there, as many as ten eggs for one stick of tobacco, value about three farthings. The Savo natives have a curious legend connected with this bird. They hold the Shark in great veneration, and say that their island was made by the Shark, who brought the stones together and placed upon them a man, a woman, the yam-plant, and the Megapode. Things went well for a time, and the people increased, and so did the Megapodes. At last the people went to the Shark and complained that the Megapodes made much havoc among the yam-patches by digging holes

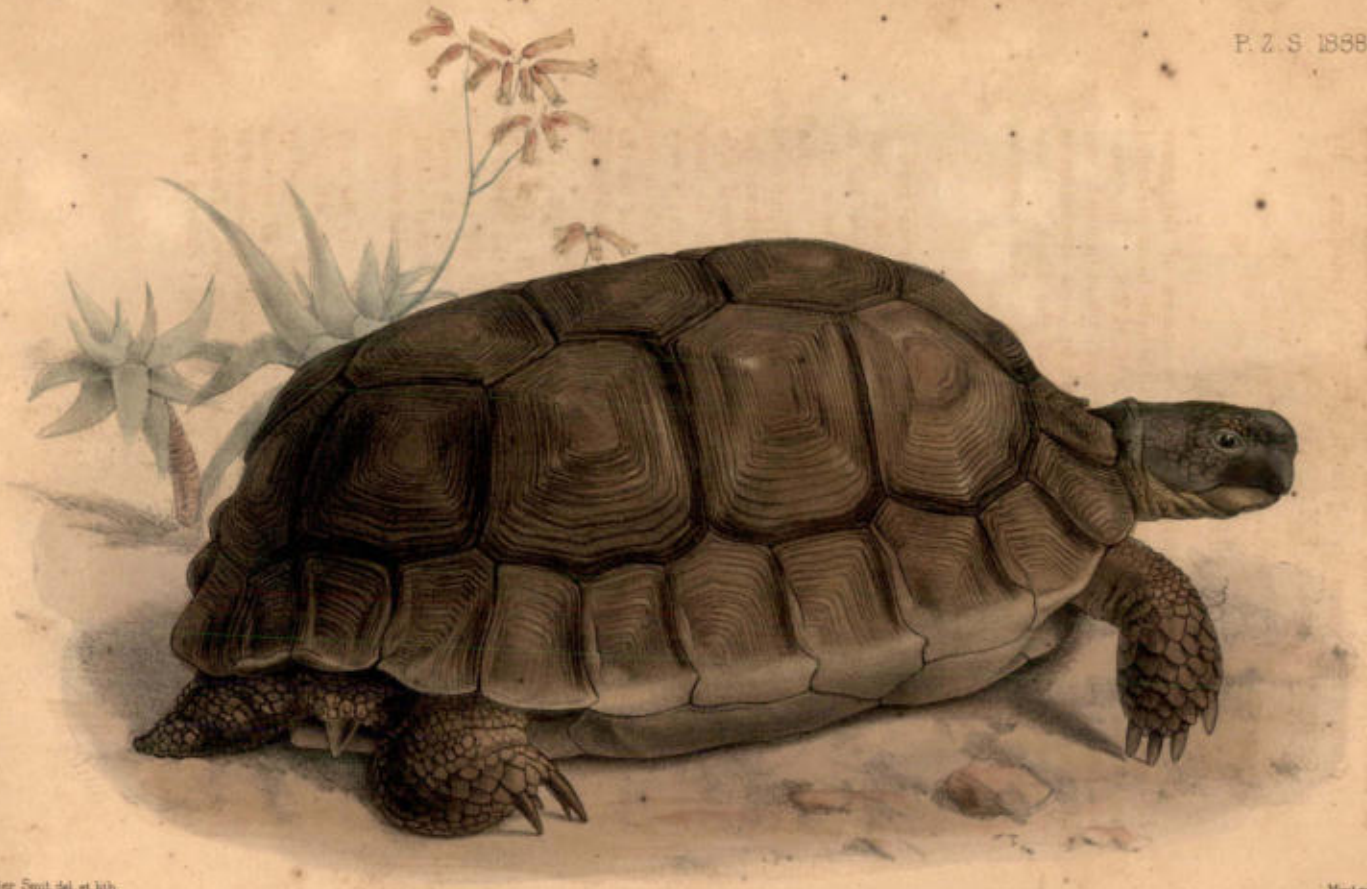
to lay their eggs; so they asked the Shark to take the Megapodes away. This was done; but now the natives missed the Megapodes' eggs, so they asked the Shark to bring the Megapodes back but to confine them to one spot. This request was also complied with, and the result may now be seen. The Megapodes lay their eggs on two large cleared sandy spaces, and nowhere else on the island. Upon these no weeds or grass can grow, as the sand is constantly being turned over by the birds when digging holes to lay their eggs, and by the natives when in search of them. The sandy spaces are fenced off into plots which belong to different owners.

I met with one of these Megapodes' laying-yards at Aola, on Guadalcanar, and was fortunate enough to be able to photograph it. The first photograph gives a general view of the yard, which was nearly half a mile in length and about fifty yards wide, with the fences dividing it off for different owners. The second photograph shows a closer view of a portion of the yard, with the holes scraped in the sand by the birds. All over the yard may be noticed the tracks of the tails of the large Monitors, as though a stick had been drawn along the sand. I expect they take a pretty severe toll of the eggs. The eggs, which are buried from a foot to two feet in the warm sand, receive no further care from the birds, but the young shift for themselves from the time of hatching, and can fly at once, or very soon after leaving the egg. The natives are quite indifferent as to the condition of the eggs when they eat them—whether they are newly laid or well advanced towards hatching being all the same to them. From experience I can say that they are excellent food.

The laying-yards are always made where the soil is loose and sandy, the birds require no other inducement. An open space being of course essential to allow the rays of the sun to warm the ground, it would evidently be quite useless for the birds to lay in the thick forest, or under the shade of trees. It is easy to imagine that before the natives constructed and cleared these laying-yards for the birds, they would be likely to lay in the yam-patches and garden clearings, and where they were plentiful would prove a serious inconvenience, as alleged in the Savo legend.

The birds do not build a mound, but, as will be seen from the second photograph, make a hole from a foot to two feet deep. The sand afterwards falls in and covers the egg. The ground is consequently full of depressions, reminding one forcibly of the pitfalls of the ant-lion on a large scale.

Among the Butterflies this group of islands appears to be the limit of range of the genus *Ornithoptera*, which, curiously enough, as in the case of Cockatoos and Hornbills, does not extend to San Christoval. Two species occur—the somewhat wide-ranging *O. duvilliana* and the remarkable and local *O. victoriæ*. This latter is, so far as I know, confined to the islands of Guadalcanar, Florida, and part of Malayta.



Peter Smit del. et lith.

Mintern Bros. imp.

HOMOPUS FEMORALIS.

2. Description of a new Land-Tortoise from South Africa, from a Specimen living in the Society's Gardens. By G. A. Boulenger, F.Z.S.

[Received April 6, 1888.]

(Plate XIV.)

The following is a description of a new species of the genus *Homopus*, three (female) specimens of which have been presented to the Society by the Rev. G. H. R. Fisk, C.M.Z.S. They were obtained at Cradock. In a letter to the Secretary and in one to me, Mr. Fisk drew attention to differences shown by these specimens as compared to those of the neighbourhood of the Cape. These differences indicate unquestionably a distinct species, which I propose to name

Homopus femoralis, sp. nov. (Plate XIV.)

Shell more than twice as long as deep, flat on the vertebral region, posterior margin reverted and serrated. Dorsal shields not swollen, concentrically striated, separated by deep grooves; areolæ not or but feebly impressed; vertebral shields as broad as or a little narrower than the costals; nuchal small, longer than broad. Plastron and plastral shields as in *H. areolatus*. A pair of large præfrontal shields, followed by a large frontal; beak feebly hooked; lower jaw narrower than in *H. areolatus*. Fore limb anteriorly covered with very large, imbricate, pointed tubercles, one of which, on the inner side near the elbow, is movable at right angles to the others; a very large conical tubercle on the hinder side of the thigh. Pale brown above, each shield narrowly edged with black in front and on the sides; plastral shields yellow, brown anteriorly. Shielded or tuberculate soft parts pale brownish, naked parts orange.

Length of shell 13 centim.

This Tortoise differs from both *H. areolatus* and *H. signatus* in the larger size and the feebly hooked upper jaw: from the former in the serrated posterior margin of the carapace and in the spur-like tubercle on the back of the thigh; and from the latter by the small inguinal shield, which is widely separated from the femoral shield, the presence of large præfrontal and frontal shields, and the absence of the fifth claw in the hand.

For my knowledge of the animal of *H. signatus*, only the shell of which was known, I am indebted to Mr. Peringuey, who has recently brought to the British Museum two specimens obtained by him in Damaraland. Although provided with 5–4 claws, *H. signatus* must none the less be referred to the genus *Homopus*, on account of the absence of a median alveolar ridge in the upper jaw. *Testudo horsfieldi*, on the other hand, is, in spite of its 4–4 claws, a true *Testudo*.

3. Notes on the Visceral Anatomy of Birds.—No. II. On the Respiratory Organs in certain Diving Birds. By Frank E. Beddard, M.A., F.R.S.E., Prosector to the Society.

[Received May 1, 1888.]

This note is based on the examination of some Puffins (*Fratercula arctica*) and of examples of two species of Penguins (*Eudyptula minor* and *Spheniscus demersus*), all of which have come into my hands for dissection at the Society's Gardens.

The most noticeable peculiarity about the respiratory apparatus of *Fratercula*, indeed the only one that I observed, concerns the structure of the oblique septum ("*diaphragm thoraco-abdominale*," Sappey); the general relations of this fibrous septum, which shuts off the lungs and the 'intermediate' air-sacs from the abdominal cavity, have been already described in the 'Proceedings' of this Society[1] by Prof. Huxley; as that description applies perfectly to the three birds treated of in the present note, I merely refer to it. I may mention, however, that the best figure known to me illustrating the general disposition of the thoracic and abdominal viscera of a bird is to be found in Wiedersheim's 'Lehrbuch der vergleichenden Anatomie der Wirbelthiere'[2]. *The oblique septum of* Fratercula *is remarkable for the fact that it is covered for a considerable area with a layer of muscular fibres.* This layer of muscular fibres arises (fig. 1, p. 253) from the pubis—from the proximal and larger half of this bone; it is abundantly furnished with blood-vessels and nerves. The direction of the muscle is oblique; it covers the hinder region of the oblique septum, ending abruptly some little way in front of the posterior attachment of the latter; the oblique septum, as in other birds, arises partly from the pubis, but the posterior limit of its attachment to this bone is considerably further forward than that of the sheet of muscle. This sheet of muscle, besides ending abruptly upon the oblique septum in front, is attached below to the upper surface of the sternum, and to the abdominal parietes along the last sternal rib. On the left side of the body the sheet of muscles is attached to the sternum along a line much closer to the attachment of the umbilical ligament than on the right side. The muscular fibres which make up the sheet of muscle are arranged in a parallel series of comparatively thick bundles with transparent (? fibrous) interspaces.

The presence of this muscular layer is not, however, peculiar to the Puffin.

Prof. Huxley, in the paper already quoted, states that in the Duck the oblique septum "contains, on each side, a layer of unstriped muscular fibres." Judging from Prof. Huxley's figure (*op. cit.* p. 565, fig. 2, *m*), the layer of muscular fibres in the Duck is by no means so extensive as in the Puffin. Prof. Huxley particularly states that he has been unable to discover any such fibres in *Apteryx*.

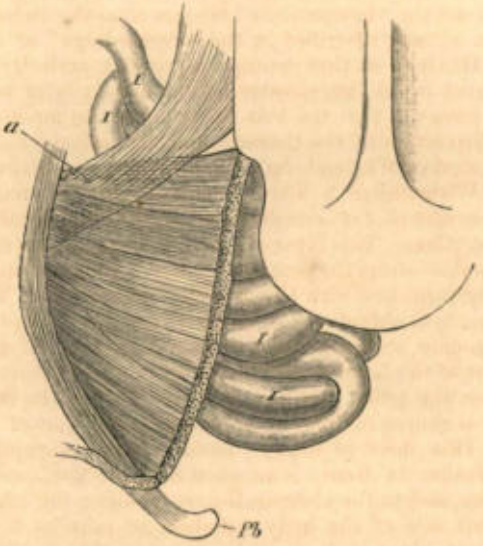
[1] P. Z. S. 1882, p. 560. [2] 2te Aufl., Jena, 1886, p. 654.

In the very complete description of the respiratory apparatus of birds which Prof. Wiedersheim gives in his 'Lehrbuch der vergleichenden Anatomie' there is no mention of any other bird in which muscular fibres cover the oblique septum; Prof. Huxley's statement about the Duck is referred to in a footnote [1].

I have found that an identical structure occurs in two species of Penguin, viz. *Eudyptula minor* and *Spheniscus demersus*; in both of these birds the oblique septum is covered posteriorly by a layer of muscular fibres which rise from the pubis and are attached ventrally to the sternum.

After referring to the late Prof. Morrison Watson's elaborate

Fig. 1.



Dissection of *Fratercula arctica*, to illustrate disposition of oblique septum.
a, oblique septum; *I*, coils of intestine; *Pb*, pubis.

and well-illustrated Report upon the Penguins collected by the 'Challenger' [2], and finding there no mention of this muscular layer, I believed that this particular resemblance between the Puffin and the Penguins would be recorded for the first time in the present paper. Quite recently I have become acquainted with the contents of a short paper [3] by M. Filhol, in which he describes this muscular layer in the Penguin, though in another species. The following

[1] P. 665, note 2.
[2] Zool. Chall. Exp. vol. vii.
[3] "Sur la constitution du diaphragme des *Eudyptes*," Bull. Soc. Philom. (7) t. vi. p. 235.

quotation from his paper will show that he probably refers to a structure identical with that described in the present note (*loc. cit.* p. 236):—

"Indépendamment de ces deux faisceaux musculaires que l'on retrouve avec la même disposition chez tous les oiseaux, j'ai observé chez les *Eudyptes* au niveau de l'ongle formé en dehors par le diaphragme thoraco-abdominale et la portion inférieure du diaphragme thoracique, un faisceau musculaire à fibres pâles et divergentes. Ces fibres sont dirigées suivant le contour qu'affecte en leur point d'existence la cavité abdominale. Elles sont assez courtes et se terminent toutes par un sommet aponeurotique. Je désignerai ce muscle par l'appellation de muscle diaphragmatique transverse."

It appears therefore that the Puffins as well as the Penguins and Ducks are to be distinguished from many other birds by the fact that the oblique septum is partially covered by a layer of muscular fibres. But this layer of muscular fibres is by no means equally developed in all the three groups of birds. It is best developed in the Puffin and in the Penguins; it appears to be very feebly developed in the Duck. Prof. Huxley gives no particular description of it in the Duck, but his figure [1] shows that the layer of muscular fibres is very limited in extent and does not reach nearly as far as the sternum. It is attached to the dorsal middle line of the body and only covers the oblique septum for a very short way. I have found in the Toucan (*Rhamphastos ariel*) a perfectly similar patch of muscle occupying an identical position; the muscular fibres in this case also were obviously unstriated.

There is another important difference between the muscular layer of the oblique septum in the Duck and that in the Puffin. *The fibres are in the Duck (according to Prof. Huxley) and in the Toucan unstriated; in the Puffin they are distinctly striated*: I unfortunately neglected to observe whether this was also the case in the Penguins, and Filhol makes no mention of the point.

It does not, however, as it appears to me, affect the question of the homology of the muscular layer covering the oblique septum in these three types to learn that the fibres are striate in the one and unstriate in the other.

The muscular fibres of the alimentary tract are commonly said to be striated in the Tench, while they are unstriated in other fish. It is unnecessary to insist upon the homology of the muscular layer in the two cases.

Mr. C. F. Marshall, in a paper upon the histology of muscle [2], points out that striation in the fibres of muscle-bundles appears to be associated with greater activity on the part of the muscle. The muscles, for example, of an *Echinus* are for the most part unstriated; those muscles which move the valves of the pedicellariæ are striated, as was shown by Mr. Geddes and myself, and more recently by Hamann. The pedicellariæ are undoubtedly the most actively moving organs of the *Echinus*; and the nature of their muscles (striate) supports the views of Mr. Marshall.

[1] *Loc. cit.* p. 565, fig. 2, *m*. [2] Quart. Journ. Micr. Sci., Aug. 1887.

It is possible then, as it appears to me, that the feebly developed muscular layer which extends for a short way over the dorsal attachment of the oblique septum in the Duck and in the Toucan may be the degenerate rudiment of the powerful muscle which extends over so large a portion of the oblique septum in the Penguin and in the Puffin. There is nothing, moreover, in the facts, so far as they have been stated, to disprove the truth of the converse to the above, viz. that the powerfully developed muscular layer of the Penguin and the Puffin is a further development of the feeble musculature of the oblique septum in the Duck.

To decide which of these two alternatives is the more probable, it is necessary to go into the question of the nature and homologies of the muscular layer in question.

I have at present been unable to discover any bird in which the oblique septum showed characters which would serve to throw any light upon the question.

No doubt the structure of the viscera of the extinct Dinosauria would solve the problem at once; but, failing these, it is clear that the Crocodilia more than any existing group of Reptiles approach birds in their structure.

Prof. Huxley has in his paper, so frequently referred to, indicated many striking resemblances between the respiratory organs of Birds and those of Crocodiles.

It had already been noted by Sir R. Owen[1] and by Dr. Martin[2] that the abdominal cavity of Crocodiles is remarkable for the great development of special serous sacs enveloping the various viscera, its cavity being thus greatly subdivided. In this arrangement there is a very close similarity to Birds, as Prof. Huxley pointed out. "A fibrous expansion extends from the vertebral column over the anterior face of the stomach, the liver, and the dorsal and front aspect of the pericardium, to the sternum and the parietes of the thorax, separating the thoraco-abdominal space into a respiratory and a cardio-abdominal cavity, and representing the oblique septum of the bird" (Huxley, *loc. cit.* p. 568). This supposed homologue of the oblique septum in the Crocodile is not, however, simply made up of a layer of fibrous tissue; Prof. Huxley goes on to say in the same paper and on the same page:—"A broad, thin muscle arises, on each side, from the anterior margin of the pubis; and its fibres pass forwards, diverging as they go, to be inserted into the ventral face of the posterior part of the pericardium and into the ventral and lateral parts of the fibrous capsule of the stomach, passing between that organ and the adherent posterior face of the liver, and being inserted into the fibrous aponeurosis which covers the anterior surface of the stomach, and represents the oblique septum."

If the homologies instituted by Prof. Huxley be allowed, then *this muscle is clearly the equivalent of the muscle which I have described in this paper in the Puffin* and which M. Filhol has described in the Penguin; in every case the muscle arises from the pubis and extends as far as the region of the stomach; in the two birds,

[1] P. Z. S. 1831, p. 139. [2] P. Z. S. 1835, p. 129.

however, the muscle is attached to the sternum and its fibres are striated (? Penguin); as to the Crocodile, Prof. Huxley does not state whether the muscles are striated or not. Judging from the analogy of other reptiles (Lacertilia), where muscular fibres also extend into the mesenteries[1], they are not; but the homology is not, in my opinion, already stated, affected by this question[2].

The rudimentary muscles which clothe a limited area of the oblique septum in the Duck and Toucan are probably to be derived from the same muscle in the Crocodile, or else they may be directly traceable to a bird ancestor in which the same muscles were present in the same hypertrophied condition that they now are in the Penguin and Puffin.

The muscle in question is in fact more highly developed in the Puffin and Penguin than in the Crocodile; but the habits of the birds suggest an explanation not only of the retention of the muscle but also of its great development and the appearance of an attachment to the ventral parietes.

Both these birds are diving birds, and it seems therefore reasonable to suppose that any organ which would facilitate vigorous inspirations and expirations would be highly advantageous. Now the respiratory movements in birds are largely brought about by the abdominal muscles, which depress the sternum and the parietes, and so drive the air from the air-sacs through the lungs to the exterior. But the sternum in the Puffin &c. is long and the muscular abdominal parietes are therefore shorter than usual. The muscular force available is as a consequence not so great as in many other birds (*e. g.* the Emu); this deficiency is made up for by the muscle covering the oblique septum, and moreover the relations of this muscle are such that it is particularly available for its presumed function.

In the first of the present series of "Notes upon the Visceral Anatomy of Birds"[3] I have called attention to the resemblance between the so-called "omentum" of Birds and the "horizontal septum" of the Crocodile, which is directly continuous with the oblique septa of the same reptile, and is apparently not distinguished from it by Prof. Huxley. It seems to me that *the entire fibrous expansion which arises from the vertebral column and extends over the anterior face of the stomach, liver, &c. in the Crocodile represents both the oblique septa and the omentum in the bird.*

The middle part of the fibrous expansion in the Crocodile bears the two anterior abdominal veins, or at least they pass between it and the ventral parietes. In the bird there are a number of small veins upon the omentum which join the portal system, and are probably collectively the equivalents of the anterior abdominal system in the Crocodile. This appears to me to be an argument in favour of identifying the median portion of the fibrous expansion in the Crocodile with the omentum of the bird.

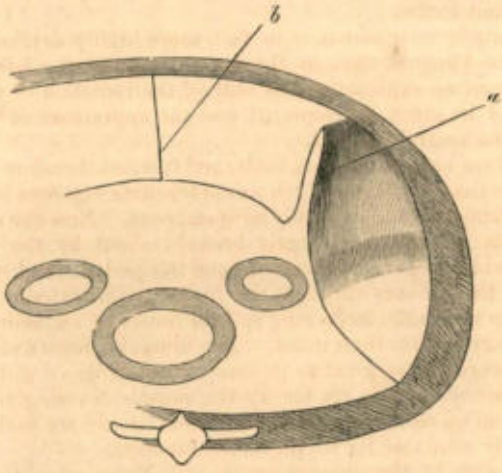
[1] Rathke, Wiener Sitzungsb. 1852.

[2] Prof. G. B. Howes tells me that the muscle in question is composed of plain fibres in the Crocodile.

[3] P. Z. S. 1885, p. 836.

A difficulty in the way of this comparison is the relation of the omentum to the oblique septa in many birds; the oblique septa pass from the hinder part of the abdominal cavity arising from, or near, the pubis; they are attached to the parietes ventrally and dorsally, and completely shut off a triangular segment of the cœlom from that portion of the cœlom which contains the intestines; the omentum comes into contact with the oblique septum and even fuses with it, but it is quite distinct from it, in the direction of its fibres, &c. It

Fig. 2.



Diagrammatic transverse section through abdominal region of Emu, to illustrate the oblique septum.

a, oblique septum; *b*, umbilical ligament.

might appear therefore at first sight as if the omentum was a structure peculiar to birds and that the whole of the "fibrous expansion" of the Crocodile represented the oblique septa, the only difference being that in the birds the two halves had shrunk away from each other towards the lateral parietes.

The relation of the oblique septa to the omentum in the Emu is rather different from that of many birds and enables this difficulty to be surmounted. The oblique septa pass back to the extremity of the abdominal cavity, but posteriorly they are not attached to the ventral parietes; the oblique septum has thus a free ventral edge for a considerable length; the omentum is attached to it apparently as in other birds, but on stretching the oblique septum the free edge is seen to be double and really to be produced by an upward fold; at this point the strong interlacing tendinous fibres of the oblique septum disappear and the membrane passes without any break into the omentum. If this membrane is sufficiently stretched

the intestines of the Emu are seen to be covered by a horizontal septum, which resembles that of the Crocodiles except that it does not arise from the dorsal median line but along two lines placed nearer to the lateral parietes; the relations of the posterior region of the oblique septum to the omentum are represented diagrammatically in the accompanying drawing (fig. 2, p. 257). These facts, then, support my contention that *the omentum as well as the oblique septa of birds are to be derived from the fibrous expansion which covers over the viscera in the Crocodilia.*

They also suggest that *the oblique septum of birds has been produced by a vertical fold of this fibrous expansion* which became attached to the ventral parietes and ultimately lost all traces in most birds (?) of its primitively double nature, and not by a separation of part of it.

4. Observations on the Fishes of India.—Part I.

By Francis Day, C.I.E., F.Z.S.

[Received April 13, 1888.]

During the ten years that have elapsed since the completion of my work upon the 'Fishes of India,' several new piscine forms have been obtained, both from the seas and fresh waters of that part of Asia. Extended observations among specimens preserved in the Museums of Europe have likewise convinced me that some species which I formerly considered to be undescribed have no title to that designation, while several of my new ones have been redescribed as novelties by others. The foregoing reasons would scarcely have induced me to recur again to this interesting fish-fauna had it not been that it is proposed to re-issue my work in a more portable size, better suited to the requirements of travellers and collectors. As the subject of the geographical distribution of these fishes will have to be considered, I am obliged to point out not only such forms as I have erroneously described to be new, but likewise to advert to those of other describers which I believe would come under this head.

Cromileptes altivelis.

Serranus altivelis, Cuv. & Val.

? *Serranus striolatus*, Playfair, Fish. Zanzibar, p. 11, pl. iii. f. 2.

? *Serranus gibbosus*, Boulenger, P. Z. S. 1887, p. 654.

The figure of *Serranus altivelis* in Cuv. & Val. ii. pl. xxxv. shows the spines of the dorsal fin increasing in length to the last, which is delineated nearly twice as long as the second. Cantor, in his 'Malayan Fishes,' remarked that these spines from the third were of nearly equal length; Bleeker shows them slightly, but gradually augmenting to the last, which is figured as one fifth longer than the third: I have observed them more nearly corresponding with Cantor's description. The foregoing shows that differences do exist as to the length of these spines, and that a gradual augmentation from the

third to the last is not carried out in a similar manner in all specimens.

The specimen of *S. striolatus* is stuffed, and the ends of the 3rd, 4th, and 10th dorsal spines are broken; the 3rd and 4th are said to be the longest and one third the length of the head, thus differing from *S. altivelis*: the last dorsal spine is rather more than half the length of the longest ray $\left(\frac{1\cdot4}{2\cdot4}\right)$. The soft portions of the dorsal and anal fins are similar to *S. altivelis* and *S. gibbosus*; the pectoral is shorter than in *S. gibbosus*, which is nearly as long as in *S. altivelis*.

The specimen of *Serranus gibbosus* is of very similar form to the foregoing, which may be owing to having been preserved in strong spirit instead of being a skin; its third dorsal spine is nearly as long as the longest ray, but its last spine is broken. The length of its head (from the end of the snout to the end of the opercular spines) is 4¼ in that of the total length. The colours are between the two others; its spots are larger in size than in *S. striolatus*, but having a similar tendency to form about 15 irregular rows along either side of the body.

I think the Zanzibar and Muscat fishes are merely separated from one another by their colours, and that their form differs from *C. altivelis* in the shorter lengths of their dorsal spines. This fish does not appear to extend to the Red Sea; consequently if *S. striolatus* and *S. gibbosus* are varieties of *S. altivelis*, they are found in the extreme limits at which this species extends to the west. Without, therefore, absolutely holding them to be identical, I think that when a larger number of specimens have been obtained they will probably only be ranked as varieties.

SERRANUS DIACANTHUS, Cuv. & Val.

Epinephelus retouti, Bleeker, Fish. Madagascar, p. 21, pl. xii. f. 1.

SERRANUS LATIFASCIATUS, Schlegel.

Serranus grammicus, Day, Proc. Zool. Soc. 1867, p. 700.

Since my description of this fish was published, I have seen Schlegel's types in the Leyden Museum, and they undoubtedly belong to this species.

SERRANUS MORRHUA, Cuv. & Val.

Serranus præoperc ularis, Boulenger, *l. c.* p. 654.

As I have already given an account of the colours of this fish, I will merely remark that the young have sinuous white bands, but as the fish becomes older it assumes a brown colour, with narrow black lines, which were the original borders of the white bands. In the Paris Museum is a young specimen having dark spots along the lines which bound the white bands. In Klunzinger's figure (Fisch. Roth. Meeres., t. i. f. 2), three brown lines radiate from the eye and become four curved ones on the body, the first going to the 8th dorsal spine, the second to the 5th ray, while between these are blotches, spots, or markings of the same colour. The fifth dorsal spine is shown the longest.

In *S. præopercularis* the colour differs, the lines being more or less broken up into spots; but if the smaller of the two specimens (12 inches in length) is examined, it has the distinct remains of the black lines which edge the bands on the head, as shown in my 'Fishes of India,' while the opercular spines are similarly placed to those in *S. morrhua*.

As regards colours, it is by no means unusual that vertical bands in these fishes have a tendency to disappear, and horizontal lines to break up into spots, and even entirely fade away.

GRAMMISTES PUNCTATUS, Cuv. & Val.

Sent by Dr. Bidie from Madras in 1883.

LUTIANUS ARGENTIMACULATUS, Forsk.

Mesoprion garretti, Günther, Fische d. Südsee, p. 15, t. xiii. f. B.

APOGON ELLIOTI, Day.

Apogon arafuræ, Günther, 'Challenger' Shore-fishes, 1880, p. 38, pl. xvi. f. C.

SYNAGRIS TÆNIOPTERUS, Cuv. & Val.

Synagris notatus, Day, Proc. Zool. Soc. 1870, p. 684.

GERRES SETIFER, Ham.-Buch.

Gerres altispinis, Günther, Intr. Study of Fishes, with a figure.

PEMPHERIS MALABARICA, Cuv. & Val.

Pempheris mangula, Day, Fish. India, p. 175.

PEMPHERIS RUSSELLI.

Pempheris molucca, Day, Fish. India, p. 175.

This species is identical with Russell's fish, plate xiv., but not with *P. mangula*, Cuv. & Val., a form figured in Günther's Fische d. Südsee, t. lix. f. B, whereas Klunzinger's *P. mangula* differs again from both species.

UMBRNA SINUATA, Day.

Umbrina striata, Boulenger, P. Z. S. 1887, p. 660.

TRACHYNOTUS RUSSELLI, Cuv. & Val.

Trachynotus coppingeri, Günther, Fish. Alert Exp. 1881–82, p. 29, pl. iii. f. A.

PSENES JAVANICUS, Cuv. & Val.

Psenes guamensis, Günther, Fische d. Südsee, ii. p. 145, t. xci. f. 100.

PERCIS CYLINDRICA, sp. nov.

B. vi. D. 5/21. P. 15. V. 1/5. A. 17–18. C. 15. L. l. 44.
L. tr. $2\frac{1}{2}/9$.

Length of head 4, of caudal fin $5\frac{1}{2}$, height of body $5\frac{1}{4}$ in the total

length. *Eyes*: diameter $3\frac{1}{4}$ in the length of the head, 1 diameter from the end of the snout, and $\frac{1}{4}$ of a diameter apart. The greatest width of the head equals its length excluding the snout. Cleft of mouth very slightly oblique; lower jaw a little the longer; the posterior extremity of the maxilla reaches to beneath the first third of the orbit. The greatest depth of the preorbital equals one third of the diameter of the eye. All the opercles entire; a well-marked spine on the opercle, and another on the subopercle; no shoulder-spine. *Teeth*: two enlarged ones on either side above the symphysis of the lower jaw; fine ones on the vomer. *Fins*: second dorsal spine the longest, equalling three fourths of the diameter of the eye. Pectoral nearly as long as the head. Ventral one fourth longer than the head, reaching the base of the seventh anal ray. Caudal slightly rounded. *Colours*: reddish brown, with five wide and dark vertical bands, extending from the back to the lower surface, these bands being darkest at their edges and disappearing about the middle of the body, where there are also some dark spots; a brown ocellus at the upper part of the base of the caudal fin, which has some brown spots on it. Numerous brown spots on the snout and upper surface of the head and cheeks, some on the upper edge of the eye, where there are two dark narrow bands. Ventrals white; first dorsal fin nearly black between the spines; soft dorsal and anal with fine dots between the rays.

Hab. Two small specimens from the Andaman Islands.

GOBIUS LITTOREUS, sp. nov.

B. v. D. 6/11. P. 15. V. 1/5. A. 10. C. 14. L. l. 22. L. tr. 6.

Length of head $4\frac{1}{3}$, of caudal fin $4\frac{1}{2}$, height of body $5\frac{1}{2}$ in the total length. *Eyes*: diameter 3 in the length of the head, $\frac{1}{2}$ a diameter from the end of the snout, and placed close together. The greatest width of the head equals $\frac{2}{3}$ of its length, while its height equals its length excluding the snout. Anterior profile of the head somewhat obtuse; cleft of mouth oblique, lower jaw slightly the longer; the posterior extremity of the maxilla reaches to beneath the first third of the eye. Preopercle spineless, and no warts on the head. *Teeth* in villiform rows, none enlarged. *Fins*: dorsal spines of moderate strength, the longest nearly half the length of the head; pectoral as long as the head, some of its rays fine and silk-like; caudal pointed. *Scales* ctenoid, none on the head; eleven rows between the occiput and front edge of the dorsal fin. *Colours*: yellowish, with a few dark spots on the body and a dark band from the eye to the snout, also a dark mark on the opercle. Upper half of eye black. Dorsal, anal, and caudal fins with a grey outer edging; ventrals white.

Hab. A small species from Madras.

ELEOTRIS MACROLEPIDOTA, Bloch.

This fish is not *Eleotris hoedtii* of Bleeker, as stated in Günther's

Fische Südsee,' ii. p. 185, as the type at Berlin (No. 2155) has D. 7/$\frac{1}{6}$, A. $\frac{1}{10}$ (the last ray in both being almost double, and therefore counted as two by Bloch), L. l. 30, L. tr. 13–14, and from 27 to 28 scales between the snout and the first dorsal fin.

ELEOTRIS ELLIOTI, sp. nov.

Cul nachooli, Tamil.

B. vi. D. 6/12. P. 21. V. 6. A. 13. C. 13. L. l. 80.
L. tr. 16.

Length of head $4\frac{1}{3}$, of caudal fin $4\frac{2}{3}$, height of body $5\frac{1}{2}$ in the total length. *Eyes* high up, diameter $3\frac{1}{2}$ in the length of the head, 1 diameter from the end of the snout. Height of head two thirds of its length; interorbital space narrow. Cleft of mouth somewhat oblique, the maxilla extends posteriorly to beneath the middle of the eye. *Teeth* rather large, in a single row in the upper jaw, with two small lateral canines, in two or three rows in the centre of the lower jaw, separated from the single lateral row by two large, recurved, canines. *Fins*: dorsal spines thin, flexible, and equal in height to the body below them; second dorsal and anal of similar height and one third lower than the first dorsal. Pectoral nearly as long as the head. Caudal rounded, with its central rays somewhat the longest. *Scales*: ctenoid in the posterior portion of the body, where they are larger than anteriorly, small on the surface of the head; none on the cheeks. *Colours*: whitish, with fine wide and light-coloured chestnut bands descending from the back, each of which has a black outer edge; another over the nape is without dark edges. Caudal fin brown, with a broad, yellowish, black-bordered vertical band down its centre. A dark horizontal band running along the cheeks below the eye. Dorsal fins light brown, with light outer edges, a large black white-edged blotch on the posterior half of the first dorsal fin, and a second but smaller one at the termination of the second dorsal, which last fin is white at its base.

Hab. Madras.

A skin from Sir W. Elliot's collection is 3·2 inches in length, but is in bad condition; a coloured drawing was made from the fish when captured.

PETROSCRITES STRIATUS, sp. nov.

B. vi. D. 40. P. 13. V. 3. A. 27. C. 10.

Length of head $4\frac{3}{4}$, of caudal fin $6\frac{3}{4}$, height of body 6 in the total length. *Eyes*: diameter $2\frac{2}{3}$ in the length of the head, $\frac{2}{3}$ of a diameter from the end of the snout, and the same distance apart. The greatest width of the head equals half its length; the maxilla reaches to beneath the first third of the orbit. Snout somewhat broad and rounded in front, the upper jaw a little the longer. No tentacles on the head. *Teeth*: an exceedingly large recurved canine on either side of the lower jaw, while about 14 teeth are present between the canines. *Fins*: dorsal commences midway between the eye and the hind edge of the opercles, and does not extend quite so far as

the caudal fin; the height of its longest ray equals two thirds of that of the body, and is rather more than those in the anal fin, which latter is not united to the caudal. *Colours*: with about ten broad vertical bands, extending from the base of the dorsal to the anal fins, separated from one another by a very narrow white line. Dorsal and anal fins externally black-edged, and the membranes studded with fine brown spots. Caudal light-coloured.

Hab. Ceylon.

SALARIAS SINDENSIS, sp. nov.

B. vi. D. 13/20. P. 14. V. 2. A. 23. C. 12.

Length of head 5, height of body 5 in the total length. *Eyes* situated high up near the dorsal profile, diameter $\frac{1}{4}$ of the length of the head. Body strongly compressed, profile from above the orbit to the end of the snout oblique. The height of the head equals its length excluding the snout. The posterior extremity of the maxilla reaches to beneath the front edge of the eye. No tentacles or crest on the head. *Teeth* well developed large posterior canines. *Fins*: dorsal not notched, but highest posteriorly, where the longest rays equal half the height of the body, anal not quite so high as the soft dorsal; dorsal, anal, and caudal rays unbranched. The dorsal and anal fins not quite connected to the caudal. *Colours*: olivaceous; four wide brown bands on the head, the three anterior of which encircle it; about twelve vertical bands on the body more or less distinct, but more marked at the base of the dorsal fin. Dorsal fin with a dark mark along its anterior two thirds; anal black-edged, each ray tipped with pure white. In one there appear to be marks of some narrow horizontal bands having existed along the front half of the body.

Hab. Three specimens from Kurrachee in Sind.

SALARIAS NEILLI, sp. nov.

B. vi. D. 12/17. P. 13. V. 2. A. 19. C. 10.

Length of head $4\frac{1}{2}$, height of body $4\frac{1}{2}$ in the total length. *Eyes* situated high up, near the dorsal profile, 4 diameters in the length of the head, 1 diameter from the end of the snout, and $\frac{1}{2}$ a diameter apart. Frontal profile very steep, the head as high as it is long, the maxilla reaches to beneath the last third of the eye. A fringed supraorbital tentacle about twice as long as the eye; a small fringed one at the nostril; no crest on the head. *Teeth*: a very large curved canine posteriorly in the lower jaw, and a smaller curved one in the upper. *Fins*: spinous portion of dorsal fin lower than the rayed part, the notch between the two parts of the fin well marked; the longest dorsal rays are equal to half the height of the body of the fish; neither the dorsal nor the anal fin are attached to the caudal, which latter is somewhat wedge-shaped, and its rays are branched. *Colours*: olive, with seven or eight short dark bands descending from the dorsal fin down the first third of the body; some dark bands radiate from the eye; a large black blotch below

and somewhat behind the orbit. Two semicircular brown bands across the lower surface of the mandibles. Fins darker than the body.

I have named this fish after A. Brisbane Neill, Esq., to whom I am under great obligations for the valuable assistance he has given me in my ichthyological publications.

Hab. Ten examples from Kurrachee in Sind.

SALARIAS BREVIS, Kner, 1868.

Salarias leopardus, Day, P. Z. S. 1869, p. 518.

ACANTHOCLINUS INDICUS, sp. nov.

B. vi. D. 21/4. P. 16. V. 1/3. A. 10/14. C. 17.
L. l. 40. L. tr. 14.

Length of head 4, of caudal fin 5, height of body 3 in the total length. *Eyes*: diameter $\frac{1}{5}$ of the length of the head, 1 diameter from the end of the snout, and $\frac{3}{4}$ of a diameter apart. Cleft of mouth somewhat oblique, the maxilla reaching posteriorly to beneath the hind third of the orbit. Two strong opercular spines. *Teeth* in jaws, vomer, and palate. *Fins*: dorsal spines strong, the fin not united to the caudal; pectorals rounded; ventrals long and inserted slightly in front of the base of the pectoral; caudal rounded. *Scales* cycloid. *Lateral line* absent. *Colours*: brownish black, with a milk-white band commencing on the front end of the dorsal fin, and extending to the snout; a white band over the free portion of the tail; a white spot on the base of the pectoral fin, one on either side of the base of the mandibles, one on the isthmus. The posterior half of the ventral fin, and also a ring round the vent, white, as well as the tip of the caudal fin.

Hab. Madras. A small species.

MUGIL KLUNZINGERI, sp. nov.

Mugil carinatus, Day, Fishes of India, p. 349, not C. & V., as was pointed out by Klunzinger.

PLATYGLOSSUS ROSEUS, sp. nov.

B. vi. D. 9/12. P. 14. V. 1/5. A. 2/12. C. 14. L. l. 28.
L. tr. $\frac{2}{10}$.

Length of head $4\frac{1}{3}$, of caudal fin $6\frac{1}{4}$, height of body $3\frac{3}{4}$ in the total length. *Eyes*: diameter $\frac{1}{4}$ of the length of the head, $1\frac{1}{4}$ diameter from the end of the snout, and one apart. The greatest width of the head equals half its length. *Teeth*: a posterior canine. *Fins*: caudal slightly rounded; the length of the pectoral equals that of the head behind the middle of the eye; outer ventral ray somewhat elongated. *Scales*: none on the head, those on the chest smaller than those on the body. *Colours*: in a spirit-specimen rosy, with a large black spot behind the middle of the eye, and a small one between the first two dorsal spines; two narrow light bands pass from the eye to the snout; a broad orange band along the

suborbital ring of bones; body with dark and narrow horizontal bands in its anterior half, while seven dark and wide bands pass from the back down the sides. A narrow light band goes from the eye to the middle of the base of the caudal fin. Basal third of caudal fin somewhat dark, its outer edge light.

Hab. Kurrachee in Sind.

FIERASFER HOMEI, Richardson.

An example nearly five inches long, from Madras.

EXOCŒTUS ALTIPINNIS, Cuv. & Val.

Exocœtus katopron, Bleeker, Atl. Ich. vi. p. 72.

Two specimens up to 11½ inches in length, received from Bombay.

May 15, 1888.

Dr. A. Günther, F.R.S., Vice-President, in the Chair.

The Secretary read the following report on the additions made to the Society's Menagerie during the month of April 1888:—

The total number of registered additions to the Society's Menagerie during the month of April was 63. Of these 11 were by birth, 32 by presentation, 11 by purchase, 2 by exchange, and 7 were received on deposit. The total number of departures during the same period, by death and removals, was 125.

The most noticeable additions during the month were:—

1. Two Penguins from the Auckland Islands, presented by Capt. Sutcliff, R.M.S.S. 'Aorangi,' April 19th. One of them is in adult plumage, the other is young. They are referable certainly to one of the geographical subspecies of *Eudyptes chrysocome*, but on comparing the adult with the example of the Penguin from New Zealand, received March 31st, it will be observed that there are several differences between the two specimens. The Auckland Island bird is larger and not so blue on the back, and has a distinct white line on the lower mandible above the feathering, as will be seen by the drawings now exhibited. Moreover the yellow eyebrow commences much further back, on the lores.

2. Two Indian Hill-Foxes, presented by Col. Alex. A. A. Kinloch, C.M.Z.S., and received April 20th. These Foxes, which, Col. Kinloch informs me, were obtained at Thandiani, a small station on the hills between the Hazara and Jhelum valleys, a few miles from Abbottabad, at an elevation of about 8000 feet, form an acceptable addition to the series of Canidæ in the Society's Collection. They appear to be immature specimens of *Canis montanus*.

3. A fine example of the Spotted Hawk-Eagle (*Spizaëtus nipalensis*) of Northern India, also presented by Col. Kinloch, and new to the Society's Collection.

A communication was read from Sir John Lubbock, containing a letter addressed to him by Mr. George A. Treadwell, concerning a fatal case of poisoning by the bite of *Heloderma suspectum*. Mr. Treadwell gave the following extracts from the 'Cochise Record' of May 2nd, 1884:—

"Sunday evening Dr. Matthews was summoned, by telegram, to Fairbanks (a railway-station near Tombstone, Arizona Territory, U.S.A.), to attend Colonel Yearger, who was reported seriously ill. Owing to a delay in the telegram, the doctor did not reach the patient until several hours after his death, which had been very sudden.

"It appears that Yearger had been fooling with a Gila Monster, and in attempting to open the creature's mouth, was bitten on the right thumb. Instantly the poison took effect, and although every convenient remedy was applied, he lived but a few hours. An inquest was subsequently held, and a verdict returned in accordance with the above facts.

"As this is the third or fourth death which has occurred in the Territory from bites of this reptile, it should set at rest, at once and for ever, the theory so prevalent that their bite is not poisonous."

Mr. Boulenger exhibited the type specimen of a new genus of Snakes, *Azemiops feæ*, recently discovered by M. Fea, of the Genoa Civic Museum, in the Kakhien Hills, Upper Burma. This discovery was considered the most striking that had been made in Indian Ophiology within the present century. The new Snake combined the external characters of a Lycodontoid Colubrine with the poison-apparatus of a Viper. The loreal shield, which was present in *Azemiops*, had hitherto been regarded by Indian Ophiologists as indicating the innocuous nature of a Snake; and it was therefore useful to emphasize on the inefficiency of such a criterion in the hopeless task of distinguishing poisonous from harmless Snakes otherwise than by examination of the dentition.

The specimen exhibited was unique, and had been entrusted to Mr. Boulenger by the Marquis G. Doria. The description would shortly appear in the 'Annals of the Genoa Museum.'

The following letter, addressed to the Secretary by Mr. E. E. Cotes, Entomological Department, Indian Museum, Calcutta, was read:—

"Indian Museum, Calcutta.
23rd April, 1888.

"My dear Sir,

"I venture to ask for your assistance in the following matter. The question of economic entomology is being taken up by the Trustees of the Indian Museum, and an endeavour is being made to collect specimens of the various Indian insect-pests, and to record all that can be learnt about them, both from practical men, who have actual experience of them out here, and also from entomologists in various parts of the world. The idea is, that when the life-histories of the insects have been accurately learnt, methods of dealing

with them may in many cases be devised, as has already been the case to a considerable extent in America and Europe.

"For this purpose it is of the first importance to get the insects accurately named, both in order to establish their identity beyond doubt, and also to enable them to be compared with allied species which have often been minutely studied elsewhere.

"In the Indian Museum are considerable collections of insects, which have been roughly arranged, and, to a certain extent, named, but which are generally insufficient for the purpose of accurately determining the insects which are now being constantly sent to the Museum as damaging crops in various parts of India.

"I am therefore anxious to call the attention of entomologists of your Society, who may be interested in special groups of insects, to the fact that their assistance in determining the insect-pests will be gratefully received, and that I shall be most happy to correspond with any one on the subject, and to give all the help I can.

"Besides the actual insect-pests, which it is chiefly important to have determined, there are large collections in the Museum of Insects from all parts of India, besides Burma, the Andaman Islands, the Nicobar Islands, and Ceylon, which it is desirable to have worked out—help being specially needed with the groups Hymenoptera (except Formicidæ), Coleoptera (except Cerambycidæ, Buprestidæ, and Elateridæ), Neuroptera, Diptera, and Orthoptera (except Mantidæ).

"Enclosed are some circulars which show the lines on which the investigation of the insect-pests is being conducted.

"Yours faithfully,

E. E. Cotes,

Entomological Department,

Indian Museum."

"*To the Secretary of the Zoological Society of London.*"

Mr. Henry Seebohm exhibited a series of Pheasants from Mongolia, Thibet, and China, including examples of the two species discovered by Colonel Prjevalski, *Phasianus vlangali* and *P. strauchi*. The former was from Tsidam, west of Koko-Nor, and the latter from Kansu. The range of *P. strauchi* appeared to extend as far south as Moupin, whence examples, which had hitherto been referred to *P. decollatus*, were brought by Abbé David, and were now in the Paris Museum.

Prof. Bell, F.Z.S., exhibited and made remarks upon three specimens of a large Pennatulid, *Funiculina quadrangularis*, collected by Mr. John Murray on the west coast of Scotland, which showed very clearly the difference between examples of this species of different ages.

The following papers were read :—

1. List of a Collection of Birds made by Mr. L. Wray in the Main Range of Mountains of the Malay Peninsula, Perak.

By R. Bowdler Sharpe, F.L.S., F.Z.S., &c., Zoological Department, British Museum.

[Received April 24, 1888.]

(Plate XV.)

From the collections previously sent by Mr. Wray (*cf.* P. Z. S. 1886, p. 350, and 1887, p. 431) it was so easy to prophesy that his future explorations would bring to light the existence of more Himalayan genera in the high mountains of the Malayan Peninsula, that I can take little credit for my prognostications; but the foreshadowing of Mr. Wray's accomplishments does not impair the credit of that explorer's success in his last expedition into the mountain-ranges of the interior of the Peninsula.

He states that the mountains on which he has lived for six months "contain really very few more birds than the Larut range, though they are so much more extensive," and he collected up to an altitude of 7000 feet.

By the present collection several interesting forms have been revealed, representatives of allied species in Tenasserim, and the ranges of several birds are extended southwards. The genera hitherto unrecorded from the mountains of Malacca are *Anthipes*, *Brachypteryx*, *Gampsorhynchus*, and *Cutia*—all Himalayan and Tenasserim forms, of which, so far as we know, only *Brachypteryx* has occurred in Sumatra. The Avifauna of the latter island is further linked to that of the mountain-ranges of the Malay Peninsula by the discovery of a Black Babbling Thrush, representing the *Melanocichla bicolor* of Sumatra.

The unexampled success which has attended Mr. Wray's efforts so far will, we hope, encourage him to still further investigations of the interesting region in which he is domiciled.

The references in the present paper are chiefly to Mr. Oates' 'Handbook of the Birds of British Burmah,' which includes an allusion to the paper on the Birds of Tenasserim by Messrs. Hume and Davison. I have also referred to Count Salvadori's essay on Dr. Beccari's collections from high Sumatra (Ann. Mus. Civic. Genov. xiv. p. 169), whenever there occurs any affinity in the Avifauna of that island with the collection under discussion.

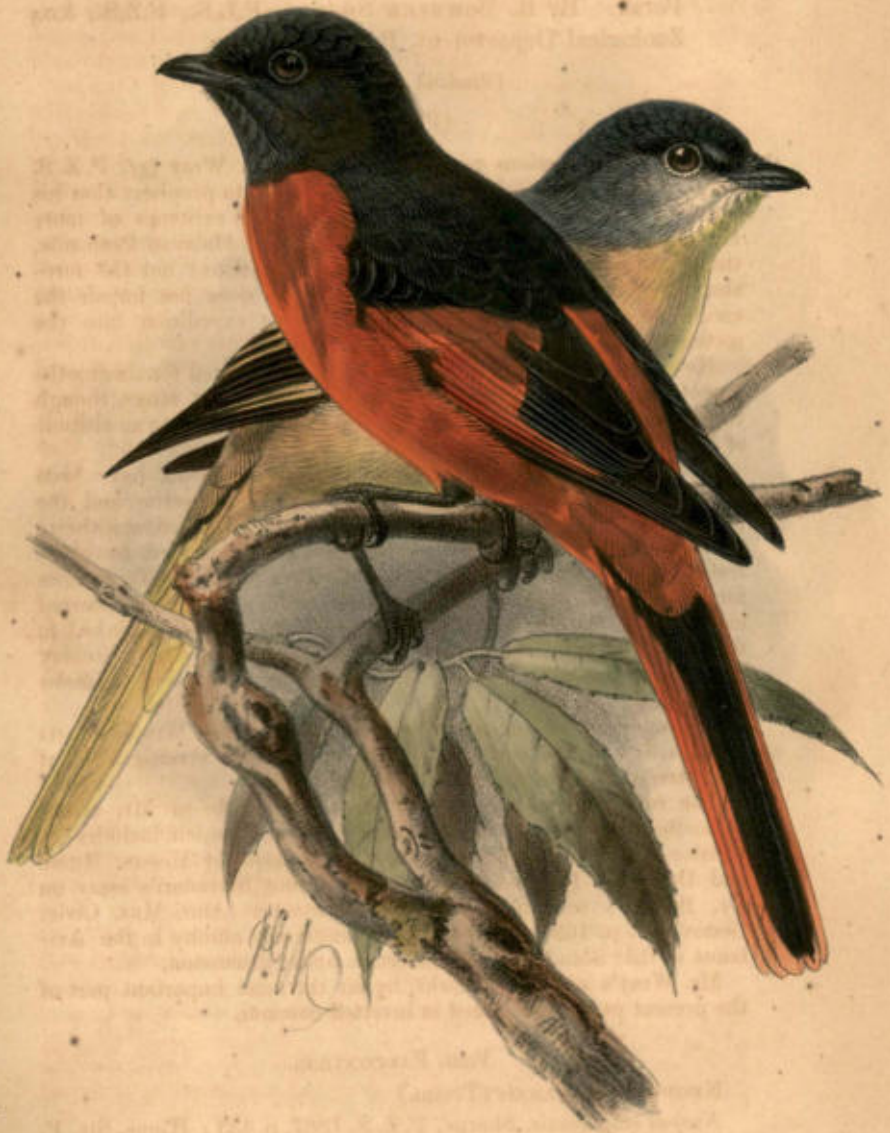
Mr. Wray's original remarks, by far the most important part of the present paper, are placed in inverted commas.

Fam. Falconidæ.

Neopus malayensis (Temm.).

Neopus malayensis, Sharpe, P. Z. S. 1887, p. 433; Hume, Str. F. 1879, p. 44.

"No. 18. ♀ ad. Mountains of Perak (Gunong Batu Putch).



J. G. Keulemans del. et lith. Mintern Bros. imp.

PERICROCOTUS WRAYI.

"Irides brown; feet yellow; cere yellow. Expanse 5 ft. 10 in., length 2 ft. 5 in.

"The stomach contained the remains of a rat, a bird's egg, and a snake's egg. The plumage of this specimen was far darker than that of the two I obtained last year on the Larut Hills."

Fam. Corvidæ.

Platylophus ardesiacus (Blyth).

Platylophus ardesiacus, Sharpe, Cat. Birds Brit. Mus. iii. p. 317; Hume and Davison, Str. F. 1878, p. 380; Oates, B. Brit. Burm. i. p. 410; Hume, Str. F. 1879, p. 66.

"No. 117. ♀ ad. Batang Padang (mountains of Perak).

"Irides dark brown; bill black; feet and legs black. It frequents the undergrowth of the forest."

Fam. Campophagidæ.

Pericrocotus wrayi, sp. n. (Plate XV.)

"No. 53. *P. igneus*, ♂ ♀ ad. Batang Padang mountains, Perak."

I can hardly believe that this is the species I identified and returned to Mr. Wray as *Pericrocotus igneus* (P. Z. S. 1887, p. 435). If such be the case I was greatly in error, for the pair of birds now sent are decidedly distinct from that species. *P. wrayi* has the quill-lining red, instead of yellow, and also the under wing-coverts, and it has the throat slaty grey and the ear-coverts slaty black, instead of glossy black like the head. Total length 6·3 inches, culmen 0·5, wing 3·1, tail 3·2, tarsus 0·55. The female of *P. igneus* differs very much from the female of *P. wrayi* in being entirely bright yellow below and in having a scarlet rump. The nearest ally of *P. wrayi* as regards the female plumage is that of *P. brevirostris*, but *P. wrayi* is of a darker slate-grey, has a brighter yellow lower back and rump, *no* yellow on the forehead, and the chin white.

The males of *P. neglectus* and *P. brevirostris* differ in their glossy black throat and fiery crimson, not scarlet, under surface.

While on the subject of the genus *Pericrocotus*, I may mention that Count Salvadori very kindly sent me over the types of his new species from Tenasserim, and I am able to state with certainty that *P. rubrolimbatus*, Salvad. (Ann. Mus. Civic. Genov. (2) v. p. 582), is = *P. solaris*, and *P. pulcherrimus*, Salvad. *t. c.* p. 580, is = *P. neglectus* of Hume.

Pericrocotus croceus, sp. n.

"No. 107. ♂ ad. Gunong Batu Putch (4300 feet).

"Irides dark brown; legs and feet black."

This is a beautiful bird, but I feel grave doubts whether it is any thing more than a yellow variety of *P. wrayi*, the red parts in *P. wrayi* being golden yellow in *P. croceus*, and the throat is darker, being black like the cheeks and sides of face. Total length 6·1 inches, culmen 0·45, wing 3·4, tail 2·95, tarsus 0·55.

Fam. Muscicapidæ.

Muscicapula hyperythra (Blyth).

Muscicapula hyperythra, Sharpe, Cat. B. Brit. Mus. iv. p. 206; Salvad. *t. c.* p. 203.

"No. 93. ♂ ad. Ulu Batang Padang (4200 feet).

"Irides dark brown; legs and feet flesh-colour. Frequents the undergrowth in the forests."

This little Flycatcher is now recorded from the Malayan Peninsula for the first time. Its presence was, however, to be suspected, as the species occurs in the Eastern Himalayas and again in Java and Sumatra.

Muscicapula westermanni, sp. n.

"No. 115. ♂ ad. Gunong Ulu Batang Padang (4200 feet).

"Irides light brown."

Adult male. General colour above blue-grey, with a slight brown wash on the scapulars and lower back; rump ochreous brown; upper tail-coverts a little more rufescent; wing-coverts dusky, edged with ochreous brown; bastard-wing, primary-coverts, and quills blackish, fringed with olive-brown, the secondaries rather more rufescent on the base of the outer web; tail-feathers brown, externally rufous-brown; head blue-grey like the back, a little more hoary on the forehead; lores and eyelid white; ear-coverts and sides of face blue-grey, with a few whitish lines on the former; throat white, with a slight ashy tinge; remainder of under surface of body white, the sides of the breast ashy grey; sides of body also washed with ashy grey; under tail-coverts white; thighs ashy; axillaries and under wing-coverts white, the edge of the wing blackish; quills dusky below, white along the edge of the inner web. Total length 3·7 inches, culmen 0·45, wing 2·2, tail 1·55, tarsus 0·55.

This is a very curious form, recalling the characters of several of the other *Muscicapulæ*. It may not be the fully adult of its species, but I believe it to be so. The reddish upper tail-coverts and tail remind one of the female of *M. maculata*, but the blue-grey upper surface distinguishes it at a glance. The female and young male of *M. superciliaris* have generally an ochreous tinge on the throat which distinguish them; but one specimen from Sikhim is white below like *M. westermanni*, while the upper surface is brown and the shade of blue which is seen on it (it is apparently a young male) is not slaty blue, but bright blue as in the adults.

Terpsiphone affinis (Blyth).

Terpsiphone affinis, Oates, B. Brit. Burm. i. p. 261.

Muscipeta affinis, Hume, Str. F. 1879, p. 58.

"No. 118. ♂ ad. Batang Padang Mountains, Perak.

"Irides dark brown; bill black; legs and feet same. This species occurs in Penang, Province Wellesley, and the Batang Padang District of Perak, but in Larut it is replaced by a slightly larger and whiter species."

PHILENTOMA VELATUM (Temm.).

Philentoma velatum, Oates, *t. c.* p. 263; Hume, Str. F. 1879, p. 58.

"No. 128. ♂ ad. Batang Padang Mountains, Perak.

"Irides crimson; bill black; feet and legs black."

PHILENTOMA PYRRHOPTERUM (Temm.).

Philentoma pyrrhopterum, Oates, *t. c.* p. 264; Hume, Str. F. 1879, p. 58.

"No. 127. ♂ ad. Batang Padang Mountains, Perak.

"Irides red; bill black."

Identical with males from other parts of the peninsula and from Tenasserim. I have re-examined the type of *P. intermedium* of Hume from Johore, and I cannot see how it differs from *P. pyrrhopterum*.

CULICICAPA CEYLONENSIS (Sw.).

Culicicapa ceylonensis, Sharpe, Cat. Birds Brit. Mus. iv. p. 369; Oates, *t. c.* p. 274; Hume, Str. F. 1879, p. 59.

"No. 111. ♂ ad. Gunong Batu Putch (3400 feet).

"Irides reddish brown; feet and legs warm brown, soles of feet red; bill black."

CRYPTOLOPHA DAVISONI, sp. n.

"No. 96. ♂ ad. Gunong Ulu Batang Padang (4200 feet).

"Irides dark brown; bill above brown, beneath yellow; legs and feet flesh-colour."

This is a Malayan representative of *C. montis* of Kina Balu, from which it differs in its larger size and intensified colouring, being dark grass-green instead of yellowish green, having all the rufous parts of the head deep chestnut instead of ferruginous, and in being much brighter yellow below. Total length 3·8 inches, culmen 0·4, wing 2·15, tail 1·55, tarsus 0·7.

CRYPTOLOPHA TRIVIRGATA (Strickl.).

Cryptolopha trivirgata, Sharpe, P. Z. S. 1887, p. 435; Salvad. *t. c.* p. 204.

"No 97. ♀ ad. Gunong Batu Putch (4300 feet).

"Irides dark brown."

STOPAROLA THALASSINOIDES (Cab.).

Stoparola thalassinoides, Sharpe, Cat. B. Brit. Mus. iv. p. 432; Hume, Str. F. 1879, p. 59.

"No. 136. ♂ ad. Larut.

"Irides light brown."

A truly Malayan species, represented by the ordinary *S. melanops* in Tenasserim, to which province the present bird does not extend.

ANTHIPES MALAYANA, Sharpe, *antè*, p. 247.

"No. 94. ♂ ad. Gunong Batu Putch (4300 feet).

"Irides dark brown; legs and feet white; bill nearly black. Lives apparently on the ground."

A young bird, mottled all over after the manner of Flycatchers, is sent by Mr. Wray from the same locality. "No. 98. Irides deep brown; legs and feet pale flesh-colour. Hops about among the undergrowth, searching for insects, making a nearly continual chirping." Although the Hume Collection does not contain any young *Anthipes* for comparison, I think that the present specimen must belong to a species of that subgenus.

NILTAVA GRANDIS, Hodgs.

Niltava grandis, Sharpe, P. Z. S. 1886, p. 251.

"No. 11. ♀ ad. Batang Padang Mountains, Perak."

NILTAVA LEUCOPROCTA (Tweedd.).

Niltava leucoprocta, Oates, B. Brit. Burm. i. p. 298.

"No. 103. ♂ ad. Gunong Batu Putch (3400 feet).

"Irides light brown; bill black; legs and feet light grey, soles of feet flesh-colour."

I have compared the adult male now sent with others from Tenasserim, and find it to be identical. The extension of the range of the species is interesting.

Fam. PYCNONOTIDÆ.

CRINIGER GUTTURALIS (Bp.).

Criniger gutturalis, Oates, *t. c.* p. 185; Hume, Str. F. 1879, p. 61.

"No. 104, 105. ♂ ad. Gunong Batu Putch (3400 feet).

"Irides red-brown. A noisy harsh-voiced bird; flies in small parties, rather high up in the trees."

Mr. Wray sends one *Criniger* (no. 105), which, after much hesitation and careful comparison with the series of skins in the Hume Collection, I have decided to be only the young of *C. gutturalis*. Its much lighter bill and rufous wings and tail, at first sight, make it look very different.

RUBIGULA CYANIVENTRIS (Blyth).

Rubigula cyaniventris, Oates, *t. c.* p. 200.

Ixidia cyaniventris, Hume, Str. F. 1879, p. 63; Salvad. *t. c.* p. 220.

"No. 131. ♀ ad. Larut.

"Irides light brown."

TRACHYCOMUS OCHROCEPHALUS (Gm.).

Trachycomus ochrocephalus, Oates, *t. c.* p. 188; Hume, Str. F. 1879, p. 61; Salvad. *t. c.* p. 218.

"No. 121. ♂ ad. Batang Padang Mountains, Perak.

"Irides brown; bill black.

"This is the *Sibharoh* or *Upik Bidau* of the Malays. It is very plentiful among the bushes which fringe the river-banks, but it is so shy that it is hardly ever seen, though its prolonged, loud, musical, and very involved song is one of the most noticeable riverside sounds in the country."

Fam. Troglodytidæ.

Pnoëpyga pusilla, Hodgs.

Pnoëpyga pusilla, Hume and Davison, *t. c.* p. 234; Salvad. *t. c.* p. 226.

"No. 95. ♀ ad. Gunong Batu Putch (4300 feet).

"Irides dark brown; feet and legs pale brown; bill black, whitish beneath and at angle. Ground bird."

Identical with a specimen collected in Karennee by Captain Wardlaw Ramsay. It has also occurred on Mooleyit.

Fam. Timeliidæ.

Brachypteryx nipalensis (Hodgs.).

Brachypteryx nipalensis, Hume and Davison, *t. c.* p. 236; Oates, *t. c.* p. 19.

"No. 89. ♂ ad. Gunong Batu Putch (4300 feet).

"Irides brown; bill black; feet and legs ash-colour. Lives on the ground in the forest."

An adult male, rather darker than the generality of Himalayan and Tenasserim specimens, though some of the latter equal it in intensity of colouring.

Phyllergates cucullatus (Temm.).

Phyllergates cucullatus, Sharpe, P. Z. S. 1887, p. 440.

"No. 112. ♀ ad. Gunong Batu Putch (3400 feet).

"Irides dark brown; bill black above, yellowish beneath; legs and feet pale brown. Also met with on Gunong Ulu Batang Padang at about the same altitude."

Gampsorhynchus saturatior, sp. n.

"No. 101. ♀ ad. Gunong Batu Putch (3400 feet).

"Irides bright yellow; legs and feet bluish ash, with tintings of flesh-colour in places; claws flesh-colour; soles of feet dull yellow; bill pale flesh-colour, dusky on the ridge below the nostrils. The fold of skin in which the rictal bristles are inserted is very prominent, and evidently when alive the bird can move the bristles as a whole backwards and forwards with great freedom.

"Length 10½ inches, expanse 12 inches. The stomach contained one large hairy caterpillar and the partly digested remains of various insects, and the egg of one of the Phasmidæ.

"This bird gave me a great deal of trouble, for every night and early each morning a small party of them used to pass the camp, sometimes on one side and sometimes on the other. They made a loud shrill cry something like the cry of the *Krekah* monkey, and

flew quickly from tree to tree. Day after day we went out into the jungle to watch for them, but as there was no certainty which side of the camp they would take, and as they always passed when it was so dark in the forest that neither they nor the sight of the gun could be distinguished, we were never successful, until nearly the last day of our stay at that camp, in shooting one. The strange thing was that we never saw these birds in the daytime. They passed up the hill to roost at nightfall and down again at dawn. Their note is so loud and distinctive, and they are so noisy, that they could not easily be overlooked or mistaken for any other bird.

"They are evidently rare, as only this one small party was seen."

This new species is very closely allied to *G. torquatus*, Hume, from Tenasserim, but is altogether of a much darker colour, the upper surface being more rufous-brown. It is evidently a southern race of the Tenasserim form.

Sibia simillima, Salvad.

Sibia simillima, Sharpe, P. Z. S. 1886, p. 352.
Heterophasia simillima, Salvad. *t. c.* p. 232.

"No. 13. ♂ ad. Batang Padang Mountains, Perak."

Pomatorhinus borneensis, Cab.

Pomatorhinus borneensis, Sharpe, Cat. B. Brit. Mus. vii. p. 411; Hume, Str. F. 1879, p. 61.

"No. 100. ♂ ad. Gunong Batu Putch (3400 feet).

"Irides very light brown; bill white, with black on the top of the ridge, reaching about halfway to the point; legs and feet bluish ash; soles of feet yellowish brown.

"Only one pair of these birds were seen, they were in company with a number of other birds."

Melanocichla peninsularis, sp. n.

"No. 84. ♂ ad. Gunong Batu Putch (3400 feet).

"Irides bluish grey; bare skin round eye and also the skin of the head and neck under the feathers dark purplish blue; bill bright reddish orange. Legs grey, edges of scales yellowish; feet same, but more yellow, soles of feet yellow. Stomach contained a quantity of reddish-coloured ants. It is a shy and uncommon bird, frequents dense jungle, in pairs or small parties of three or four, is noisy and harsh-voiced. I saw it also at nearly 5000 feet on Gunong Ulu Batang Padang."

This species is an interesting representative of *M. lugubris* of Sumatra, but is slaty grey, instead of brown or blackish, both above and below. Total length 10 inches, culmen 1·1, wing 4·8, tail 4·6, tarsus 1·45.

Rhinocichla mitrata (S. Müll.).

Rhinocichla mitrata, Sharpe, P. Z. S. 1886, p. 352.
Leiothrix mitrata, Salvad. *t. c.* p. 230.

"No. 12. ♀ ad. Batang Padang Mountains, Perak."

STACHYRIS NIGRICEPS, Hodgs.

Stachyris nigriceps, Sharpe, P. Z. S. 1887, p. 440.

"No. 84. ♀ ad. Gunong Batu Putch and Gunong Ulu Batang Padang (4000 to 5000 feet).

"Irides light brown; bill black, greyish beneath; feet, legs, and claws ash-colour, slightly tinted with green. Soles of feet light brown. Stomach contained insects. This bird is usually in company with other small birds."

STACHYRIS NIGRICOLLIS (Temm.).

Stachyris nigricollis, Sharpe, Cat. B. Brit. Mus. vii. p. 535.

Timelia nigricollis, Hume, Str. F. 1879, p. 60.

"No. 125. ♂ ♀ ad. Batang Padang Mountains, Perak.

"Irides red; bill above black, lower mandible pale straw-colour, tipped dusky."

TURDINUS SEPIARIUS (Horsf.).

Turdinus sepiarius, Sharpe, Cat. B. Brit. Mus. vii. p. 544.

"No. 132. ♀ ad. Kinta, Perak Mountains.

"Apparently not to be separated from Javan and Bornean specimens. The flanks are perhaps a trifle more rufous-brown."

DRYMOCATAPHUS NIGRICAPITATUS (Eyton).

Drymocataphus nigricapitatus, Oates, *t. c.* p. 63.

"No. 135. ♂ ad. Larut, Perak Mountains.

"Irides red."

MIXORNIS GULARIS (Raffl.).

Mixornis gularis, Oates, *t. c.* p. 51; Hume, Str. F. 1879, p. 60; Salvad. *t. c.* p. 223.

"No. 134. ♂ ad. Larut, Perak Mountains.

"Irides dark brown."

MACRONUS PTILOSUS, J. & S.

Macronus ptilosus, Sharpe, Cat. B. Brit. Mus. vii. p. 583; Hume, Str. F. 1879, p. 60; Salvad. *t. c.* p. 224.

"No. 124. ♂ ad. Batang Padang Mountains, Perak.

"Irides dark brown; bill black; skin of head and neck and round eyes cobalt-blue."

HERPORNIS XANTHOLEUCA, Hodgs.

Herpornis xantholeuca, Oates, *t. c.* p. 151.

"No. 109. ♂ ad. Gunong Batu Putch (3400 feet).

"Irides dark brown; feet and legs flesh-colour; bill black above, fleshy beneath and at angle."

SIVA CASTANEICAUDA, Hume.

Siva castaneicauda, Hume & Davison, Str. F. 1878, p. 371; Oates, *t. c.* p. 145.

"No. 102. ♂ ad. Gunong Batu Putch.

"Irides dark brown; feet and legs bluish grey; bill brown, pale beneath. This bird seems to have the same habits as *Mesia argentauris*. I saw it on the summits of Gunong Batu Putch and Gunong Brumbrin at between 6000 and 7000 feet altitude. The only other birds I noticed were *Æthopyga wrayi*, Sharpe, and a large light greyish-brown-coloured Eagle; but this latter was far out of range."

Identical with the types from Tenasserim in the Hume Collection.

SIVA SORDIDIOR, sp. n.

Siva sordida, Sharpe, P. Z. S. 1887, p. 438 (nec Hume).

"No. 33. ♂ ad. Batang Padang Mountains, Perak."

In my first paper I ventured to doubt the identity of a specimen sent by Mr. Wray with *Siva sordida* of Hume from Tenasserim; but as the specimen was not adult, I refrained from describing it. Now that two more adult birds have been procured by Mr. Wray, there is no longer any doubt that the Perak bird is distinct, differing in its still duller coloration, the absence of blue on the head, which is like the back, and also in the absence of the ochreous-brown colour of the lower back and rump. Total length 6 inches, culmen 0·55, wing 2·55, tail 2·6, tarsus 0·85.

MESIA ARGENTAURIS, Hodgs.

Mesia argentauris, Sharpe, P. Z. S. 1886, p. 352.

"No. 10. ♂ ad. Batang Padang Mountains, Perak."

CUTIA CERVINICRISSA, sp. n.

"No. 85. ♂ ♀ ad. Gunong Batu Putch."

"Irides light brown; legs and feet bright chrome-yellow, claws white; bill black above, grey beneath and at angle. It is a rare bird, and I did not see it lower than 4000 feet. It frequents the higher trees, in small parties of three or four, and has a loud whistling double note, repeated several times in succession."

This is a race of *C. nipalensis*, a bird unknown in Tenasserim, from which the Perak form differs in its fulvescent under surface, and tawny-coloured lower abdomen and under tail-coverts. These characters, though slight, are well established when the pair sent by Mr. Wray are compared with our large series in the British Museum, all of which are white below. The measurements are as follows:—

		Total length.	Culmen.	Wing.	Tail.	Tarsus.
♂ ad.	Perak (*Wray*).	7·0	0·8	3·65	2·3	1·1
♀ ad.	„ „	6·4	0·85	3·3	2·15	1·1

Fam. LANIIDÆ.

PTERYTHRIUS ÆRALATUS, Tickell.

Pterythrius æralatus, Sharpe, P. Z. S. 1887, p. 440.

"No. 34. ♀ ad. Batang Padang Mountains, Perak."

Count Salvadori has recently (Ann. Mus. Civic. Genov. (2) v.

p. 600) expressed his non-concurrence in the views of Capt. Wardlaw Ramsay and myself that *Pterythrius cameranoi* of Sumatra is identical with *P. æralatus* of Tickell. The male of *P. cameranoi* is said by him to want the rosy tinge on the flanks which is present in Tenasserim specimens, which are also larger; while the female of *P. cameranoi* differs from that of *P. æralatus* in the grey of the head being less pure, the back more olivaceous, and in the rufous colour of the underparts being brighter and more extended towards the throat. I therefore once more compared our series of these two birds in the British Museum, including the specimens in the Tweeddale Collection. I agree with Count Salvadori that the females are rather different, as described by him, and the female from Perak is grey-headed like the Tenasserim bird; but the male agrees with the Sumatran *P. cameranoi* better than with the true *P. æralatus*. There is a slight difference in the gloss of the head in the males from Tenasserim and Sumatra, the latter having a blue-black gloss, and the Tenasserim birds being rather greenish black on the head. The Sumatran birds have decidedly more pink on the flanks.

Fam. Paridæ.

MELANOCHLORA SULTANEA (Hodgs.).

Melanochlora sultanea, Hume & Davison, Str. F. 1878, p. 378; Oates, *t. c.* p. 129; Hume, Str. F. 1879, p. 65.

"No. 90. ♂ ad. Gunong Batu Putch.

"Irides brown; bill dark grey; feet and legs blue-grey. This 'Sultan Tit' I have seen, as high as 4500 feet, both on the Larut Hills and also on the main mountain-chain."

Fam. Nectariniidæ.

ÆTHOPYGA WRAYI.

Æthopyga wrayi, Sharpe, P. Z. S. 1887, p. 440.

"No. 108. ♀ ad. Gunong Batu Putch (3400 feet).

"Irides black; legs and feet brown; bill black, yellowish at angle."

Not distinguishable from the female of *Æ. sanguinipectus*.

Fam. Dicæidæ.

PRIONOCHILUS IGNICAPILLUS, Eyton.

Prionochilus ignicapillus, Sharpe, Cat. B. Brit. Mus. x. p. 65.

"No. 110. ♂ ad. Gunong Batu Putch (3400 feet).

"Irides brown; bill black above, yellow beneath with dusky tip; legs and feet nearly black."

A young bird, without any of the fine colouring of the adult, being almost entirely olive-green.

Fam. Motacillidæ.

Limonidromus indicus (Gm.).

Limonidromus indicus, Oates, *t. c.* p. 164; Hume, Str. F. 1879, p. 65.

"No. 133. ♀ ad. Larut, Perak Mountains.

"Irides light."

Fam. Eurylæmidæ.

Corydon sumatranus (Raffl.).

Corydon sumatranus, Hume & Davison, *t. c.* p. 97; Oates, *t. c.* p. 430; Hume, Str. F. 1879, p. 50; Salvad. *t. c.* p. 200.

"No. 92. ♀ ad. Gunong Batu Putch (3400 feet).

"Irides light brown; bill above reddish, on ridge lighter, white at tip, beneath pale flesh-colour; bare skin round eye flesh-red; feet and legs black; soles of feet light brown.

"Male has the bill black above, tinted with red. The patch under the neck is also paler than in the female.

"The bird I send from the low country (No. 116) differs in several respects from the hill form, but possibly the differences are not sufficient to separate the two specifically. Iris brown; bill fleshy red."

The differences in plumage noticed by Mr. Wray consist principally in the darker coloration of one of the specimens, but it is not sufficient to separate them.

Fam. Caprimulgidæ.

Lyncornis temmincki, Gould.

Lyncornis temmincki, Hume, Str. F. 1879, p. 48; Salvad. *t. c.* p. 195.

"No. 129. ♂ ad. Batang Padang Mountains, Perak.

"Irides dark brown."

Fam. Cypselidæ.

Macropteryx comatus (Temm.).

Macropteryx comatus, Hume & Davison, Str. F. 1878, p. 51; Salvad. *t. c.* p. 196.

Dendrochelidon comata, Hume, Str. F. 1879, p. 47.

"No. 120. ♂ ♀. Batang Padang Mountains, Perak.

"Irides dark brown. This bird sits on the upper branches of a tall tree and flies off, like a Flycatcher, after insects, returning again to its perch. I have seen it on the hills as high as 1000 feet."

Macropteryx longipennis (Rafin.).

Macropteryx longipennis, Hume & Davison, *t. c.* p. 52.

Dendrochelidon longipennis, Hume, Str. F. 1879, p. 47.

"No. 130. ♂ ad. Larut, Perak Mountains.

"Irides dark brown."

Fam. Picidæ.

Miglyptes tukki (Less.).

Meiglyptes tukki, Oates, *l. c.* vol. ii. p. 61 ; Hume, Str. F. 1879, p. 52 ; Hargitt, Ibis, 1884, p. 193.

"No. 123. ♂ ad. Batang Padang Mountains, Perak.

"Irides brown ; bill black above, pale horny beneath."

Lepocestes pyrrhotis (Hodgs.).

Venilia pyrrhotis, Hume & Davison, Str. F. 1878, p. 142 ; Oates, *t. c.* p. 39.

"No. 99. ♂ ad. Gunong.

"Irides warm light brown ; bill pale yellow ; feet and legs dull blackish brown. Seems to be rare, as I only saw this single specimen."

Lepocestes porphyromelas (Boie).

Lepocestes porphyromelas, Salvad. *t. c.* p. 181.

Venilia porphyromelas, Hume & Davison, *t. c.* p. 143 ; Oates, *t. c.* p. 40 ; Sharpe, P. Z. S. 1887, p. 443.

Blythipicus porphyromelas, Hume, Str. F. 1879, p. 52.

"No. 91. ♂ ad. Gunong Batu Putch (3400 feet).

"Irides red ; bill bright yellow ; feet and legs dark blackish brown."

Gecinus puniceus (Horsf.).

Gecinus puniceus, Hargitt, Ibis, 1888, p. 176.

Chrysophlegma puniceus, Oates, *t. c.* p. 44.

Collolophus puniceus, Hume, Str. F. 1879, p. 52.

"No. 113. ♀ ad. Gunong Batu Putch (3400 feet).

"Irides red-brown ; bill black above, yellow beneath."

Micropternus brachyurus (V.).

Micropternus brachyurus, Oates, *t. c.* p. 58 ; Hume, Str. F. 1879, p. 52 ; Hargitt, Ibis, 1885, p. 10.

"No. 122. ♂ ad. Batang Padang Mountains, Perak.

"Irides dark brown ; bill black."

Sasia abnormis (T.).

Sasia abnormis, Hume, Str. F. 1879, p. 53 ; Hargitt, Ibis, 1881, p. 235.

"No. 126. ♂ ad. Batang Padang Mountains, Perak.

"Irides white, skin round eye fleshy red ; bill above black, beneath yellow ; legs and feet flesh-colour ; claws pale yellow."

Chrysophlegma wrayi, sp. n.

"No. 87. ♀ ad. Gunong Batu Putch (from 3400 to 4000 feet).

"Irides red-brown ; feet and legs ash-colour ; bill black above,

grey beneath and at angle. The irides in one specimen were dark brown. No males were collected."

A very interesting race of *C. flavinucha* of Tenasserim, with a large series of which I have compared it. I showed the specimen to my friend Mr. Hargitt, and we examined it together, so that I have the best possible confirmation of the distinctness of the species. It differs from *C. flavinucha* in having the feathers of the throat pure black, narrowly margined, except at the tip, with white, the black expanding about midway. The bill is black, yellowish at the angle of the lower mandible; the rufous bars on the wings are about equal in width to the black interspaces.

The size is considerably less, and the general coloration is darker, especially on the face, which is deep olive. Total length 10·5 inches, culmen 1·28, wing 5·6, tail 4, tarsus 0·93.

The immature female of *C. flavinucha*, which the Perak bird most resembles, has the feathers of the throat of an olive-black, edged with white, the black contracted about midway. The adult of the same species has the base of the feathers entirely white, the apex only being olive-black.

Fam. Trogonidæ.

Harpactes erythrocephalus (Gould).

Harpactes erythrocephalus, Oates, *t. c* p. 99.
Harpactes hodgsoni, Gould, Hume & Davison, *t. c.* p. 66.

"No. 86. ♂ ♀ ad. Gunong Batu Putch (3400 feet).

"Irides light red; feet pale flesh-colour, with bluish-white bloom; bill cobalt-blue, black on ridge and at points; bare skin round eye purple. The female has the irides light brown, at least in the single specimen I met with. It keeps usually in the undergrowth and lower trees of the forest, and has the same habits as *Harpactes kasumba*."

Compared with Himalayan specimens, and apparently quite identical.

Harpactes oreskius (T.).

Harpactes oreskius, Oates, *t. c.* p. 100.

"No. 114. ♂ ♀ ad. Gunong Batu Putch (3400 feet).

"Irides light brown, the female pale grey; bill black, shading into cobalt-blue at angle; legs and feet ash."

Fam. Capitonidæ.

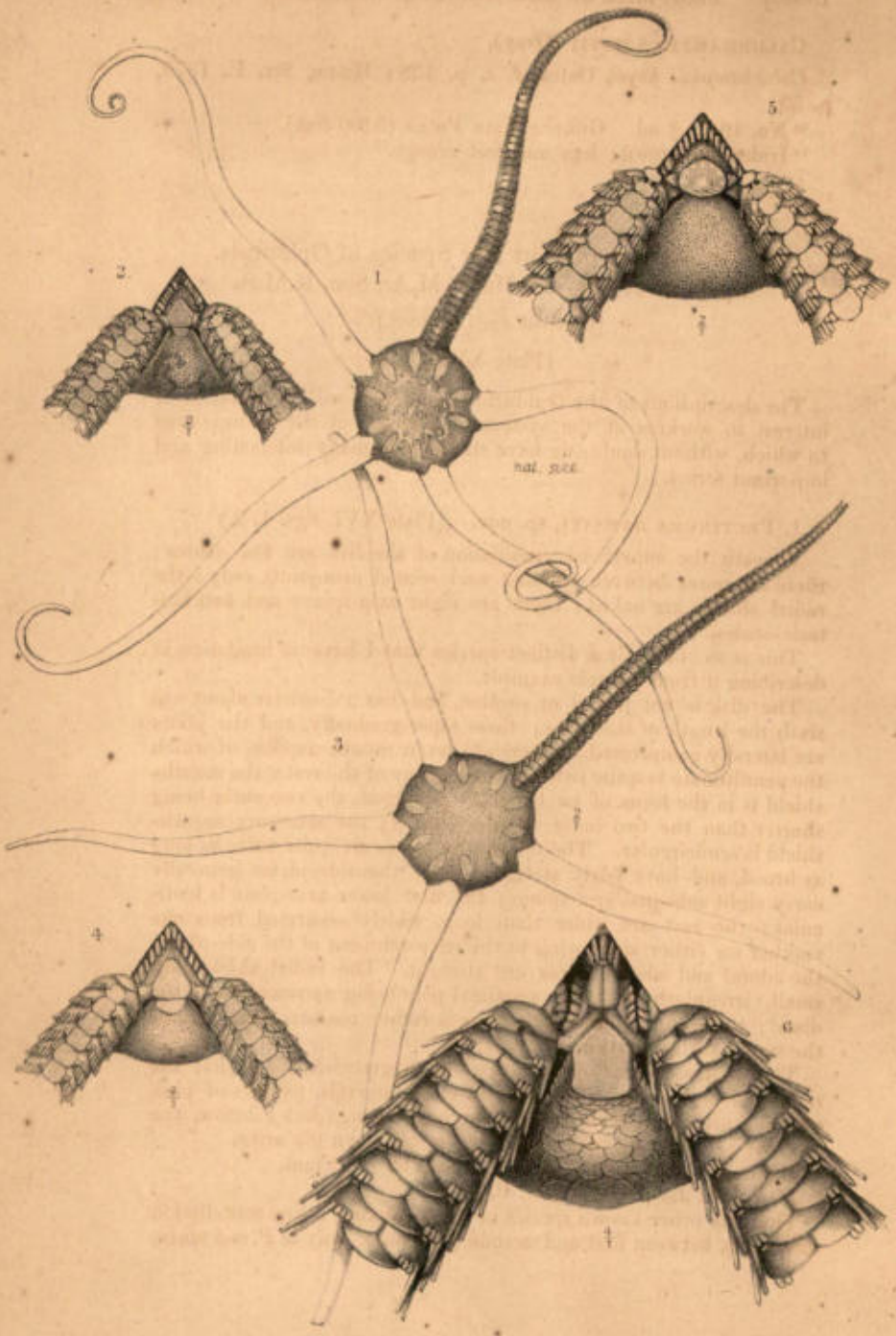
Megalæma versicolor (Raffl.).

Megalæma versicolor, Hume, Str. F. 1879, p. 53.

"No. 119. ♀ ad. Batang Padang Mountains, Perak.

"Irides dark brown, bill black.

"This is a rare bird, which I have only met with on two occasions, both times in heavy jungle."



Benjeman & Highley del. et lith.

NEW OPHIUROIDEA

Mintern Bros. imp.

CALORHAMPHUS HAYII (Gray).

Calorhamphus hayii, Oates, *t. c.* p. 138; Hume, Str. F. 1879, p. 53.

"No. 106. ♂ ad. Gunong Batu Putch (3400 feet).

"Irides red-brown; legs and feet orange."

2. Descriptions of Four new Species of Ophiurids.

By Prof. F. JEFFREY BELL, M.A., Sec. R.M.S.

[Received April 26, 1888.]

(Plate XVI.)

The descriptions of the Ophiurids that follow will, I think, be of interest to workers at the systematic zoology of the group—one to which, without doubt, we have still to add many interesting and important forms.

1. PECTINURA RAMSAYI, sp. nov. (Plate XVI. figs. 1, 2.)

Beneath the superficial granulation of the disk are fine scutes; there are pores between the first and second arm-joints only; the radial shields are naked; there are eight arm-spines and two tentacle-scales.

This is so obviously a distinct species that I have no hesitation in describing it from a single example.

The disk is not puffed or swollen, and has a diameter about one sixth the length of the arms; these taper gradually, and the joints are laterally compressed. There are seven mouth-papillæ, of which the penultimate is quite twice as large as any of the rest; the mouth-shield is in the form of an irregular pentagon, the two outer being shorter than the two inner or adoral sides; the accessory mouth-shield is semicircular. The upper arm-plates are quite twice as long as broad, and have fairly straight sides; the side-plates generally carry eight subequal arm-spines; the first lower arm-plate is lenticular; the rest are wider than long, widely separated from one another on either side owing to the encroachment of the side-plate; the adoral and aboral edges are straight. The radial shields are small, irregularly oval, the proximal pole being narrower than the distal; the granulation on the lower is rather coarser than that on the upper surface of the disk.

The general colour of the specimen is greenish above, but the radial shields are pink, and there are, at intervals, patches of pink on the arms, about every fifth dorsal plate being pink; below, the creature is lighter in colour, with darker bands on the arms.

Diam. of disk 17 mm.; length of arm 68 (ca.) mm.

Hab. Port Jackson; in coll. B.M.

The only other known species in which there is a fine scutellation with pores between first and second arm-joints only is *P. maculata*,

where the arms are proportionately longer, the disk swollen, and the accessory mouth-shield double or triple, and the colour is very different; but it may be of some significance to observe that that species is from the not distant shores of New Zealand.

2. PECTINURA CAPENSIS, sp. nov. (Plate XVI. figs. 3, 4.)

Beneath the superficial granulation of the disk are well-marked, somewhat swollen plates; there are no pores between the arm-joints; the radial shields are naked; there are ordinarily five short arm-spines and two tentacle-scales.

There are two representatives of this well-marked species, but, unfortunately, none of the arms are complete.

The disk does not appear to be puffed or swollen, and its diameter is probably about one fifth the length of the arms; there is a slight ridge to the arms. There are seven or eight mouth-papillæ; the outermost is very small, the penultimate very large; the mouth-shields are triangularly cordiform, the sides faintly notched, the accessory mouth-shields small and sometimes divided.

The upper arm-plates are encroached upon by the side-plates in such a way that their lateral margins are acutely angulated, and the plates are wider in their middle than along either the proximal or distal edge; the side arm-plates are a little swollen and projecting, and ordinarily carry five short spines; the under arm-plates have the distal edge, which is concave adorally, nearly twice as long as the proximal; the sides are excavated by the two tentacle-scales, the inner of which is obscured by lying behind the lowest spine.

The naked radial shields are rather small, irregularly pyriform. There is very little difference between the rather coarse granulation of the upper and lower surfaces of the disk.

The dried specimens are yellowish in colour; darker bands extending over four or five joints of the arm are separated from one another by about five more lightly coloured joints.

Diam. of disk 10 mm.

Hab. Cape of Good Hope; in coll. B.M.

According to the arrangement of Mr. Lyman ('Challenger Report,' p. 14), this new species stands between *Pectinura infernalis*, in which there are nine, and *P. heros*, in which there are three arm-spines.

3. OPHIOPEZA ASSIMILIS, sp. nov. (Plate XVI. fig. 5.)

A species very closely allied to, but apparently distinct from, *O. conjungens*, Bell; thus the arms are not carinated, are more, not less, than four times the diameter of the disk, the granulation of the disk is coarser, the radial arm-shields are less prominent, the mouth-shield is of a somewhat different contour, and the arm-spines are subequal.

I must confess that had this specimen come from Torres Straits instead of Port Jackson, I should have greater hesitation in regarding it as representative of a distinct species—great as the hesitation has been. But the differences between the fauna of Port Jackson and Torres Straits are, as we are now beginning to recognize generally, so considerable that the difference in habitat together with the number of

distinctive characteristics—minute though some of them may appear to be—seem to justify the formation of a new species for this form.

The description is drawn up from a single dried specimen.

Disk distinctly, but not sharply, pentagonal; arms about four and a half times its diameter; they are not carinated at their base, nor, on the other hand, markedly flattened; they taper gradually. Granulation of disk rather coarse, about nine granules to a millimetre; the radial shields not marked by special depressions. Mouth-shields not divided, irregularly lenticular, the more convex edge being adoral; side mouth-shields quite small; the granulation between the mouth-shield and the edge of the jaw is very coarse. Mouth-papillæ seven, the penultimate quite twice the size of its neighbours.

The upper arm-plates have pretty straight edges, and are about twice and a half as long as broad; the under arm-plates are not quite so much encroached upon by the side-plates as in *O. conjungens*, and are rather more regularly hexagonal; an aboral notch frequently found in the allied species is not to be seen in the one now under description. The side arm-plates carry ten subequal spines[1], none of which are as long as the plate that bears them; there are two tentacular scales near the base of the arm and one further out; there are two pores between the first and second arm-plates.

It would be unsafe to form a judgment as to the colour of this species either when alive or as preserved in alcohol; but it is probably paler than *O. conjungens*, and not so much mottled; there are signs of sets of three joints at a distance of from seven to ten joints from one another being darker than the rest; this would give a banded appearance to the arms; the mouth-shields are probably darker than the rest of the oral surface.

Diam. of disk 100 (ca.) mm; length of arms 24 mm.

Hab. Port Jackson; in coll. B.M.

4. Ophioglypha amphitrites, sp. nov. (Plate XVI. fig. 6.)

This species appears to belong to Mr. Lyman's first division of the genus, or those in which the disk is flat and is "covered with imbricated scales. Under arm-plates small, widely separated; much wider than long beyond the second plate, and thereafter constantly diminishing in size. Arm-comb of more or less needle-like papillæ. Arm slightly flattened, with spines about as long as a joint. Tentacle-scales few, beyond the second pair of pores." But it does not appear to be referable to any form yet described.

Arms three to four times the diameter of the disk. Mouth-papillæ five at the outer mouth-angle, separated by a bare space from the five (two on each side, and one larger central one) which lie just below the teeth, and have almost the appearance of teeth-papillæ. Mouth-shield longer than broad, a little constricted in the middle, distal edge rounded, proximal forming an acute angle; side mouth-shields long and narrow, meeting within.

First under arm-plate broader distally than proximally, the second

[1] *O. conjungens* may bear nine or ten arm-spines near the base of the arms.

and succeeding shorter, triangular in shape, with the apex proximal. All the side arm-plates meet their fellows below, the line of suture deep; above the insertion of the spines they appear to form a scale on the side of the arm. Upper arm-plates broader than long, very regularly oblong, though the proximal edge is encroached upon by the scale-like portions of the side arm-plates; a good deal arched near the disk.

Disk bulging a little between the arms, flat, covered with plates of various sizes, among which the five primary and the central are very distinct; a not very regular row of plates extends along the middle of each interbrachial space as far as the edge of the disk. Just below this there is one very large plate. Radial shields rather long, broader without than within, where they are pointed; separated from one another. The scales on the actinal surface diminish in size and increase in numbers from without inwards. Papillæ along edge of genital scale small, numerous, closely set; about twelve may be seen from above, of which the uppermost are smaller than those just beyond them. Arm-spines three or four, of which the uppermost is longest, and longer than an arm-joint. Three tentacle-scales as far as the sixth or seventh arm-joint; a rudimentary third may persist for some further distance; after a time the second scale disappears and only one persists.

Hab. Ecuador; from the Haslar coll. (J. O. Goodridge, Surgeon R.N.). Coloration creamy yellow, in alcohol, after perhaps thirty years' preservation.

Measurements.—Diam. of disk 19; 16 mm. Length of arms 74; 54. Breadth of arms at base 5; 3·5. Length of radial shields 4; 3·3.

EXPLANATION OF PLATE XVI.

Fig. 1. *Pectinura ramsayi*, from above, to show the general form of the body.
2. Mouth-angle of *P. ramsayi*, × 2.
3. *P. capensis*, from above, × 2.
4. Mouth-angle of *P. capensis*, × 4.
5. Mouth-angle of *Ophiopeza assimilis*, × 2.
6. Mouth-angle of *Ophioglypha amphitrites*, × 4.

3. On certain Points in the Visceral Anatony of *Balæniceps rex*, bearing upon its Affinities. By Frank E. Beddard, M.A., Prosector to the Society, Lecturer on Biology at Guy's Hospital.

[Received May 9, 1888.]

I have been able lately, through the kindness of Mr. Charles Stewart, to examine the viscera of a specimen of *Balæniceps rex* preserved in the stores of the College of Surgeons. The specimen was purchased from this Society some 25 years ago; it was one of those brought back by Mr. Petherick in 1860.

So far as I am aware there has been no description of the viscera of

Balæniceps rex; the osteology, however, and some of the more important external characters (*i. e.* the presence of powder-down patches) have been described by Prof. Parker[1] and by Mr. A. D. Bartlett[2] in the publications of this Society. The memoirs of these two naturalists and their views as to the affinities of *Balæniceps* will be further referred to in the course of the present notes.

With regard to the viscera, I am not able to give anything like a complete account; only the alimentary tract with the kidneys and the trachea and bronchi were preserved in the College of Surgeons; an attempt had been made to inject the intestinal arterial system, but the injection had not been successful.

Alimentary Tract.

The *tongue* is short and broad, forming an approximately exact equilateral triangle; the smallness of the tongue has been already noticed by Prof. Parker[3]. The tongue of *Balæniceps*, in fact, agrees with that of *Scopus umbretta*[4].

In the *liver* the right lobe is very much larger than the left; and, as in all Herodiones, there is a gall-bladder present. With regard to the proportions of the lobes of the liver there is not much to say concerning the affinities of the bird. On the whole the Storks are characterized by having an equilobed liver; the Herons (including *Scopus*) are on the whole to be distinguished from the Storks by the fact that the right lobe of the liver is larger than the left. There are, however, numerous exceptions which prevent our defining the Ardeidæ as Herodione in which the right lobe of the liver is larger than the left lobe. It is to be noted that these exceptions appear to be entirely among the Herons. In the Storks the lobes of the liver are invariably subequal, while among the Herons they are rarely so.

There is therefore, in my opinion, some reason to regard the structure of the liver in *Balæniceps* as indicating its Ardeine affinities, and there is no reason against uniting it particularly with *Scopus*.

In the *intestines* I could not discover any traces of cæca at all; I believe that the single cæcum which characterizes the Ardeidæ (there are two in the Ciconiæ) may be extremely minute, and might therefore easily escape recognition in the spirit-preserved alimentary tract[5].

Syrinx.

The most characteristic organ of *Balæniceps* from the point of view of the affinities of the bird is unquestionably the syrinx. This

[1] See P. Z. S. 1860, p. 243; "On the Osteology of *Balæniceps rex*," Trans. Zool. Soc. vol. iv. p. 269.

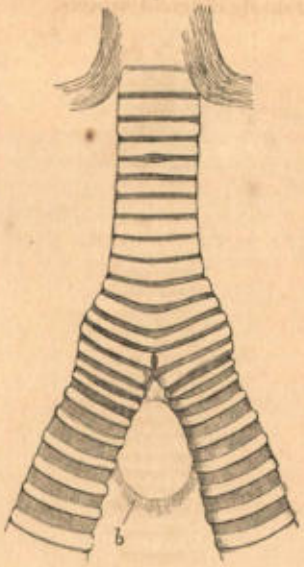
[2] "On the Affinities of *Balæniceps*," P. Z. S. 1861, p. 131 (reprinted in Nitzsch's 'Pterylographie,' Ray Soc. edition, p. 155).

[3] Abstract of Notes on the Osteology of *Balæniceps rex*. P. Z. S. 1860, p. 330 (note ii).

[4] Beddard, "A Contribution to the Anatomy of *Scopus umbretta*," P. Z. S. 1884, p. 543.

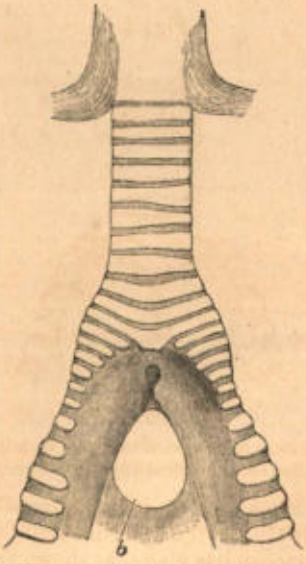
[5] Mr. W. A. Forbes (Collected Papers, p. 333 note) has noted a single cæcum in a specimen mounted in the Museum of the Royal College of Surgeons.

Fig. 1.



Syrinx of *Balæniceps rex*. Front view. *b*, free margin of bronchidesmus.

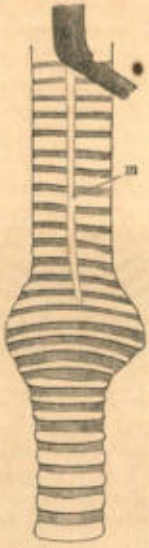
Fig. 2.



Syrinx of *Balæniceps rex*. Posterior surface. *b*, as in fig. 1.

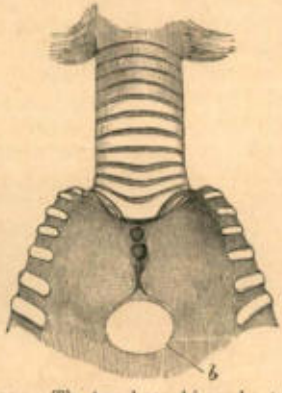
organ is represented in the accompanying drawings (woodcuts, figs. 1, 2, 3, 4), which illustrate its different aspects.

Fig. 3.



Syrinx of *Balæniceps rex*. Lateral view. *m*, ligamentous rudiment of intrinsic syringeal muscle.

Fig. 4.



Syrinx of *Balæniceps rex*. The two bronchi are bent upwards backwards to display the pessulus and membrana tympaniformis. *b*, as in fig. 1.

Before studying the syrinx itself it is interesting to note that the membrane termed by Garrod the bronchidesmus, which binds together the two bronchi, is incomplete above, as shown in figs. 1, 2, 4. This

character recalls the Ardeine syrinx[1]; in the Storks the bronchidesmus appears to be invariably complete—that is to say, it extends right up to the point of bifurcation of the bronchi. The syrinx itself is almost completely Ardeine; the rings are entirely cartilaginous; there appear to be no traces of ossification anywhere; there is a well-marked pessulus (fig. 4); the bronchial rings are only semirings, and there is therefore a well-developed *membrana tympaniformis externa*; the free extremities of each of the bronchial semirings begin to approach each other some little way before the entrance of the bronchi into the lungs, but they do not become whole rings. In all the characters mentioned the syrinx of *Balæniceps* is distinctively Ardeine, and as clearly unlike any Stork. The only true Stork which is at all markedly abnormal in the structure of the syrinx is *Abdimia*[2]; in this genus, and to a much less extent in *Xenorhynchus*, the first bronchial rings are semirings, and there is therefore a *membrana tympaniformis*; but in these two genera the lowermost rings of the trachea are modified in the typically Ciconiine fashion[3].

The only point, in fact, in which the syrinx of *Balæniceps rex* is not thoroughly Ardeine is in the absence of a pair of intrinsic muscles; so far as I am aware, all the Ardeidæ, and also *Scopus*, are characterized by the presence of a single pair of muscles.

A careful examination of the syrinx of *Balæniceps*, however, does, in my opinion, show traces of a syringeal muscle. On each side of the syrinx, and rather nearer to its posterior than to its anterior border, is a delicate ligament (which is shown rather exaggerated in the drawing, fig. 3, p. 287), running from the first bronchial semiring to one of the last tracheal rings. The occasional degeneration of muscles into tendons leads me to think that this fibrous band is really a degraded rudiment of the syringeal muscles.

The facts recorded in the present paper are conclusively in favour of regarding *Balæniceps* as a Heron and not a Stork. It now remains to be seen how far they are in accord with other observations upon the structure of this remarkable bird. The important discovery by Mr. Bartlett[4] of powder-down patches on *Balæniceps* is evidently in favour of the Ardeine as opposed to the Ciconiine affinities of the bird. The value of the evidence must of course be discounted by the very irregular distribution of powder-down patches among birds; but in the present case the evidence is of more weight, because it is associated with other characters, all of which point the same way.

A very detailed study of the osteology of the *Balæniceps* has led Prof. Parker to the opinion that "its nearest relations are the South-American Boatbill (*Cancroma cochlearia*) and the little South-African Umbre (*Scopus umbretta*)."

[1] I have figured the bronchidesmus in the syrinx of *Scopus* (P. Z. S. 1884, p. 544); in *Balæniceps* the anterior (free) margin is further away from the bifurcation of the bronchi than in *Scopus*.

[2] See F. E. Beddard, "On the Trachea in certain Storks," P. Z. S. 1886, p. 321.

[3] Weldon, "On some points in the Anatomy of *Phœnicopterus* and its allies," P. Z. S. 1883, p. 639.

[4] *Loc. cit.*

In a postscript added to his paper Prof. Parker again dwells upon the Ardeine affinities of *Balæniceps*, quoting the discovery of powder-down patches by Mr. Bartlett.

Prof. Reinhardt [1], while admitting that *Balæniceps* comes nearer to *Cancroma* than to the Pelicans (to which group it was referred by Mr. Gould), is disposed to think that the resemblances in the beak to the former bird are merely superficial, and that as the middle claw is not pectinated *Balæniceps* cannot be referred to the Herons. Prof. Reinhardt would associate *Balæniceps* particularly with *Scopus*.

After reviewing the general structural characters of the birds in question, I cannot agree with Prof. Reinhardt's conclusion any more than could Mr. Bartlett.

Balæniceps agrees with *Scopus* in many osteological characters, through apparently not more closely than it agrees with *Cancroma* &c. The syrinx also is somewhat like that of *Scopus*, but differs in certain particulars, such as the absence of the syringeal muscles. The syrinx of *Balæniceps*, however, agrees equally with other Ardeidæ in all these particulars.

Balæniceps differs from *Scopus* in having powder-down patches, and only one cæcum to the intestine.

The differences seem to me to be more striking than the resemblances. I should regard *Balæniceps*, in fact, as a rather aberrant Heron, having no near affinities to the Storks nor to *Scopus*. The following diagram expresses the conclusion with respect to the mutual affinities of the Herodiones to which our present knowledge of the structure of the group appears to me to point :—

Fig. 4.

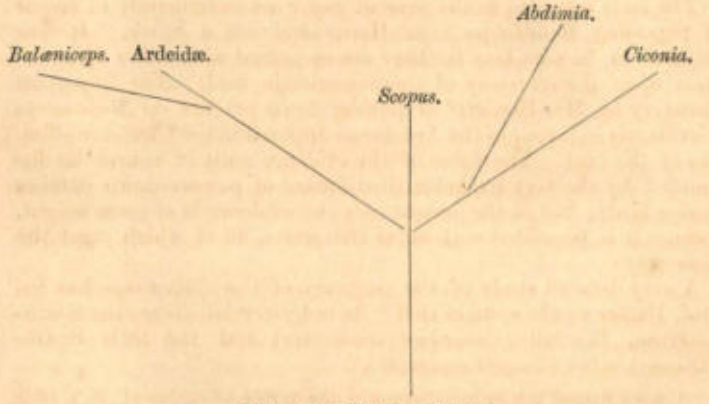


Diagram of the Herodiones.

Scopus, which combines in so many ways the structural characteristics of Herons and Storks, probably comes near to the ancestral form of both groups.

[1] "On the Affinities of *Balæniceps*," P. Z. S. 1860, p. 377.

The Ciconiine stem gave off *Abdimia* before the Ciconiine characters were fully acquired. *Balæniceps* appears to me to be a further specialization of the Ardeidæ, and not to stand nearer to the form which gave rise to the Ardeidæ. I believe this because *Balæniceps* is decidedly a Heron in respect of its alimentary tract, powder-down patches, and syrinx; the loss of the syringeal muscles is a further specialization, and evidently a recent one (from the fact of their degenerate equivalent being present). The form of the syrinx in the Herodiones was originally that which is now seen in *Scopus* and the Ardeidæ; that this is so, seems to be shown by the fact that the Ardeine form of syrinx is found in so many other groups of birds, while the Ciconiine form is peculiar to the Ciconiæ. In *Abdimia* (and to a less extent in *Xenorhynchus*) the syrinx has not quite acquired the typical Ciconiine form—the *membrana tympaniformis* is, to a considerable extent, left; that is to say, the bronchial semirings have not yet united to obliterate the *membrana tympaniformis*, as is the case with the typical Storks. For this reason I regard *Abdimia* as having branched off from the main stem a little before the development of the typical Storks.

4. Description of a Gigantic new Species of *Aspergillum* from Japan. By G. B. Sowerby, F.Z.S., F.L.S.

[Received May 3, 1888.]

Aspergillum giganteum, n. sp.

Asp. *testa valvis magnis, subtrapezoideis, concentrice rugosis irregulariter striatis; antice paulum attenuatis, rotundatis; postice latioribus oblique truncatis. Vagina maxima, elongata, solidiuscula, subrecta, calculos et arenulas agglutinante; limbo conspicue irregulariter 6–7-fariam foliato; disco irregulariter convexo, calculos et conchas agglutinante, tubulis numerosis parviusculis rotundatis armato.*

Hab. Japonia.

A species of extraordinary magnitude, the specimen being over 13 inches (32½ centim.) in length and about 1½ inches (4 centim.) in diameter, in the widest part. The sheath is of the form of *A. vaginiferum*; but the valves are much larger in proportion and of quite a different form, which, apart from the unusual dimensions, would be sufficient to constitute it a distinct species. The valves are 25 millim. long and 15 broad.

A second specimen (somewhat smaller, but in better condition) of this species is in the Museum of the Zoological Society ("Natura Artis Magistra") of Amsterdam, placed there by Mr. Oltmans, the late Curator, with the name of *Aspergillum japonicum*, confirming the locality. So far as is at present known, *Aspergillum vaginiferum* inhabits exclusively the Red Sea.

June 5, 1888.

Prof. Flower, C.B., LL.D., F.R.S., President, in the Chair.

The registered additions to the Society's Menagerie during the month of May were 144 in number. Of these 55 were acquired by presentation, 37 by purchase, 2 by exchange, 30 on deposit, and 20 by birth. The total number of departures during the same period, by death and removals, was 113.

Mr. H. E. Dresser exhibited an example of a new species of Shrike from the Transcaspian district, and made the following remarks:—

"Dr. Gustaf Radde has lately sent to me for examination and comparison a small but interesting collection of birds made by him during his late trip in the Transcaspian district; and amongst other rarities I find a Shrike which is certainly new, and which I propose to name *Lanius raddei*, after its discoverer. It belongs to the group of small Shrikes which have been separated by Bonaparte under the generic title of *Otomela*, but differs from all of them in approaching *Lanius excubitor* and its allies in general tone of colour. General colour above bluish grey, much lighter and clearer on the crown and forehead, the lower portion of the mantle washed with pale brownish buff; wings dull blackish, the secondaries narrowly margined with dull white; alar patch very small; central tail-feathers black, the outermost rectrix on each side white, but with a black line along the shaft which broadens considerably towards the tip, the next two with much more black towards the tip; a narrow line over the forehead and a broad streak extending through the eye and over the ear-coverts deep black, bordered above with white; chin, throat, and entire underparts, with the under wing-coverts, pure white; bill and feet black. Total length about 6·75 inches, culmen 0·6, wing 3·55, tail 3·2, tarsus 0·9.

"Although differing so much in coloration from *Lanius vittatus*, for it lacks the broad black frontal band, the maroon on the mantle, and the rufous flanks, yet in many respects *L. raddei* approaches nearest to that species, of which it may be called a pale grey form. The specimen in question was obtained at Kulkulais, on the 24th August, 1886 (old style), and is a male, and apparently an old one."

Mr. Sclater, on the part of Mr. F. M. Campbell, F.Z.S., exhibited a pair of Pallas's Sand-Grouse (*Syrrhaptes paradoxus*), shot at Gepps Farm, between Hoddesden and Hertford, at 6 P.M. on May 20th, 1888, and made remarks on the numerous recent occurrences of this species in Western Europe. Mr. Sclater also stated that a living specimen of this bird had just been received by the Society, presented by H. Hewat Crane, Esq., of West Foulden, Berwick-on-Tweed, having been captured at that place on May 28th.

The Secretary exhibited, on behalf of Prof. R. Collett, C.M.Z.S.,

a nest, eggs, and two young ones in down of the Ivory Gull (*Larus eburnea*), belonging to the Tromsö Museum. These specimens had been obtained in August, 1887, by Capt. J. Harrison, on a small island lying about sixteen miles to the east of Cape Smith, in Spitzbergen.

The following papers were read :—

1. On Lepidoptera collected by Major Yerbury in Western India in 1886 and 1887. By W. Warren, M.A., F.E.S.

[Received May 8, 1888.]

The insects which form the subject-matter of this paper were collected by Major Yerbury in the summer of 1886 and the following spring, through pretty nearly the same range of localities as those previously forwarded by him, and treated of by Mr. A. G. Butler in the 'Proceedings' of this Society for 1886, pp. 355–395. For the account of these localities it will be sufficient to refer to that paper. Both collections are in the possession of the British Museum. The present one contains 544 specimens, distributed among 206 species (not reckoning about 12 which from their condition are beyond positive identification or description). Of these about 50, so far as I have been able to ascertain, are either new or undescribed, while 3 require to be placed in genera by themselves. Several, as was to be expected, are the same as those of the previous consignment.

I must not forget to record my indebtedness to Mr. A. G. Butler and Mr. W. F. Kirby for useful suggestions and kind assistance rendered in various ways.

By way of preface, in some sort, to the reading of the accompanying paper, I wish to draw attention to one or two points in which I have felt myself honestly compelled to differ from authorities of far greater experience, *in general*, than I can lay claim to, and thereby to acquit myself of any intention to depreciate their labours.

There would seem to have arisen a tendency to exaggerate slight external modifications, due to varying conditions of place and development, into specific differences, and that, too, often from the examination of a very limited number of examples. Now as "in the multitude of counsellors there is safety," so, from the consideration of a larger number of examples, from different localities, subject to different conditions, I think we shall arrive at the conclusion that the number of species is not infinite.

(i.) In the necessity of reducing *Leucania bistrigata*, Moore, and *Leucania penicillata*, Moore, to synonyms of *Leucania l-album*, I am glad to say that Mr. Butler himself coincides.

(ii.) *Amyna stricta*, Walker, I regard as of general distribution throughout the tropical zone, and look forward confidently to the time when a larger number of examples of the so-called species, *A. undulifera*, Butler, *A. stellata*, Butler, and *A. stigmatula*, Snellen, will prove them to be merely local forms. In this opinion, however, Mr. Butler, naturally enough, does not yet agree. Nor, in making

Scotomera tristis, Butler, a synonym of *Actenia gnidusalis*, Walker, do I intend to cast the slightest slur on Mr. Butler's acumen. The specimens he had to describe were in so poor a condition that the only wonder is that he was able to describe them at all.

I wish also to draw attention to two species in particular, both occurring in the collection, each of which varies in precisely the same respect from its nearest allies, viz. *Oxira ochracea*, Walker, and *Euplexia* (?) *pectinata*, sp. n. Both these species have the antennæ of the male strongly pectinated. In all other respects, alike in markings and in structure, they agree, the former with the group of *Graphiphora*, of which *G. dahlii* of Europe is the type, the latter with *Euplexia albovittata*, Moore. The question at once arises, whether this structural exaggeration of a single organ (which obtains, it would seem, more especially in the equatorial regions) is sufficient, if unattended by any further departure from the type, to warrant the erection of a separate genus; or is not rather to be regarded as an instance of what may be termed "specific aberration from a generic type."

Family Sphingidæ.

1. Nephele hespera. (No. 39.)

Sphinx hespera, F. S. E. p. 546.
Sphinx morpheus, Cram. Pap. Exot. ii. p. 84, pl. 149. fig. D.

One female from Campbellpore, June 8, 1886, with the two central white spots strongly marked.

2. Protoparce orientalis. (No. 4.)

Protoparce orientalis, Butler, Trans. Zool. Soc. 1877, p. 609, pl. 91. figs. 16, 17.

One specimen of each sex from Campbellpore, dated June and July, 1886, with the remark added, "Common, both dark and light forms," that is both sexes.

3. Acherontia styx. (No. 73.)

Acherontia styx, Westw. Cab. Or. Ent. p. 88, pl. 42. fig. 3.

A single male from Campbellpore, June 20, 1886. "The only specimen taken."

4. Hippotion celerio. (No. 5.)

Hippotion celerio, Hb. Verz. p. 135.
Sphinx celerio, L. S. N. i. 2, p. 800.

One male from Campbellpore, July 29, 1886, with the remark "Common: larva on vine."

5. Deilephila livornica. (Nos. 5 & 6.)

Sphinx livornica, Esper, Ausl. Schm. ii. pp. 87, 176, pl. 8. fig. 4.

Two specimens—one, a female, taken July 29, 1886; the other a male, May 31, at Campbellpore.

The male is a dwarf, barely more than half the size of the female, and smaller than any example in the Brit. Mus. collection.

6. HEMARIS SAUNDERSII. (No. 77.)

Sesia saundersii, Wlk. Cat. Lep. Het. B. M. viii. p. 83.
Macroglossa saundersii, Boisd. MSS.

One female, taken May 3, 1887, at Thundiani.

The specimen was numbered the same as the next following species, *Cephonodes hylas*, from which it is distinguished by the broader dark border of the fore wing, and the green scaling of the same wing reaching as far as the median vein.

7. CEPHONODES HYLAS. (No. 77.)

Sphinx hylas, L. Mant. i. p. 539.

Two specimens, both females, from Campbellpore and Hassan Abdal, June and July, 1886. "Rare."

Family AGARISTIDÆ.

8. ÆGOCERA VENULIA. (No. 47.)

Phalæna venulia, Cram. Pap. Exot. ii. pl. 16. fig. D.

One female, May 21, and one male, July 19, 1886, from Campbellpore. "A few in May."

Family ZYGÆNIDÆ.

9. SYNTOMIS MINOR, sp. n. (No. 177.)

Two males and two females from Kala Pani, taken August 30, and September 1, 1886. The specimens are all more or less damaged as to the head, palpi, and antennæ. They belong to the group which has the abdomen marked with two yellow rings, and come nearest to *S. georgina*, Butler, but are much smaller, none of the four exceeding ¾ of an inch.

Purplish brown: fore wing with five whitish hyaline spots:—1, small, near the base; 2, small, at the end of the cell; 3, large, of varying shape, below 2; 4, small, subcostal, halfway between 2 and the apex; 5, large, and always geminated, *obliquely* below 4, and *nearer the hind margin* than in the allied species, so that the distance between 3 and 5 is greater.

Hind wing with one, largish, basal, and another, smaller, hyaline spot beyond it. As far as can be made out from the condition of the insects, none of the four ever had a yellow collar, but the face and two abdominal bands are distinctly yellow.

In the Brit. Mus. collection there is a single unnamed specimen, also damaged, from Abyssinia, which accords well, both in size and disposition of the spots, with these four from India.

"Common between Kala Pani and Abbotabad."

10. ZYGÆNA CASCHMIRENSIS. (No. 46.)

Zygæna caschmirensis, Kollar, Kasch. iv. p. 459, pl. 19. fig. 6.

Five specimens, three females and two males, from Thundiani and

Chittar, caught in July and September 1886, and marked "very common."

The crimson abdominal band occupies two segments in the female, and three in the male, leaving the last segment only in the latter, but the last two in the former, dark.

Family Chalcosiidæ.

11. Agalope basalis. (No. 89.)

Agalope basalis, Wlk. Cat. Lep. Het. B. M. ii. p. 438.

Three examples from Thundiani, two females taken in August, the male in October 1886. "Common at Thundiani and Murree, August and September."

12. Soritia pulchella. (No. 186.)

Chalcosia pulchella, Kollar, Kaschmir, iv. p. 461.
Eterusia pulchella, ♀, Wlk. Cat. Lep. Het. B. M. ii. p. 431.
Eterusia trilituratа, ♂, Wlk. Cat. Lep. Het. B. M. xxxi. p. 119.

One female from Thundiani, September 15, 1886.

The specimens in the Brit. Mus. collection are from Nepaul and Mussourie. Major Yerbury notes that only two specimens were taken; but that it was reported to be common at Nandar in September, though he himself did not see any.

Family Lithosiidæ.

13. Lacides ficus. (No. 101.)

Noctua ficus, F. E. S. iii. p. 27.

One male, in good condition, Campbellpore, July 30, 1886.

14. Digama hearseyana. (No. 61.)

Digama hearseyana, Moore, Cat. Lep. E. I. C. ii. p. 298, pl. 7.

Three females and two males from Campbellpore and Khairabad, all taken between the end of May and middle of June.

15. Pentacitrotus vulneratus. (No. 206.)

Pentacitrotus vulneratus, Butler, Ill. Lep. Het. v. p. 35, pl. 86. fig. 5.

One female from Thundiani, taken October 10, 1886. Two specimens only were seen.

This new genus, containing the single species here named, is placed in the Brit. Mus. collection by Mr. Butler between *Padenia*, Moore, and *Tigrioides*, Wlk. The species itself is there represented by a single example, a male, from Darjiling, of which the ground-colour is coppery-orange. The markings consist of two quadrate black blotches standing on the inner margin, embracing between them a perfect arch of the ground-colour: from the top inner angle of the first and from the top outer angle of the second proceed two narrower black arms; the first joins a costal blotch towards the base; the second is abbreviated and rounded off before reaching the apex. In the middle of the costa is another quadrate black marking, united

by two narrower arms to those on the inner margin, and capping the arch of ground-colour before mentioned; the last quarter of the costa is narrowly black, which shade is continued round into the hind margin; the apical fringes are whitish; a narrow black line runs from the base along the inner margin to the first quadrate spot; all the black markings are finely edged with lustrous coppery scales. Hind wing with a broad black border and coppery fringes.

The specimen in Major Yerbury's consignment from Thundiani is also single, but a female, and though differing considerably, as will be seen, from the male above described, is almost certainly the female of the same species. The ground-colour, especially of the hind wing, is paler, more orange; the first quadrate spot on the inner margin is present, but with both edges curved, not perpendicular; united also, as in the male, with the two black costal spots; the second quadrate spot on the inner margin is reduced to a flat rectangle, while the narrow arm, which should connect it with the middle costal blotch, is replaced, in the left wing, by a nearly confluent black spot, and, in the right, by a round isolated one; while in both wings the outer process towards the apex is represented only by a small round spot. The black apical margin, and the black basal streak along the inner margin are both present. Hind wing bright orange, having, in place of the broad black border of the male, two large separate round black spots, one at the apex, the other on the hind margin, and an elongated black mark along the inner margin from the base.

In both sexes the abdominal segments are ringed *above* with orange-yellow, but with white on the sides and underneath. The single female is considerably larger than the male, but this difference in size, as well as that in the constitution of the marginal band in the hind wing, is observable in several allied insects; as, for example, in *Nepita conferta*, Wlk., from Ceylon, and *Nepita anila*, Moore, from Bengal. In *Eubaphe brevicornis*, Wlk., *E. guniaria*, Grote, and in two other unnamed species of the same genus from N. America, of which only a female example in each case is represented in the Brit. Mus. collection, this breaking up of the band of the hind wing still more closely approaches that which occurs in *P. vulneratus*.

Family Arctiidæ.

16. Spilosoma sangaica. (No. 7.)

Spilosoma sangaica, Wlk. Cat. Lep. Het. B. M. xxxi. p. 294.

A single female from Murree, dated 13th August, 1885, in very bad condition, having been apparently under water, is, as far as can be made out, identical with, or closely related to, this species.

Walker's types are from Shanghai.

Family Liparidæ.

17. Charnidas aurantiaca, sp. n.

One male from Attock, April 16, 1887.

Fore wing unicolorous dull brown, with a darker spot at the end of

the cell; cilia dull orange. Hind wings dull fuscous orange, with the cilia rather brighter: abdomen coloured like the hind wing; thorax apparently concolorous with the fore wings. Expanse of wings 30 mm. The species bears a superficial resemblance to *Orgyia simplex*.

18. PORTHESIA XANTHORRHŒA. (No. 1.)

Liparis xanthorrhœa, Kollar, Kaschmir, p. 470.

One female and three males from Campbellpore and Khairabad, taken in April, May, and June, and a male from Abbotabad, taken as late as October, 1886.

The specimens in the Brit. Mus. collection are from the Punjaub, Ceylon, and the Kangra district.

19. THYRGORINA SPILOSOMATA. (No. 214.)

Thyrgorina spilosomata, Wlk. Cat. Lep. Het. B. M. xxxi. p. 318.

One female, Dumtanar, near Abbotabad, September 29, 1886.

20. ARTAXA PUSILLA. (No. 14.)

Artaxa pusilla, Moore, Ceylon, ii. p. 86, pl. 112. fig. 4, ♂.
Euproctis pygmæa, Moore, Desc. Lep. Coll. Atkinson, p. 48.

Three specimens, a female and two males, taken at the end of May and beginning of June 1886, at Campbellpore.

21. ARTAXA FRATERNA. (No. 211.)

Artaxa fraterna, Moore, Ceylon, ii. p. 85.
Artaxa guttata, var. δ, Wlk. Cat. Lep. Het. B. M. iv. p. 795.
Artaxa guttata, var. β, male only, Wlk. *ibidem*.

One male from Hurripur, Oct. 13, 1886. "At sugar; the only specimen."

Walker, in his description of *A. guttata*, iv. p. 795, confounds three species; in vol. xxxii. p. 329, he sinks his *A. guttata* as a synonym of *A. digramma*, Boisd., but fails apparently to see that under his varieties two other species are denoted. His description of the type form of *A. guttata* assigns two black subapical dots only to the male, none to the female; his var. γ of the male also has no spots. It follows that his typical male alone was *digramma*, Boisd., his typical female and male var. γ being one of the spotless species; while his var. δ ♂ ♀ and his var. β ♂ are evidently the species which Mr. Moore has now named *A. fraterna*.

22. CHILENA SIMILIS.

Chilena similis, Wlk. Cat. Lep. Het. B. M. v. p. 1071.
Lasiocampa strigula, Wlk. Cat. Lep. Het. B. M. xxxii. p. 563.

A single female, in beautiful condition, but without date or locality.

Walker describes the male as being sometimes whitish, at others brown; but it seems that really the females only are white, the males being pinkish brown. (*Cf.* also Moore, Ceylon, iii. p. 543, pl. 212. fig. 5 ♂.)

23. Lymantria superans.

Lymantria superans, Wlk. Cat. Lep. Het. B. M. iv. p. 876.

One female only from Dumtanar, near Abbotabad.
Also recorded from Darjiling and Sikkim.

24. Diphthera pallida. (No. 170.)

Diphthera pallida, Moore, P. Z. S. 1867, p. 46, pl. vi. fig. 6.

One female, from Thundiani, Aug. 24, 1886. "Two specimens only, at sugar."

Family Lasiocampidæ.

25. Trabala vishnu. (No. 192.)

Gastropacha vishnu, Lefebvre, Zool. Journ. iii. p. 207, ♀.

One fine male taken in the Berham Gully, September 25, 1886.
"A few cocoons found towards Kala Pani early in September; a pair *in coitu* at Berham Gully, September 25. Not common at Thundiani, but at Murree 18 cocoons were found in one day; these are covered with the short hairs of the caterpillar, which irritate the skin considerably."

26. Taragama venustum. (No. 26.)

Megasoma venustum, Wlk. Cat. Lep. Het. B. M. vi. p. 1449.

One female taken May 31, 1886, at Campbellpore.
Also recorded from Ceylon and the Philippine Islands.

Family Uraniidæ.

27. Actias selene. (No. 226.)

Actias selene, Leach, Zool. Misc. pl. 70.

One female from Dumtanar, which emerged on the last day of March 1887 from a cocoon found on the 11th of the preceding October.

Family Drepanulidæ.

28. Oreta obtusa. (No. 178.)

Oreta obtusa, Wlk. Cat. Lep. Het. B. M. v. p. 1167.

A single much-worn female from Kala Pani, taken on the 1st of September 1886, much smaller than average-sized specimens.

29. Somatina anthophilata. (No. 215.)

Somatina anthophilata, Gn. Phal. ii. 907, pl. 18. fig. 2.

Two females, very much worn, from Campbellpore and Dumtanar, September 24 and November 10, 1886.

30. Problepsis cinerea. (No. 9.)

Argyris cinerea, Butler, P. Z. S. 1886, p. 387, pl. xxxv. fig. 3.

One male, caught 6th of June, 1886, at Campbellpore.
Mr. Butler's type, in the Brit. Mus. collection, is also from Campbellpore.

Family Psychidæ.

31. Psyche longicauda, sp. n. (No. 223.)

Wings dull fuscous; the costa of the fore wing more thickly scaled, and so appearing darker; the rest of the wings semidiaphanous. Thorax and abdomen clothed with long shaggy fuscous hair; the latter ending in a prolonged tuft of smoky-black hairs; antennæ of the same smoky-black hue. Expanse 30 millim.

One male, bred November 8, 1886, from Campbellpore, accompanied with the remark "that the larva makes a faggot of straws." These cases are an inch and half long; the inner part composed of grey silk into which apparently the empty seed-cases of a grass have been spun; this is covered externally with small lengths of shining yellow flower-stems of the grass; those at the base closely packed and shorter, about ½ inch long; those on the sides longer and projecting beyond the apex.

Family Notodontidæ.

32. Moma champa. (No. 156.)

Moma champa, Moore, P. Z. S. 1879, p. 483, pl. 33. fig. 2.

A pair from Thundiani, taken in August 1886.

Recorded also from the Cameroons and the Congo. Mr. Moore's types were from the N.W. Himalayas.

Family Cymatophoridæ.

33. Thyatira cognata. (No. 104.)

Thyatira cognata, Moore, MS.

One female from Kala Pani, dated August 9, 1886, somewhat wasted.

Allied to *T. vicina*, Gn., from Java, but the fore wing has only four peach-coloured patches, that on the inner margin being filled up with the fuscous-olive ground-colour, and only visible in outline. As in *vicina*, the basal blotch is prominently produced in the centre, but the two subapical blotches are *not* confluent.

A comparison of a more extensive series of specimens of this form, in the Hocking Collection in the British Museum, in which there occurs considerable variation in the distinctness of the blotch on the inner margin, has led Mr. Butler to consider this a mere variety of *T. batis*, and not a distinct species. In this he is, I have no doubt, right; but it must still be considered a merely local form, and not a variety of general occurrence.

34. Polyploca albidisca, Moore, MS.

Fore wing greyish white, with a greenish tinge; extreme base blackish, with a tuft of raised white scales; followed by a pale grey sinuous band, indistinctly traversed by a darker central line; then a dark-edged darker sinuous fascia, also traversed by an indistinctly darker line; the external angle of this fascia below the costa is marked by a short vertical black dash of raised scales, representing

the orbicular stigma, followed by a similar, but longer, black dash, slightly inclined to the former, representing the reniform stigma; each of these black dashes is also edged with pale erect scales; beyond the second dash are two or three angulated, and one sinuous dark line, following an indistinct central pale fascia, which is whitish on the inner margin; midway between the sinuous dark line and the hind margin is a pale denticulated submarginal line, preceded by an irregular dark grey fascia. Extreme hind margin with a series of black lunules; a straight black dash from the apex to the submarginal line. Hind wing dull grey; head and thorax mottled light and dark grey; cilia grey, with a darker line along their centre and apex, and a dark dash at the end of each nervure.

Expanse of wings 34 millim.

One female from the Berham Gully, September 1886.

Although the markings are so different, I think it not improbable that a longer series of the species will show that this insect, and another, which I describe as *P. dubia*, are one and the same.

There is one example, also a female, in the Hocking Collection.

35. Polyploca dubia, sp. n. (No. 216.)

Fore wing grey, with a greenish tinge; base silvery grey, edged by a black line running obliquely from near the base of the costa halfway across the wing; an indistinctly darker central fascia is edged internally by an angulated dark line, and externally by a sinuous dark one, which approach each other on the inner margin, and traversed by a central dark line which touches the orbicular stigma; this is obliquely placed, edged with darker, and contains raised scales, the reniform stigma is represented by a long curved black line of raised scales; apical area paler grey, traversed by an indistinct pale submarginal line, preceded by a darker fascia. An oblique *curved* black dash from the apex; hind margin with a row of black lunules. Hind wing dull fuscous.

Expanse of wings 34 millim.

One female from Handar, September 1886; "the only specimen."

36. Asphalia cinerea, sp. n. (No. 185.)

Fore wing dull grey, with slight pink tinge; rather sparsely scaled; two or three short black dashes from the base. Before and beyond the middle a double black transverse line; the former forms on the median vein an angle pointing towards the base of the wing; the latter an angle pointing outwards; the part above the angle forming a single curve, concave outwards; that below the angle a double curve; an indistinct pale submarginal line; the veins varied with black and white. Hind wings pale dull grey with rounded margin. Head, thorax, and abdomen all dull grey.

Expanse of wings 40 millim.

Four females and one male from Thundiani, August, September, and October 1886.

An inconspicuous-looking insect; but the specimens are none in fine condition. "Fairly common, at light and sugar."

Family Bryophilidæ.

37. Bryophila nigrivittata, sp. n. (No. 68.)

Fore wing chalk-white, dusted with pinkish grey towards the hind margin; a broad velvety-black central fascia, narrowed towards the inner margin, the inner edge of which is slightly concave, the outer sinuous, forming in the centre a decided projection; a small black spot before the anal angle. Hind wing whitish, with a grey suffusion and with the darker outline of a band like that on the fore wing just perceptible. Head, face, thorax, and abdomen white; palpi black. Legs white, tarsi black with white joints. Underside whitish, darker in the fore wing.

Expanse of wings 22–24 millim.

A pair from Campbellpore, taken in May and June 1886.

Family Leucaniidæ.

38. Leucania unipuncta. (No. 53.)

Leucania unipuncta, Haw, Lép. Brit. p. 174.
Leucania extranea, Gn. Noct. i. p. 77.

Two specimens, one female, one male, from Campbellpore; the latter taken in May, the former in August 1886.

39. Leucania loreyi. (No. 59.)

Leucania loreyi, Dup. iv. p. 81, pl. 105. fig. 7.

Three specimens of this widely distributed species from Campbellpore, May and June 1886.

40. Leucania l-album. (No. 148.)

Phalæna-Noctua l-album, Gmel. S. N. i. 5. p. 2540. 154.
Leucania bistrigata, Moore, P. Z. S. 1881, p. 334, pl. 37. fig. 18.
Leucania penicillata, Moore, P. Z. S. 1881, p. 335.

One female and two males from Thundiani, August and September 1886. "Uncommon; a few specimens only at sugar."

I cannot find sufficient grounds for considering Mr. Moore's *bistrigata* and *penicillata* to be distinct species. On the underside of the hind wings the band is more continuous and distinct.

Family Xylophasiidæ?

41. Rhizogramma inextricata. (No. 141.)

Rhizogramma inextricata, Moore, P. Z. S. 1881, p. 342.

Three females and two males from Thundiani, all taken in August, and a single female from Dumtanar, in October 1886. "Common at sugar in August; found off and on till October."

Also from Dalhousie, N.W. Himalayas, Solun in the Punjaub, and the Neilgherries.

From additional knowledge gained since working through the collection, I find myself compelled to make the following alteration. Relying on Mr. Moore's authority, I made *R. inextricata*, as well as

R. indica, to belong to the genus *Rhizogramma*; whereas, in fact, if we examine the palpi, *R. inextricata* is very widely separated from *R. indica*. It comes, indeed, very much nearer *Amphipyra*. Mr. Butler thinks it will form the type of a distinct genus of the *Cucullidæ*.

42. Rhizogramma indica. (No. 131.)

Xylophasia indica, Wlk. Cat. Lep. Het. B. M. xxxii. p. 647.

One female, taken "at sallow-bloom," Thundiani, May 2, 1887.

The fact of a female being taken at sallow-bloom in spring would rather betoken relationship to the *Xylinidæ* than to the *Xylophasiidæ*.

The specimen is accompanied by the remark "one of the commonest moths at sugar." In all probability this remark refers to *R. inextricata*.

Family Apameidæ.

43. Mamestra brassicæ. (Nos. 134 & 168.)

Phalæna-Noctua brassica, L. S. N. i. p. 576.

Two females, four males, from Thundiani, August and October 1886.

44. Mamestra stoliczkæ. (No. 168.)

Mamestra stoliczkæ, Feld. Reis. Nov. pl. 109. fig. 32; Moore, P. Z. S. 1881, p. 347.

Four specimens, all males, from Thundiani, August and September 1886.

Mr. Moore says it is nearest to *serratilinea* (!), and quotes as other localities, Dalhousie, N.W. Himalayas, and the Sind valley, Kaschmir.

45. Mamestra nigerrima, sp. n. (No. 113.)

Fore wings deep blackish brown, with all the markings very obscure; the margins of the orbicular and claviform stigmata just visibly darker, the latter also sometimes filled up with black; the reniform stigma contains two minute white dots at its lower end, and one ochreous one at its upper end; a faint pale submarginal line, and three or four pale costal dots before the apex. Hind wings dark fuscous, slightly paler in the male; head, face, and thorax black-brown, as are the tips of the abdominal tufts; the abdomen itself fuscous. Underside dull ochreous, speckled with dark grey; the fore wing has a pale straw-coloured or ochreous patch near the base of the inner margin; both wings with a narrow, curved, darker band; hind wing with a central spot besides.

Expanse of wings 48–50 millim.

Two females and four males, August 1886, from Thundiani.

Allied to *M. chalybeata*, Moore, but much blacker; also resembling *M. dolorosa*, Wlk., but the white dots are confined to the costa.

Family Caradrinidæ.

46. Caradrina sabulosa. (No. 8.)

Caradrina sabulosa, Swinhoe, P. Z. S. 1864, p. 516, pl. 47. fig. 6.

Four females and one male from Campbellpore, May, June, and July 1886.

First taken at Kurrachee, May 1879, and described by Col. Swinhoe.

47. Caradrina externa.

Orthosia externa, Wlk. Cat. Lep. Het. B. M. xxxiii. p. 715.

Fore wings silky, mouse-colour; a dark subdentate line near the base, and a curved, strongly denticulate discal line, followed by a darker band before the paler submarginal line; stigmata indistinct, generally rather darker than the ground-colour; a narrow angulated central shade, touching the inside of the reniform stigma; at the base of the wing, between and on each side of the two stigmata and broadly below them, are paler patches. Hind wings silky fuscous in both sexes. Head, thorax, and abdomen mouse-colour.

Four specimens, one female and three males, taken at the end of August and beginning of September 1886, at Kala Pani.

Akin to our *C. morpheus*, but smaller, and with darker hind wings.

After the above description was made, from the insects from Kala Pani, two of which are in perfect condition, I discovered that Walker's *Orthosia externa*, described from an inferior specimen, in the British Museum collection, and wrongly placed among the Orthosidæ, was identical. I have, however, left the redescription standing, as it may serve to supplement Walker's necessarily somewhat imperfect and misleading account.

A specimen from Col. Swinhoe, locality not given, is mentioned by Mr. Butler, P. Z. S. 1883, p. 161.

48. Amyna stricta. (No. 66.)

Poaphila stricta, Wlk. Cat. Lep. Het. B. M. xiv. p. 1476.
Ilattia cephusalis, Wlk. ibid. xvi. p. 209.
Miana inornata, Wlk. ibid. xxxii. p. 677.
Perigea leucospila, Wlk. ibid. xxxii. p. 683, female.
Amyna cephusalis, Butler, P. Z. S. 1881, p. 617.
? *Amyna stigmatula*, Snellen, Tijd. v. Ent. xv. p. 35, pl. iv. fig. 15.
? *Amyna stellata*, Butler, Ann. & Mag. Nat. Hist. 1878, i. p. 162.
? *Amyna undulifera*, Butler, Ann. & Mag. Nat. Hist. 1875, ii. p. 403.

Two females and three males from Campbellpore, the last week in July.

The two specimens of *Poaphila stricta*, Wlk., from Honduras and Santarem, still in the British Museum collection, are certainly identical with those of *Amyna* (*Ilattia*, Wlk.) *cephusalis* in the same collection, which latter come from such diverse localities as the

Andaman Islands, Shanghai, Kutch, Solun, and Rockhampton, and must therefore belong to a species of very general distribution.

Of the five examples now sent from Campbellpore, two have the lower half of the reniform stigma filled up with pale ochreous, which, in one example, certainly *is* placed more obliquely, as in *A. stigmatula*, Snellen.

Now, of the four examples in the British Museum collection of *A. stigmatula*, Snellen (the characteristic of which is that the reniform stigma is *oblique* and filled up with *ochreous*, instead of white), one is from Kurrachee, two from Aden, and one from the Congo; while Snellen's own types come from Lower Guinea.

Of *A. stellata*, Butler (in which species the reniform stigma is filled up with *pure white*, and is said to be less oblique), there are specimens from Tokio, and *one from Kutch*, from the Indian Museum, set low, and evidently from the same lot as the five from the same source placed under *Amyna stricta* (*cephusalis*), one of which also is from Kutch.

Of a third species, *A. undulifera*, Butler, from Natal, the single type in the British Museum collection is indistinguishable from one of *A. cephusalis* from the Andaman Islands, in both of which the red tints predominate. In a single example from Shanghai, of a dark reddish-brown tint, this colour has entirely swamped the usually pale outlines of the transverse lines and stigmata.

Taking all these facts into consideration, I cannot help coming to the conclusion that *A. stigmatula*, Snellen, *A. stellata*, Butler, *A. undulifera*, Butler, and the unnamed reddish form from Shanghai, are all merely local forms of one widely spread and variable species, *A. stricta*, Wlk.

Mr. Moore (Ceylon, iii. p. 27) implies that the specimens with the reniform stigma filled up with grey are males, those filled up with ochreous or white, females; but, in fact, both variations in the stigma occur in each sex.

49. Laphygma exigua. (Nos. 51, 54, 64.)

Noctua exigua, Hb. Eur. Schmet. fig. 362.

Five females and four males from Campbellpore, and one female from Rawal Pindi, taken from April to July, with the remark appended, "very common."

50. Agrotis aristifera. (No. 72.)

Agrotis aristifera, Gn. Noct. i. p. 266.
Agrotis munda, Wlk. Cat. Lep. Het. B. M. x. p. 348.

One female, worn, from Rawal Pindi, March 28th, 1887; and one male, small, taken at Campbellpore. This latter, in the shortness of the claviform stigma and the absence of the black dagger-shaped marks before the submarginal line, resembles the Australian form, *munda*. Col. Swinhoe (P. Z. S. 1884, p. 516) records the species from Kurrachee as common, and, like this example of the female, taken early in the year, viz. February.

51. Agrotis suffusa. (No. 147.)

Phalæna-Noctua suffusa, Gmel. S. N. i. 5. p. 2541.

One female and two males from Thundiani and Rawal Pindi; the pair from the former locality, August, 1886; but the male from Rawul Pindi is dated March 3rd, 1887. "At sugar, very common, August."

52. Agrotis segetum. (No. 147.)

Noctua segetum, W. V. 81. 12, pl. 1. fig. 3 *a*, *b*.

Four females and six males, with the usual variations in depth of colouring, from Thundiani, Rawal Pindi. "Very common at sugar in August."

53. Agrotis corticea. (No. 166.)

Noctua corticea, W. V. 81. 13.

? *Agrotis ingrata*, Butler, Ann. & Mag. Nat. Hist. 1878, i. p. 162; Ill. Lep. Het. B. M. ii. p. 27, pl. xxix. fig. 9.

Agrotis fraterna, Moore, Desc. Ind. Lep. Atk. ii. p. 116.

One female and four males from Thundiani, August 1886.

A rather small and strongly-marked form, like the examples from Dhamsala in the Hocking Collection, with the costa of the fore wing, the face, and palpi, conspicuously darker. In *A. ingrata*, Butler, the females are larger and stouter, with the claviform stigma, as a rule, longer, but the male seems identical.

54. Agrotis intracta. (No. 163.)

Agrotis intracta, Wlk. Cat. Lep. Het. B. M. x. p. 346.

One male from Thundiani, October 8th, 1886.

Walker's description was made from the single male from Nepaul, in the British Museum collection. Mr. Moore, I believe, has now two females. The species belongs to the group in which the hind wings of the male as well as of the female are dark.

55. Agrotis quadrisigna. (No. 132?)

Agrotis quadrisigna, Moore, P. Z. S. 1881, p. 350.

Chersotis quadrisigna, Butler, P. Z. S. 1881, p. 617.

One female, taken in May; one male at the end of September, in the Berham Gully; both much damaged.

Mr. Moore makes it allied to *A. labyrinthica*, Staud., and to *A. placida*. Mr. Butler, on the other hand, says it is related to *Chersotis rectangula*, which, however, in the male has strongly pectinated antennæ.

In his description Mr. Moore has omitted to mention one characteristic marking, viz. that the centre of the outer margin of the reniform stigma is filled up with brick-red.

56. Graphiphora valida. (Nos. 20, 154?, 163?)

Graphiphora valida, Wlk. Cat. Lep. Het. B. M. xxxiii. p. 711.

Seven specimens, all females, from Thundiani, August to October, 1886.

Walker's types are from Shanghai.

The species appears peculiarly liable to grease. It is a narrower-winged insect than the European *G. ravida*.

57. GRAPHIPHORA CANESCENS. (Nos. 154 & 163.)

Graphiphora canescens, Butler, Ann. & Mag. Nat. Hist. 1878, i. p. 165.

Cerastis subdolens, Butler, Trans. Ent. Soc. 1881, pt. ii. p. 181.

Two females and six males from Thundiani, August, September, and October, 1886.

Very closely allied to, if not identical with, *G. dahlii* of Europe. As in that species, the females are usually much darker than the males, though dark males are occasionally to be seen.

58. OXIRA OCHRACEA. (Nos. 132 & 154.)

Oxira ochracea, Wlk. Cat. Lep. Het. B. M. xxxii. p. 657.

Seven males and six females from Thundiani, Handar, and Rawal Pindi, August, September, and October, 1886; a single female from Rawal Pindi, March 31, 1887. "Very common at sugar."

Smaller and of more slender build than *G. canescens*, Butler, the male with *pectinated* antennæ. As in that species, the fore wing of the female is dull brown or brownish red, of the male more reddish ochreous, though in this case also some specimens of the male are as dark as the females. The markings are similar. A geminated sinuous black basal and subbasal line, a curved denticulated discal line, often immediately followed by a narrow paler fascia; a pale submarginal line, preceded on the costa by a brownish shade; orbicular stigma of the ground-colour, merely edged with darker; reniform variable, often pale-margined only, or with the upper part filled up with ochreous grey, the lower with dark fuscous, often more conspicuously paler in the female. In each sex they are sometimes preceded by a black spot; that before the orbicular being triangular or wedge-shaped; that before the reniform subquadrate; the claviform stigma is represented, as in all the allied species, by a small dark dot; an angulated central dark streak crosses the wing just before the reniform stigma; cilia of the ground-colour, with a paler basal line, preceded by a series of dark lunules. Hind wing dull fuscous, with *reddish* fringes in both sexes. Head and thorax concolorous with the fore wings; abdomen fuscous (darker in the female), with the anal tuft reddish; *antennæ of the male pectinated*.

Underside somewhat iridescent, pinkish ochreous, more pink along the costa and hind margin of the fore wing; hind wing with a central dark spot and narrow curved band.

After the above description (of a supposed new *Graphiphora*) was written, made from the fourteen specimens above recorded, I discovered that the type of Walker's *Oxira ochracea*, a male from Ceylon, was identical. In all points, except the pectinated antennæ, the species agrees well with *Graphiphora canescens*, Butler, the

Indian type of *G. dahlii*. Walker described his insect from the single male still extant, and by reason of the pectinated antennæ placed it next after *Heliophobus*. This is manifestly not its proper place, but if the pectination of the male antennæ is held to be sufficient reason for the erection of a new genus, that genus must stand in immediate proximity to *Graphiphora*.

59. Ochropleura denticulata, sp. n. (No. 144.)

Fore wing dull dark brown with a reddish tinge, blackish towards the base of the inner margin; the costa broadly, but not strikingly, paler from the base to beyond the middle, never with so decided a streak as in *O. triangularis*; a pale sinuous subbasal line, bordered on either side with darker; a curved and strongly serrated pale line beyond the middle, also dark-bordered; this latter starts obliquely, and somewhat indistinctly, from the costa, then turns and runs parallel to the hind margin, forming four very prominent teeth (of which the first is curved and blunt, the other three very acute), and attains the inner margin with three short curves; beyond this line is a dark brown fascia, with an irregular outer edge; orbicular stigma pale, oblique, its upper end merged in the pale costal streak; reniform stigma filled up with dark, and with a paler margin; the space between the stigmata dark brown, as is also the claviform stigma, fringes dark brown with a fine pale basal line, preceded by a series of black curves. Hind wings entirely dark fuscous, with white fringes; head, face, and thorax reddish brown; abdomen fuscous. Underside glossy ochreous grey, with a reddish tinge along the costa of the fore wing; all the veins strongly marked; each wing with a central spot and a narrow dark band, the hind wing also broadly darker before the hind margin.

Expanse of wings 58 millim.

Three males from Thundiani, August 1886. "Taken at sugar."

60. Ochropleura flammatra.

Phalæna-Noctua flammatra, Gmel. S. N. i. 5. p. 2543.

Two males, taken at sugar. Rawal Pindi, March 31, 1887.

61. Ochropleura triangularis.

Ochropleura triangularis, Moore, P. Z. S. 1867, p. 55.

One female in good condition, at sallow-bloom. Thundiani, May 1, 1887.

62. Ochropleura cognata. (No. 167.)

Graphiphora cognata, Moore, Desc. Lep. Col. Atkinson, ii. p. 119.

One male, Thundiani, August 6, 1886.

"Not uncommon at sugar in August."

63. Ochropleura c-nigrum.

Phalæna-Noctua c-nigrum, L. F. S. p. 1193.

One female, Campbellpore, March 20, 1886.

Family Hadenidæ.

64. Eurois virens. (No. 143.)

Eurois virens, Butler, Ann. & Mag. Nat. Hist. 1878, i. p. 194; Butler, Ill. Lep. Het. B. M. pt. iii. pl. 45. fig. 5.

One male, caught August 23, 1886, at Thundiani.

"Only two specimens were captured."

65. Euplexia pectinata, sp. n. (No. 131.)

Two females and two males, from Thundiani, 21st August, 1886.

"One of the commonest moths at sugar, in August."

Resembling greatly, but in reality quite distinct from, *E. albovittata*, Moore. The tints of the fore wing are dull dark olive, never passing into pinky brown; the subbasal white band is narrower, not so attenuated towards the costa; the second white band is much narrower on the inner margin, being largely suffused with olive, and varied towards the costa with small dull olive dots, but never showing the large brownish costal blotch of *albovittata*. Hind margin dark olive-brown, traversed by a fine undulating white line, before which it is darker. Thorax dark olive, with only a small pinkish-white tuft behind; abdomen dull fuscous, without a white base; palpi wholly dark, not white-tipped; antennæ in the female annulated black and white at the base; in the male *decidedly pectinated*. Hind wings in the female wholly dark grey, in the male more whitish towards the base; with two curved whitish lines at the interior angle, the inner one being composed of two subcontiguous white curves.

Underside dull grey; the darker central band and base of fore wings showing through; the hind wing with a distinct central dark spot, and less distinct narrow band. In *albovittata* the underside of the fore wings shows a distinct large whitish spot.

Expanse of wings 34 millim.

66. Trachea auriplena. (Nos. 161 & 210.)

Eurois auriplena, Wlk. Cat. Lep. Het. B. M. xi. p. 557.

One female from Thundiani, August 20, and another from Hurripur, October 13, with the remark, "rare, at sugar."

67. Hadena chenopodii. (No. 55.)

Phalæna-Noctua chenopodii, Gmel. S. N. i. 5. p. 2543. 1036.

One male from Campbellpore, taken May 22, 1886.

The only difference between this specimen and ordinary *H. chenopodii* is a more noticeable pale oblique blotch beneath the reniform stigma.

68. Hadena adjuncta. (No. 134?)

Hadena adjuncta, Moore, P. Z. S. 1881, p. 357.

Five females and three males, all considerably worn, August 1886. Thundiani.

Allied to *H. thalassina*.

69. Polia scotochlora. (No. 120.)

Polia scotochlora, Kollar, Kaschmir, p. 482.

Two females and one male from Thundiani, August 1886. "A few only."

Hitherto unrepresented in the Brit. Mus. collection.

70. Hecatera modesta. (No. 117.)

Hecatera modesta, Moore, Desc. Het. Lep. Coll. Atk. pt. ii. p. 125.

One female from Thundiani, taken September 5, 1886. "Two or three only were taken."

Family Cosmiidæ.

70 *a*. Cosmia ——, sp. n. (No. 132?)

Two females from Dumtanar, October 11, 1886, both much worn. Sent along with *Oxira ochracea*, and confused with it, till a series of specimens in good condition in the Hocking Collection enabled them to be separated. Mr. Butler has determined it to be a *Cosmia*, at present unnamed.

Family Heliothidæ.

71. Heliothis armigera. (Nos. 12 & 21.)

Noctua armigera, Hb. Noct. pl. 79. fig. 370.

Four males, all from Campbellpore, and four females from that place and from Hassan Abdal and Akhor, in April, May, and June, 1886.

All the males are the small brown form; all the females the larger greyer one.

72. Heliothis peltigera. (No. 12.)

Noctua peltigera (W. V. 89. 2), Hb. Noct. pl. 63. fig. 310.

One male taken the end of July, at Khairabad.

Family Acontiidæ.

73. Acontia lucida. (No. 46.)

Phalæna-Noctua lucida, Hufn. Berl. M. iii. p. 302. 424.
Acontia solaris, Tr. Schm. Eur. v. Abh. 3, p. 244. 6.

One female from Chittar Pahar, two males from Campbellpore and Khairabad; all taken in April, 1886.

74. Thalpochares triangularis, sp. n. (No. 49.)

Fore wing very pale olive tinged with pink; a sharply bordered basal patch, an equally sharply bordered, but smaller, costal triangle, and a narrow marginal line together with the fringes dark olive-brown; immediately beyond the basal patch and the costal triangle are two delicate pink fasciæ, glossy in certain lights. Hind wing with the cilia dull fuscous. Head, face, and thorax dark olive-

brown; palpi paler; abdomen fuscous. Underside pinkish ochreous, with the dark markings of the fore wing slightly visible.

Expanse of wings 16 millim.

One female from Campbellpore, May 21, 1886.

In the Hocking Collection, and likewise in Mr. Moore's, there is a species closely allied to the present one, which Mr. Moore has referred to the genus *Xanthoptera*. But all the species of that genus, as at present known, have quite a different facies and ground-colour, and are all natives of America only. For the present, therefore, I have thought it better to locate the species in *Thalpochares*, a genus which, as our knowledge increases, will no doubt demand a further subdivision.

75. Xanthodes innocens.

Xanthodes innocens, Wlk. Cat. Lep. Het. B. M. xv. p. 1752.

One worn male from Campbellpore, July 23, 1886.

Also taken at Aden and Kurrachee.

76. Curubasa cruentata. (No. 108.)

Curubasa cruentata, Moore, P. Z. S. 1881, p. 367.

One male from Kala Pani, August 7, 1886. Hardly recognizable.

Mr. Moore's specimens are from N.W. India and Noashera, Cashmir.

77. Dorika sanguinolenta.

Dorika sanguinolenta, Moore, P. Z. S. 1881, p. 363.

One male, dreadfully worn, from Abbotabad, August 31, 1886.

Mr. Moore gives Bombay as a locality.

78. Adisura marginalis.

Adisura marginalis, Moore, P. Z. S. 1881, p. 368.

Anthophila marginalis, Wlk. Cat. Lep. Het. B. M. xii. p. 830.

One female, dated July 27, from Campbellpore.

A. marginalis has no pink flush on the hind margin and the costa is narrowly pale. *A. delicia*, Felder, pl. 108. fig. 40, has yellow fringes. *A. dulcis*, Moore, P. Z. S. 1881, p. 368, pl. 37. fig. 20, should have the hind margin, according to the description, *pink*, but the figure does not so represent it.

Family Thyrididæ.

Thyridiphora, gen. nov.

Fore wings triangular; costa thickened, with a strong fold on its under surface for four fifths of its length; convex at the base, then incurved beyond the middle, and again convex before the apex, which is prominently produced; hind margin curved, convex, with a slight prominence halfway down, and a strongly expressed anal angle; the inner margin is also slightly curved outwards. Costal vein hidden under the fold; cell long, reaching to four fifths of the wing; first subcostal branch starting at four fifths, the second half-

way between the first and the end of the cell; here the subcostal divides and forms an oval additional cell, devoid of scales, from the upper end of which the third and fourth subcostal branches start, and the fifth from the lower end; discocellular regularly curved; the radial from the centre; upper median from a little above the lower end of the cell; middle median from its end; lower at four fifths; submedian straight to a little above the anal angle; internomedian fold parallel to it; internal vein curved basewards. Hind wings triangular, but with both angles rounded; the subcostal much thickened at the base, having apparently absorbed the costal; the cell broad, reaching to four fifths of the wing; discocellular strongly angulated basewards in the centre, its upper half obsolete; two subcostal branches from the upper end, from the upper one of which a short third branch is emitted, representing the end of the costal; a recurrent vein through the angle of the discocellular; radial and two upper medians all close together from the lower end of the cell; lower median at four fifths; three internal veins. Head, thorax, and abdomen stout, as are the legs and palpi; the latter thickly scaled, as long as the head, ascending, the third joint curved downwards; antennæ laminated, very thick in the male; eyes large.

79. Thyridiphora fenestrata, sp. n.

Fore wing greyish ochreous with two faintly darker lines, which show slight traces of serration; one leaving the inner margin in the middle and curving into the costa, the other starting a little way beyond the first and running obliquely towards the apex, but deflexed before reaching it on to the costa, which it reaches above the oval, scaleless eyelet-hole, which stands beyond the apex of the cell; fringes slightly darker. Hind wing paler, but with darker hind margin. Underside dull ochreous, with patches of darker scales along the course of the lines. Head, thorax, and abdomen all pale ochreous. Expanse of wings 14 millim.

One female, Campbellpore, July 3, 1886.

This peculiar little species is like a *Bombyx mori* in miniature. It appears much subject to grease. Two examples from Col. Swinhoe, unnamed, in the Brit. Mus. collection, are almost transparent from this cause. Although so much smaller in expanse, the neuration of the wings and the structure of the antennæ indicate an affinity with the Thyrididæ.

Family Plusiidæ.

80. Plusia ni. (No. 43.)

Noctua ni, Hb. Noct. pl. 58. fig. 284.

? *Plusia extrahens*, Wlk. Cat. Lep. Het. B. M. xii. p. 929.

? *Plusia significans*, Wlk. Cat. Lep. Het. B. M. xii. p. 930.

One male and one female from Campbellpore, taken early in June, 1886.

The only difference discernible in *P. extrahens*, Wlk., = *P. significans*, Wlk., is that the males have the underside of the anal tuft *blackish*.

81. Plusia nigrisigna. (No. 43.)

Plusia nigrisigna, Wlk. Cat. Lep. Het. B. M. xii. p. 928.

Two males from Campbellpore, March 3, 1886. "Not uncommon."

Walker's types were from N. India.

82. Plusia orichalcea. (No. 44.)

Noctua orichalcea, Fabr. Sp. Ins. ii. 237.

Six examples, all males, from Thundiani. "Common in April and May; two specimens in October."

Family Amphipyridæ.

83. Amphipyra magna. (No. 45.)

Amphipyra magna, Wlk. Cat. Lep. Het. B. M. xxxiii. p. 868.

Three females and two males, Thundiani, August 1886. "The commonest moth at sugar."

84. Amphipyra monolitha. (No. 45.)

Amphipyra monolitha, Gn. Noct. ii. p. 414.

Two males from Dumtanar and Nandar, dated September 25, and October 11, 1886. Sent as supposed females of *A. magna*.

Also from N. China and Silhet.

85. Amphipyra flavicaudata, sp. n. (No 203.)

Fore wings pale fawn-colour, with a slight olive tint; crossed by a succession of slightly darker lines and shades, the most conspicuous of which are a straight, diffuse, central, and a curved, distinctly margined, submarginal fascia. The basal area is hardly perceptibly darker, but contains a short, transverse costal line, and is bordered by a diffuse undulating line; in the paler interval between this and the central fascia a slender sinuous line is visible, and in the pale space between the central fascia and the submarginal a curved, slender, denticulated line; the inner edge of the submarginal fascia is evenly curved, the outer edge is jagged; orbicular stigma very indistinct, the margins only faintly expressed; reniform stigma largish, and filled up with darker; both are contiguous to the central fascia; on the costa before the apex are four or five minute light dots; veins towards the hind margin varied with dark and light scales; fringes concolorous, preceded by a series of thin fuscous lunules. Hind wings fuscous with the veins darker; the fringes and the costa broadly ochreous yellow. Head, thorax, abdomen, and legs concolorous with the fore wings, the thorax slightly the darkest; anal tuft *orange*. Underside straw-colour; each wing with a narrow dark band, the hind wing with a central dark spot.

Expanse of wings 54–60 millim.

Eight females from Thundiani, all but one taken in October, and stated to be "very common at sugar in that month, but not seen before;" the eighth, which is in much worse condition than the rest, was taken in August, and was accompanied with the note "not

uncommon in August." The species is, *in appearance*, unlike all other *Amphipyræ*.

Family Homopteridæ.

86. Homoptera vilis. (No. 78.)

Homoptera vilis, Wlk. Cat. Lep. Het. B. M. xxxiii. p. 889.

Five females and seven males from Campbellpore, Khairabad, and Hassan Abdal, July 1886.

87. Pandesma quénavadi. (Nos. 52 & 66.)

Pandesma quénavadi, Gn. Noct. ii. p. 438.

Two females and four males, May, June, and July, 1886, Campbellpore.

Very variable, both in size and markings; widely distributed.

88. Pandesma benenotata, sp. n.

Fore wing grey; a dark, blackish-brown, broken line before the middle, which runs at first obliquely outward from the costa and then vertically to the inner margin, becoming most conspicuous in the centre of the wing; a sinuous brown line beyond the middle, followed by a diffuse fuscous shade; a tortuous pale submarginal line, with a darker fuscous shade on either side, and preceded towards the costa by two or three still darker patches; cilia grey, with a darker basal line. Hind wing fuscous, diffusely darker towards the hind margin; cilia whitish. Head, face, thorax, and abdomen grey. Underside whitish ochreous; in the fore wing with a dark patch before the hind margin, and a faint central spot; hind wing without markings; both wings are faintly, but sparsely dusted with darker scales. Antennæ of the male ciliated.

One male, Rawal Pindi, March 31, 1887. Expanse of wings 22 millim.

89. Alamis umbrina. (Nos. 2 & 48.)

Alamis umbrina, Gn. Noct. iii. p. 4.

Two females and four males, Campbellpore, May and June, 1886.

90. Plecoptera reflexa. (Nos. 64, 71, 75.)

Plecoptera reflexa, Gn. Noct. ii. p. 431.

Poaphila? simplex, Wlk. Cat. Lep. Het. B. M. xv. p. 1840.

Trigonodes gammoides, Wlk. Cat. Lep. Het. B. M. xv. p. 1833.

Five females and six males from Khairabad and Campbellpore, July 25 and 30, 1886.

A very variable species.

Family Catocalidæ.

91. Catocala afghana. (No. 199.)

Catocala afghana, Swinhoe, Trans. Ent. Soc. 1885, p. 352, pl. ix. fig. 8.

Two males from Dumtanar, near Abbotabad, Oct. 11, 1886. "Not uncommon."

Swinhoe gives Gwal (in June) and Quetta as other localities.

92. CATOCALA NIVEA. (No. 160.)

Catocala nivea, Butler, Cist. Ent. ii. p. 241. 2; Ill. Lep. Het. B. M. pt. ii. pl. 33. fig. 4,

One male, August 20, 1886, from Thundiani, differing from Mr. Butler's type from Japan only in the black band of the hind wing not quite reaching the costa.

"Two specimens at sugar."

93. CATOCALA PERSIMILIS, sp. n. (No. 146.)

One female, Thundiani, August 17, 1886.

Resembles *C. dotata*, Wlk., very closely, but differs in the following points:—in the fore wings the basal area is not filled up with dark, but is bordered by a dark line; the serratures of the transverse line beyond the middle are much less acute and prominent, except that above the inner margin, which is decidedly larger. On the costa beyond the line is a distinct blackish blotch, and before the hind margin a dark plain fascia, which in *C. dotata* is a black serrated line: in the hind wing the yellow space between the central and marginal dark bands is much ampler, and broadly interrupts the marginal band. Expanse of wings 56 millim.

94. CATOCALA PATALA. (No. 207.)

Catocala patala, Feld. Reise Nov. pl. 112. fig. 23.

One male, from Thundiani, October 8, 1886.

Akin to *C. jonasei*, Butler, from Japan, but slightly larger, and distinguished at once by the bluish tinge and the dark basal area, which in *jonasei* is merely pale grey with a darker bordering line.

Felder's types also were from North Hindostan.

As the species has never been described, but is only figured by Felder, I insert the following description:—

Fore wing pale grey, with a slight bluish tinge; basal area brownish grey, with a short black transverse line near the base, and bordered by a distinct oblique blackish line, which is sharply angulated basewards on the submedian nervure; this darker tint of the basal area is continued beyond it along the inner margin as far as the next line; central area pale ochreous grey, containing a brownish patch on the costa, between two black spots, and embracing the reniform stigma, which has beyond it and obliquely below it a large patch of bluish grey; external area fuscous grey, bounded internally by a strongly marked serrated black line, which emits a black dash basewards along the submedian nervure; beyond this line can be traced a zigzag light and dark fascia; a row of black, white-centred lunules along the hind margin. Hind wing luteous, clouded with darker at the base along each margin; with a black central fascia, which forms a strong right angle externally, nearly meeting a projection of the marginal border; this latter is broad, black, and uninterrupted, with a broad, roundish, luteous spot at the apex. Underside fuscous, varied with paler, both wings with a broad black central fascia, which in the fore wing is preceded by a pale luteous,

and followed by a whitish fascia; the hind wing has the entire base luteous, and a luteous fascia before the marginal border.

Head and thorax pale grey, mottled with darker grey and fuscous; abdomen dull fuscous above, pale ochreous grey, almost whitish, beneath; palpi fuscous, with the apex of the second joint and the underneath parts pale grey. Expanse of wings 70 millim.

In this case also, from a comparison of six good specimens in the Hocking Collection, Mr. Butler has come to the conclusion that the species is distinct both from *C. patala*, Felder, and *C. jonasei*, Butler.

Family Ommatophoridæ.

95. Nyctipao albocincta. (No. 176.)

Nyctipao albicincta, Wlk. Cat. Lep. Het. B. M. xiv. p. 1304.
Erebus albicinctus, Kollar, Kaschmir, iv. p. 474, pl. 22.

One male from Abbotabad, August 31, 1886.

Family Erebiidæ.

96. Sypna punctosa. (No. 213.)

Sypna punctosa, Wlk. Cat. Lep. Het. B. M. xxxiii. p. 939.

One female from Abbotabad, August 31, 1886.

97. Patula macrops. (No. 176.)

Patula macrops, Gn. Noct. iii. p. 177.
Phalæna-Attacus macrops, L. S. N. iii. p. 225.

One female taken at Abbotabad, August 31, 1886.

Family Hypopyridæ.

98. Spirama cohærens. (No. 212.)

Spirama cohærens, Moore, Ceylon, iii. p. 149, pl. 165. figs. 3, 3*a*.
Spiramia cohærens, Wlk. Cat. Lep. Het. B. M. xv. p. 1321.

One male from Hurripur, October 13, 1886. "Fairly common."

99. Hypopyra extricans.

Hypopyra extricans, Wlk. Cat. Lep. Het. B. M. xiv. 1328.

One female, taken October 13, at Hurripur.
Walker's types were from North China.

Family Dysgoniidæ.

100. Achæa melicerte. (No. 33.)

Phalæna-Noctua melicerte, Drury, Ins. i. p. 46, pl. 23. fig. 1.

One male, three females, Campbellpore, July 19, 1886.

101. Remigia archesia. (No. 180.)

Phalæna-Noctua archesia, Cram. Pap. Exot. iii. p. 145, pl. 273. figs. F, G.

Remigia bifasciata, Wlk. Cat. Lep. Het. B. M. xxxiii. p. 1014.
Remigia gregalis, Gn. Noct. iii. p. 320.
Remigia pellita, Gn. Noct. iii. p. 318.

One female, from Kala Pani, September 1, 1886.

A widely distributed species. The females are more reddish, the males greyer, with the two fasciæ more pronounced. The latter very frequently, *but not invariably*, have a black spot near the inner margin before the first fascia.

Mr. Moore (Ceylon, iii. 191) erects this species into a genus by itself, under the name *Cauninda*; but the characteristics given appear to be merely relative.

102. Lagoptera elegans. (No. 200.)

Ophiusa elegans, Van der Hoeven, Lep. Nov. pl. 5. fig. 6 *a*, *b*.

One female, Dumtanar, September 29, 1886.

103. Dysgonia latifascia, sp. n. (No. 17.)

Fore wing olive-brown; the usual central fascia whitish, with a lilac tinge, wider at each extremity than in the middle; the olive-brown space beyond it quite as wide as the basal space, narrowly white-bordered throughout from costa to inner margin; this border is not angulated nor indented, as in other species; it runs at first obliquely outward from the costa for about one third of the wing, then, without forming an angle, vertically for a short distance, not concave inwards, and finally obliquely inwards, slightly *sinuous*, but without any distinct indentation. Apex with a triangular olive-brown spot, faintly white-bordered internally, and a smaller confluent one below it; hind margin pale lilac-grey, preceded by a dull fuscous shade; a row of very minute dark submarginal dots. Cilia pale ochreous. Hind wing dull olive-brown, with a rather ill-defined bluish-white central band; fringes nearly white; the anal angle narrowly greyish. Head, thorax, and abdomen fuscous-olive.

Expanse of wings 48 millim.

One male from Campbellpore, July 20, 1886.

This agrees precisely with a very perfect specimen from Solun in the British Museum collection, which had been inadvertently placed among *D. arctotænia*. It may be distinguished at once from all allied species by the much greater width of the discal band, which approaches that of *D. conficiens*.

104. Dysgonia olympia. (No. 17.)

Ophiusa olympia, Swinhoe, P. Z. S. 1885, p. 466.

One male from Campbellpore, June 3, 1886.

In this specimen the white band is not only thinner than in the female, but also differs in shape, being much narrower on the inner margin than at the costa, as in *D. analis*.

The comparison of a numerous series in the Hocking Collection proves this to be only a variety of *D. albivitta*.

105. Homœa clathrum. (No. 78.)

Homœa clathrum, Gn. Noct. iii. p. 207.

One female, July 18, 1886, from Hassan Abdal.

106. Grammodes stolida. (No. 29.)

Noctua stolida, Fabr. Sp. Ins. ii. 218. 54.

One female and three males from Campbellpore and Chittar Pahar; dated June 2 and April 28 respectively.

Family Thermesiidæ.

107. Capnodes trifasciata. (No. 100.)

Capnodes trifasciata, Moore, P. Z. S. 1877, p. 612.

One female from Campbellpore, July 30, 1886. In fresh specimens, like this one, the three dark fasciæ are scarcely visible, while the white dots are more distinct. *C. stellata*, Moore, a larger, redder insect, with the costal white dots still more pronounced, is probably only a local, insular form.

108. Magulaba mœstalis.

Magulaba mœstalis, Wlk. Cat. Lep. Het. B. M. xxxiv. p. 1127.
Egnasia erebina, Butler, Ann. & Mag. Nat. Hist. 1879, iv. p. 450.

One female from Campbellpore, July 27, 1886.

Walker gives 9 lines as the expanse of the wings; his type in the British Museum collection, which is from Sierra Leone, only measures 6 lines, as does the other specimen from Aden. The present one from Campbellpore expands 8 lines. Mr. Butler's type of *erebina* measures 11 lines: this is from Japan.

Family Hypenidæ.

109. Hypena laceratalis.

Hypena laceratalis, Wlk. Cat. Lep. Het. xvi. p. 60; Moore, Ceylon, iii. p. 224, pl. 176. figs. 5, 5 *a*.

Two dilapidated specimens from Campbellpore, July 30, 1886.

110. Hypena angustalis, sp. n.

One female only, from Dumtanar, October 11, 1886.

The single specimen sent is much rubbed towards the base of the fore wings; but it evidently belongs to the group containing *H. abducalis*, Wlk., from the Punjaub, *H. curviferalis*, Wlk., from Java, and *H. columbaris*, Butler, from Japan, which all have a single long curved streak running from the apex to near the base of the inner margin. It most closely resembles *H. abducalis*; but the fore wing is narrower and longer, with a trace of a row of dark submarginal spots. Expanse of wings 34 millim.

111. Hormisa cramboides. (No. 112.)

Hormisa cramboides, Butler, Ill. Lep. Het. iii. p. 62, pl. 56. fig. 6.

Six specimens, two females and four males, from Thundiani and

Kala Pani, taken in July and August, 1886, and April 1887. "Common in August."

The three specimens in the British Museum collection, from Japan, are all males; the female is paler and clearer.

112. HYDRILLODES ERYTHUSALIS.

Bocana erythusalis, Wlk. Cat. Lep. Het. B. M. xvi. p. 177.

One female, much damaged, from Dumtanar, July 29. "Taken at ivy."

Occurs also at Sarawak, Borneo.

GEOMETRINA.

Family URAPTERYGIDÆ.

113. URAPTERYX PLURISTRIGATA, sp. n. (No. 109.)

Ground-colour pure white; fore wings with two, hind wings with one, rather broad transverse grey lines; those on the fore wing almost parallel, and containing between them a short, thin, grey transverse line, which does not touch the costa; the basal, central, and marginal areas all thickly shot with fine grey transverse streaks; fringes grey. Hind wing also thickly covered with similar streaks, and bearing at the base of the tail two black submarginal spots, the upper one linear, twice as long as the lower, with some brick-red scales at its lower end; fringes brick-red. Head, thorax, and abdomen pure white; palpi and antennæ brownish. Expanse of wings 42–45 millim.

Three males from Thundiani, August 1886.

This is closely allied to an unnamed species from Japan, in the British Museum collection; but the Japanese insect has blunter fore wings, with the two transverse lines evidently approximating on the inner margin, and only the marginal area streaked with grey; in the hind wings the upper of the two tail-spots is *round*, with a red centre.

Family ENNOMIDÆ.

114. RUMIA MIMULINA. (No. 114.)

Rumia mimulina, Butler, P. Z. S. 1886, p. 388.

Three males from Thundiani, August 15, 1886.

Family OXYDIIDÆ.

115. HYPERYTHRA LUTEA. (No. 79.)

Phalæna-Geometra lutea, Cram. Pap. Exot. iv. p. 157, pl. 370. figs. C, D.

Hyperythra luteata, Moore, P. Z. S. 1867, p. 619.

Hyperythra limbolaria, Gn. Phal. i. p. 101, pl. 3. fig. 34.

Hyperythra penicillaria, Gn. Phal. i. p. 101.

Aspilates susceptaria, Wlk. Cat. Lep. Het. B. M. xxxv. p. 1664.

Two males and one female from Khairabad and Campbellpore, dated July 23 and 27, 1886. All three much worn.

116. Pyrinia phœnico-tæniata. (No. 107.)

Aspilates phœnico-tæniata, Kollar, Kaschmir, p. 487.
Heterolocha phœnico-tæniata, Feld. Reise Nov. pl. 133. figs. 6, 6*a*.

One female and two males, from Kala Pani and Thundiani, August and September, 1886.

The specimen in the Brit. Mus. collection is from Murree.

117. Angerona stramineata, sp. n. (Nos. 122 & 187.)

Fore wing yellowish straw-colour, thickly sprinkled with fulvous dots, especially over the basal and marginal areas, and above the anal angle; with two fulvous transverse lines and a fulvous central spot; the first line near the base is curved, and bluntly angulated below the costa; the second runs parallel to the hind margin. Hind wing with two curved fulvous lines, one in the centre, the other submarginal, approximating on the inner margin, where the fulvous dots are densest. Head, face, thorax, abdomen, and antennæ all alike, straw-coloured. Underside paler, only sparsely sprinkled with dots, but with the two lines, and the central spot of the fore wing, and the two lines of the hind wing strongly marked.

Expanse of wings 38–42 millim.

Four males from Thundiani, September 1886.

118. Psyra debilis, sp. n. (No. 122.)

? *Semiothisa diplotata*, Feld. Reise Nov. pl. 128. fig. 16.

Fore wings pale straw-colour, sparsely dusted with transverse fulvous or dark brown flecks, more thickly towards the base of the costa, and crossed by three sinuous fulvous or brown lines, which all start from black-brown costal blotches—the first at one third from the base, the second in the middle, the third submarginal: this last contains two small black subcostal dots, with a larger double blotch obliquely beneath them, and again two smaller ones at the inner margin: between the second and third lines a still fainter one can be traced, consisting sometimes only of a series of isolated fulvous dots, starting also like the rest from a brown-black costal blotch; a faint fulvous central dot; hind margin with a row of black dots; fringes short, straw-colour. Hind wings straw-colour, with a central brown band and central spot touching it, followed by a narrower one, and with traces of a third, submarginal, with a brown spot in its centre; the transverse flecks brown; hind margin with a row of black dots. Head, thorax, and abdomen straw-colour. Underside with all the markings much darker; the base of the costa in the fore wing brown.

Expanse of wings 38–40 millim.

Three males from Thundiani, August 16 and 19, September 5, 1886, with the remark "fairly common in August."

A much more fragile and delicately-built insect than either *P. cuneata*, Wlk., or *P. angulifera*, Wlk., without the striking angular dark blotches which form so prominent a feature in them.

Semiothisa diplotata, Feld. Reise Nov. pl. 128. fig. 16, from Bengal, *may* represent a small strongly-coloured male of this species.

Family Œnochromiidæ.

119. Niphonissa arida. (No. 227.)

Niphonissa arida, Butler, Ann. & Mag. N. H. 1878, i. p. 394.

One female from Thundiani, caught April 30,1887, agreeing perfectly with Mr. Butler's type from Japan.

Family Boarmiidæ.

120. Menophra subplagiata. (No. 125.)

Hemerophila subplagiata, Wlk. Cat. Lep. Het. B. M. xxi. p. 319.

One female and three males, from Thundiani and Murree; one male dated September 1885, two males August 1886, and the female *April* 30, 1887. "Uncommon."

121. Alcis iterata. (No. 184.)

Boarmia iterata, Butler, P. Z. S. 1886, p. 389.

Three females from Thundiani, August and September 1886, and one female from Murree, September 1885.

In two of the females the ground-colour is suffused with dark fuscous, leaving only two pale blotches, one subcostal, and another in the middle of the hind margin: in the other two, the entire wing is dull dirty fuscous, with the lines very obscure.

Underside: fore wing dull ochreous, with a dark grey marginal band of uniform width, containing a paler patch in the middle; another paler patch is in the centre of the costa.

122. Alcis trikotaria. (No. 115.)

Boarmia trikotaria, Feld. Reise Nov. pl. 126. fig. 10.

? *Boarmia picata*, Butler, Trans. E. S. 1881, p. 408.

Two females, seven males, from Thundiani, August 16, 1886.

Like so many others of the genus, this species varies considerably in depth of colour and disposition of shades. The two females have the central band much paler and clearer, very much like *Alcis picata*, Butler, from Japan. Sometimes the space between the first and second lines is filled up with dark, so as to form a curved blackish fascia.

It occurs also in the Himalayas, and in Afghanistan.

The underside of this species is rather bright straw-colour: the fore wing with a broad black hind margin, especially at the apex, and with a black projection from it in the centre towards the inner line, which is itself sometimes blackish; in the middle of the marginal black band is a straw-coloured patch: hind wing with dark hind margin, two undulating dark lines, and central spot dark.

"Very common in August."

123. Alcis nudipennis, sp. n. (No. 115.)

Fore wing pale grey, without any darker suffusion; a curved black line at one third, and another beyond it, about the centre, are both more distinctly marked on the costa, and approach one another on

the inner margin; the space between them is sometimes filled up with blackish; at one third from the apex another line, also blackest towards the costa, starts, forming in its course two blunt angulations and three curves, and reaches the inner margin at an equal distance from the central line as that line is from the first; beyond this third line the wing is slightly darker. Hind wing pale grey, with two strong dark lines, the first, nearest the base, straight, the second curving; hind margin darker grey, with traces of paler undulating lines.

Underside: fore wing pale ochreous, with the base of the costa, the starting-points of the lines, and the third line itself black; beyond the third line fuscous. Hind wing pale ochreous, with two lines and central spot dark. Expanse of wings 38 millim.

Two males from Thundiani, August and September, 1886.

It is possible that these may prove to be only pale forms of *Alcis iterata*, Butler.

124. Gnophos obtectaria. (No. 153.)

Gnophos obtectaria, Wlk. Cat. Lep. Het. B. M. xxxv. p. 1597.

Three females and three males, from Thundiani and Abbotabad, August 1886.

125. Gnophos perlita. (No. 179.)

Gnophos perlita, Butler, P. Z. S. 1886, p. 389.

Two males, from Abbotabad—one taken August 31, 1886, the other May 7, 1887.

126. Gnophos dispunctata. (No. 103.)

Gnophos dispunctata, Wlk. Cat. Lep. Het. B. M. xxi. p. 469.

One female, two males, from Thundiani, August 19, 1886.

"Common in August and September."

127. Gnophos isometra, sp. n. (No. 153.)

Fore wing grey, finely dusted with darker; the markings very indistinct; a round central spot; a dark spot on the inner margin, apparently marking the termination of the first line; a denticulated blackish line forming the edge of a very slightly darker central fascia; a series of dull fuscous lunules before the fringes; hind wing the same. Head, thorax, abdomen, and fringes grey. Underside pale, without dusting or markings. Expanse of wings 25 millim.

One male, from Akhor, April 22, 1886.

A small species, about the size of *G. mucidaria* of Europe, and bearing a superficial resemblance to *Tephrosia vagaria* from Australia.

Family Idæidæ.

128. Asthena ochracea, sp. n.

Dull ochreous yellow. Fore wing presents a succession of sinuous ochreous-yellow bands, separated from one another by paler and narrower ones; the basal area is a little suffused with grey, and

traversed by a narrow pale band; the hind margin is yellowish, preceded by a more distinct submarginal pale band, which is slightly interrupted above the anal angle, and terminates in a wider spot on the inner margin. In one example this submarginal band consists of a series of pale spots separated from one another by the yellow veins, and the pale band before it is paler and wider. Hind wings with the hind margin yellowish, and the rest of the wing traversed by a series of undulating greyish-ochreous bands, separated, like those of the fore wing, by paler ones. Head, thorax, and abdomen pale ochreous tinged with darker.

Expanse of wings 22 millim.

Two females, from Thundiani, August 17, 1886, in poor condition.

129. Idæa mutanda.

Acidalia inductata, Wlk. Cat. Lep. Het. B. M. xxiii. p. 792, *non* Gn. Phal. i. p. 494, Wlk. xxii. p. 721.

One male from Campbellpore, May 21, 1886.

Walker's description of his *A. inductata* is very good, but his name must be altered as there was already an *A. inductata*, Gn., from N. America.

130. Idæa pallida, sp. n.

Fore wing silky white tinged with ochreous; with five sinuous ochreous lines; a series of minute black marginal dots, and a larger central one: hind wing the same, but with only four ochreous bands. Head, thorax, and abdomen white. Expanse of wings 28 millim.

One male, from Thundiani, August 1, 1886.

An unnamed specimen from Murree, in the Brit. Mus. collection, appears identical.

131. Lycauges relictata.

Acidalia relictata, Wlk. Cat. Lep. Het. B. M. xxxv. p. 1629.
Lycauges demissus, Swinhoe, P. Z. S. 1886, p. 456.

One example, male, without the abdomen, Campbellpore, July 14, 1886.

Col. Swinhoe records it as common at Mhow from February to June. In his description, which is fuller than Walker's, he does not remark that the oblique line on the fore wings is, like that on the hind wings, reflexed towards the costa before the apex; indeed, the markings on both wings are identical. In other species of the genus the line on the fore wing runs *into* the apex, and the markings of the two wings are not alike.

Walker described the species from a male in the Saunders collection; the male appears to be darker and smaller than the female.

132. Craspedia persimilis.

Craspedia persimilis, Moore, Desc. Lep. Coll. Atk. pt. iii. p. 254.

One male, May 6, 1887, from Kala Pani.

Family Caberidæ.

133. Corycia mytylata.

Corycia mytylata, Gn. Phal. ii. p. 58.

One female, from Thundiani, dated 4th of May, 1887, is so much worn that identification is difficult, but it appears to answer the description; there is no example in the Brit. Mus. collection.

Family Macariidæ.

134. Gonodela fuscomarginata, sp. n.

Fore wing ochreous, dusted with grey; basal patch slightly darker; central line very faint except towards the costa; beyond the sinuous submarginal line the outer margin is dull purplish fuscous, slightly paler at the extreme hind margin and before the apex. Hind wing the same; both wings have a very distinct black central spot, preceded in the hind wing by a faint cross line. Fringes rather paler, but with darker bases.

Expanse of wings 26 millim.

One female from Campbellpore, July 19, 1886.

This species is closely allied to *G. sinicaria* from China, and may turn out to be merely a dark form of it.

135. Gonodela streniataria. (No. 95.)

Macaria streniataria, Wlk. Cat. Lep. Het. B. M. xxvi, p. 1646.

One female from Campbellpore, July 30, 1886.

Family Fidoniidæ.

136. Epifidonia signata. (No. 111.)

Epifidonia signata, Butler, P. Z. S. 1886, p. 392, pl. 35. fig. 9.

One male from Thundiani, August 15, 1886.

Mr. Butler's types are from Murree. "Common at Murree, rare at Thundiani."

137. Phyletis pelloniaria. (No. 182.)

Phyletis pelloniaria, Gn. Phal. ii. p. 169.

One female and two males from Thundiani, the latter in September 1886, the females in April 1887. The species will therefore be probably double-brooded.

"Not uncommon in September."

138. Phyletis inconspicua. (Nos. 137, 182.)

Phyletis inconspicua, Butler, P. Z. S. 1886, p. 391.

One female and two males, from Thundiani and Kala Pani, September and October, 1886.

"Not uncommon in August and September." Mr. Butler's were from Murree.

139. Aspilates obliquaria. (No. 228.)

Aspilates obliquaria, Moore, P. Z. S. 1867, p. 649.

Four females, in good condition, May and June 1886 and 1887, two males worn in August, all from Thundiani. The females are all larger than the males.

140. Sterrha sacraria. (No. 19.)

Phalæna-Geometra sacraria, L. S. N. ii. p. 863.
Sterrha labda, Cram. Pap. Exot. ii. 129, pl. 181. fig. D.

One male, July 1886, from Campbellpore.

S. labda appears to be only a form of *sacraria* with the stripe broader.

Pseudosterrha, gen. nov.

Resembling *Sterrha*, but with the following differences:—In the hind wing the upper half of the discocellular, which in *Sterrha* is obsolete, is clearly present, and marked by a slightly darker spot; the scaling is decidedly coarser; the antennæ of the male are more coarsely plumose; and the hind wings, instead of being white, are of the same ochreous tint as the fore wings.

141. Pseudosterrha ochrea, sp. n. (No. 62.)

Fore wings pale ochreous, tinged with reddish, without markings except a dark, indistinctly expressed line running obliquely from the middle of the inner margin towards the apex, before which it is reflexed on to the costa. Hind wings and fringes of both wings ochreous. Underside reddish ochreous, the hind wing also showing traces of a central band. Antennæ of the male strongly plumose. Expanse of wings, female 18, male 16 millim.

One male and one female from Campbellpore, July 16, 1886. "Common in June."

Family Zerenidæ.

142. Abraxas fuscescens. (No. 152.)

Abraxas fuscescens, Butler, P. Z. S. 1886, p. 392, pl. 35. fig. 10.

One female and two males from Thundiani, September 1886. "Not uncommon in August."

Mr. Butler's specimens were from Kala-Bagh.

143. Abraxas intermedia, sp. n. (No. 149.)

Fore wing white, with a small basal patch of mixed fuscous and tawny scales, followed by a clear white fasciaform space; in the middle of the wing are the remains of a curved central fascia, consisting of a leaden-grey spot on the costa, fulvous at its costal edge, immediately followed by two small leaden-grey spots, one touching the costa, and the other beneath it, and of two or three leaden-grey variable spots near the inner margin; a submarginal curved row of

flattened oval grey spots is preceded on the costa by a single larger one, and terminates on the inner margin in a large irregular blotch of fulvous and bluish grey; hind margin with a series of grey lunules, preceded by a few scattered grey dots, which sometimes coalesce a little below the centre into a small marginal blotch. Hind wings white, with grey marginal lunules; a fulvous and grey blotch at the anal angle, like that on the fore wing, and a submarginal row of small grey dots, one on each vein; sometimes there is a faint central fascia, most pronounced on either margin. Head, thorax, and abdomen yellow, spotted with black.

Expanse of wings 38–40 millim.

A pair from Thundiani and Kala Pani, March and April, 1887.

The species is intermediate between *A. ulmata* and *A. pusilla*, Butler, from Japan; smaller than *ulmata*, and paler than both.

144. Abraxas diversicolor, sp. n. (Nos. 119, 123.)

Fore wings grey, with a faint ochreous tinge in certain lights, thickly dusted with fine black atoms, the costa itself with fine black streaks; a blackish curved line before the middle, and a black serrated, and slightly curved line beyond the middle, both darkest at their extremities; a dark spot on the costa between them appears to be the commencement of a faint ochreous central line, which approaches the outer line on the inner margin; a black linear central spot; submarginal line edged internally with dark, and externally with whitish; towards the costa with four blackish blotches internally and a *white* border externally; a series of marginal black dots; fringes paler. Hind wings pale fuscous, with faint indications of two curved lines, one in the centre, the other submarginal: the latter edged with paler, and containing three darker patches, one at each angle and one in the middle; fringes whitish. Head, thorax, and abdomen grey.

Underside: fore wing dull smoky fuscous, darker towards the hind margin; the costa dotted black and ochreous; the central line showing dark, and the submarginal ochreous: hind wing ochreous, speckled with darker, with the central band distinct, and the submarginal scarcely visible.

Expanse of wings 38 millim.

One male and two females, from Thundiani, August 15, 1886.

Unlike any other *Abraxas*, but agreeing both in neuration and the structure of the palpi and antennæ.

145. Ligdia coctata. (No. 58.)

Ligdia coctata, Gn. Phal. ii. p. 210.

Melanippe restituta, Wlk. Cat. Lep. Het. B. M. xxv. p. 129[7].

One female and one male, from Kali Pani and Campbellpore; the latter caught July 16, 1886, the former April 28, 1887.

Doubtfully distinct from the European *L. adustata*. Guénée says, "fore wings more elongated, and produced at the apex, the outer margin straight, the fascia less marbled; hind wings with the outer margin less bent, and the fascia more evenly dentate."

Family LARENTIIDÆ.

146. THERA CONSIMILIS, sp. n.

Fore wings dull greyish fuscous; the curved outer edge of the basal patch and the black-bordered central fascia darker; the costal portion of this latter is much broader than the lower, running obliquely outward, and containing an oblique black dash on the end of the cell; the outer edge forming in its lower half a succession of small curves. The space between the basal patch and central fascia, and another fascia beyond this are somewhat fuscous; hind margin greyish white, traversed by an undulating paler submarginal line; veins beyond the middle blackish; a black thrice-angulated line runs obliquely from the apex to the central fascia. Hind wing dark grey, with a curved pale submarginal fascia. Abdomen fuscous. Antennæ of the male pectinated. Underside dull whitish, without distinct markings.

Expanse of wings 31–33 millim.

Five males and one female from Thundiani and Nandar, August, September, and October 1886; the female, May 2nd, 1887, at sallow-bloom.

This species is allied to the European *T. juniperata*, but is larger and duller. The British Museum collection contains a single female, unnamed, from Afghanistan.

147. YPSIPETES UNDULATA, sp. n. (No. 158.)

Fore wing grey, with a tinge of ochreous or pink, and thickly sprinkled with grey atoms; basal patch dark grey, bordered by a double blackish line; the pale fascia following, narrow on the costa, and broader on the inner margin; central fascia dark grey, broad on the costa, and narrowed on the inner margin, edged on each side by a geminated blackish line; the inner two merely sinuous, the two outer running at first obliquely outwards from the costa, and then inclining inwards, and forming a series of small curves; a fuscous fascia follows, and is succeeded by a much undulating pale submarginal line, beyond which the hind margin itself is dark grey. An oblique dark grey dash from the apex, above which the costa is paler; the base of the central fascia and of the outer edge of the basal patch, on the inner margin, velvety black; cilia grey, preceded by a strong black basal line. Hind wing pale fuscous with a reddish tinge, dark grey at the base of the cilia, and slightly paler before the hind margin. Underside: fore wing with the basal two thirds dark; the extreme costa and marginal one third ochreous; hind wing ochreous, with a darker central band and spot.

Expanse of wings 32 millim.

One female, three males, from Thundiani, August and September, 1886; "not uncommon." A single example of an unnamed, but allied species, from Sumatra, is in the British Museum collection.

In the sparseness of the scaling, and the long, narrow shape of the scales, the species approaches more nearly the genus *Thera*.

148. Scotosia expansa. (No. 157.)

Scotosia expansa, Moore, Desc. Lep. Coll. Atk. iii. p. 274.
Scotosia venimaculata?, Butler, P. Z. S. 1886, p. 393.

One female and five males from Thundiani, August and September, 1886; "very common."

Mr. Moore gives Darjiling and the Himalayas as other localities.

149. Scotosia dubiosata. (No. 121.)

Scotosia dubiosata, Wlk. Cat. Lep. Het. B. M. xxv. p. 1352.

One female from Thundiani, August 19, 1886.

150. Scotosia conturbata. (No. 195.)

Larentia conturbata, Wlk. Cat. Lep. Het. B. M. xxvi. p. 1703.

Three females and five males from Thundiani, August 19, 1886.

Two of the males have the fore wings suffused with dull ochreous, which forms a fascia on either side of the central dark band.

151. Scotosia nigralbata, sp. n. (No. 102.)

Fore wing sooty black; brownish black, when worn; the usual lines marked by a series of snow-white dots on the veins, two of which, in the submarginal line, are larger and conspicuous, as is one on the costa before the apex; a broad white blotch runs obliquely from the costa to the middle of the hind margin, and across it two undulating dark lines are visible; fringes mottled black and white. Hind wing sooty, with the apical fringes white. Head, thorax, and abdomen sooty. Underside dull sooty; with the white patch, the spot at the anal angle, and the costal spot also white.

Expanse of wings 44–48 millim.

Two females and three males from Thundiani, August 1886. There are also two specimens from Sikkim in the British Museum collection, taken by Major Elwes. "Fairly common in August."

152. Phibalapteryx nigrovittata, sp. n. (No. 133.)

Fore wings wood-coloured, almost wholly suffused with dark brownish black, the pale ground-colour being confined to a diffuse streak along the costa, and two oblique lines on the inner margin, bordering the dark central fascia; the whole wing is traversed by a succession of dark brown and light brown wavy oblique lines, which are all obscurely reflexed towards the costa; the base on the inner margin, a broad oblique central band, which below the apex is diverted into the hind margin, and the hind margin itself all dark brown; submarginal line wavy, distinct, preceded first by a narrow pale fascia, and then by a broader one; veins dusted black and white; fringes dark brown, with a basal row of short, thick, black dashes. Hind wings grey-brown, occupied by a succession of dark and light grey wavy lines, towards the costa paler and without distinct markings; head, thorax, and abdomen dark brown. Underside dull grey, speckled with darker, with the veins and central spot dark.

Expanse of wings 36 millim.

Two females, Thundiani, dated August 17, 1886, and April 4, 1887. "Fairly common in August." This remark applies also to *P. nigripunctata*, as the two species were confounded and numbered alike.

153. PHIBALAPTERYX NIGRIPUNCTATA, sp. n. (No. 133.)

Fore wing dull grey-brown, varied with oblique darker lines, distinct only on the inner margin; a dark subapical blotch on the hind margin, a smaller one obliquely beneath it, and another, more diffuse, above the anal angle; veins speckled, black and white; a distinct black central spot; fringes brown, preceded by a series of thick, short, black dashes. Hind wing greyer, likewise with the veins speckled dark and light; marked by a succession of darker and paler sinuous lines or narrow fasciæ, most conspicuously towards the hind margin; central spot distinct, black; fringes as in the fore wing. Underside pale grey, with the central spots distinct; head, thorax, and abdomen dull fuscous.

Expanse of wings 32 millim.

One male August 10, two females August 10 and 26, 1886. Thundiani.

All three specimens are more or less worn, so that the markings are not exactly made out. It appears to be related to the common European *P. tersata*.

PHOTOSCOTOSIA, gen. nov.

Not differing in neuration from *Scotosia*, but separable at once by the very short *globose* palpi, the terminal joint of which is invisible, and by the possession of a long tuft of hairs on the underside of the fore wings in the male. These hairs are pale ochreous at their base, and velvety back at their apex, and extend from the base of the wing to near the hind margin, occupying the whole space between the median and submedian veins; towards the hind margin also the under surface of the wing beneath the hairs has deep black scales. Wings shaped like *Scotosia*, but with the hind margins plain, not scalloped; in the male the hind wing has the costa more or less broadly pale, whitish or ochreous; antennæ of male faintly ciliated. Besides the two species here mentioned, there is a third, *lucicolens* (Butler), also from Hindostan.

154. PHOTOSCOTOSIA AMPLICATA. (No. 162.)

Cidaria amplicata, Wlk. Cat. Lep. Het. B. M. xxv. p. 1404.

A single male from Thundiani, August 20, 1886; "rare."

Also from Darjiling.

155. PHOTOSCOTOSIA MINIOSATA. (No. 183.)

Scotosia miniosata, Wlk. Cat. Lep. Het. B. M. xxv. p. 1354.

One female and one male from Nandar and Thundiani, September 1887. "Uncommon, a few in September."

Occurs also in Bhootan and in N. Hindostan.

156. Melanippe flavistrigata, sp. n.

Fore wing white, much suffused with dark grey; a basal patch, a sinuous central fascia, broader at the costa, and a subapical costal spot, blackish; from the subapical spot an undulating dark line runs to the anal angle, followed by a similar pale submarginal one; the usually pale fascia between the basal patch and the central fascia is filled up with dark grey, but has a horizontal yellowish dash running across it in the centre, which colour also appears beyond the central fascia; a grey patch on the hind margin below the apex. Hind wing grey, with paler curved fascia. Head, face, thorax, and abdomen blackish; legs also blackish. Underside greyish white, with the darker markings showing through; all the wings with a dark central spot.

Expanse of wings 22 millim.

One male from Kala Pani, September 1, 1886.

This insect somewhat resembles a small dark *M. fluctuata*.

157. Coremia livida. (No. 60.)

Coremia livida, Butler, Ann. & Mag. N. H. 1878, i. p. 449.

One female, Campbellpore, May 31, 1886.

Mr. Butler's type is from Japan.

158. Cidaria subrubescens, sp. n.

Fore wing dull fuscous, tinged with reddish; basal patch small, blackish; central fascia blackish, its inner edge concave, with a small angulation below the costa; the outer edge forms two small curves below the costa, then a small sharp angulation and a larger curve to the inner margin; rest of the wing reddish fuscous, with faint traces of undulating lines towards the costa. Hind wing dark fuscous, with a well-defined central spot; a distinct sinuous central line, and several alternately light and dark lines beyond it. Head, thorax, and abdomen fuscous; base of the latter with a reddish-grey ring. Underside pinkish ochreous, glossy; both wings with a strongly marked dark sinuous central line and dark spot.

Expanse of wings 22 millim.

One male from Berham Gully, September 24, 1886.

159. Cidaria thomasata, sp. n.

Very closely allied to *C. jameza*, Butler, from Japan. The only difference is that the external shoulder of the brown central band, instead of consisting of two broad blunt, rounded teeth, forms a single, more angulated, projection, and the indentation beneath the shoulder is more deeply inserted.

Expanse of wings 30 millim.

Two males from Thundiani, August and September, 1886.

In the British Museum collection is a single worn specimen from Murree, which Mr. Butler doubtfully referred to his Japanese species, *jameza*, P. Z. S. 1886, p. 393.

160. Cidaria rostrifera, sp. n. (Nos. 169 & 127.)

Fore wing pinky grey; without markings except the central fascia, which is dark velvety brown, deepest on either margin, and containing on the costa a paler patch with a dark central dot. The fascia is twice as broad on the costa as on the inner margin; its inner edge is simply sinuous, but the outer is twice angulated, the upper angulation being especially acute and conspicuous; between the two is a deep concavity, and above and below each respectively is a shallower one; both margins are narrowly edged with pale ochreous. Hind wing like the fore wing, with a faintly darker central sinuous line. Head, thorax, and abdomen grey. Underside pinky ochreous, thickly sprinkled in the hind wing with transverse greyish streaks; each wing with a distinct black central spot.

Expanse of wings 28 millim.

One male from the Berham Gully, dated September 24, 1885, and one female from Thundiani, September 15, 1886. "Uncommon." Neither specimen is in very good condition, and in both the palpi and antennæ are absent.

161. Cidaria brevifasciata, sp. n.

Fore wing dark brown; basal patch traversed by a fine straight white line, and followed by a slightly oblique white fascia, with a single brown line running down its centre; central fascia abruptly cut off below the middle of the wing, with a narrow white subcostal projection into its inner edge, and a prominent angle on its outer edge, followed by a broad angulated white fascia, also traversed by a single brown line; the two pale fasciæ meet on the inner margin, and contain between them a brown wedge-shaped mark, the remnant of the central fascia; hind margin brown, interrupted by a white patch in the middle, and traversed by a fine white line. Hind wing whitish grey, with slightly darker hind margin and fascia, and the basal area greyer, with a small central dot. Head, thorax, and abdomen dark fuscous; the latter paler beneath, like the wings.

Expanse of wings 28 millim.

One male from Thundiani, August 19, 1886.

162. Stamnodes pamphilata. (No. 126.)

Cidaria pamphilata, Feld. Reis. Nov. pl. 132. fig. 34.

Six specimens, including one female from Thundiani, August 1886. Marked "common in August."

163. Docirava æquilineata. (No. 151.)

Docirava æquilineata, Wlk. Cat. Lep. Het. B. M. xxvi. p. 1635.

One female from Dumtanar, near Abbotabad, September 29, 1886.

164. Docirava uvaria. (No. 137.)

Aspilates uvaria, Wlk. Cat. Lep. Het. B. M. xxvi. p. 1681.
Anaitis vastata, Wlk. Cat. Lep. Het. B. M. xxxv. p. 1700.

Two females, one from Thundiani, August 18, the other from

the Berham Gully, September 24, 1886 "Fairly common in August."

Also recorded from Darjiling.

165. EUPITHECIA QUADRIPUNCTATA, sp. n.

Fore wing silky grey, semidiaphanous, without any markings except a large spot of raised black scales on the cell; three dark costal spots above it, and a very faint pale undulating submarginal line; fringes grey, with a thin black basal line. Hind wing still more sparsely scaled, with a dark central spot. Head, thorax, and abdomen dark grey; the incisions of the segments whitish. Expanse of wings 28 millim.

One female from Thundiani, April 30, 1887, at sallow-bloom.

The species resembles *E. trisignata*, but has longer, more pointed fore wings, with thinner scaling.

166. EUPITHECIA, sp.

One female, taken September 24 in the Berham Gully, is in too poor a condition to admit of identification. The fore wings are pointed, dull fuscous, with a linear black central spot, and traces of transverse lines. Hind wing more greyish, with traces of a paler band. Expanse of wings 20 millim.

Family EUBOLIIDÆ.

167. EUBOLIA NASIFERA, sp. n. (No. 151.)

Fore wing whitish grey, tinged towards the base with fuscous; basal patch small, inconspicuous, its curved outer edge only visible, the usually pale fascia beyond it being of the same shade; central fascia with its margins velvety brown, and a pale pinkish-grey space between them, in which, at the end of the cell, is a short linear dash. The inner edge of the central fascia forms two short curves; the outer forms a strong angulation in the middle, below which it is deeply concave; it is followed immediately by two or three pinkish-grey lines; in the grey hind margin is a pale submarginal line; a dark dash obliquely from the apex, and a dark grey shade on the costa before the apex. Hind wing pale fuscous, with a faint trace of a darker band and a paler submarginal fascia. Fringes of both wings grey. Head, thorax, and abdomen dark grey. Antennæ of male pectinated. Underside grey, with the dark markings of the fore wing showing through.

Expanse of wings 32 millim.

One male, in fine condition, Thundiani, August 19, 1886.

168. ANAITIS EFFORMATA. (Nos. 110, 185.)

Anaitis efformata, Gn. Phal. ii. p. 500.

Two females, five males, from Thundiani and Nandar, August, September, and October.

Guénée gives Syria as the locality for the species, and says it is closely related to *A. plagiata*, L., but smaller, fore wings paler,

the fasciæ formed by lines less marked and not darkened; denticulations blunter, the second fascia curved, not sinuated; the apical dash pale ferruginous. The present examples seem to answer his description, but it is doubtful if they are a distinct species.

PYRALIDINA.

Family Pyralididæ.

169. Pyralis bractiatella. (No. 65.)

Myelois bractiatella, Wlk. Cat. Lep. Het. B. M. xxvii. p. 36; Moore, Ceylon, iii. p. 262, pl. 178. fig. 5, ♀.

Two females and one male from Campbellpore, May and June 1886, July 1885.

170. Pyralis platymitris. (No. 65.)

Pyralis platymitris, Butler, P. Z. S. 1882, p. 166.

One male, taken August 9 at Kala Pani.

Darjiling and Solun are other localities.

The species very much resembles *P. elachia*, Butler, Ill. Lep. Het. iii. p. 70, pl. 58. fig. 3.

171. Pyralis xylinalis.

Pyralis xylinalis, Swinhoe, P. Z. S. 1885, p. 865, pl. 57. fig. 17.

A single female from Campbellpore, somewhat worn, but recognizable, July 20, 1886.

172. Surattha albipennis. (No. 23.)

Surattha albipennis, Butler, P. Z. S. 1886, p. 383.

Two males and two females from Campbellpore, dated July 1886.

173. Actenia gnidusalis. (No. 88.)

Aglossa gnidusalis, Wlk. Cat. Lep. Het. B. M. xvii. p. 278.

? *Scotomera tristis*, Butler, P. Z. S. 1881, p. 623.

? *Cledeobia infumatalis*, Erschoff, Fedtschenko Reise, Lep. p. 73, pl. v. fig. 79, ♀.

One male, Campbellpore, July 25, 1886, in perfect condition.

Walker's description, made from insects in the collection of Mr. E. L. Layard, is very exact; but he omits to notice that the head and face are pale ochreous.

Three other species which Walker assigns with a ? to the genus *Aglossa*—*harpialis*, xvii. p. 276, *rufiflualis*, xxxiv. p. 1249, *basalis*, xxxiv. p. 1250, and *A. laminalis*, Gn. Delt. & Pyr. 129. 27,—alike from the structure of the palpi and antennæ, and from the character of the markings, appear to belong rather to this genus.

The two specimens from which Mr. Butler described *Scotomera tristis*, l. c., are both considerably worn and without fringes; besides which, being both females, the fore wings are naturally narrower than those of the male; the *whiteness* of the face and of the under surface, which he notices in describing them, are of course to be

expected in wasted specimens; in all essential points they agree well with Walker's description. These were from Kurrachee; and there is another specimen, equally worn, among some insects from Col. Swinhoe, who in the P. Z. S. 1884, p. 526, speaks of taking it at Kurrachee in March, and on the Hubb river in November.

Erschoff's figure of *Cl. infumatalis* ♀ seems to represent the same insect, with the hind wing possessing a paler fascia. This was from Turkestan.

Family Ennychiidæ.

174. Pyrausta silhetalis. (No. 150 or 32.)

Pyrausta silhetalis, Gn. Delt. & Pyr. p. 166.
Botys pangialis, Feld. Reise Nov. pl. 134. fig. 25.

One male from Thundiani, taken August 28, 1886.

A very pretty and distinct species, with wholly dark fore wings, and bright orange hind wings with a broad black border. There is no example in the British Museum collection.

Guénée's type was from Silhet. Felder's from Pangi, in the Himalayas. In the present example from Thundiani the fringes of the hind wings are dark throughout, only slightly tinged with orange at their apices.

Family Asopiidæ.

175. Hymenia recurvalis. (No. 84.)

Phalæna recurvalis, F. S. E. p. 407.
Phalæna angustalis, F. Mant. p. 309.
Phalæna-Pyralis fascialis, Cram. Pap. Exot. iv. p. 236, pl. 398. fig. O.

One female and one male from Campbellpore, and a female from Hassan Abdal, July 1886; all considerably worn. "Common in July."

176. Samea (?) bipunctalis, sp. n. (No. 116.)

Fore wing dull fuscous, with two obscure darker transverse bands—one straight near the base, the other near the hind margin, very sinuous, deeply concave in the centre; the two stigmata conspicuously dark fuscous; before the orbicular is a short, wedge-shaped, straw-coloured spot; a larger, subquadrate one between the stigmata, and a large pale costal blotch of the same colour before the second transverse line, reaching more than half across the wing, and filling up the concavity in the line; on the costa beyond the line stands another smaller pale spot. Hind wings very pale straw-colour; with a central spot, a sinuous submarginal band, shaped like that of the fore wing, and a broadish marginal band, all dull fuscous, as are the thorax, abdomen, and fringes.

Two males and one female from Thundiani, August 15, 1886. "Common in August."

The species is of the same size as *S. magna* and *S. yerburii*, but is decidedly different from either.

177. Samea (?) gracilis.

Samea gracilis, Butler, Ill. Lep. Het. iii. p. 74, pl. 59. fig. 4.

One male, Thundiani, September 11, 1886, very much worn, but apparently identical with the above.

Family Hercyniidæ.

178. Aporodes meleagrisalis.

Herbula meleagrisalis, Wlk. Cat. Lep. Het. B. M. xvii. p. 324.

Four males and two females, Campbellpore, May and June, 1886. Swinhoe gives Quetta and Candahar besides.

179. Herbula cespitalis.

Pyralis cespitalis, W. V. p. 123. 32.

Two males, Abbotabad, September 20, 1886.

Family Hydrocampidæ.

180. Paraponyx vagalis.

Oligostigma vagalis, Wlk. Cat. Lep. Het. B. M. xxxiv. p. 1530.

One male, Hassan Abdal, July 18, 1886.

The type in the British Museum collection is a female, much larger and browner than the male. Together with three other unnamed species in the same collection, this species has the exterior margin of the fore wings strongly elbowed in the middle, its upper half being nearly vertical; the markings of the fore wing also are peculiar. Lederer in his treatise on the Pyralidina, W. e. M. 1863, pp. 451, 452, makes no reference to this difference; but his descriptions of *P. fragmentalis* and *gangeticalis* and of *Hydrocampa tortalis* indicate members of this group.

Family Margaroniidæ.

181. Pygospila tyres. (No. 83.)

Phalæna-Pyralis tyres, Cram. Pap. Exot. iii. p. 124, pl. 263. fig. C.

Pygospila tyresalis, Gn. Delt. & Pyr. p. 312. 340.

One female, Campbellpore, July 29, 1886.

182. Margaronia transvisalis.

Margaronia transvisalis, Gn. Delt. & Pyr. p. 304. 320.

One female, taken at Rawal Pindi, March 31, 1887.

Family Botydidæ.

183. Ravanoa creonalis. (No. 97.)

Botys creonalis, Wlk. Cat. Lep. Het. B. M. xviii. p. 579.
Botys neoclesalis, Wlk. Cat. Lep. Het. B. M. xviii. p. 635.
Botys suspicalis, Wlk. Cat. Lep. Het. B. M. xviii. p. 667.
Botys convectalis, Wlk. Cat. Lep. Het. B. M. xxxiv. p. 1411.

One male from Campbellpore, July 30, 1886.

The types of Walker's different species come respectively from San Domingo, the Cape, Ceylon, and S. Hindustan.

The genus *Ravanoa* was formed for the reception of this species and *Zebronia bilineolalis*, Wlk., by Mr. Moore, Ceylon, iii. p. 284.

184. Botys nubilalis.

Botys nubilalis, Hb. Eur. Schmett. fig. 94.
Botys lupulinalis, Gn. Delt. & Pyral. p. 331.
? *Phalæna lupulina*, Clerck, Icon. pl. 9. fig. 4.

A pair from Kala Pani, April 28, 1887.

185. Botys carnealis.

Botys carnealis, Dup. Hist. Nat. Lep. viii. p. 322, pl. 232. fig. 4 (non Tr.).
Botys diffusalis, Gn. Delt. & Pyr. p. 340.
Botys tenuialis, Mann, W. e. M. vi. p. 387, pl. 3. fig. 5.
? *Botys corticalis*, Hb. Eur. Schmett. Pyral. fig. 137.

One male and one female from Campbellpore, taken in May and September, 1886.

Hitherto only a European species.

186. Scopula vinctalis. (No. 18.)

Scopula vinctalis, Wlk. Cat. Lep. Het. B. M. xxxiv. p. 1476.

One female, Campbellpore, May 21, 1886.

Has occurred also at Aden; in S. Hindustan and Australia.

The species seems entirely out of place either as a *Scopula* or among the Scopariidæ. In facies it approaches more nearly the species of *Hydrillodes*, Gn.

Family Scopariidæ.

187. Nomophila noctuella.

Nomophila noctuella, Ld. Pyr. W. e. M. vii. p. 379.
Tinea noctuella, W. V. p. 136.
Stenopteryx hybridalis, Gn. Delt. & Pyr. p. 414.

Six specimens, from Campbellpore, Abbotabad, and Chittar Pahar, April and May, 1886.

188. Hellula undalis.

Phalæna undalis, F. E. S. iii. p. 226.
Scoparia ? *alconalis*, Wlk. Cat. Lep. Het. B. M. xix. p. 827.
Scoparia optatusalis, Wlk. Cat. Lep. Het. B. M. xix. p. 1018.
Leucinodes ? *exemptalis*, Wlk. Cat. Lep. Het. B. M. xxxiv. p. 1313.
? *Scopula criasusalis*, Wlk. Cat. Lep. Het. B. M. xix. p. 1016.
? *Pyralis subtrigonalis*, Wlk. Cat. Lep. Het. B. M. xxxiv. p. 1244.

Two males from Campbellpore, May and June, 1886.

Walker's *criasusalis* appear to be merely larger specimens with more prominent dark grey markings.

Family PHYCITIDÆ.

189. ANERASTIA, ? sp.

Two examples, probably distinct, from Campbellpore, 26 and 30 May, 1886, both terribly worn, and without palpi.

190. ACROBASIS NIGRESCENS, sp. n.

Fore wings blackish grey, with two transverse pale lines; the first distinct, white, oblique and slightly curved before the middle; immediately beyond this line the costa is broadly darker, and the inner margin before it; the second line is grey, submarginal, and bordered on each side with darker; fringes grey, with a row of black dots at their base; in the centre of the costa is a paler space with two grey wedge-shaped marks below it, each mark containing an arrow-headed black spot. Hind wing and fringes dark grey, somewhat diaphanous. Head, thorax, and abdomen blackish.

Expanse of wings 20 millim.

One female from Kala Pani, September 1, 1886.

191. SPERMATOPHTHORA (?) PULVERULENTA, sp. n.

Fore wing grey, powdered with darker, mealy-looking, with no traces whatever of spots or markings. Hind wing white, with veins and hind margin fuscous; head and thorax like the fore wing; abdomen paler. Expanse of wings 18 millim.

One female, July 23, 1886, Campbellpore.

192. MYELOIS (?) CARNEA, sp. n.

Fore wing smooth, dull salmon-colour, with the costa broadly, and the hind margin narrowly, greyish white, intermixed with darker atoms; a fine pale transverse line before the middle, only distinct on the inner margin; with a fine black dot on its outer edge above the inner margin; a similar, but sinuous, submarginal line, with a black dot before it near the costa; fringes salmon-colour. Hind wings white, with the veins and hind margin fuscous; cilia whitish; face and palpi pinkish grey; thorax and (probably) the abdomen salmon-coloured.

Expanse of wings 18 millim.

One female, Campbellpore, June 8, 1886.

The only example sent being a female, it is impossible to state positively to which genus it belongs.

Myelois convergens, Erschoff, Fedtschenko, Reise, Lep. p. 86, pl. vi. fig. 98, and *Myelois urbicella*, id. fig. 99, both from Turkestan, appear nearly related to the present species.

193. CANTHELIA LUCIDA, sp. n.

Fore wings pale yellowish olive, with the basal patch, a central streak, another beyond the end of the cell, and the extreme hind margin lucid pink. Hind wings yellowish white, with pinkish hind margin. Head, thorax, and abdomen yellowish olive. Expanse of wings 14 millim.

One female only, from Campbellpore, May 26, 1886.

Possibly only a variety of *C. ægnusalis*.

Family Crambidæ.

194. Eromene ocellea. (No. 50.)

Eromene ocellea, Haw. Lep. Brit. p. 486.

Four males, two females, taken May 26, 1886, at Campbellpore.

195. Crambus luteellus.

Crambus luteellus, W. V. p. 134.

Two females from Campbellpore, June and July, 1886, both much worn, and decidedly smaller than the specimens from Japan in the Brit. Mus. collection. This plain-looking and widely-spread insect in appearance more nearly resembles a *Chilo* than a *Crambus*.

196. Ancylolomia chrysographella. (No. 87.)

Jartheza chrysographella, Wlk. Cat. Lep. Het. B. M. xxvii. p. 184.

Chilo chrysographella, Kollar, Kaschmir, p. 494.

One female, Campbellpore, July 23, 1886.

TORTRICINA.

Family Tortricidæ.

197. Cacœcia simulana.

Godana simulana, Wlk. Cat. Lep. Het. B. M. xxxv. p. 1801.

One female, April 27, 1887, Abbotabad.

The example is smaller than Walker's type, but otherwise identical. The genus *Godana* must, I think, be allowed to sink, as not essentially different from *Cacœcia*, Hüb.

Family Cochylidæ.

198. Xanthosetia innotatana, sp. n.

Fore wing pale straw-yellow, with faint traces of deep colour; otherwise without markings of any kind; decidedly deflexed beyond the cell. Hind wings yellowish grey. Head, thorax, and abdomen yellowish. Expanse of wings 24 millim.

One female, May 6, 1887, Kala Pani.

TINEINA.

Family Hyblæidæ.

199. Phycodes hirudinicornis. (No. 27.)

Phycodes hirudinicornis, Gn. Noct. ii. p. 389.

Phycodes hirundinicornis, Moore, P. Z. S. 1881, p. 377.

Tegna hyblæella, Wlk. Cat. Lep. Het. B. M. xxxv. p. 1810.

Two specimens from Hassan Abdal, dated July 18th, and another from Khairabad, dated 25th.

200. Phycodes minor.

Phycodes minor, Moore, P. Z. S. 1881, p. 378.

One male from Campbellpore, July 19, 1886.

This genus was wrongly assigned by Guénée a place amongst the Noctuæ. The larva spins a cocoon between leaves, somewhat flattened, and of glutinous silk, from the end of which the empty pupa-case remains sticking out after the emergence of the imago. Superficially the species have a certain amount of resemblance to the Tortrix, *Carpocapsa pomonella*, but the absence of the fork at the base of the submedian nervure of the fore wing prevents its admission among the Tortricina. Its more appropriate place would seem to be near the beginning of the Tineina, in the neighbourhood of the genus *Atychia* and its allies.

Family TINEIDÆ.

201. HAPSIFERA SECLUSELLA. (No. 67.)

Cimitra seclusella, Wlk. Cat. Lep. Het. B. M. xxix. p. 780.

One male, Campbellpore, June 12, 1886.

Walker's type in the Brit. Mus. collection is a female, and therefore considerably larger than the present specimen.

202. ALAVONA BARBARELLA. (No. 81.)

Alavona barbarella, Wlk. Cat. Lep. Het. B. M. xxviii. p. 575.

One male, July 5, 1886, Campbellpore.

Family PLUTELLIDÆ.

203. AZINIS ASSAMENSIS.

Hyponomeuta assamensis, Butler, Trans. Ent. Soc. 1879, p. 6.

One male from Kala Pani, April 28, 1887.

Mr. Butler's type is from Cachar.

204. HYPONOMEUTA MILLEPUNCTATELLUS, sp. n. (No. 105.)

Fore wing bluish white, with five complete rows of very small, black dots, and several intermediate incomplete rows; costa narrowly black at the base; head, thorax, and abdomen like the fore wings; thorax with six or eight black dots. Hind wings dark grey, rather transparent; fringes paler grey. Expanse of wings 22 millim.

Two females, August 9, 1886, Kala Pani.

Akin to *H. padi*, but easily distinguished by the intermediate half rows of dots.

205. ADELA LATIFASCIELLA, sp. n. (No. 130.)

One male, August 24, 1886, Thundiani, much worn.

The fore wings violaceous purple towards the apex, apparently paler towards the base, with a broad oblique yellowish-white fascia beyond the middle.

Family CRYPTOLECHIIDÆ.

206. GELECHIA, sp.

One male, September 26, 1886, Berham Gully.

Fore wings pointed; base of the costa and two blotches, one before,

the other beyond, the middle, blackish. The example is so much rubbed that it is impossible to say what the ground-colour of the fore wings may have been; the head and thorax appear to have been whitish.

2. Descriptions of new Species of Phytophagous Coleoptera from Kiukiang (China). By Martin Jacoby, F.E.S.

[Received May 17, 1888.]

The specimens now described have for the most part been received by Mr. J. H. Leech, from Kiukiang in China, unless otherwise stated, and are contained in that gentleman's collection and in my own.

Sagra leechi, n. sp.[1]

Dark blue; thorax remotely punctured, the anterior angles prominent; elytra metallic golden cupreous, depressed below the shoulders, finely geminate-punctate-striate, the lateral margins violaceous blue.

Var. Elytra entirely metallic blue.

♂. The posterior femora slightly extending beyond the elytra, their upper margin in shape of an acute ridge, their inner surface with a large fulvous tomentose patch, the apex with a larger and a smaller tooth; the posterior tibiæ curved at the base, their outer margin furnished with a long tooth below the middle, the inner margin with a smaller one at the same place, the extreme apex also produced into an acute point.

♀. The posterior femora not extending beyond the elytra, their lower edge provided with a short denticulate ridge, their tibiæ simple, strongly curved through their entire length.

Length 3–6 lines.

Head with a few deep but distantly placed punctures, the space between the antennæ divided by deep grooves which cross each other obliquely; the clypeus depressed, impunctate. Antennæ half the length of the body, dark violaceous, the lower 7 joints shining, the rest opaque, terminal joint very long. Thorax subquadrate, scarcely longer than broad, the sides slightly concave, the anterior angles obliquely thickened and produced outwards, the disk irregularly impressed with scattered punctures; scutellum blue. Elytra broadly ovate, deeply depressed within the shoulders, and to a less extent below the base and at the sides, the basal margin raised; each elytron with 5 or 6 double rows of punctures, more distinctly visible anteriorly than below the middle, the interstices finely aciculate near the apex. Below shining, without punctures or pubescence.

This species, one of the most beautiful of the genus, is allied to *S. petelii* and *S. jansoni*, Baly, but differs from either in the very

[1] It is possible that this species is identical with *S. fulgida*, Weber, also from China.

prominent anterior angles of the thorax, the more sparingly punctured surface of the latter, and other particulars pointed out above. From *S. petelii* the present insect differs further in the possession of another tooth at the inner margin of the posterior tibiæ and in the less transversely wrinkled surface of the elytra. The size of the species is often reduced to half the general length. A great many specimens were obtained of either colour, but differing in no other way.

CRIOCERIS CHINENSIS, n. sp.

Black; thorax obscure fulvous, strongly and irregularly punctured; elytra very deeply and closely punctate-striate, the interstices costate and wrinkled near the apex; femora stained with rufous.

Length 3½–4 lines.

Head black, the neck fulvous; the space surrounding the eyes covered with yellow pubescence; eyes very deeply notched; clypeus punctured and pubescent. Antennæ extending slightly beyond the thorax, black, the third and fourth joints equal, short, slightly longer than the second joint, the terminal joints thickened, but not broader than long. Thorax subquadrate, widened at the base and to a less extent at the apex, the sides moderately constricted, the surface irregularly impressed with larger and smaller punctures, leaving a narrow central space generally smooth and impunctate, fulvous or rufous; scutellum fulvous. Elytra without basal depression, deeply and closely punctured, especially at the sides, where the interstices are costate and transversely raised. Underside and legs black, sparingly covered with grey pubescence; the femora more or less rufous at the base.

C. chinensis is closely allied to *C. rugata*, Baly, from Japan, from which it differs in the anteriorly more widened thorax and in the much finer punctuation of the latter; in *C. rugata* the anterior portion of the thorax is rounded and not produced, and the disk is very deeply, almost rugosely punctate; the sculpture of the elytra, however, is exactly the same in both insects, but the femora are entirely black in *C. rugata*.

CRIOCERIS TRIPLAGIATA, n. sp.

Black; head deeply constricted behind; thorax longer than broad, nearly impunctate; elytra flavous or fulvous, remotely punctate-striate, a large ovate spot extending to the middle on each elytron, and the apex broadly, black.

Length 4 lines.

Head very deeply constricted behind the eyes; the vertex raised into two large tubercles; eyes very prominent, deeply notched. Antennæ half the length of the body, the four lower joints shining, the rest opaque, slightly thickened towards the apex, the joints longer than broad. Thorax about one half longer than broad, the sides concave at the middle, the surface without basal sulcation, black, very shining, with a few very fine punctures near the anterior margin; scutellum black. Elytra with a very faint depression before the

middle, the shoulders rounded, not grooved within; the punctures distinct, but only visible at the base near the suture and at the sides, the middle of the disk as well as the apex nearly impunctate; the lateral margin thickened and accompanied by a row of deep punctures. Underside and legs black, finely pubescent.

This handsome species will be easily recognized by the pattern of the elytra, the large ovate black spot occupying the middle of the disk anteriorly, but not extending to either margin; the apical third portion is entirely black, this colour forming a broad transverse subtriangular band, the anterior margin of which does not quite extend to the sides.

CRYPTOCEPHALUS CHINENSIS, n. sp.

Reddish fulvous; the antennæ, tibiæ, and tarsi black; thorax with three impressions; elytra flavous, strongly punctate-striate, the margins, a spot on the shoulder, and a narrow transverse band below the middle, black.

Length 2 lines.

Head fulvous, with a few very fine, remotely placed punctures, the clypeus and the space near the inner margin of the eyes flavous. Antennæ two thirds the length of the body, black, the three basal joints more or less flavous below, the third joint one half shorter than the fourth; thorax nearly three times broader than long, narrowed in front, the sides rounded and narrowly margined, the surface entirely impunctate, with a distinct oblique depression at each side and a very indistinct one at the base, reddish fulvous, very shining, the posterior margin very narrowly flavous; scutellum fulvous, margined with brown, strongly raised. Elytra subcylindrical, parallel, bright flavous, regularly punctate-striate on the disk, irregularly punctured at the sides, narrowly margined with black, the shoulders with a small black spot, and a similarly coloured narrow transverse band placed below the middle and extending to either margin; the elytral epipleuræ black, distinctly punctured. Below fulvous, finely punctured, the outer margin of the tibiæ and the tarsi black.

Of this species, of which I cannot find any published description, two specimens are before me, which only differ very slightly in the elytral black band being more deeply black and extending across the suture in one specimen, while in the other this band is slightly interrupted near the suture. *C. chinensis*, on account of its coloration, seems somewhat allied to *C. crucipennis*, Suffr.

COPTOCEPHALA BIFASCIATA, n. sp.

Black; the basal joints of the antennæ and the base of the tibiæ fulvous; thorax transverse, fulvous, impunctate; scutellum fulvous; elytra very finely semipunctate-striate, fulvous; a broad transverse band at the base, and another, variable in size, slightly oblique, below the middle, black.

Length 2½–3 lines.

♂. Head swollen at the vertex, entirely impunctate, black, very shining, the space between the eyes irregularly depressed; the

anterior margin of the epistome triangularly emarginate; jaws large and prominent. Antennæ black, the three lower joints fulvous, the third joint very small, half the size of the second. Thorax three times broader than long, the sides nearly straight, the posterior margin rounded and produced in the middle, perfectly straight at the sides, the anterior margin narrowly raised at the sides; scutellum with a raised central ridge. Elytra very finely and rather closely punctured, the punctures arranged in irregular rows near the suture, fulvous, the base with a transverse black band extending to the suture but not quite to the lateral margin, its posterior edge rather deeply indented at the middle, another band, not quite extending to either margin and slightly oblique, is placed immediately below the middle. Underside and legs black, clothed with yellow pubescence, the base of the tibæ fulvous.

C. bifasciata, although very closely allied to several almost similarly coloured species (*C. nair*, Lac., *C. küsteri*, Kraatz), seems yet sufficiently to differ to justify its separation; the first elytral band extends quite to the basal and sutural margin, although not quite to the sides, and the second band is placed immediately below the middle, not so close to the apex as in several allied species; the fulvous base of the tibiæ, the rest of the underside being black, will also help to distinguish *C. bifasciata*; the female has, as is usual, a much smaller head. Many specimens were obtained.

ACROTHINIUM CUPRICOLLE, n. sp.

Metallic blue or green; antennæ and legs black; head, thorax, and scutellum reddish cupreous, finely pubescent, closely punctured; elytra closely punctate-striate, violaceous blue, the suture greenish, the lateral margin bright cupreous.

Length 3 lines.

Head deeply and closely punctured, strigose on the vertex, the latter piceous at the base, the other portion bright cupreous; labrum and jaws black; antennæ more than half the length of the body, the terminal joints slightly thickened and short, the basal two joints more or less fulvous below. Thorax about one half broader than long, subcylindrical, the sides nearly straight, slightly narrowed towards the base, the surface sparingly covered with fulvous pubescence, bright metallic cupreous, strongly and closely punctured; scutellum metallic greenish cupreous, pubescent. Elytra with a distinct oblique basal depression and a longitudinal groove within the shoulders, closely and rather strongly punctured, the punctures arranged in closely approached semiregular rows, dark metallic violaceous, the suture narrowly metallic green or blue, the lateral margin bright reddish cupreous; the surface sparingly clothed with stiff blackish hairs. Underside dark blue or greenish, strongly punctured and sparingly pubescent; legs with a slight bluish gloss; the femora with a very small tooth; the anterior margin of the thoracic episternum convex.

This beautiful species, of which a great many specimens were received from Kiukiang, may be at once known from the only other

species of the genus, *A. gaschkevitchi*, by the colour of the thorax and that of the elytra.

COLASPOIDES CHINENSIS, n. sp.

Piceous; above metallic green; antennæ, labrum, and legs flavous; head finely rugose; thorax remotely punctured; elytra deeply punctate, the interstices at the sides rugose and wrinkled.

Length 2½ lines.

Head with a longitudinal groove on the vertex, closely punctured and slightly rugose at the vertex; clypeus finely punctured, its anterior margin nearly straight; labrum fulvous. Antennæ two thirds the length of the body, very slender, pale fulvous, the terminal joint fuscous at its apex; thorax nearly three times broader than long, narrowed in front, the sides evenly but not strongly rounded, the surface impressed with some fine punctures which disappear entirely at the sides and near the base; scutellum impunctate. Elytra with a scarcely visible depression below the shoulders, the latter prominent, smooth; the disk impressed with rather deep and closely arranged punctures, which form very irregular rows, the interstices at the sides and at the apex rather strongly transversely wrinkled and rugose; legs entirely fulvous or flavous. Underside nearly black.

Many specimens, allied to *C. martini*, Lefev., and differing in the colour of the underside, the differently coloured thorax, and the want of the tooth at the femora; *C. femoralis*, Lefev., has a strongly punctured thorax and differently coloured antennæ and tibiæ.

COLASPOIDES OPACA, n. sp.

Piceous; the labrum and the five lower joints of the antennæ fulvous; head and thorax metallic green or cupreous; elytra blackish, opaque, the suture and lateral margin narrowly metallic.

Length 2½ lines.

Head with a longitudinal groove at the middle, finely and rather closely punctured, metallic cupreous or green, the clypeus not separated from the face; labrum fulvous; palpi testaceous. Antennæ two thirds the length of the body, black, the basal five joints testaceous. Thorax transverse, the sides rounded, narrowed in front, the anterior angles thickened and acute, the posterior margin oblique at the sides and slightly sinuate, the surface very finely and closely punctured, and covered throughout with fine longitudinal strigæ; scutellum obscure cupreous. Elytra finely and closely semiregularly punctate-striate, the shoulders acute, the base without any depressions, nearly black with a very slight metallic tint, the margins very narrowly metallic green and cupreous. Underside and legs black, the breast tinged with metallic green.

C. opaca may be at once known from any other species of *Colaspoides* by the finely strigose surface of the thorax and the nearly black and opaque colour of the elytra.

COLASPOIDES SPINIPES, n. sp.

Black; the basal joints of the antennæ, the labrum, and the femora

and tibiæ fulvous; thorax and elytra metallic greenish cupreous or blue; thorax very finely punctured, elytra closely and more strongly punctate.

♂. The anterior tarsi dilated; the posterior femora with a long and strong spine.

Length 3 lines.

Head with a longitudinal depression at the middle, finely and closely punctured; eyes slightly sinuate, the epistome separated from the face by a transverse groove; labrum fulvous; antennæ filiform, two thirds the length of the body, the first five joints fulvous, the rest black. Thorax rather long, less than twice as broad as long, narrowed in front, the sides rounded, the anterior angles acute, the lateral margin narrowly reflexed, the surface finely and not very closely punctured, the punctures scarcely stronger at the sides than at the middle. Elytra narrowed towards the apex, without basal depression; the shoulders narrowly raised and smooth; the disk much more strongly punctured than the thorax, the punctures here and there arranged in lines; the interstices slightly rugose at the sides near the base. Underside black; the sides of the breast metallic green; femora rather thickened, fulvous, the posterior ones triangularly dilated at the middle and ending in a long spine; posterior tibiæ curved at the middle; tarsi black, the anterior and intermediate ones widened and elongate.

Of this very distinct species, greatly distinguished by the long femoral spine, there are two male specimens before me, which do not differ from each other except in the greenish cupreous or metallic dark blue colour of the upperside; a smaller specimen, evidently a female, has a more transverse thorax and nearly black and simple legs, but does not seem to differ in any other way.

NODOSTOMA LEECHI, n. sp.

Black; above metallic dark violaceous blue; head and thorax strongly punctured, sides of the latter angulate at the middle; elytra with the basal portion strongly swollen, moderately strongly punctate-striate.

Length 2 lines.

Head deeply punctured, strigose on the vertex, the epistome not separated from the face; labrum and palpi piceous; jaws black. Antennæ two thirds the length of the body, the three lower joints obscure fulvous, the others black. Thorax twice as broad as long, the sides angulate at the middle, the surface transversely convex, impressed with deep but not very closely arranged punctures, the interstices somewhat raised; in front of the anterior margin is a narrow transverse groove; scutellum subpentagonal, impunctate. Elytra subquadrate, the base very strongly swollen, bounded by a semicircular depression, the shoulders also strongly raised and deeply longitudinally depressed within, the punctures rather deep within these depressions, fine and arranged in striæ on the lower portion of the surface; legs black, the posterior femora with a small tooth.

Foochan, also Kiukiang.

Very closely allied to *N. modestum*, Jac., from Japan, but differing in the more deeply punctured thorax, the narrow transverse groove near the anterior margin, in the less distinctly angulate sides of the thorax, and in the much more strongly raised base of the elytra, which forms a rounded tubercle, distinctly visible to the naked eye; there is also a distinct lateral depression visible at the disk of the thorax in *N. modestum* which in *N. leechi* is absent. About a dozen specimens were obtained.

HETERASPIS NITIDISSIMA, n. sp.

Metallic green or cupreous, clothed with whitish pubescence and black erect hairs; antennæ black, the base fulvous; head and thorax strongly and closely punctured.

Length 3–4½ lines.

Head closely punctured at the vertex, the latter convex, the epistome more remotely and strongly punctate, its separation from the face indicated by a small more or less distinct tubercle, its anterior margin deeply emarginate at the middle and at the sides; labrum smooth, impunctate, cupreous; jaws black. Antennæ slender, half the length of the body, the lower three joints fulvous, the rest black. Thorax subcylindrical, the sides strongly deflexed, the anterior angles with a smooth tubercle; the posterior margin straight at the sides, rounded and produced at the middle, the surface impressed with deep and closely placed punctures, clothed like the head with white and black erect hairs; scutellum finely rugose. Elytra with a faint transverse depression below the base, the shoulders acute and prominent, the surface very closely punctured, the punctures smaller than those at the thorax, but intermixed with larger ones, the apex very finely punctate. Below closely punctured and pubescent.

H. nitidissima is very closely allied to *H. vestita*, Baly, but differs in the bright metallic green or cupreous general colour; the latter in *H. vestita* is obscure æneous; there are besides this some other differences to be found, the present species having a tubercle placed at the middle of the face. There seem to be only females in the present collection amongst more than 12 specimens, and I am not able to say anything in regard to the two teeth to be found on the epistome in the male of *H. vestita*; it is, however, possible that the insect described here is a variety of the last-named species.

HETERASPIS IMPERIALIS, Baly.

All the specimens obtained at Kiukiang, which I must refer to Mr. Baly's species, differ from the type in the more strongly punctured elytra, which have the interstices more finely punctured, so that the punctuation consists of larger and smaller punctures crowded together.

CHRYSOMELA JAPANA, Baly.

Of this species Mr. Leech obtained a great many specimens, which prove great variability in regard to the sculpture and also shape of the thorax; the latter has the sides sometimes greatly widened before the middle, much less so in other specimens, and the punctuation of

the disk is often close, at other times remote and very irregular. Most of the specimens in the present collection were obtained at Hakodate and are with few exceptions females, which may be recognized at once by the very curious appendage of the last abdominal segment, unique amongst the numerous species of this genus with which I am acquainted; this structure consists in a triangular acutely pointed kind of sheath, hollowed at its base and placed upon the middle of the last abdominal segment; the pygidium ends in a blunt protuberance and seems capable of closing the posterior opening of the sheath; I find no reference to any similar structure in this or any other species. The males are much smaller, and the penis is a slender curved tube, narrowed and blunt at its apex. The colour of the thorax and elytra varies from purplish to blue or green, and the latter have two or three more or less distinct longitudinal smooth spaces; wings are absent.

Chrysomela virgata, Motsch.

Obtained in numerous specimens at Gensan in Corea.

Chrysomela obscurofasciata, Jac.

This species, described by myself in the Proc. Zool. Soc. 1885, seems to be only a variety of the preceding species, with which it entirely agrees in size, shape, and sculpture; the entire insect is, however, dark purplish-blue in colour with an elytral still darker band, the latter in *C. virgata* is reddish cupreous.

Melasoma octodecimpunctata, n. sp.

Metallic greenish, the six basal joints of the antennæ, the sides of the thorax, and the legs fulvous; elytra very closely punctured, fulvous or testaceous, each elytron with nine rounded black spots (1, 3, 2, 2, 1).

Length 2–3½ lines.

Head finely and closely punctured, greenish æneous; antennæ scarcely extending to the base of the thorax, black, the basal six joints fulvous. Thorax three times broader than long, the sides broadly flattened, fulvous, the disk metallic green, very finely punctured, bounded at the sides by a deep longitudinal groove, which is impressed with deep punctures; scutellum metallic green. Elytra very closely punctured, with traces of longitudinal striæ, fulvous or flavous; the suture, a spot at the shoulder, three, placed triangularly at the base, two slightly larger ones placed transversely at the middle, two below the latter, and another transversely shaped spot near the apex, blackish; legs entirely fulvous. Underside metallic greenish.

At first sight this species seems identical with the well-known *M. 20-punctata*, but the insect is quite distinct from the last-named; the sides of the thorax in *M. 18-punctata* are much more broadly fulvous, and the green colour does not encroach on it except by a small spot at each side (as in *M. 20-punctata*): but the principal difference is to be found in the number, shape, and position of the elytral spots; these latter are not elongate but rounded; the six

anterior spots are placed exactly as in *M. 20-punctata*, but of those placed below the middle the intermediate spot is wanting, so that only two remain, and the last or apical spot is transverse, not elongate as in the allied form; the elytra are also more closely punctured in the present species, and the legs are entirely fulvous. There are more than twenty specimens before me, which all show the same differences, as pointed out, and can be separated easily from *M. 20-punctata*.

PHYTODECTA FLAVIPENNIS, n. sp.

Broadly ovate, pale fulvous; the terminal joints of the antennæ and the legs black; thorax very minutely punctured on the disk, strongly on the sides; elytra finely punctate-striate, the interstices scarcely visibly punctured.

Length 2½ lines.

Head distinctly but irregularly punctured; antennæ extending to the base of the thorax, the terminal joints transversely shaped, black, the lower four joints fulvous; thorax three times wider than long, narrowed in front, very minutely punctured, the sides deeply punctate; scutellum fulvous; elytra broad, subquadrate, the punctures moderately deep, the interstices extremely finely punctured.

The present species seems to differ from any other described *Phytodecta* in several particulars: from most of them *P. flavipennis* differs in the fulvous upper and underside; *P. rufa*, Kraatz, which also has the underside red, is larger and the legs are described as red with the exception of the knees. There are two specimens before me, which show no difference, except that the colour in one is paler, and that the upper and lower margins of the breast are black, the latter is deeply rugose-punctate.

PHYTODECTA TREDECIMMACULATA, n. sp.

Broadly subquadrate, fulvous; thorax with three black spots; scutellum black; elytra strongly and closely punctured, the punctuation irregular, each elytron with six black spots; breast piceous.

Length 3 lines.

Head rather closely punctured on the vertex and on the clypeus. Antennæ entirely fulvous, extending to the base of the elytra. Thorax three times broader than long, the sides evenly rounded, the anterior margin broadly concave; the disk finely and remotely, the sides strongly and closely, punctured; a large black spot is placed at the middle, but does not extend to the base, a smaller one is situated at each side; scutellum black, very broad. Etytra subquadrate, convex and short, very closely and distinctly punctured, the punctuation not arranged in lines; of the black spots, which are large, one of oblique shape occupies the middle of the base, two, placed transversely at, and two others, of which the inner one is sutural, below the middle; another sutural spot is placed at the extreme apex. Below and the legs strongly punctured, the breast more or less piceous.

Foochan.

In this species the elytral punctuation, instead of being arranged as in most of the allied forms, is irregular and the pattern differs from any with which I am acquainted; of the elytral spots, two are common to both and placed across the suture below the middle.

PAROPSIDES NIGROFASCIATUS, n. sp.

Fulvous; head and thorax with two black markings; elytra finely and irregularly punctured, each with two large subsutural spots, placed longitudinally, and a sublateral band, abbreviated behind, black.

Var. *a*. The posterior subsutural spot wanting.

Var. *b*. This spot present only.

Var. *c*. Entirely fulvous, the thorax with some small piceous spots; elytra with a small black humeral spot.

Length 5–6 lines.

Head finely punctured, with a central impressed groove, fulvous, the base with two large black spots, the anterior margin of the clypeus and the apex of the jaws also black. Antennæ short, entirely fulvous, the apical joint thickened. Thorax three times broader than long, the anterior margin deeply emarginate at the middle, the anterior angles strongly produced in front, the sides rounded, narrowed towards the apex, the surface minutely and not very closely punctured on the disk, more strongly at the sides; the disk fulvous, with two large subquadrate black spots touching the base and leaving a narrow line of the ground-colour between them; scutellum fulvous. Elytra convex, widened towards the middle, impressed with rather small punctures, partly arranged in lines, the interspaces also very finely punctured, the lateral margin accompanied by several rows of deeper punctures, each elytron with two large elongate spots, placed longitudinally near the suture and a longitudinal band (often narrowed or interrupted at the middle) extending from the shoulder to below the middle near the lateral margin. Underside and legs fulvous, the abdomen often spotted with black; claws appendiculate, the inner division very long.

PAROPSIDES HIEROGLYPHICA, Gebl.

PAROPSIDES 12-MACULATA, Gebl.

Both these species were obtained at Foochow, and I am very much inclined to believe that one is only a variety of the other, since I cannot find any differences except that of colour; in *P. hieroglyphica* the elytra have three rows of black spots, if these are connected in a certain way the pattern peculiar to *P. 12-maculata* is produced, in the same way as in many species of *Cryptocephali*; the underside in one species (*P. hieroglyphica*) is fulvous, in the other black.

EUSTETHA THORACICA, n. sp.

Fulvous; the antennæ (the three basal joints excepted), the breast, and legs black; head with one, thorax with four, black spots; elytra dark violaceous blue, closely and strongly punctured.

Var. Elytra obscure fulvous.

Length 3½ lines.

Head impunctate, fulvous, the vertex with a black spot; labrum black; palpi fulvous, the penultimate joint incrassate. Antennæ only extending to the base of the elytra, black, the lower three joints fulvous, piceous above, shining, the others opaque, pubescent, the second and third joints short, equal. Thorax three times broader than long, the sides slightly rounded at the middle, narrowly margined, the anterior angles thickened, the surface impunctate, fulvous, with four black spots placed transversely; scutellum black. Elytra ovate-oblong, metallic dark blue or violaceous, covered throughout with distinct punctures of variable size, arranged here and there in indistinct lines, of which a short one more deeply impressed is placed within the shoulders, and another row accompanies the sutural margin; legs and breast black, the tibiæ closely pubescent; abdomen fulvous; mesosternum swollen and tuberculate.

E. thoracica may be distinguished from *E. flaviventris*, Baly, by the want of the thoracic impressions and the colour and markings of the same part.

PHYLLOBROTICA (?) ORNATA, n. sp.

Fulvous; antennæ, the upper edge of the femora, tibiæ and tarsi, black; thorax bifoveolate; elytra finely punctured, black, an ovate patch at the side and another near the apex, flavous; epipleuræ extremely small.

Var. Head black at the vertex, elytra entirely fulvous.

Length 3 lines.

Head dark fulvous, impunctate, the frontal tubercles transverse; clypeus in shape of a triangular ridge. Antennæ slender, filiform, the second joint short, the third and following joints nearly equal, the three lower ones more or less fulvous below, the rest black. Thorax about one half broader than long, the sides straight, slightly concave, the posterior angles acute, obliquely cut, the surface with a few minute punctures near the base, the latter depressed, with a deep fovea at each side; scutellum broad, its apex broadly rounded, flavous. Elytra finely and closely punctured, somewhat depressed anteriorly along the suture, the black portion interrupted at the sides by a large ovate flavous spot which, commencing a little below the base, extends to the middle, but not to the sutural or lateral margin; a somewhat similar-shaped spot is placed near the apex, which it does not quite reach, being surrounded by a narrow margin of the ground-colour. The underside and the legs fulvous, the femora above and the outer edge of the tibiæ with a black streak; tibiæ unarmed; the first joint of the posterior tarsi as long as the three following joints together; claws appendiculate.

Hab. Foochan.

Although this species has the general appearance of *Phyllobrotica* and its structural characters, it differs somewhat in having extremely small elytral epipleuræ and a longer metatarsus of the posterior legs. In the absence of other similarly constructed species I have placed

the present insect in *Phyllobrotica*; it will not be difficult to recognize by the elytral pattern. A single specimen of the variety was obtained, which differs only in colour.

CNEORANE FEMORALIS, n. sp.

Metallic blue; the head, thorax, and the anterior legs fulvous; antennæ fuscous; elytra greenish blue, closely semirugose-punctate; below pubescent; posterior femora obscure blackish blue.

Length 4–4½ lines.

This species, obtained by Mr. Leech at Foochan, although very closely allied to *C. fulvicollis*, Baly, seems to differ sufficiently to be considered distinct from that species: the present insect is less widened posteriorly, the antennæ are entirely black, the basal joints only are fulvous below; the thorax is rather less transverse and longer, and has often three small foveæ placed triangularly on the disk, the latter being entirely impunctate; the punctuation of the elytra is close and distinct, the interspaces being somewhat rugose with traces of longitudinal ridges; the colour of the upper part of the breast as well as of the four anterior femora is fulvous; the posterior femora and the tibiæ are obscure dark blue; the rest of the underside is metallic lighter blue, clothed with long yellowish pubescence. There seems to be no difference in regard to the structure of the antennæ in both sexes, but the anterior tibiæ in the male are curved at the apex and their first tarsal joint is dilated and flattened. Mr. Baly gives the colour of the underside in *C. fulvicollis* as piceous; in a specimen kindly given to me, the abdomen is dark metallic blue, as in the present species, but this colour does not extend to the breast as in *C. femoralis*; the posterior femora in *C. fulvicollis* are fulvous instead of dark blue. All the specimens agree in the above details: *C. elegans* from Japan is much smaller, bright metallic green, and the punctuation of the elytra is much finer; the latter in *C. femoralis* are of a rather dull bluish colour.

LUPERODES NIGRIPENNIS, Motsch.

Two specimens obtained at Gensan I refer to Motschulsky's species, with the description of which they agree perfectly; the head in the specimens I have for examination is fulvous with the space immediately behind the eyes black (of this the author's description says nothing); the labrum and the antennæ are also black, with the exception of the first two joints of the latter, which are fulvous; they are nearly two thirds the length of the body; the thorax is twice as broad as long, fulvous, the surface impunctate without depressions; the elytra are black and very finely and closely punctured, with their epipleuræ extending below the middle; the abdomen is flavous; the legs are black, the apex of the femora and the base of the anterior tibiæ are stained with fulvous. The structural characters of *Luperodes* are all present. In the almost useless figure given by Motschulsky the abdomen is made to protrude largely beyond the elytra; whether this is characteristic of all the females of this species I am unable to say.

LAPHRIS EMARGINATA, Baly.

Of this species there are a few examples contained in the present collection, amongst which is a male, which differs considerably in the shape of the antennæ from the female sex; these organs are longer and their intermediate joints are strongly flattened and triangularly dilated, although of the same elongate shape; the broad, black or piceous band of the elytra is occasionally of nearly equal width instead of being deeply emarginate at its middle as in the type.

NOTES.

In my catalogue of Japanese Phytophaga (Proc. Zool. Soc. 1885, p. 752) several mistakes and omissions have been made, which I will here rectify, thus:—

Lema melanopa is left out, the species is, I believe, found in Japan.

Adimonia multicostata, Jac. (p. 755), is identical with *Galerucella punctatostriata*, Motsch.; the species belongs, however, to *Adimonia*.

Monolepta flaviventris, Motsch. (p. 755), should have been placed in *Malacosoma*.

According to M. Fairmaire the following species described by him from China (1876) are synonyms:—

Paralina impressiuscula, Fairm., = *P. fallaciosa*, Stål.

Lina ignitincta, Fairm., = *Galeruca fulminans*, Mén.

Anthraxantha davidis, F., = *Mimastra cyanura*, Hope.

3. On the Scaling of the Reproduced Tail in Lizards. By G. A. BOULENGER.

[Received June 5, 1888.]

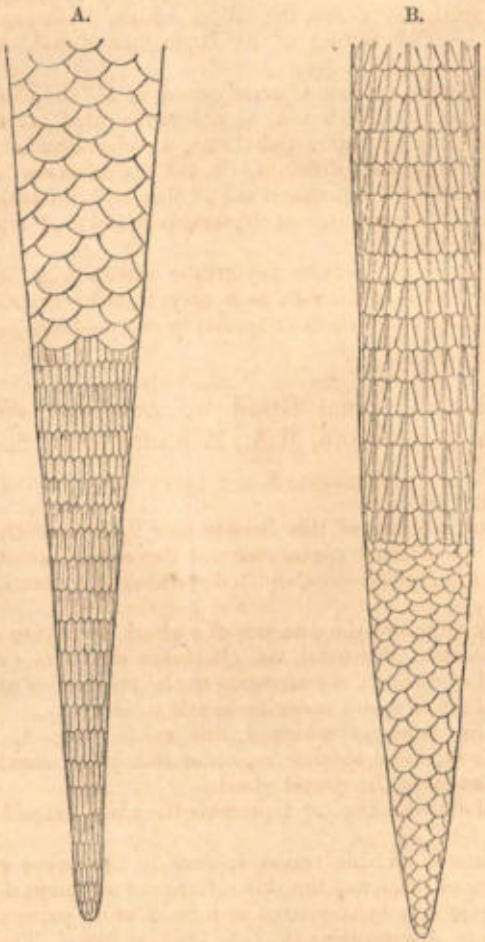
It is a well-known fact that in such Reptiles as have the power of reproducing the tail, the scaling of the renewed portion often differs considerably from that of the normal organ. It is generally held that the difference consists merely in the irregularity of the scaling, or in the absence of certain tubercles or enlarged scutes which are characteristic of the species. Such a view is erroneous. I have convinced myself that, in some cases, the aberrant scaling of the reproduced tail is a reversion to an ancestral form.

That a tail with heterogeneous lepidosis may be reproduced as such, is shown by *Hatteria*; the dorsal series of compressed tubercles, so strikingly similar to that of *Chelydra*, is present on the reproduced portion, which differs only in the scales not being verticillate.

That a tail with uniform scaling may be reproduced with diversified scales is exemplified by a large number of Scincoids and some Geckoids, which, having a tail covered with subequal scales, develop on the new portion a ventral, or both a ventral and a dorsal, series of large transverse scutes, such as exist normally in other species of the same or of allied genera.

All Lacertidæ, Gerrhosauridæ, and Scink-like Anguidæ, so far as I am aware, reproduce a caudal scaling true to their type.

A very striking example of reversion is exhibited by the Teioid genus *Gymnophthalmus*. It is necessary first to say that this genus, though agreeing with the Chalcidine Teiidæ in general structure, presents the scaling, and a most deceptive appearance, of a Scincoid, and has therefore been placed in the latter group, to which it



Tails of (A) *Gymnophthalmus quadrilineatus* and (B) *Ophisaurus gracilis*, with reproduced terminal portion.

bears, however, not the slightest affinity. Now, the character of the reproduced tail, with which I was not acquainted when I arrived at my conclusions respecting the affinities of this genus

with *Heterodactylus*, affords a striking confirmation of the correctness of these conclusions. As may be seen from the drawing (fig. A, p. 352), the scaling of the reproduced tail of *Gymnophthalmus* is that of a *Heterodactylus* or Cercosaurine Teioid.

Another example (see fig. B, p. 352) is afforded by the tail of *Ophisaurus* (*Pseudopus*), a genus which I have, following Cope, placed in the same family as the Slow-worm (*Anguis*). Here we have a Lizard with verticillate scales, the tail of which, when reproduced, assumes the cycloid scaling of its Diploglossine and, no doubt ancestral, allies.

According to the taxonomic arrangement of all the older and of many modern authors, such tails as are represented in the above figures exhibit, on the same individual, a 'chassé-croisé' of the characters of two primary divisions, viz. the "*Cyclosaura*" (normal tail of *Ophisaurus* and reproduced tail of *Gymnophthalmus*) and the "*Geissosaura*" (normal tail of *Gymnophthalmus* and reproduced tail of *Ophisaurus*).

It will be useful in future to pay greater attention to the scaling of the renewed tails of Lizards, as it may, in some cases, afford a clue to the affinities of genera or species to one another.

4. Note on the Sternal Gland of *Didelphys dimidiata*.

By Frank E. Beddard, M.A., Prosector to the Society.

[Received June 5, 1888.]

At a recent meeting of this Society (see P. Z. S. 1887, p. 527) I described the external appearance and the minute structure of a peculiar gland in *Myrmecobius*, situated just above the anterior end of the sternum.

I have now to record the presence of a gland occupying a similar position in another Marsupial, viz. *Didelphys dimidiata* (Wagner). Mr. Thomas has directed my attention to the presence of this gland and requested me to report upon its minute structure.

One of the drawings which I now exhibit (fig. 1, p. 354) represents the head and anterior region of *Didelphys dimidiata* and shows the position of the sternal gland.

The second drawing (fig. 2) represents the gland magnified more highly.

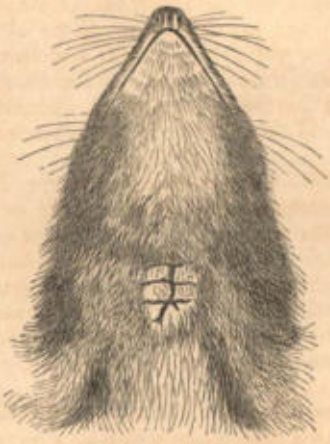
The integument in this region appears to the naked eye to be entirely devoid of hairs, and the skin is furrowed in various directions. The latter figure may be compared with fig. 2 of my paper upon the sternal gland of *Myrmecobius* (P. Z. S. 1887, p. 528). The orifices of the glands upon the exterior are by no means so plain as in *Myrmecobius*. It is of course possible that the appearance of the glandular patch in *Didelphys* owes its difference from the appearance of the corresponding structure in *Didelphys* to the state of contraction of the skin—caused by the alcohol in which the animal was preserved.

In *Myrmecobius* the glandular patch upon the integument had a

smooth appearance and the mouths of the glands were widely dilated.

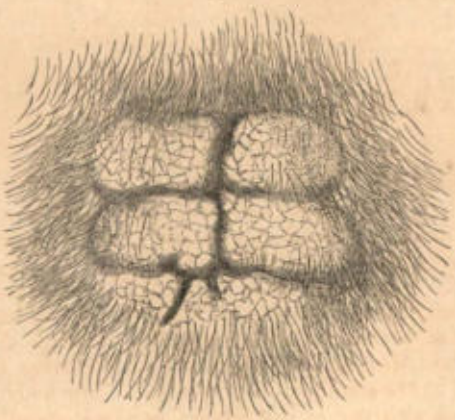
In *Didelphys* the skin in this region of the body was much

Fig. 1.



Didelphys dimidiata.
Ventral view of head and neck, to show the sternal gland.

Fig. 2.



Didelphys dimidiata.
Sternal gland, more highly magnified.

wrinkled, and the mouths of the glands were not apparent. This looks very much as if the difference were merely due to the more contracted

condition of the integument in *Didelphys*; and I cannot find any reasons for believing that the integumental glands, which will shortly be described, are any smaller in *Didelphys* than in *Myrmecobius*.

Apart, however, from the question as to whether the external appearance of the glandular patch in *Myrmecobius* is really different from that of *Didelphys dimidiata*, there is a close agreement between the two species in the microscopic structure of the gland. The sternal gland of *Myrmecobius* is a complex structure. The epidermis in this region is greatly thickened and contains numerous sudoriferous glands grouped together into oval masses. Beneath the dermis is a large compound gland the structure of which resembles the sudoriparous glands.

In *Didelphys dimidiata* the elements entering into the formation of the glandular patch are precisely the same as in *Myrmecobius*. As in that species, there are a few hairs scattered over the surface of the gland which are too small and too few to be recognized by the naked eye. The same groups of modified sudoriparous glands as those which I termed sudoriparous follicles in *Myrmecobius* occur in *Didelphys dimidiata*. And, finally, underneath the dermis is a compound tubular gland which, however, appears to be relatively smaller than in *Myrmecobius*.

To describe these various glandular structures more in detail is unnecessary, as such a description would be a mere repetition of the greater part of my paper upon *Myrmecobius*.

It is interesting to find that there exists in both these genera, which are not in other respects very nearly related, a glandular apparatus having the same anatomical relations and the same minute structure [1].

5. Note on a new Gregarine.

By Frank E. Beddard, M.A., Prosector to the Society.

[Received June 5, 1888.]

The Gregarine described in the present note was found in a *Perichæta* which has recently been sent to me from New Zealand by Mr. W. W. Smith. This species occurred in the *vesiculæ seminales* and in the body-cavity, and is a large Gregarine, reaching a length of 1½–2 millim. I observed three stages in the development of this parasite, which I cannot identify with any described form.

The smallest examples that I observed were about the same size as the common *Monocystis lumbrici*, but of a different form, which is illustrated in the accompanying woodcut. The body is globular, and furnished with one or two slender processes usually of greater length; they are placed (if there are two) one at each end of the body, so that the Gregarine has the appearance of a bead strung upon a thread. I only observed individuals of this stage in the vesiculæ seminales. The body-cavity of the *Perichæta* was crowded

[1] P. Z. S. 1887, p. 527.

with individuals of the next stage; this is characterized by its larger size and rather more complicated structure. The general form of the body is, however, the same. The drawing (p. 357) illustrates this stage, as well as the encysted condition to be presently described. The upper part of the figure represents an individual of the second stage; the lower part illustrates the encysted condition, in which the whole Gregarine is enclosed by a cyst which is limited in the figure to the lower process.

In the second stage the body is limited externally by a clear membrane of some thickness, which is probably the cuticle; the coarse granules which fill the interior of the parasite are sometimes restricted to the globular part of the body, and are sometimes also found in one or both of the slender processes. These differences are, however, probably due to movements in the protoplasm of the living Gregarine, which has been arrested at various intervals. The surface of the two processes, and probably of the whole body, is covered with delicate fibres, which generally run obliquely to the long axis of the process, as is shown in the diagram (*b*). Careful focusing shows these fibres to be quite superficial, and they are therefore probably cuticular. During this stage, and also in the earlier stages, the Gregarine multiplies by transverse fission—a process rare among the Gregarinida [1].

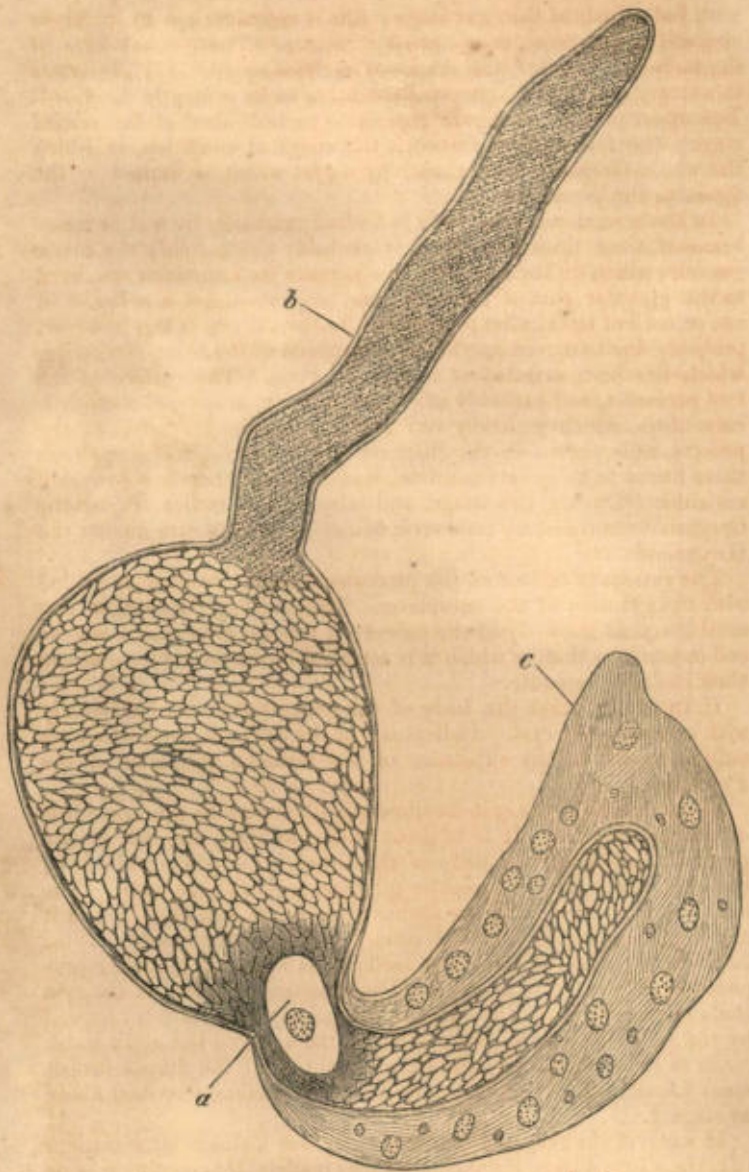
The extremity of one of the processes becomes swollen and filled with the granules of the entoplasm. This swelling increases in size until it equals the body of the parent; a process grows out from the end opposite to that by which it is attached to the parent; these two then probably separate.

In the third stage the body of the parasite is covered externally with a remarkable cyst. Individuals in the encysted condition were only met with in the substance of the vesiculæ seminales of the *Perichæta*.

The structure of the cyst-membrane is illustrated in the lower half of the drawing (*c*). It is of great thickness upon the one or two processes into which the body of the Gregarine is prolonged; it is, however, much thinner upon the spherical region of the body. The main mass of the cyst has a fibrous appearance, and imbedded in it are numerous bodies which I cannot but regard as nuclei; these latter were evident in transverse sections, as well as in glycerine preparations of the entire parasite. The presence of nuclei in the cyst leads me to infer that the latter is not (at any rate entirely) formed by the parasite; the fibrous portion of the cyst, on the other hand, looks as if it were an hypertrophied condition of the fibroid investment found in the free living parasites of the cœlom described above as stage 2.

In some of the encysted parasites there was a single large nucleus (*a*); in others a large number of smaller nuclei; this condition is no doubt preliminary to sporulation. Karyokinetic figures were observed in the dividing nuclei.

[1] Figured by Ruschhaupt (Jen. Zeitschr. 1885, Taf. xxii. fig. 13) in *Monocystis porrecta*.



Gregarine from body-cavity of *Perichæta novæ-zelandiæ*.

a, nucleus; *b*, process of body showing oblique striation of cuticle; *c*, posterior process of body to show the outer cyst-membrane enclosing nuclei.

The drawing is a compound one; the middle part of the body and the upper process represent a free (unencysted) individual; the lower process that of an encysted individual.

I regret to have no further stages in the life-history of this Gregarine; I have not yet seen any evidence of sporulation, except in the division of the nucleus. I propose, however, to publish a fuller description later, when I may perhaps have succeeded in discovering the formation of spores.

I think it is clear that this organism is a *Sporozoon*, and that it belongs to the Gregarinidæ; I refer it to the true Gregarines on account of its general form, the nature of the granules in the protoplasm, &c. But the cyst is quite unlike anything that has been recorded in a Gregarine [1]. On the other hand, in the Myxosporidia cysts are met with which are nucleated, and probably therefore formed pathologically by the tissues in which the parasite lives.

June 19, 1888.

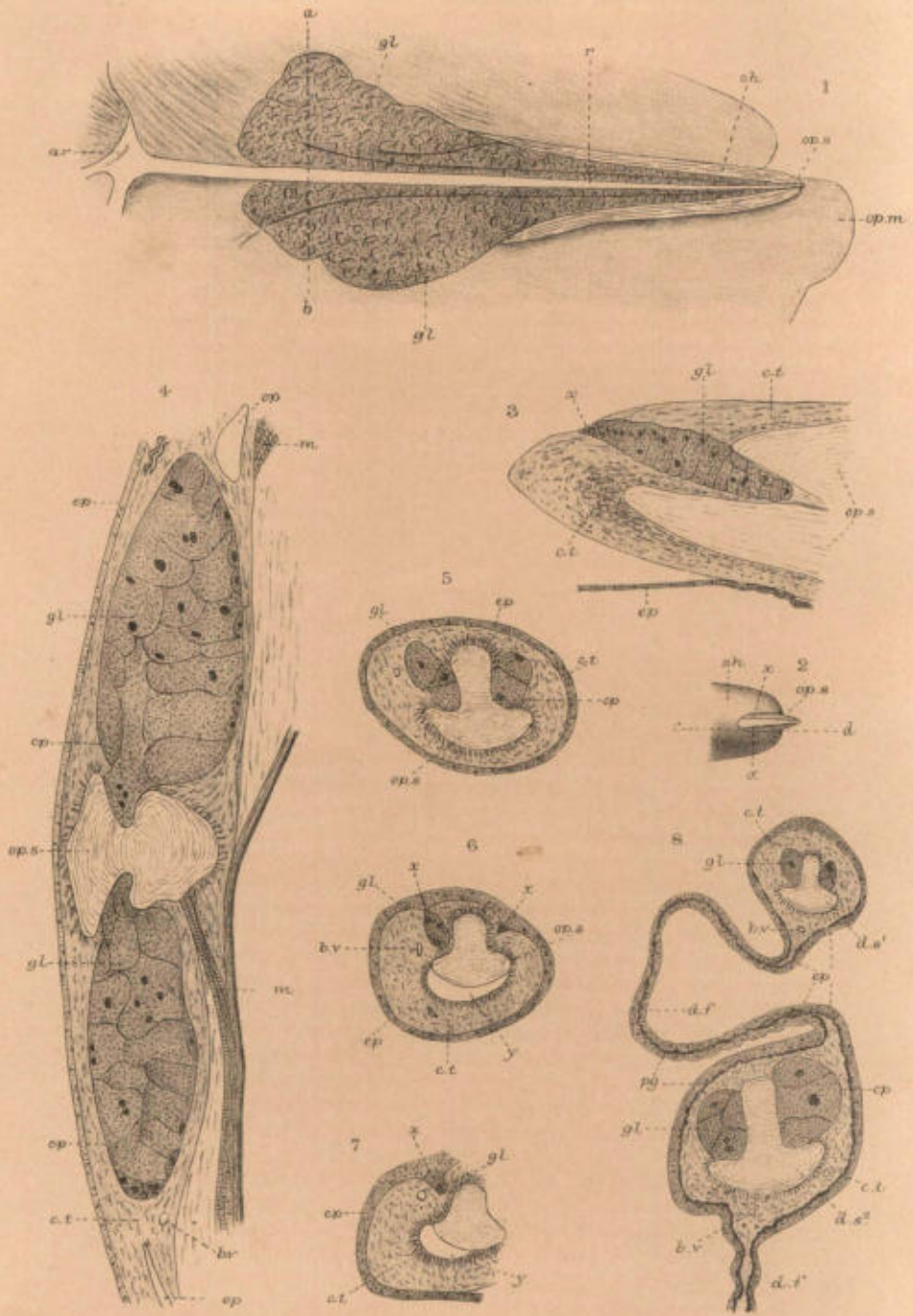
Prof. Flower, C.B., LL.D., F.R.S., President, in the Chair.

A letter was read addressed to the President by Dr. Emin Pasha, dated Tunguru Island (Lake Albert), October 31st, 1887, announcing the despatch of further collections of natural-history objects, and promising for the Society some notes on European migratory birds observed in that country.

The following extract from a letter addressed by Mr. E. L. Layard, F.Z.S., H.B.M. Consul at Nouméa, New Caledonia, to Mr. J. Ponsonby, F.Z.S., concerning the distribution of some Land-shells of the genus *Stenogyra*, was read:—

"Mr. Garrett's remarks (P. Z. S. 1887, p. 185) on the distribution of *Stenogyra tuckeri* remind me to tell you that he wished me to communicate to the Zoological Society the fact that the West-Indian species, *S. octona*, has suddenly turned up here in thousands; how introduced none can tell. They are on a coffee-estate at Kanala on the East Coast, about halfway to the north end of the island. I have made inquiries, and cannot learn that Mons. Evain (presumably the planter) ever had any seed coffee from the West Indies. All he planted came from Bourbon, and it would be interesting to find out whether the species has appeared there also. Mons. Evain's nephew, who collects shells, found it here, and gave it to me as a fine example of *S. souverbiei*, our native species. I recognized it at once; but he was much astonished on being shown what it was. He says it is in thousands. Garrett said that this fact might throw light on the distribution of the other species. I have always maintained that there was no difference between *S. souverbiei*, *S. artensis*, *S. tuckeri*,

[1] Waldenburg (Arch. Path. Anat. 1862) speaks of a *nucleated* cyst-membrane in certain Gregarines of the Earthworm. Bütschli, however (Bronn's 'Thierreich,' Protozoa, p. 536, note) is disinclined to believe in Waldenburg's statement. It may be that Waldenburg has found cysts in *Lumbricus* like those of *Perichæta* described here.



W.N.P. del. ad nat.
Parker & Coward lith.

West, Newman & Co. imp.

Poison-organs of Trachinus

and the Ceylon species. I suppose *S. octona* will soon get down here; I am on the watch for it."

Prof. Bell exhibited and made remarks on a specimen of *Cerianthus membranaceus* in its tube; this fine example had been obtained by Mr. John Murray at a depth of 71 fathoms in Loch Etive.

Mr. Tegetmeier exhibited and made remarks on the feet of an Australian Rabbit, supposed to have acquired arboreal habits, and made some observations on the change of habits of this Rodent since its introduction into Australia.

Mr. J. B. Sutton, F.Z.S., read a paper on some abnormalities occurring among animals recently living in the Society's Gardens.

The following papers were read:—

1. On the Poison-Organs of *Trachinus*. By W. Newton Parker, F.Z.S., Professor of Biology in the University College of S. Wales and Monmouthshire.

[Received June 2, 1888.]

(Plate XVII.)

Although it is well recognized that the British Weevers (*Trachinus draco* and *T. vipera*) are poisonous, most ichthyologists express doubt as to the existence of any specific glands in connexion with the stinging-apparatus, some even denying altogether the presence of such glands.

Before passing on to a description of my own observations, I will briefly refer to those of former investigators whose works I have had an opportunity of consulting. It must, however, be noted first that in both species of Weever the anterior dorsal fin is provided with five or six strong and grooved spines, the second and third of which are the longest; and a still larger spine is present upon the opercular bone, extending backwards, and projecting freely for a short distance posteriorly. All these spines are enclosed in a sheath of connective tissue, and their apices are sharply pointed; in transverse section they have somewhat the form of the letter T, the base of the T being anterior in the case of the dorsal, external in the case of the opercular spines.

In 1841, Allman (1)[1] accurately described and figured the opercular spine of *T. vipera*. But he could detect no gland, "only a small pulpy mass in each of the conical cavities," at the base of the spine, which he thought might possibly be of a glandular nature,

[1] The numbers in brackets refer to the list of works at the end of this paper.

and he simply conjectures that the seat of the virus is in "the pulpy sheath of the spine."

The most important observations on the subject which have been made by any English naturalist are undoubtedly those of Byerley (3), which appeared in 1849, but which have not been credited by many subsequent authors.

Byerley correctly describes and figures transverse sections of the opercular and dorsal spines, as well as the position of the glands in connexion with them. In examining the microscopic structure of the glands, he simply scraped a portion out of its groove with a needle and mounted it in water, so that it is not to be wondered at that in this respect his conclusions are far from accurate; the "tubes," "sacculi," and "follicles" which he describes are quite imaginary. He was unable to make out any duct, and mentions that the integument completely covers even the points of the spines in a normal condition, but that they are rarely seen thus, as they usually protrude for some distance from their loose sheaths. His explanation of the manner in which the secretion is injected into the wound is that when the spine is driven some distance forcibly into the flesh, the integument which covers it yields to the pressure of the wounded parts, and is thus thrust downwards towards the base of the spine. In this way the gland must be squeezed with some violence, and its contents pass along the grooves of the spine into the wound. This unsatisfactory account of the structure of the glands led Günther (13) to doubt the accuracy of Byerley's conclusions, and to consider that the substance which he took for a gland was simply "the poisonous fluid itself, coagulated or hardened by the action of the spirits in which the specimen had been preserved." Günther, moreover, states elsewhere (11) that "no special poison-organ has been found in these fishes, but there is no doubt that the mucous secretion in the vicinity of the spines has poisonous properties." (Comp. also 12.)

Day (9) also states that nothing certain is known, either as to the seat of the poison or the manner of its ejection, and mentions that "it has been surmised that the virus is a secretion or excretion from the mucous surface of the loose skin which covers the spines."

Couch (5) describes "the skill and precision with which the formidable spine of the neck (of *T. draco*) is directed to an object of fear," and, without mentioning Byerley at all, states that "the spines of the dorsal fin have also been an object of dread; but in these cases the wound is only accidental, and the fish does not employ them for any purpose of injury or defence." He also states that "it is certain that no exudation or discharge of a poisonous fluid proceeds from this projecting (opercular) spine."

Yarrell (22) quotes Couch, and mentions that the Weever "strikes with great force either upwards or sideways. Pennant states that he has seen it direct its blows with as much judgment as a fighting cock."

Macalister (16) simply states that the Weever "is commonly thought to inflict poisonous wounds;" and Seeley (18) speaks of the

opercular spine as "an offensive weapon," while Saville Kent (15) makes similar statements to those of Günther and Day.

Turning now to observers in other countries, I find that Cuvier (6, 7, & 8) and Bleeker (2; quoted by Dr. Günther, 13) not only deny the existence of a gland, but even state that it is a mistake to suppose that the Weevers are poisonous at all. Cuvier, moreover, mentions the *dorsal* spines only. And as recently as 1886, Tybring (19) has made the following statement:—"In the Norwegian waters there are no poisonous fishes, but it is well known that the sting-bull [a local name for the Greater Weever, see Day, 9], may be dangerous if one happens to run the pointed dorsal fin into the finger, or any other part of the body."

Canestrini (4) gives a brief reference to Byerley's paper, and acknowledges his conclusions.

In Wiedersheim's 'Lehrbuch d. vergl. Anatomie' (20) the following passage occurs in the chapter on the integument (p. 20):—"Weiter gehört dahin die unter der Stacheln der Rückenflosse von *Trachinus* liegende Giftdrüse. Sie ruht jederseits auf dem Grund vom sackartigen Haut-Einstülpungen, während ihre Ausführunsgänge im Bereich der Stacheln liegen." (See also 21.) I am unable to state on whose authority this statement is made, as Professor Wiedersheim cannot at present lay his hands on the paper from which the passage was abstracted. But it will be noticed that no mention is made of the opercular poison-organ; and that the description of the glands of the dorsal spines differs considerably from my own observations.

Before sending in the present paper for publication, a reference was given me by Professor Hubrecht to a work by Gressin (14), and I much regret that I have been unable to obtain a copy, especially as from its title it is probably an important contribution to the subject. But as apparently this work is not known to most English ichthyologists, I have been advised to publish my own observations independently.

Structure of the Poison-Apparatus.

Opercular Organs.—The form of the opercular spine and its relation to the bony operculum are shown in the accompanying drawing (fig. 1, p. 362). A deep groove (*gr*) runs along both upper and under surfaces right to the apex; and where the base of the spine joins the operculum the grooves are continued forwards for a short distance into small conical cavities (*z*), entirely surrounded by bone. Fig. 2 represents the third dorsal spine, which is slightly stouter than the others; the grooves here also extend from base to apex.

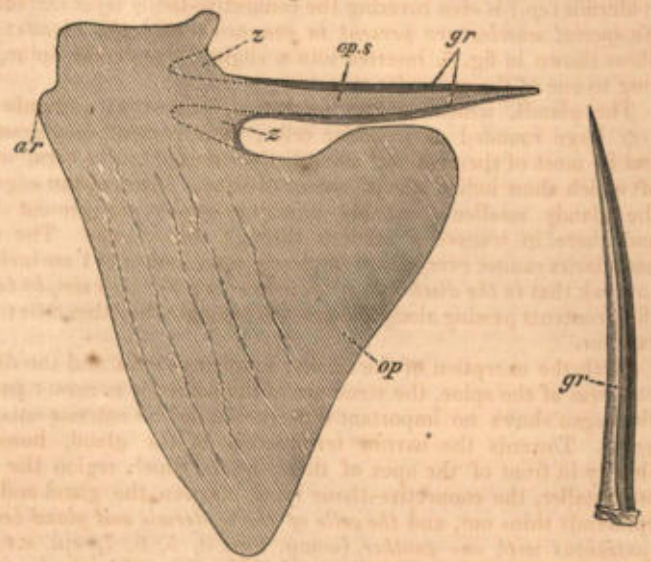
Both figs. 1 and 2 are taken from *T. draco*[1], the other figures (Plate XVII.) refer to *T. vipera*. I find there is no important difference between the two species as regards the structure of the apparatus, and have chosen the smaller species for histological examination, as it requires less decalcification and is more convenient for preparation.

[1] I am indebted to Mr. J. J. Neale of Cardiff for a fresh specimen of this fish.

In both species *distinct glands are present in the grooves of the opercular and dorsal spines*, and in the former they are very large, extending a considerable distance both above and below the spine, along the greater part of its length. *The glands consist of relatively enormous granular nucleated cells*, the structure of which is apparently similar in both species.

Plate XVII. fig. 1, taken from a transparent preparation, shows the general form and relations of the opercular glands. Anteriorly both dorsal and ventral portions project into the bony cavities already described as being present at the junction of spine and bony operculum. From this region each gland broadens out to form a large anterior

Fig. 1. Fig. 2.



Trachinus draco.

Fig. 1. External view of the left opercular bone and its spine.
Fig. 2. Side view of the third dorsal spine.

ar. Articulation of opercular bone with hyomandibular. *gr.* Groove in spine. *op.* Opercular bone. *op.s.* Opercular spine. *z.* Conical cavities in opercular bone, continuous with the grooves of the spine.

lobe, which in its widest part consists roughly of about nine or ten irregular rows of cells. About halfway along the spine the anterior lobe gradually narrows, and ends a short distance from the projecting apex of the spine.

In Plate XVII. fig. 2 a surface view of the apex of the spine is shown, indicating the manner in which it usually projects from its

sheath, and the two points (x, x) at which the glands are connected with the epidermis. It will thus be seen that the end of the spine somewhat resembles in its arrangement a hypodermic syringe.

In order to make out the more detailed structure of the various parts, serial sections were taken of both opercular and dorsal organs in various planes. The specimens were decalcified, stained with borax-carmine, imbedded and mounted in the usual way.

A transverse section through the line a–b in fig. 1 is represented in fig. 4. The spine (*op.s.*) in this region broadens out on both sides of the grooves, which are thus narrower here than they are more posteriorly; the dorsal and ventral glands (*gl.*), enclosed in their thin membranous capsules (*cp.*), are seen projecting into them. The capsule proper is surrounded by a mass of dermal connective-tissue (*c.t.*), except where it projects into the groove of the spine: the epidermis (*ep.*) is seen covering the connective-tissue layer externally. *No special muscles are present in connexion with the glands*: the fibres shown in fig. 6, inserted into a slight ridge of the spine, belong to one of the opercular muscles.

The glands, which contain no lumen, consist of a number of very large rounded or irregular cells; their contents are granular and in most of them one or more distinct nuclei can be seen, many of which show indications of recent division. Around the edges of the glands smaller—probably immature—cells are present here and there in transverse sections through this region. The cell-boundaries cannot everywhere be clearly made out, and I am inclined to think that *in the discharge of their secretion the cells simply burst*, their contents passing along the grooves amongst the other cells to the exterior.

With the exception of the smaller number of cells and the different form of the spine, the structure of the posterior narrower part of the organ shows no important difference from the anterior enlarged part. Towards the narrow termination of the gland, however, shortly in front of the apex of the spine, in which region the cells are smaller, the connective-tissue lying between the gland and the epidermis thins out, and *the cells of the epidermis and gland become continuous with one another* (comp. figs. 3, 5, 6, 7, *ep.*, *c.t.*, x). Owing to the toughness of the decalcified spine and to the looseness of its connective-tissue sheath, it is exceedingly difficult to obtain satisfactory unbroken sections in this region, and I have not yet succeeded in ascertaining with certainty the manner in which the secretion passes to the exterior, but am inclined to accept Byerley's explanation. There can, however, be little doubt that the gland is developed as an epidermic involution, the whole of which gives rise to secretory cells, so that there is no marked differentiation into gland and duct.

Dorsal Organs.—The arrangement here is precisely similar to that seen in the posterior narrow part of the opercular organ. There is an expanded part of the gland, which extends along both grooves of each dorsal spine, showing not more than three or four cells in a single transverse section through the broadest part. A connexion

with the epidermis a short distance below the apex can here also be made out.

Fig. 8 represents a transverse section through the first and second dorsal spines. The first being shorter than the second, it is cut through at a relatively different level.

So far as I am aware, there is only a single other case in which the presence of an integumentary gland which gives rise to a definite secretion has been distinctly proved amongst fishes: I refer to the gland of the clasper (*glandula pterygopodii*) of male Elasmobranchs[1]. But from the similarity in many points between the general arrangement of the poison-organs in *Trachinus* with those of *Thalassophryne*[2] and *Synanceia*[3], as described by Dr. Günther, I cannot help thinking that a careful histological examination of the "poison-bags" of these fishes might prove the existence of gland-cells in them also. A number of other fishes, which are said to be poisonous, might likewise repay further examination.

It would be exceedingly interesting to ascertain the nature of the poison of *Trachinus* and to obtain more facts as to its effects. An account of an experiment which Prof. Allman made upon himself is given in the paper already quoted (1). He stung himself in the thumb with the opercular spine of a *T. vipera*, and found that it caused most excruciating pain which lasted about an hour and a half, as well as swelling and inflammation of the thumb and hand. The swelling lasted for some days, but the pain on pressure continued for more than a week. Sir William Jardine (10) quotes a Dr. Parnell as saying that the sting gives rise to a "painful wound, which causes the parts to swell and almost immediately to assume a dark-brown appearance which remains for 4 to 6 hours." Couch (5) mentions that "there are instances where, within a few minutes, the pain has extended from the hand as high as the shoulder;" and states that the danger is not wholly removed after the fish is dead: on this account it is provided by law in some places that the spines shall be removed before the fish is offered for sale in the market. Allman, however, found that inoculation from a fish about 24 hours dead only caused a slight smarting. Byerley (3) describes the erection of the dorsal spines and operculum, and with regard to the effects of the poison gives the following details:—The acute pain caused by the punctures is stated to last usually four or five hours, and to leave the parts in a numb and tender state for some time afterwards. In some cases acute inflammation follows, causing sloughing or mortifying of the parts around the puncture, and even

[1] See Petri, Zeitschrift f. wiss. Zoologie, Bd. xxx. Brock has described some gland-like cells in the curious dendritic appendage which is situated behind the urinogenital papilla of *Plotosus anguillaris* (Zeitschrift f. wiss. Zoologie, Bd. xlv., 1887, p. 532). Comp. also R. von Lendenfeld, on the luminous organs of Fishes, 'Challenger' Reports, vol. xxii. Appendix B. Saville Kent (15) states that *Uranoscopus* and its allies are provided with poison-glands, but does not give his authority for this statement.

[2] Trans. Zool. Soc. vi. p. 437. [3] Fische d. Südsee, i. p. 84.

giving rise to permanent stiffening of the part. In other cases, instead of a slough of this kind being produced, intense inflammation of the finger, hand, and even forearm may follow, the lymphatic vessels becoming inflamed up to the arm-pit, the glands of which become enlarged and painful. Purulent matter is also often formed amongst the tissues, and the effects of the poison will sometimes be felt for from three to five months in severe cases.

Day (9) states that the swelling usually subsides in about 12 hours, but mentions one case in which a sailor was incapacitated from work for many weeks, and refers to Schmidt (17) as giving further details concerning the effects of the virus.

Mention is also made of the physiological aspect of the question in the paragraph already referred to by Wiedersheim (20), where it is stated that "Die Wirkung des Giftes, selbst auf grössere Thiere, ist eine starke. Es afficirt das centrale Nervensystem und das Herz (Convulsionen, Starrkrampf, Paralyse)."

Additional evidence as to the effects produced by the sting of the Weever is given in many of the works already quoted, but much of this, like the accounts one hears from fishermen themselves, is not sufficiently authenticated to be of much value. Dr. Day states (9) that "surgeons have found that olive-oil, to which a little opium has been added, is most efficacious as a cure."

T. vipera is said to be much more venomous than *T. draco*; but this can probably be explained by the fact that the former has had more attention directed to it, owing to its habit of burying itself in the sand, when it is liable to be trodden upon by bathers; whereas in the case of the Greater Weever the cases of poisoning are mostly confined to fishermen who have incautiously handled the fish when it has been brought up in the trawl.

List of Works referred to.

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17. Schmidt. Nord. Med. Arch. vi. no. ii. 1875.
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20. Wiedersheim, R. Lehrbuch d. vergl. Anat. Jena, 1886, p. 20.
21. Wiedersheim, R. Comp. Anat. of Vertebrates (translated by W. N. Parker). London, 1886, p. 18.
22. Yarrell. British Fishes. Vol. ii. pp. 3, 8.

EXPLANATION OF PLATE XVII.

All the figures refer to *Trachinus vipera*.

Fig. 1. The whole of the opercular apparatus, drawn from a transparent preparation mounted entire in Canada balsam.
Fig. 2. The apex of the opercular spine, showing the manner in which it projects beyond its sheath.
Fig. 3. A slightly oblique longitudinal section, taken about through the line *c–d* in fig. 2. The epidermis has broken away, but the point at which the cells of the gland were continuous with it is shown at *x*.
Fig. 4. Transverse section through the opercular apparatus taken through the line *a–b* in fig. 1.
Fig. 5. Transverse section through the narrower part of the apparatus, near the apex of the spine.
Fig. 6. The 20th section posterior to (that is, nearer the apex of the spine than) the last, passing through the region at which the involution of the epidermis occurs (*x*); the section is slightly oblique, and thus passes through the involution at different levels on either side.
Fig. 7. The 6th section posterior to the last, also passing through the epidermic involution.
Fig. 8. Transverse section through the first and second dorsal spines and glands. The first spine being shorter than the second, the section cuts it nearer the apex, through its narrower portion.

The sections were all drawn with the camera lucida to the same scale.

LIST OF ABBREVIATIONS.

ar. Articulation of opercular bone with hyomandibular. *b.v.* Blood-vessel.

c.p. Capsule of gland. *c.t.* Connective tissue. *d.f.* Dorsal fin. *d.s.* Dorsal spine. *ep.* Epidermis. *gl.* Poison-gland. *gr.* Groove in spine. *m.* Opercular muscles. *op.* Opercular bone. *op.m.* Opercular membrane. *op.s.* Opercular spine. *pg.* Pigment-layer of skin. *r.* Outer ridge of opercular spine. *sh.* Sheath of opercular spine. *x.* Region at which the cells of the epidermis are continuous with those of the gland. *y.* Space between the opercular spine and its sheath.

2. On a Collection of Coleoptera from Korea (Tribes Geodephaga, Lamellicornia, and Longicornia), made by Mr. J. H. Leech, F.Z.S. By H. W. Bates, F.R.S., F.Z.S., &c.

[Received June 5, 1888.]

During his recent entomological exploration of Japan and the neighbouring coasts of Eastern Asia, Mr. J. H. Leech paid a visit of six weeks' duration (May–June 1886) to the eastern side of the Korean peninsula, and was enabled, though his attention was chiefly occupied with Lepidoptera, to obtain a considerable collection of Coleopterous insects. His excursions were limited to the hilly country in the neighbourhood of Gensan, a district which appears never before to have been visited by an entomologist. Our knowledge of the products of Korea in this branch was previously confined to the western side of the country, where a small collection was made in 1883 and 1884 by Dr. C. Gottsche, and another, somewhat more extensive, a little later, by Herr Otto Henz. The former was catalogued and described by Herr Kolbe in Wiegmann's 'Archiv für Naturgesch.' in 1886; the latter by Ganglbauer in 'Horæ Soc. Entom. Rossicæ,' vol. xx. (1886), and by Von Heyden in the same periodical, vol. xxi. (1887). To the number of species thus recorded, viz. 286, Mr. Leech, in the three groups here catalogued, has added about 60, making a total of 346, which is, of course, but a small fraction of the Coleopterous fauna of the country. It is welcome, however, as affording us for the first time a glimpse of the nature of the fauna and of its relations to those of Japan and the regions of continental Asia to the north and south. So far as it goes it points to an essential unity of the Coleopterous fauna with those of the Amur and Northern China, and at the same time a decided difference between the faunas of Korea and Japan, in the same Order of Insects. The difference is twofold—it consists, first, in a large proportion [1] of continental Palæarctic genera and species being found in Korea but not in Japan; and, secondly, in the mixture of tropical forms, which is so well known a feature of temperate latitudes in Eastern Asia, being of a different nature in the two countries, for the proportion of these forms is decidedly less in Korea than in Japan, and consists of different genera as well as species.

[1] Of the 100 Korean species here catalogued, no fewer than 42 appear not to be found in Japan. Four of the 42 are tropical, not properly Palæarctic, forms.

This seems to show that the source and perhaps the epoch of immigration of tropical forms have been different for the two countries. It is, however, too soon to generalize with confidence on these points, seeing that we at present know scarcely a tenth of the species of Coleoptera almost certainly existing in Korea. I put forward these considerations, suggested by the examination of a large portion of Mr. Leech's acquisitions, chiefly to show that interesting problems lie before us in the fauna of this country, and that an attractive field lies open for future travellers and residents.

Fam. Cicindelidæ.

Cicindela chinensis, De Geer, Ins. 4, t. 17. f. 23.

Two examples, closely resembling the richly-coloured form prevalent in Japan.

Cicindela gemmata, Faldermann, Mém. Acad. Petrop. ii. (1835), p. 14, t. 3. f. 1; Kolbe, Archiv f. Naturgesch. Berlin, 1886, p. 164, t. xi. f. 21.

Taken abundantly at Gensan, and found also by Dr. Gottsche between Söul and Fusan. On the Amur it reoccurs as a rather well-marked variety. Faldermann described it from Mongolian specimens taken by Bung more than half a century ago. To Herr Kolbe belongs the credit of resuscitating this species, which had been by most authors suppressed as a synonym of *C. sylvatica*, from which it is very distinct.

Cicindela raddei, Morawitz, Bull. Acad. Petrop. iv. p. 188 (1862).

Three examples, agreeing well with the above-cited description.

Cicindela japanensis, Chaudoir, Bull. Mosc. 1863, i. p. 202.

Many examples taken at Gensan. Common in Japan and on the Asiatic mainland as far south as the Yang-tsze.

Fam. Carabidæ.

Carabus van-volxemi, Putzeys, Ann. Soc. Ent. Belg. xviii. p. 2.

Gensan. One example only, differing from Japanese specimens in the fainter granulations of the interstices, and possibly indicating a distinct local variety.

Carabus tuberculosus, Dejean, Sp. Gen. Col. v. p. 549.

Gensan, one example.

Carabus bilbergi, Mannerheim, Hummel's Ess. vi. p. 25.

One example, apparently an elongate variety of this species.

Coptolabrus smaragdinus, Fischer, Ent. Russ. ii. p. 103.

Two examples of a rich uniform golden-coppery colour, the apex

of the elytra sharply bidentate. It agrees in colour with the var. *pyroclopus*, Kraatz, but seems to differ from it and from all other varieties of the species by the distinct but short and fine tooth or spine near the sutural apex of each elytron.

COPTOLABRUS LEECHI.

C. gehinii (*Fairmaire*) *quoad formam similis, sed valde differt elytris utrinque triseriatim breviter nigro-tuberculatis tuberculisque* (*fere sicut in* C. schrenckii, *Motsch.*) *inter se annulo tenui ovato concatenatis. Long.* 37 *millim.* ♀.

Gensan; one female example.

This magnificent species in general form resembles a *Damaster*, with the exception that the elytra are more ovate and convex, and quite simple at the apex. The colour of the upper surface is rich golden coppery, more brilliant (owing to the sparser sculpture) on the head and thorax than on the elytra, which latter are very closely rugulose-punctate, or more properly coarsely shagreened, the three rows of rather short oblong tubercles, and a row of much smaller ones between each pair and along the suture, being shining black. The head, with the neck, is long and narrow, the labrum strongly sinuated in the middle, the mandibles much elongated, and the surface somewhat faintly punctulate and rugulose. The thorax is narrow, at the apex not wider than the neck, moderately rounded in the middle, and constricted before the base, the hind angles being produced, but obtuse at their apices; the surface is faintly and irregularly transverse rugulose. The underside is violet-black and smooth; the underside of the head and prothorax, sides of breast and abdomen, and the elytral epipleuræ coppery violet. The legs, antennæ, and palpi are black.

SCARITES SULCATUS, Olivier, Ent. iii. 36, p. 7, t. i. f. 11; Chaudoir, Monogr. Scaritides (1880), p. 80.

One example, taken at Gensan, of this well-known Indian species.

CHLÆNIUS COSTIGER, Chaudoir, Bull. Mosc. 1856, iii. p. 258.

Distributed throughout Eastern China, from north to south; Japan and Formosa.

CHLÆNIUS VIRGULIFER, Chaudoir, Monogr. des Chléniens, p. 61.

Also found throughout Eastern China.

CHLÆNIUS NÆVIGER, Morawitz, Beitr. zur Käferfaun. Ins. Jesso, p. 33, t. i. f. 16.

North China and Japan.

CHLÆNIUS HOSPES, Morawitz, *l. c.* p. 32, t. i. f. 15.

North China and Japan.

ANISODACTYLUS SIGNATUS, Illiger, Käf. Preuss. i. 174.

Found throughout Europe and Siberia and in Japan. It appears to be a common insect at Gensan.

ANISODACTYLUS TRICUSPIDATUS, Morawitz, Beitr. Käferf. Ins. Jesso, p. 66.

Gensan, several examples. Also found in Japan.

HARPALUS GRISEUS, Panzer; Dej. Sp. Gen. Col. iv. p. 251.

A generally distributed species throughout Europe, Northern Asia, and Japan.

HARPALUS RUGICOLLIS, Motschulsky, Etud. Ent. 1860, p. 5.

Found also in Japan.

HARPALUS, sp. inc.

Gensan, one example. Species doubtful.

HARPALUS CHALCENTUS, Bates, Trans. Ent. Soc. 1873, p. 263.

North-eastern China to the Yang-tsze; Japan.

HARPALUS CRATES, Bates, Trans. Ent. Soc. 1883, p. 239, note.

One example. Found throughout Eastern China.

HARPALUS TARDUS, Panzer, Faun. Germ. Heft 37. f. 24.

A common Palæarctic species, recorded as occurring throughout Europe and Asia as far east as Kulja.

Two examples, not distinguishable from European specimens.

CYRTONOTUS NITENS, Putzeys, Etud. s. les Amara, p. 234.

Gensan; apparently abundant. A widely distributed insect throughout Northern China and Japan.

BRADYTUS BREVIPENNIS, Chaudoir, Bull. Mosc. 1844, iii. p. 446.

Found also in Eastern Siberia.

TRIPLOGENIUS INGENS, Morawitz, Beitr. Käferf. Ins. Jesso, p. 54.

Throughout Northern China and Japan.

LAGARUS ABERRANS, Morawitz, Bull. Ac. St. Pétersb. 1863, p. 251.

Also recorded from the Amur and Japan.

LAGARUS SULCITARSIS, Morawitz, Bull. Ac. St. Pétersb. 1863, p. 250.

Found also in Manchuria and Japan.

LAGARUS NIMBATUS, Morawitz, Bull. Acad. St. Pétersb. 1863, p. 235.

Also Japan.

OMASEUS ROTUNDANGULUS, Morawitz, Bull. Ac. St. Pétersb. 1863, p. 252.

Also Japan and Eastern Siberia.

Omaseus fortis, Morawitz, Bull. Ac. St. Pétersb. 1863, p. 252.

Also coast of Manchuria and Japan.

Gensan; three examples, agreeing with the Japanese form, but somewhat smaller in size.

Dolichus flavicornis, Fabr.

Taken in plenty at Gensan. A well-known South-European species, extending through Turkestan to Eastern Asia and Japan.

Anchomenus (Limodromus) magnus, Bates, Trans. Ent. Soc. 1873, p. 278.

Found also throughout Eastern China to the Yang-tsze, and in Japan.

Pheropsophus jessoensis, Morawitz, Bull. Ac. St. Pétersb. 1863, p. 322.

Gensan; many examples, closely resembling the Japanese form.

Drypta dentata, Rossi.

Gensan; a single example, differing from West-European and British specimens only in the slightly finer punctuation of the elytra and the stronger dorsal furrow of the thorax. I do not find the species mentioned in Von Heyden's Catalogue of the Coleoptera of Siberia (1881).

Fam. Copridæ.

Scarabæus sacer, Linn., var. peregrinus, Kolbe, Archiv f. Naturgeschichte, 1886, p. 184, t. xi. f. 26.

Mr. Leech obtained two examples of this insect, in this eastern extremity of its wide range. The Korean variety differs from the typical Mediterranean form chiefly in the dark-brown hair-fringes of the hind tibiæ. The species has not hitherto been found in Japan.

Copris ochus, Motschulsky, Etud. Entom. 1860, p. 13.

A common insect in Japan.

Copris tripartita, Waterhouse, Trans. Ent. Soc. 1875, p. 74.

Found also in Japan.

Onthophagus rugulosus, Von Heyden, Deutsch. ent. Zeits. 1886, p. 289.

Described from examples from the neighbourhood of Peking. Mr. Leech obtained a fair series of both sexes at Gensan.

Onthophagus lenzii, Harold, Abhandl. nat. Ver. Bremen, iv. 1875, p. 290.

Also found in Japan.

Onthophagus fodiens, Waterhouse, Trans. Ent. Soc. 1875, p. 75.

Also a Japanese insect.

ONTHOPHAGUS SOLIVAGUS, Von Heyden, Deutsch. ent. Zeits. 1886, p. 290.

Von Heyden described the male only, from Peking. Mr. Leech's two examples, females, agree very well with the description, but they are smaller (8½ millim., Von Heyden gives 10 millim.); the head has two sharply raised and slightly arcuated carinæ; in the male the occiput has a short horn.

ONTHOPHAGUS ——?

A single example; indeterminable.

ONITICELLUS PHANÆOIDES, Westwood, in Royle's Himalaya, Entom. p. 55, t. 9. f. 3.

The Korean differs from the Japanese form in the transverse posterior ridge of the thorax, in fully-developed males, being depressed and crossed by a groove. In this feature they approach the North-Indian type-form more nearly than does the Japanese variety, in which the elevation described is triangularly elevated in the middle.

Fam. APHODIIDÆ.

APHODIUS APICALIS, Harold, Berl. ent. Zeits. 1861, p. 96.

Found also, widely distributed, in Japan.

APHODIUS SORDIDUS, Fabr. Syst. Ent. i. p. 16.

A species distributed throughout the entire Palæarctic region from Western Europe (including Britain) to Manchuria and North-eastern China, and extending to Japan, according to Waterhouse, in the variety 4-*punctatus*. Korean examples do not differ from West-European specimens with which I have compared them.

APHODIUS UROSTIGMA, Harold, Berl. ent. Zeits. 1862, p. 170; id. Mittheil. Münch. 1880, p. 156.

Found also in Java, Ceylon, and Annam. From the last-named locality M. Fleutiaux has sent me a series of specimens under the name of *A. pallidicornis* (Walker), but they agree better with *A. urostigma* as defined by Von Harold. The pygidium is uncovered and clothed with hairs, a peculiarity not noticed by the describer.

Fam. MELOLONTHIDÆ.

HOPLIA RUFIPES, Motschulsky, in Schrenck's Reise, p. 133, t. 9. f. 4; Kraatz, Deutsch. ent. Zeits. 1879, p. 232.

A large series of examples taken at Gensan, nearly all obscure and uniform in the colour of the scales of the upper surface. The species occurs also on the Amur, and I have examples from the coast of Manchuria.

SERICA HERZI, V. Heyden, Hor. Soc. Ent. Rossicæ, xxi. (1887), p. 264.

Two examples taken at Fusan.

Apogonia cupreoviridis, Kolbe, Archiv f. Naturgesch. 1866, p. 193.

Gensan; four examples.

The species (if I have determined it aright) differs from *A. splendida* (Boh.) of Japan and China in the more arcuated outline of the clypeus, which describes the segment of a circle, not flattened as in *A. splendida*, and in the sides of the elytra at their widest part having only two instead of four smooth interstices.

Lachnosterna diomphalia.

L. parallelæ (*Motsch.*) *affinis et simillima, sed differt pygidio ♂ valde convexo, ante apicem bicalloso. Long.* 20 *millim.*

Fusan; two examples, ♂.

Similar to the common Japanese and Chinese *L. parallela* (Motsch.); of similar elongate oblong form, shining black colour, and strong but separated punctuation of the head and thorax. The males, however, differ greatly: in *L. parallela* the pygidium is simply and moderately convex, and the apical ventral segment transversely convex; in *L. diomphalia* the pygidium is bigibbous a little before the apex, with a strong marginal groove, and the apical ventral segment is large and transversely tumid.

Lachnosterna morosa, Waterhouse, Trans. Ent. Soc. 1875, p. 104.

Three examples, one black and two piceo-castaneous.

Lachnosterna ——?

A single example; undeterminable.

Hoplosternus japonicus, Harold, Abhandl. nat. Ver. Bremen, iv. 1875, p. 291.

One example only, a ♀, having a longer sternal spine than Japanese specimens; but as the latter vary considerably in the length of the spine, it is open to doubt whether the Korean insect is specifically distinct.

Fam. Rutelidæ.

Phyllopertha conspurcata, Harold, Deutsch. ent. Zeitschr. 1878, p. 71.

Taken abundantly at Gensan. Also found in Japan.

Anomala rufocuprea, Motschulsky, Etud. Entom. 1860, p. 14; Harold, Deutsch. ent. Zeitsch. 1877, p. 350.

All the very numerous examples taken by Mr. Leech differ from Japanese specimens in the rather stronger and closer punctuation of the upper surface of the body, the punctures on the elytra tending to coalesce into transverse rugæ. The wide range of colour-variation is similar in both forms, viz. — 1 (typical and the least numerous), coppery red; 2, brassy-green in different shades; 3,

brassy-green with tawny-red elytra glossed with green; 4, coppery, with coppery-brown elytra; 5, violet-brown; and 6, nearly black.

ANOMALA SIEVERSI, V. Heyden, Horæ Soc. Ent. Rossicæ, xxi. (1887), p. 266.

Gensan and Fusan. Abundant also at Kiukiang on the Yang-tsze. A species resembling much in colour and pilosity the Japanese *Phyllopertha octocostata*, Burm., which, according to Von Heyden, was taken by Herz also in Korea.

ANOMALA TESTACEIPES, Motschulsky, Etud. Entom. 1860, p. 14; Harold, Deutsch. ent. Zeitsch. 1877, p. 356.

One example only, of brassy-testaceous colour, taken at Gensan; with elytral interstices much less opaque than in the Japanese form.

ANOMALA ORIENTALIS, Waterhouse, Trans. Ent. Soc. 1875, p. 108.

A good series of examples from Gensan, nearly all with unicolorous elytra, one only dark coppery brown; in other respects they do not differ from the Japanese form.

ANOMALA DUBIA, Ballion, Bull. Moscou, 1870, iv. p. 344.

I refer with some hesitation a species, of which Mr. Leech took several examples at Gensan, to the above. They agree with the very insufficient description, if we may suppose that it was drawn up from an immature example in which the elytra are "testaceis, æneomicantibus." The normal colour of the whole upper surface is rich metallic green, in some examples having a more æneous or golden-green tint. It is an oblong densely-sculptured species, and is closely allied to the Chinese *A. aulax* (Wiedm.), from which, in fact, it scarcely differs except in its smaller size (12–14 millim.), in the underside being wholly dark metallic, and in the absence of any traces of pale borders to the thorax and elytra.

ANOMALA (EUCHLORA?) MONGOLICA, Faldermann, Mém. Acad. Pétrop. ii. 1835, p. 379.

Many examples taken at Gensan. Found also in Mongolia, on the Amur, and in Japan. The species is placed by all later authors in the genus or subgenus *Euchlora*; but I can discover no single point of structure to distinguish it from the typical *Anomalæ* (*A. fritschii* and allies), with which it agrees in the angularly dilated lower branch of the larger anterior tarsal claw in the male—a character which separates the typical *Anomalæ* from *Euchlora viridis* and its immediate relatives.

ANOMALA (PARASPILOTA) IMPICTA.

Elongato-ovata, glabra, flavo-testacea, supra (maculis thoracis vagis fuscis exceptis) impicta antice auro-tincta, subtus corpore medio, pedibus antennisque plus minusve nigris; clypeo lato et brevi, antice late truncato medio subsinuato, marginibus alte

reflexis ; capite toto disperse punctulato ; thorace transverso, a basi usque ad apicem subrotundatim angustato disperse punctulato, lateribus vage multi-impresso, marginibus reflexis medio basi immarginato plano, angulis posticis valde obtusis ; elytris punctato-striatis vix costatis, interstitio 2do lato confuse punctato ; pygidio fere lævi ; pectore breviter sparsim pubescenti. Spina sternalis gracilis, elongata, acuta. Unguis exteriore tarsorum 4 anticorum sat gracilis, fissus. ♂ ♀. *Antennarum clava utroque sexu elongata (in* ♀ *vix brevior).*

♂. *Pygidium versus apicem convexum ; segmentum ventrale apicale breve.*

♀. *Pygidium æqualiter modice convexum ; segmentum ventrale apicale elongatum.*

Long. 14–17 *millim.*

Gensan ; many examples.

Agrees with the section *Spilota* (*sensu* Dejean) in most of its characters, but peculiar in the form of its labrum, which is broader in the middle and pointed. This character may not prove of the importance it seems when the labrum in all the *Anomalæ* is more closely examined than it has hitherto been. Authors seem to have followed Erichson in giving it as inflexed and emarginated. Such species as I have dissected prove not to be emarginated, but to be rather produced and rounded in the middle of the anterior margin. The inflexion which commences nearly from the base is increased near the apex, giving the false appearance of emargination when viewed from above.

MIMELA SPLENDENS, Gyll. in Schönh. Syn. Ins. i. 3, App. p. 110 ; Burm. Handb. d. Ent. iv. 2, p. 506.

Mimela gaschkevitschi, Motschulsky, Etud. Ent. 1857, p. 32.

Mimela simplex, Bates, Proc. Zool. Soc. 1866, p. 345.

A common insect in Japan and Northern Formosa. Mr. Leech obtained many examples at Gensan.

MIMELA FUSANIA.

M. chinensi (*Kirby*) *proxime affinis ; aureo- vel æneo-viridis apud latera testaceo-translucens, subtus (cum pedibus) testaceo-ænea, fusco-cuprea vel læte cuprea, fere nuda ; clypeo rugoso-punctulato, fronte et thorace disperse punctulatis hoc crebre minutissime punctulato, linea dorsali lateribusque vage impressis margine integro ; elytris sat grosse passim punctatis, costis ordinariis distinctis lævibus interstitio 2do lato ; pygidio sculpturis curvatis discretis medio lævioro. Long.* 14–15 *millim.*

Fusan ; many examples.

Exactly similar in form and sculpture to the form of *M. chinensis* (Kir.) met with abundantly on the Lower Yang-tsze Kiang ; but differing constantly in its darker colour, the Chinese species being yellow-testaceous tinged with brassy. It cannot be *Mimela luteipennis*, Motsch., Peking, as that species is described as "abdomine testaceo-villoso"

Popilia indigonacea, Motschulsky, Etud. Entom. 1853, p. 47.

A few examples only were taken, at Gensan. Kolbe records it as found commonly by Dr. Gottsche on the western side of Korea. Originally described from examples taken near Peking. It is scarcely more than a local var. of *P. cyanea*, Hope.

Popilia atrocærulea, n. sp.

P. indigonaceæ *similis, sed convexior, elytris basi angustioribus pygidioque albo-bifasciculato. Cærulescenti-nigra, polita, thorace toto (disco posteriore subtilius) punctato; elytris utrinque prope basin haud profunde rugoso-foveatis, interstitio 2do basi confuse multipunctato et rugoso, versus apicem punctis multo paucioribus, deinde usque ad callum humeralem striis punctulatis 4 mediocriter impressis; pygidio transversim (disco posteriore sparsius) punctulato-rugoso; processu sternali breviore et obtusiore; corpore subtus nigro, nitido. Long.* 11–13 *millim.*

Var. *Elytris utrinque macula magna triangulari (versus apicem plus minusve extensa) fulvo-castanea.*

Gensan and Fusan; a very large number of examples.

The white pubescent spots of the pygidium distinguish this species from *P. indigonacea* and *cyanea*, more conspicuously than the narrower base and more convex surface of the elytra. *P. cærulea* (Bohem.) of Hong Kong (recurring in Formosa in numerous colour-varieties) is a much smaller insect (10½ millim.), and distinguished by the very deep foveæ near the base of the elytra, the much deeper striæ, and the short and almost uniseriate puncture-row of the second interstice.

Of the variety there are several examples (from Fusan) in Mr. Leech's collection; others, with the castaneous spot clearer and larger, were taken by A. Adams, either in Korea or on the coast of Manchuria a little farther north.

Von Heyden records *P. adamas*, Newm., from Korea; but this is an Indian species, widely different from the above, having white pubescence, partly lying in a broad groove, on the sides of the thorax.

Popilia bogdanowi, Ballion, Bull. Moscou, 1870, iv. p. 345.

A small species (9–10½ millim.), taken at Gensan; agrees very well with the above-cited description. It is closely allied and similar to the Javan *P. biguttata* (Wiedm.), and like that species destitute of foveæ near the base of the elytra.

Adoretus tenuimaculatus, Waterhouse, Trans. Ent. Soc. 1875, p. 112.

Gensan. Common in Japan.

Fam. Cetoniidæ.

Glycyphana cupreola, Kraatz, Deutsch. ent. Zeitschr. 1879, p. 243 *et seq.*

A series of examples from Gensan, differing little amongst themselves in form, colour, or sculpture, though considerably in pubescence,

agree very closely with two male examples from the Amur, which I identify with *G. viridiopaca* var. *cupreola* of Kraatz described from the same locality. They all differ, in both sexes, from *G. viridiopaca*, *G. bensoni*, and *G. pilifera* very strikingly in the shallow emargination of the thorax adjoining the scutellum. In colour they differ also from those species in being coppery with more or less of an æneous tinge, more or less subopaque above and brilliant beneath; the tarsi, and sometimes the tibiæ, dark brassy green. An example from Fusan differs from those above described in being dark coppery brown above and densely hairy, the hairs short and erect on the thorax, longer and looser on the elytra.

GLYCYPHANA PILIFERA, Motschulsky, Etud. Entom. 1860, p. 15.

Fusan. Common throughout Japan.

The single Fusan specimen resembles the Yezo form in the dark colour of the four anterior tarsi; in all specimens from the southern islands of Japan which I have examined the tarsi of all the legs are rich coppery like the under surface of the body.

GLYCYPHANA JUCUNDA, Faldermann, Mém. Acad. Pétrop. ii. p. 386.

The numerous examples are in a discoloured condition, and it is not possible to ascertain whether they belong to the North-China type-form or to the Japanese variety (*G. jucunda* var. *argyrosticta*).

GLYCYPHANA KUPERI, Schaum, Trans. Ent. Soc. (3 ser.) v. p. 69, t. 8. f. 6.

Gensan; two examples. Found also on the Lower Yang-tsze.

GLYCYPHANA FULVISTEMMA, Motschulsky, Schrenck's Reise, Ins. p. 135.

Gensan. Spread over Eastern Siberia, Northern China (to the Yang-tsze), and Japan.

CETONIA SEULENSIS, Kolbe, Archiv f. Naturgesch. 1886, p. 194, t. xi. f. 29.

Gensan; many examples of both sexes. The strong sinuation of the side of the thorax preceding a prominent hind angle, on which Herr Kolbe lays stress, is variable. I find scarcely anything, except the denser sculpture, to distinguish the species from *C. brevitarsis*, Lewis, and both so closely resemble the Europæo-Siberian *C. marmorata* that they can scarcely be considered more than slight geographical varieties of that species. The sides of the clypeus are, as in *C. marmorata*, scarcely elevated (not carinated as in *C. floricola*, Hbst., and its subspecies). The pygidium is extremely closely rugulose and not convex in either sex; the abdomen is longitudinally concave in the male.

CETONIA SUBMARMOREA, Burm. Handb. d. Ent. iii. p. 460.

Gensan; two examples. Common in Japan.

Trichius succinctus, Pallas, Ic. Ins. p. 18, t. A. f. 19; Burmeister, Handb. d. Ent. iii. p. 758.

A species of wide distribution in Eastern Siberia and extending to Japan.

Fam. Prionidæ.

Prionus insularis, Motschulsky, Etud. Entom. 1857, p. 36, 1861, p. 21.

A common species in North China and Japan.

Ægosoma sinicum, White, Cat. Long. Col. Brit. Mus. p. 30.

Also found in Japan and North China.

Fam. Cerambycidæ.

Spondylis buprestoides, Linn. Syst. Nat. xii. 2, p. 621.

A widely distributed and well-known Palæarctic insect, from Western Europe to North China and Japan.

Asemum punctulatum, Blessig, Hor. Soc. Ent. Ross. ix. p. 182.

Two examples from Gensan, closely agreeing with a specimen with which I have compared them from the Amur, whence Blessig obtained the species. It appears to be peculiar to this part of Asia, but, like the other species of the genus, it is scarcely more than a local variety of the European *A. striatum*.

Criocephalus rusticus, Linn. Syst. Nat. xii. 2, p. 634.

Has a range precisely similar to that of *Spondylis buprestoides*.

Distenia japonica, Bates, Ann. Mag. Nat. Hist. (4) xii. p. 155.

Apheles gracilis, Blessig, *l. c.*

Extends to the Amur and Japan.

Leptura (Pidonia) gibbicollis, Blessig, Hor. Soc. Ent. Ross. ix. p. 258.

Found also on the Amur and the coast of Manchuria.

Leptura succedanea, Lewis, Ann. Mag. Nat. Hist. (5) iv. p. 464.

Found also in Japan.

Leptura cincta, Fab. Syst. El. ii. p. 356.

Ranges from Western Europe through Siberia to Korea, but apparently not extending to Japan.

Leptura atra, Fab. Syst. Ent. p. 197.

Range similar to that of *L. cincta*.

Leptura (Stenura) arcuata, Panzer, Faun. Germ. 8. 12.

Range same as the two preceding.

Callichroma bungii, Falderm. Mém. Ac. Pétrop. 1835, ii. p. 433, t. 5. f. 5.

A species, in its typical form with red thorax, confined to Northern China, Mongolia, and countries to the north and east. It has not been recorded from Japan. In Southern China a local var., entirely black, is found.

Polyzonus fasciatus, Fabr. Sp. Ins. i. p. 232.

Nearly the same range as the preceding.

Clytus capra, Germar, Ins. Sp. Nov. p. 518.

Spread throughout the Palæarctic region from Western Europe through Siberia, but apparently not extending to Japan.

Clytanthus plebejus, Fabr. Sp. Ins. i. p. 243.

Same range as the preceding.

Fam. Lamiidæ.

Lamiomimus gottschei, Kolbe, Archiv f. Naturgesch. 1886, p. 224, t. xi. fig. 39.

A genus, so far as at present known, peculiar to Korea. Judging from the description *Lamia adelpha*, Ganglbauer (Hor. Soc. Ent. Ross. xx.), published about the same time as Kolbe's, is probably the female.

Lamia textor, Linn. Syst. Nat. ed. x. p. 392.

Found from Western Europe through Siberia to the Pacific; but not yet recorded from Japan.

Anoplophora (Melanauster) chinensis, Forster, Nov. Spec. Ins. 1771, p. 39.

A common and well-known Chinese species, found also in Japan. The genus *Melanauster* agrees with *Anoplophora* in all essential points of structure and the style of markings is fundamentally the same; the only difference is the distinctly-formed tubercular prominence on the mesosternum in *Melanauster*, which in *Anoplophora* exists only in a rudimentary state as a slight elevation.

Mesosa myops, Dalm. in Schönh. Syn. Ins. i. 3, App. p. 168.

A widely distributed Palæarctic species, ranging from Finland through Siberia to the Pacific coast. It appears to be represented in Japan by *M. japonica* (Bates), and the single Korean example seems by its tawny yellow markings to be in some degree intermediate between the two.

Mesosa hirsuta, Bates, Journ. Linn. Soc., Zool. xviii. p. 244.

A very distinct species, known at present only from Japan and Korea.

Mæchotypa fuliginosa, Kolbe, Archiv f. Naturgesch. 1886, p. 221, t. xi. f. 38.

A northern representative of a tropical genus common to the Indian and African regions. It is possibly the *Tylophorus wulffussii* of Blessig (Hor. Soc. Ent. Ross. ix. p. 245, t. vii. f. 3), but the description does not fit in essential points.

Agapanthia amurensis, Kraatz, Deutsch. ent. Zeitschr. 1876, p. 115.

Found also on the Amur.

Saperda gebleri, Falderm. Mém. Acad. Pétrop. ii. (1835) p. 434, t. 5. f. 6.

Northern China and Korea.

Oberea vittata, Blessig, Hor. Soc. Ent. Ross. ix. p. 255.

Amur valley and Eastern Manchuria, according to Blessig. Mr. Leech met with male examples only at Gensan.

Oberea marginella, Bates, Ann. Mag. Nat. Hist. (4) xii. (1873) p. 390.

Found also in Japan.

3. On some new Species of Coleoptera from Kiu-Kiang, China. By H. W. Bates, F.R.S.

[Received June 9, 1888.]

The following are descriptions of the new species of Cicindelidæ and Carabidæ contained in the first arrivals from Mr. Leech's collector (Mr. Pratt), who is now exploring, entomologically, the valley of the Yang-tsze-Kiang.

Cicindela lobipennis.

C. ovipenni (*Bates*) *affinis*: *differt, inter alia, elytrorum humeris latius rotundatis, apice utrinque lobato-productis. Fusco-cuprea, opaca, labro virgulaque transversa elytrorum discoidali flavis, labro medio quadratim producto unidentato lateribus parum sinuato: capite thorace latiore inter oculos concavo longitudinaliter striato, occipite vermiculato-rugoso: thorace fere plano, quadrato, carina laterali verticaliter arcuata, toto vermiculato-strigoso: elytris elongato-ovatis, lateribus acute carinatis, epipleuris latis intus obliquatis paullo ante apicem terminatis ibique margine subito depresso, apice ipso producto, quasi lobato: palpis antennisque basi viridi-æneis. Prothoracis episterna undique undulato-rugosa. Corpus subtus obscure viridi-*

æneum; pedes rufo-cuprei, tarsis viridi-æneis. Metasterni episterna brevissima. Long. 18 *millim.*

Kiu-Kiang, one female example only.

CARABUS (COPTOLABRUS) AUGUSTUS.

C. lafossei *longior et minus convexus, thorace (violaceo) et elytris (obscure viridibus) splendidissime late igneo-cupreo marginatis. Caput angustum, nigrum, postice parum rugulosum, viridi-auratum; thorace elongato, medio rotundato-dilatato nec angulato, postice sicut in* C. lafossei *sinuatim angustato, disco violaceo opaco subtiliter transversim undulato-striato: elytris valde elongato-ovatis, dimidio basali vix convexis, apice bimucronatis, utrinque triseriatim tuberculatis, tuberculis magis ovatis nigris, interspatiis subtilissime alutaceis, opacis et sparsim minute tuberculatis, tuberculisque paullo majoribus in seriebus flexuosis quatuor ordinatis. Subtus, antennæ, palpi et pedes chalybeo-nigra.* ♂. *Tarsi antici articulis tribus mediocriter dilatatis, subtus spongiosis. Long.* 43–46 *millim.*

Kiu-Kiang. Many examples.

Var. C. IGNIMITELLA.—*Paullo magis convexus, thorace antice et postice magis angustato (omnino igneo-cupreo cincto) elytrisque nigris aurescenti-viridi marginatis, tuberculis angustioribus et convexioribus. Long.* 40 *millim.*

Fu-chau. Two examples.

The very minute sculpture and opacity of the depressed parts of the elytra cause the shining black tubercles to stand out in more conspicuous relief than in *L. lafossei* and its var. *cœlestis*, the minute irregular tubercles as well as the waved row (down each interstice between suture and lateral border) of rather longer tubercles being quite distinct from the ground-sculpture. The fiery metallic border of the thorax is furrowed with transverse rugæ coarser than those of the opaque violet-coloured disk.

CARABUS KIUKIANGENSIS.

C. fiduciario (*Thoms.*) *proxime affinis, elytris similiter punctato-striatis et utrinque tricatenatis, thoraceque ruguloso-punctulato, sed differt striarum interstitiis crassioribus catenarumque tuberculis multo latioribus plerumque ovatis; differt autem antennis* ♂ *multo longioribus (media elytra attingentibus) articulisque quinto et sexto apice infra valde nodosis. Niger vix æneseens, parum nitidus, thorace quadrato-cordato, ante medium valde rotundato et postice fortiter sinuato, angulis posticis sicut in* C. fiduciario *obtuse productis; tibiis anticis* ♂ ♀ *intus simplicibus. Long.* 32–33 *millim.*

Kiu-Kiang, Yang-tsze.

LEBIA CŒLESTIS.

Lata, mediocriter convexa, flavo-testacea, elytris subviolaceo-

azureis, capite supra (cum labro mandibulis et palpis), antennis (articulo basali flavo excepto), abdomine apice, genubus, tibiis apice et tarsis nigris: capite sparsissime punctulato, fronte utrinque vage rugato: thorace latissimo lateribus late explanatis et rotundatis, loboque basali distincte producto, vix perspicue sparsissime punctulato: elytris quadrato-ovatis, apice sinuato-truncatis, angulis exterioribus valde rotundatis, subtiliter punctulato-striatis, interstitiis fere planis subtilissime sparsim punctulatis. Long. 10–13 *millim.* ♂ ♀.

Kiu-Kiang. Many examples. The lobes of the mentum are furnished with narrow epilobes; the species would therefore belong to Chaudoir's group *Lampriades*, but the very broad and strongly pectinated tarsal claws and all other characters are those of the typical *Lebiæ*. The penultimate tarsal joint is bilobed or, at least, very deeply emarginated.

LEBIA CHRYSOMYIA.

Oblongo-ovata, rufo-testacea, elytris aurescenti-viridibus: capite et thorace vagissime sparse punctulato-rugosis: thorace transverso, lateribus late explanato-reflexis rotundatis, postice paullo angustato, lobo basali breviter producto: elytris sat profunde punctulato-striatis, interstitiis convexis subtilissime sparsim punctulatis, apice sinuatim truncatis extus rotundatis. Tarsi articulo quarto longe bilobato, unguibus mediocriter latis, denticulis sat longis 5–6. *Subtus sparsim pilifero-punctulata. Long.* 9 *millim.*

Kiu-Kiang. Much resembles certain Mexican species of *Loxopeza*, a genus founded chiefly on the oblique position of the anterior tarsal joints of the male. The examples of *L. chrysomyia* appear to be females.

LEBIA CALIGATA.

Oblongo-ovata, nigra, antennis, partibus oris, tibiis, tarsis ventreque medio piceo-rufis, femoribus flavis apice nigris: capite et thorace sat crebre punctatis hoc disco læviore et vage ruguloso: thorace mediocriter lato, lateribus minus explanatis, rotundatis, postice rectis, angulis posticis rectis, lobo basali angustiore et longius producto: elytris profunde striatis, striis vix perspicue crenulato-punctulatis, interstitiis convexis sparse punctulatis. Tarsi articulo quarto breviter bilobato, unguibus dilatatis, denticulis parum elongatis 5–6. *Subtus pilifero-punctata. Long.* 9 *millim.*

Kiu-Kiang. Allied, and similar, to the Japanese *L. fusca* and *L. duplex*, but differing essentially from both in sculpture, colour of the legs, and form of the thorax.

LEBIA XANTHOPHANA.

Magna, fulvo-testacea, thorace disco infuscato, capite supra et infra prosternoque medio nigris, antennis et partibus oris rufo-

testaceis : capite sparse vage strigoso et punctulato : thorace minus transverso, subrotundato, antice magis quam antice angustato, angulis posticis rectis sed apice obtusis, lateribus late explanato-reflexis ; dorso undulatim haud acute striguloso : elytris elongato-oblongis, postice paullo latioribus, apice arcuatim truncatis, angulis acutis, subproductis, acute et profunde subpunctulato-striatis, interstitiis parum convexis sparsissime punctulatis, tertio punctis setiferis quatuor, octavo postice valde dilatato et in dilatatione bistriato. Tarsi articulo quarto valde bilobato, unguibus latis 10–11 *pectinatis. Venter setiferopunctulatus. Long.* 14 *millim.* ♀.

Kiu-Kiang. One example.

COLPODES SUPERLITA.

C. amœnæ (*Chaud.*) *simillima, sed differt elytris apice prope suturam rotundatis anguloque suturali haud dentato. Long.* 11 *millim.*

Kiu-Kiang. Of similar elongated subdepressed form to the widely-distributed Asiatic *C. amœna*, Chaud. (*splendens*, Moraw.), but differing in the form of the sublobular apex of the elytron, which in the latter is truncated near the suture, with dentate sutural angle, and, in *C. superlita*, simply rounded. The whole insect in both species is ruddy testaceous, with the surface of the elytra (*i. e.* excluding basal folds and epipleuræ) brassy green.

4. Report on a Collection of Echinoderms made at Tuticorin, Madras, by Mr. Edgar Thurston, C.M.Z.S., Superintendent, Government Central Museum, Madras. By Professor F. JEFFREY BELL, M.A., Sec. R.M.S.

[Received June 5, 1888.]

As the Society did me, last year, the honour to publish a report on a collection of Echinoderms from the Andaman Islands[1], I hope they will accept a notice of a collection from the opposite, or western, side of the Sea of Bengal. The specimens were collected in the course of last year by my friend Mr. Edgar Thurston, C.M.Z.S., who has presented a large number of them to the British Museum.

Before proceeding to give a list of this well-prepared series of specimens, I may be allowed to remind the student of the recent appearance of a memoir on the Echinoderm fauna of the Island of Ceylon[2], from which it is to be gathered that fifty-four species of Echinoderms are known from Ceylon. Shortly after the distribution of that memoir, my respected correspondent, M. de Loriol, was kind enough to write and tell me of four other species of

[1] P. Z. S. 1887, p. 139.

[2] Scientific Transactions of the Royal Dublin Society (2), iii. p. 643 *et seq.*

Echinoids, all of which had been collected at Aripo by M. Alois Humbert. Of these four (*Phyllacanthus annulifera, Temnopleurus reynaudi, Clypeaster humilis*, and *Laganum depressum*), *C. humilis* has been found by Mr. Thurston.

Of the Echinoderms collected by Dr. John Anderson, F.R.S., in the Mergui Archipelago, reports on the Ophiuroids by Prof. Martin Duncan, F.R.S., and on the Holothurians by myself have alone appeared as yet[1]; these, as well as the forthcoming reports by Dr. H. Carpenter and Mr. Sladen, should be consulted by the student who desires to make himself acquainted with the Echinoderm fauna of the Indian Ocean.

I shall probably best serve the cause of brevity and clearness if I follow the arrangement of the Andaman Report, and give first a list of the species collected, and then some notes and descriptions of the new species. With regard to some of the Temnopluroid forms and a new Ophiuroid, apparently allied to *Hemieuryale*, I reserve an account till I can deal with them in monographical detail. As usual, there are a few Holothurians which cannot be at present satisfactorily determined.

I. Crinoidea.

1. Antedon palmata, *Müll.*
2. —— reynaudi, *Müll.*
3. Actinometra parvicirra, *Müll.*

II. Asteroidea.

4. Echinaster purpureus, *Gray.*
5. Linckia lævigata, *Gmelin.*
6. Antherea pentagonula, *Lamk.*
7. Oreaster lincki, *De Bl.*
8. —— superbus, *Mobius.*
9. —— thurstoni, sp. n.
10. Asterina cepheus, *M. Tr.*
11. Luidia hardwickii, *Gray.*
12. —— maculata, *M. Tr.*
13. —— sp. (young).
14. Astropecten hemprichii, *M. Tr.*
15. —— sp. (young).

III. Ophiuroidea.

16. Pectinura gorgonia, *M. Tr.*
17. —— intermedia, sp. nov.
18. Ophiocoma erinaceus, *M. Tr.*
19. Ophiothrix longipeda, *M. Tr.*
20. Ophiothrix nereidina, *Lamk.*
21. Ophiomaza cacaotica, *Lyman.*
22. Hemieuryalid.

IV. Echinoidea.

23. Temnopleurus toreumaticus, *Leske.*
24. Temnopleuroid.
25. Salmacis bicolor, *Ag.*
26. —— dussumieri, *Ag.*
27. —— sulcata, *Ag.*
28. Stomopneustes variolaris, *Lamk.*
29. Echinometra lucunter, *Leske.*
30. Clypeaster humilis, *Leske.*
31. Lagamnum decagonale, *Less.*
32. Echinodiscus biforis, *Gm.*
33. Echinolampas oviformis, *Gm.*
34. Lovenia elongata, *Aud.*
35. Rhinobrissus pyramidalis, *A. Ag.*
36. Brissus unicolor, *Leske.*
37. Metalia sternalis, *Lamk.*

[1] Journal of the Linnean Society, Zool., vol. xxi. pp. 25 and 85.

V. Holothuroidea.

38. Haplodactyla australis, *Semp.*
39. Holothuria atra, *Jäger.*
40. —— marmorata, *Jäger.*
41. Holothuria monacaria, *Lesson.*
42. —— vagabunda, *Selenka.*

Notes and Descriptions.

Oreaster thurstoni.

A triplacanthid form, with the spines, except the five apicals, as a rule poorly developed.

R=2·7 *r*. Disk moderately elevated; lophial spines only just indicated; a spinous tubercle on both supero- and infero-marginal plates, very rarely more than one; no spines on the ventral plates. The arms rather short, wide at their base; marginals about twenty, both above and below; angles between the superomarginals, into which the pores extend. The spinous tubercles are very slight, and present no indication of becoming spines.

Adambulacral spinulation triplacanthid; spines of innermost row eight in number, diverging very gracefully, not very slender; in the middle and outer rows there are two or three spines in each cluster, and these are, as usual, much stouter; but the middle row is much more prominent than the outer. The granulation of the lower surface tends to take on a regular pattern, owing to the aggregation of the granules into tufts, in the centre of which is a spiniform tubercle. There is a plentiful supply of sessile bivalved pedicellariæ. The pore-areas of the dorsal surface are very distinctly marked on and near the disk, but are rather vaguer near the sides of the arms; there is no central apical spine; the five spines which end the lophial line are large and prominent, and have a marked tendency to double; the other spines of the lophial line are very inconspicuous. Along either side of that line there runs a row of small tubercles; outside these there is another row which does not extend beyond the disk; the constituents of these rows are quite small and inconspicuous. Madreporic tubercle large, just outside apical region, irregularly quadrate. Colour creamy yellow. R=130, *r*=47 millim.

Of the five specimens which I refer to this species three have the characters just enumerated; the two other examples differ to a somewhat remarkable extent from what appears to be the more typical form of the species. In one the apical spines are much less prominent than in the form already described, while the tubercles on either side are much more distinctly spinose, and many of the infero-marginal plates have several spinous tubercles in a tuft. In the other specimen the apical spines remain large, while the tubercles on either side become quite prominent, and the whole appearance of the form is thereby quite altered.

By many zoologists these three forms would be regarded as three distinct species; but I do not think that anybody who knows how Echinoderms vary will regard them as anything else than varieties of one and the same species. However, there are, in this instance,

a number of intermediate stages wanting, which Mr. Thurston will, I hope, be some day able to fill up.

This species is quite distinct from any of the triplacanthid Oreasters known to me.

PECTINURA INTERMEDIA.

This species stands with *P. gorgonia*, *P. marmorata*, and *P. stellata*[1] of Mr. Lyman's arrangement; for it has the disk covered under its granulation with coarse scales, and there are pores between the first and second arm-plates; but the disk is flat, with the arm compressed from side to side and keeled superiorly, while there are eight arm-spines.

Radial shields naked, of moderate size, rather irregularly elliptical in form; the rest of the disk covered superiorly by a coarse granulation, beneath which are plates of fair size. The arms widest at their insertion, distinctly carinated; accessory mouth-shields of fair size; pores between first and second arm-plates only; near the base of the arms eight spines; upper arm-plates not broken. Eighteen mouth-papillæ, the outermost on either side small; its neighbour the largest of the series; four teeth. Mouth-shields irregularly hexagonal, the adoral edge the shortest; accessory mouth-shields irregularly semicircular in form; side mouth-shields tend to the form of an equilateral triangle; granulated space between mouth-papillæ and mouth-shield well-marked.

Lower arm-plates at first wider than long; further out they become unequally hexagonal, owing to the encroachment of the side-plates on the adoral edge; the upper arm-plates, near the edge of the disk, are quite three times as wide as they are long; further out their adoral edge becomes encroached on by the side-plates; the carination is best marked on the proximal half of the arm; while there are eight arm-spines near the base, there are only six some way out; the spines are always delicate and short; the two lowest are a little longer than the rest, but they are never so long as the side arm-plate. Two tentacle-scales.

The disk is, above, of a brownish hue, with yellowish patches and black dots; the radial shields are lighter, as is also the oral surface. The arms are banded lighter and darker, in sets of four or five; in the case of the darker bands the most proximal and the most distal plates are a good deal darker than the intermediate three.

Diameter of disc 18, 16 millim.; length of arm about 75 from the edge of the disk; width of arm at disk 4, 3·5; height of same 3·5, 3·5.

RHINOBRISSUS PYRAMIDALIS.

I should have less diffidence in assigning two specimens to this species had I been fortunate enough to have been enabled to compare with them the examples in the Liverpool Museum, on which

[1] This is the *Ophiopinax stellatus* of the 'Alert' Report (p. 136).

Prof. Alex. Agassiz based his description. I give the more important measurements of the larger of the two specimens, from which it will be seen that the proportions are very similar to those of the type:—

	millim.
Longest diameter	38·5
Greatest breadth	33
Height	21
Distance of apical system from anterior edge	21
Length of anterior petals	15
Length of posterior petals	16
Width of interporiferous space	4
Width of actinostome	9·5

HAPLODACTYLA AUSTRALIS.

I think that Prof. Ludwig (SB. Ak. Berl. 1887, p. 1218) is right in regarding *H. andamanensis*, Bell, as a synonym of Semper's species; but I may point out that the figure of the spicules given by Selenka differs somewhat from the representation drawn by Prof. Ludwig; the resemblance between the latter and my figures of the spicules of *H. andamanensis* is very close.

HOLOTHURIA VAGABUNDA.

With regard to this species I have to observe that, noting in one the great muscularity of the walls of the cloaca, I concluded it must have extensible Cuvierian organs; I therefore opened another specimen, and found the cavity of the cloaca occupied by a mass of tubes, just as I figured it in the case of *H. nigra* (P. Z. S. 1884, p. 374); the third specimen had the tubes projecting from the vent, but still in organic connexion with the mass inside.

In concluding this paper it may be convenient to give, in a summary form, an account of the present state of our knowledge of the Echinoderm-fauna of the Sea of Bengal, taking as southern boundaries Ceylon on the west, and the Nicobars on the east[1]. This is a region which has not been touched by any recent explorations, such as the 'Challenger,' 'Alert,' or 'Gazelle.'

I. CRINOIDEA.

1. Antedon carinata, *Leach.*
2. —— adeonæ, *Lamk.*
3. —— reynaudi, *Müll.*
4. —— palmata, *Müll.*
5. Actinometra cumingii, *Müll.*
6. —— fimbriata, *Müll.*
7. —— parvicirra, *Müll.*

[1] In addition to the papers already cited, the list given by Dr. Lütken (Vid. Med. 1871, p. 272) has been used in the preparation of this summary. Information as to the Ophiurids collected by the 'Novara' at the Nicobars is to be found in Herr Marktanner-Turneretscher's paper in the 'Annalen des k. k. Naturh. Mus.' ii. p. 291 *et seq.*

II. Asteroidea.

8. Acanthaster echinites, *E. & S.*
9. Echinaster purpureus, *Gray.*
10. Fromia indica, *Perrier.*
11. —— milleporella, *Lamk.*
12. —— tumida, *Bell.*
13. Linckia lævigata, *Gm.*
14. —— pacifica, *Gray.*
15. Scytaster ægyptiacus, *Gray.*
16. —— galatheæ, *Ltk.*
17. —— variolatus, *Retz.*
18. Oreaster lincki, *de Bl.*
19. —— superbus, *Möbius.*
20. —— reinhardti, *Ltk.*
21. Oreaster thurstoni, *Bell.*
22. —— westermanni, *Ltk.*
23. Culcita grex, *M. Tr.*
24. —— novæ-guineæ, *M. Tr.*
25. —— schmideliana, *Retz.*[1]
26. Asterina burtoni, *Gray.*
27. —— cepheus, *Val.*
28. Luidia hardwickii, *Gray.*
29. —— maculata, *M. Tr.*
30. Astropecten hemprichii, *M. Tr.*
31. —— polyacanthus, *M. Tr.*
32. —— euryacanthus, *Ltk.*
33. Archaster typicus.

III. Ophiuroidea.

34. Pectinura gorgonia, *M. Tr.*
35. —— intermedia, *Bell.*
36. Ophiolepis annulosa, *M. Tr.*
37. —— cincta, *M. Tr.*
38. —— nodosa, *Dunc.*
39. Ophioplocus imbricatus, *M. Tr.*
40. Ophiactis savignii, *Audouin.*
41. Ophiophragmus affinis, *Dunc.*
42. —— difficilis, *Dunc.*
43. Ophiocnida sexradia, *Dunc.*
44. Ophiocoma scolopendrina, *Lamk.*
45. —— æthiops, *Lamk.*
46. —— brevipes, *Lamk.*
47. Ophiomastix annulosa, *M. Tr.*
48. Ophiarachna incrassata, *M. Tr.*
49. Ophiothrix longipeda, *Lamk.*
50. —— nereidina, *Lamk.*
51. Ophiothrix martensi, *Lyman.*
52. —— punctolimbata, *Martens.*
52*a*. —— galateæ, *Ltk.*
52*b*. —— hirsuta, *M. Tr.*
52*c*. —— comata, *M. Tr.*
53. —— andersoni *Dunc.*
54. —— mergueiensis, *Dunc.*
55. —— variegata, *Dunc.*
56. —— variabilis, *Dunc.*
57. Ophiocampsis pellicula, *Dunc.*
58. Ophiocnemis marmorata, *Lamk.*
59. Ophiomaza cacaotica, *Lym.*
60. Ophiothela holdsworthi, *Smith.*
60*a*. Ophiolophus novaræ, *Markt.*
61. Hemieuryalid.
61*a*. Trichaster elegans, *Ludw.*
62. Astrophyton clavatum, *Lym.*

IV. Echinoidea.

63. Phyllacanthus annulifera, *Lamk.*
64. —— imperialis, *Lamk.*
65. —— verticillata, *Lamk.*
66. Diadema setosum, *Gray.*
67. Echinothrix calamaria, *Pall.*
68. Astropyga radiata, *Leske.*
69. —— freudenbergi, *Sarasin.*
70. Asthenosoma urens, *Sarasin.*
71. Echinus angulosus, *Leske.*
72. Toxopneustes pileolus, *Lamk.*
73. Tripneustes gratilla, *L.*[2]
74. Temnopleurus toreumaticus, *Leske.*
75. —— reynaudi, *Ag.*
76. Temnopleurid.
77. Salmacis bicolor, *Ag.*
78. —— dussumieri, *Ag.*
79. —— rarispina, *Ag.*
80. Salmacis sulcata, *Ag.*
81. Stomopneustes variolaris, *Lamk.*
82. Echinometra lucunter, *Leske.*
83. —— oblonga, *de Bl.*
84. Colobocentrotus atratus, *L.*
85. Clypeaster humilis, *Leske.*
86. Laganum decagonale, *Less.*
87. —— depressum, *Ag.*
88. Arachnoides placenta, *L.*
89. Echinodiscus biforis, *Gm.*
90. Echinoneus cyclostomus, *Leske.*
91. Echinolampas oviformis, *Gm.*
92. Lovenia elongata, *Aud.*
93. Maretia alta, *A. Ag.*
94. Rhinobrissus pyramidalis, *A. Ag.*
95. Brissus unicolor, *Leske.*
96. Metalia sternalis, *Lamk.*
97. Moira stygia, *A. Ag.*

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[1] "*Randasia granulata*" may be the young of one of these species of *Culcita* or of an unknown species; it has been taken at the Andamans.

[2] See Prof. Lovén's valuable memoir, just published, on the Linnean species of *Echinus* (Bih. Svensk. Vet.-Akad. Handl. Bd. 13. Afd. iv. no. 5, p. 77).

V. Holothurioidea[1].

98. Synapta beselii, *Jäger.*
99. —— grisea, *Semp.*
100. —— recta, *Semp.*
101. Chirodota rufescens, *Brdt.*
102. Haplodactyla australis, *Semp.*
103. Cucumaria assimilis, *Bell.*
104. —— forbesi, *Bell.*
105. Colochirus armatus, *Marenz.*
106. Ocnus javanicus, *Sluiter.*
107. —— typicus, *Théel.*
108. Thyone sacellus, *Sel.*
109. Pseudocucumis acicula, *Semp.*
110. Actinopyga echinites, *Jäger.*
111. —— lecanora, *Jäger.*
112. —— mauritiana, *Q. & G.*
113. —— miliaria, *Q. & G.*
114. Holothuria albida, *Bell*[2].
115. Holothuria argus, *Jäger.*
116. —— atra, *Jäger.*
117. —— cadelli, *Bell*[3].
118. —— cæsarea, *Ludwig.*
119. —— fusco-cinerea, *Jäger.*
120. —— imitans, *Ludwig.*
121. —— impatiens, *Forsk.*
122. —— maculata, *Brdt.*
123. —— marmorata, *Jäger.*
124. —— monacaria, *Less.*
125. —— ondaatjei, *Bell.*
126. —— papillata, *Bell.*
127. —— pardalis, *Sel.*[4]
128. —— spinifera, *Théel.*
129. —— vagabunda, *Sel.*
130. Stichopus chloronotus, *Brdt.*
131. —— variegatus, *Semper.*

If we bear in mind that our knowledge of the Echinodermata of the Indian Ocean is still in a comparatively unsatisfactory condition, or, in other words, remember that some of the species, such as *Fromia tumida, Pectinura intermedia, Holothuria ondaatjei,* which are as yet known only from the Bengal Sea, may be found elsewhere when a search is made for them, we can at present only conclude that we have here to do with representatives of the intertropical fauna which extends across the Indo-Pacific area, and whose limits appear to be marked by thermal lines[5].

[1] Prof. Ludwig has lately published a list of the species of Holothurians collected at Ceylon by Dr. P. and Dr. F. Sarasin (SB. Akad. Berlin, 1887, pp. 1217–29).

[2] Prof. Ludwig considers this to be a synonym of *H. edulis,* Lesson.

[3] = *H. scabra,* Jäger, *teste* Ludwig.

[4] = *H. insignis,* Ludw., *H. lineata,* Ludw., *H. peregrina,* Ludw., *teste* Ludwig (*l. c.*).

[5] See 'Alert Report,' p. 174.

Since this paper was read Dr. Herbert Carpenter and Mr. Sladen have read to the Linnean Society an account of the Crinoids, Asterids, and Echinoids collected at Mergui by Dr. Anderson.

Dr. Carpenter informs me that the Crinoids were:—

Antedon elegans, andersoni (sp. n.), *milberti, conjungens* ('Challenger'), *spicata.*
Actinometra notata (sp. n.).

Mr. Sladen tells me that the Asterids were:—

Archaster typicus.
Astropecten andersoni (sp. n.), *hemprichii, notograptus,* sp. n.
Luidia forficifer (Sladen, 'Challenger'), *maculata.*
Goniodiscus articulatus.
Nepanthia suffarcinata, sp. n.
Asterina cepheus.

And the Echinoids:—

Temnopleurus toreumaticus.
Salmacis sulcata, dussumieri, bicolor.
Laganum depressum.
Arachnoides placenta.

I am greatly indebted to my friends for these lists, which bring up the total of Echinoderms now known from the Sea of Bengal to 147 species.

5. Descriptions of new Genera and Species of Lepidoptera Heterocera, collected by Rev. J. H. Hocking, chiefly in the Kangra District, N.W. Himalaya. By F. Moore, F.Z.S.

[Received June 12, 1888.]

Fam. Sphingidæ.

Polyptychus trilineatus, n. sp.

Allied to *P. dentatus* and *P. timesius*. Upperside of a paler brownish-ochreous colour than *P. dentatus*; fore wing crossed by a slightly waved oblique antemedial brown line, a less distinct medial inwardly-oblique line which touches the end of the cell in crossing, and a waved postmedial line; the medial and apical area clouded with darker brown: hind wing with an indistinct greyish transverse discal narrow fascia.

Expanse 3⅞ inches.

Hab. Dharmsala. In coll. British Museum.

Ambulyx placida, n. sp.

Upperside—fore wing pale purplish lilacine greyish-brown; crossed by an indistinct single antemedial zigzag slender brown line, an oblique outwardly-curved postmedial line followed by three less distinct wavy discal lines, and a prominent outer marginal inwardly-curved olivaceous-bordered line, the latter also bent inward below the apex and then curving upward to the costa; the area between the postmedial line and outer margin being darker than the basal area; a small blackish-brown pale-bordered round spot at basal end of the cell; a large spot below the submedian near the base, and a less perfectly formed rounded spot on the costal edge above the latter, a less distinct smaller spot also at the lower end of the disco-cellular veinlet: hind wing dull yellowish-ochreous, with an oblique transverse medial and a marginal lilacine-blackish band with two interdiscal oblique series of similar coloured spots. Body pale purplish lilacine greyish-brown; a broad blackish-brown frontal band, and a similar broad hindwardly-confluent band down each side of the thorax; abdomen with pale ochreous segmental bands and anal tuft.

Expanse 4¼ inches.

Hab. N.W. Himalaya. In coll. British Museum.

Nearest allied to *A. sericeipennis*, Butler, P. Z. S. 1875, p. 251. A male specimen collected at Solun, N. Punjab, by Capt. R. B. Reed, is also in Mr. Moore's collection.

Dahira, n. g.

Fore wing elongated, narrow; costa arched towards the end, apex produced; exterior margin very oblique, slightly concave below the apex, even; first subcostal branch emitted at one fourth, second at

two thirds between the base of second and end of the cell, third at a short distance beyond the cell, fourth and fifth at one third beyond the cell; discocellulars inwardly-oblique, slightly concave, upper longest, radial from near the lower end; middle median at one-sixth and lower at one half before end of the cell; submedian much recurved from the base. Hind wing short; cell extending to less than half length of the wing; two subcostals from end of the cell, the upper curving slightly upward from the end; discocellulars outwardly-oblique, recurved, radial from the middle; the middle median vein at one eighth and lower at one third before end of the cell; submedian and internal slightly recurved. Body long.

Allied to *Pergesa*.

DAHIRA RUBIGINOSA, n. sp.

Male. Fore wing dark reddish olivaceous-brown; crossed by three indistinct outwardly-oblique darker waved lines, three or four discal inwardly-oblique lines, and a curved line from the apex, the latter white-speckled; a blackish discocellular spot; cilia black, minutely spotted with white: hind wing red, the abdominal area and extreme outer margin brownish; cilia white. Body dark reddish-brown above, yellow beneath, with dull greyish-white dorsal segmental bands. Wings beneath dull paler red; both wings crossed by indistinct discal darker waved lines; legs greyish-white above.

Expanse 2⅞ inches.

Hab. Mundi, N.W. Himalaya. In coll. British Museum.

"Taken at Mundi (a native state), in March; at sugar." (*Hocking*).

AMPELOPHAGA FASCIOSA, n. sp.

Male and Female. Fore wing pinkish olivaceous-brown; crossed by two outwardly-curved oblique indistinctly darker brown narrow subbasal fasciæ, a broader medial fascia, and two slender discal lunular fasciæ, beyond which a streak ascends to the apex, the outer border of the wing being much paler; an indistinct spot at end of the cell: hind wing dusky purplish ochreous-brown, with an indistinctly paler pinkish discal fascia, and cilia. Body darker ochreous olive-brown, pinkish beneath, with an ochraceous-white dorsal line, and a lateral line on thorax.

Expanse 3¼ inches.

Hab. Dharmsala. In coll. British Museum.

Taken at sugar only, by Mr. Hocking. Specimens taken at Umballa by Capt. R. B. Reed are also in Mr. Moore's collection.

HEMARIS SIMILLIMA, n. sp.

Nearest allied to *H. fuciformis*. Fore wing with a vinous-black costal, outer, and posterior marginal band, the outer band somewhat narrower than in *H. fuciformis*, the posterior band sparsely covered with olive-green scales: hind wing with cupreous-red marginal band, the abdominal border prominently white-speckled. Head, thorax, and base of abdomen pale dull ochraceous olive-brown, the two red

bands of a dull chestnut tint, basal segments yellowish-ochreous, anal lateral tuft black.

Expanse $1\frac{7}{10}$ inch.

Hab. Kangra Valley. In coll. British Museum.

Fam. ÆGERIIDÆ.

MELITTIA KULLUANA, n. sp.

Nearest *M. nepcha* (Moore, Lep. Coll. Atkinson, p. 10). Wings comparatively shorter; apical area of fore wing traversed by four veins; a short black vein projecting within the cell from middle of the discocellular streak. Thorax, head, palpi, pectus, and femora beneath olivaceous-yellow; abdomen above purple-black, with narrow pale bluish segmental bands; abdomen beneath bluish-white; palpi slightly black-fringed; mid legs black, fringed with golden-yellow hairs; hind legs densely clothed with long black hairs, hind femora and tibiæ above with interspersed dull chestnut-red and yellow hairs.

Expanse $1\frac{1}{10}$ inch.

Hab. Kullu. In coll. British Museum.

From *M. indica*, Butler, this may be distinguished by its much broader transparent apical area.

Fam. CALLIDULIDÆ.

PTERODECTA ANCHORA, n. sp.

Upperside olive-brown. Fore wing with a large orange-red anchor-shaped transverse discal mark. Underside brownish-ochreous: fore wing with the orange-yellow band black-bordered; a white spot at end of the cell and two smaller spots in the middle; hind wing tessellated more or less with yellow and black strigæ, which form transverse fasciæ; a yellow spot at end of the cell.

Expanse $1\frac{1}{4}$ inch.

Hab. Dharmsala.

Fam. LITHOSIIDÆ.

SETINA CALAMARIA, n. sp.

Fore wing ochreous-yellow, with a prominent black triangular discocellular spot, a smaller spot at base of the cell, and another spot on base of the costal margin: hind wing paler yellow, a black spot on each tegula, and two on the middle of thorax; tip of fore tibia, and of all tarsi fuliginous-black.

Expanse $1\frac{1}{8}$ inch.

Hab. Palampore. In coll. British Museum.

ÆMENE SAGITTIFERA, n. sp.

Male and Female. Creamy-white: fore wing with five large spots on the costal border, a sagittate spot within the cell near base, a triangular spot at end of the cell, two smaller linear spots on the subcostal vein, two on each of its branches, two on the median, and four on the submedian, these spots forming four transverse series; the fifth costal spot having a few blackish speckles only below it; on the costal margin is also a row of regularly-disposed small black

spots: hind wing cinereous-white. Thorax black-spotted; palpi brown; legs with blackish bands.

Expanse, ♂ $\frac{8}{12}$, ♀ $\frac{9}{12}$ inch.

Hab. Dharmsala (*Hocking*); N.W. India (*Leitner*). In coll. British Museum and F. Moore.

Taken at sugar.

ÆMENE INCONSTANS, n. sp.

Male. Fore wing very pale brownish-ochreous, crossed by an antemedial and a postmedial very indistinct dusky sinuous line, both lines with two medially-disposed black spots, the upper spot at end of the cell on the latter being the largest; on the costal margin are three or four indistinct spots, and on the outer margin is a row of regularly-disposed small linear spots; a dusky zigzag fascia crosses the disk: hind wing ochreous-white. Thorax pale brownish-ochreous; palpi and abdomen pale ochreous; legs brownish-ochreous.

Expanse $\frac{9}{12}$ inch.

Hab. Dharmsala. In coll. British Museum.

RŒSELIA SCRIPTA, n. sp.

Male. Allied to *R. confusalis*: fore wing pinkish-grey, basal area slightly brown-speckled; crossed by two contiguous inwardly-oblique antemedial black lines, and two recurved postmedial lines, followed by a submarginal series of black spots, of which the upper and lower spot is large, the others small and dentate; the area between the medial lines traversed by a zigzag black line: hind wing and abdomen pale pinkish-cinereous. Thorax, palpi, and legs above, and antennæ greyish-brown.

Expanse, ♂ $\frac{7}{10}$ inch.

Hab. Dharmsala. In coll. British Museum.

RŒSELIA FRATERNA, n. sp.

Female. Near to *R. cuculatella*: fore wing comparatively narrower; the antemedial blackish-speckled transverse line more angular and broader at the costal end, the postmedial line also more irregularly sinuous: hind wing cinereous-white, underside much paler. Thorax grey; palpi and legs brownish above; tarsi with pale bands.

Expanse $\frac{8}{12}$ inch.

Hab. Kullu. In coll. British Museum.

RŒSELIA ANGULATA, n. sp.

Near *R. cristulalis*: fore wing greyish-white, sparsely brown-speckled; crossed by a prominent blackish antemedial curved outwardly-angulated band, a postmedial pale-bordered sinuous line, and a similar submarginal line, the postmedial line preceded by a broad costal patch: hind wing and abdomen cinereous-grey. Thorax white, crossed by a blackish band; palpi and legs brownish; tarsi with pale bands.

Expanse, ♂ $\frac{7}{12}$, ♀ $\frac{9}{12}$ inch.

Hab. Dharmsala (*Hocking*); N.W. India (*Leitner*). In coll. British Museum and F. Moore.

Fam. Arctiidæ.

Spilarctia dalbergiæ, n. sp.

Allied to *S. stigmata* (Moore, P. Z. S. 1865, p. 809). Fore wing of a pale ochreous creamy tint; with a very obliquely-disposed discal series of small slender black spots, a spot towards base of submedian, and a submarginal medial series of smaller spots; a small dentate spot more or less distinct at the upper end of cell hind wing paler; with a large black spot at upper end of the cell; two duplex subanal spots, one also between the radial and subcostal vein, and in the female another before the apex. Thorax with a black streak down the middle; abdomen orange-yellow, with a dorsal and lateral row of black spots.

Expanse, ♂ $1\frac{5}{8}$, ♀ 2 inches.

Hab. Dharmsala. In coll. British Museum.

Larva pale purple-brown, mottled and minutely spotted with yellow. Second, third, and fourth segments with a small yellow lateral spot; other segments with an oblique yellow lateral streak; each segment with tufts of long purple-brown radiating hairs; head black, shining; legs black.

"Feeds on Sissoo (*Dalbergia sissoo*). May, 4000 feet." (*Hocking.*)

Spilarctia sagittifera, n. sp.

Male and Female. Paler and of a uniformly yellower tint than *S. casignata*. Fore wing with similar markings, the transverse discal series of spots more oblique, touching the lower angle of the cell and terminating in larger spots on middle of posterior margin; one or two spots also within the cell near the base; hind wing paler yellow throughout, spots larger than in *S. casignata*. Abdomen crimson, with more or less prominent black dorsal and lateral spots; a small black sagittate streak on middle of thorax. Underside paler, not washed with crimson, markings more distinct.

Expanse, ♂ $1\frac{6}{8}$, ♀ $2\frac{4}{8}$ inches.

Hab. Dharmsala. In coll. British Museum.

Icambosida dorsalis, n. sp.

White; fore wing with an indistinct blackish-grey discal oblique transverse narrow macular band, which in the male stops below the radial vein, and in the female extends to the apex by a series of short linear streaks, the female also having some less distinct submarginal streaks situated between the radial and middle median veins; a similar coloured spot at upper end of the cell, and a less defined spot sometimes on middle of subcostal: hind wing with an indistinct spot at upper end of the cell, and a less distinct subanal spot situated between the lower median and submedian, the female sometimes showing a spot also below the apex and another above it on the costa. Sides of thorax in front and pectus crimson; palpi black above, crimson beneath; legs white; fore femur crimson above; femora tipt with black; fore and middle tibiæ and tarsi and hind tarsi black above; abdomen in male crimson above, with black

lateral spots, and in female with dorsal spots; anal segments in female white.

Expanse, ♂ $1\frac{3}{10}$, ♀ $1\frac{7}{10}$ to $1\frac{9}{10}$ inch.

Hab. Dharmsala. In coll. British Museum.

This has much the appearance of *Spilosoma rubidorsa* (Moore, P. Z. S. 1865, p. 808), but differs in the narrower and more elongated form of fore wing.

Larva pale yellowish cream-colour, with a broad dorsal purple-brown band; each segment laterally with finely-speckled purple-brown oblique streaks, the segments also with sparse dorsal tufts of fine brown and grey hairs and lateral tufts of grey hairs, the dorsal tufts springing from glossy purple-black tubercles; dorsal band with a central row of linear yellowish spots and slender transverse segmental streaks; head red; legs yellow.

"Feeds on cherry; July 14; gregarious whilst young; many hundreds together in a web; afterwards spreading over the tree and devouring all before them. Pupa, July 28; imago, August 16."

CHALLA QUADRIMACULATA, n. sp.

Allied to *C. bimaculata*. Ochreous-yellow; fore wing comparatively broader and more regularly triangular in form; with a prominent black spot at upper end of the cell, and a less distinct similarly disposed spot on the hind wing. Palpi black-tipped; legs blackish above.

Expanse $1\frac{1}{4}$ inch.

Hab. Palampore. In coll. British Museum.

Fam. PSYCHIDÆ.

AKESINA, n. g.

Wings somewhat elongated, oval; semitransparent; sparsely clothed with very short slender hairy scales. Fore wing very convex at the apex; costal vein extending to near the apex; cell long, extending beyond two thirds the wing; first subcostal emitted at one eighth before end of the cell, bent upward and anastomosing with the costal for a short distance and terminating before the apex; second and third branches on a footstalk beyond end of the cell; discocellular twice-angled, the angles at equal distances, upper angle directed slightly outward, lower angle directed very obliquely inward, radial from upper angle; a discoidal veinlet emitted within the cell from lower angle and extending to base of cell; two upper median veins from angles at end of the cell, middle median from one third and lower median from one half before end of the cell; submedian nearly straight and apparently looped at the base. Hind wing very convex externally; subcostal vein running very close along the margin, arched at the base and thence straight to apex, the branch emitted closely before end of the cell; discocellular, radial, and discoidal veinlet as in fore wing; two upper median veins at wider angles from end of the cell, middle median at one third and lower at one half before end of the cell; submedian and internal vein

slightly recurved. Body short, slightly pilose; legs almost naked; antennæ short, broadly bipectinated, the pectinations plumose; palpi very minute.

AKESINA BASALIS, n. sp.

Wings semitransparent, pale fuliginous; the lower basal area of fore wing and entire basal area of hind wing pale ferruginous-red: body and legs ferruginous-red; antennæ brown.

Expanse $1\frac{1}{10}$ inch.

Hab. Dharmsala. In coll. British Museum.

BARANDRA, n. g.

Wings short, broad, nearly naked. Fore wing somewhat obovate; costa slightly arched near the end, apex very convex; exterior margin oblique and slightly rounded, posterior angle convex; costal vein nearly straight; subcostal angled close to end of the cell, four-branched, first branch arising at half length and second at angle before end of the cell, third bifid at one third beyond the cell; cell very broad; discocellulars angled inward, upper bent slightly outward, the radial branch starting from its angle; a single discoidal veinlet emitted within the cell from middle of discocellulars; median vein four-branched, curved hindward to lower branch and angled at each branch, the branches short, wide apart, and nearly equidistant; submedian slightly angled near its end, emitting a short lower spur from the angle. Hind wing oval; exterior margin very convex; costal vein extending to apex; subcostal vein extending from base to below the apex, and joined to the costal by a short cross branch about one third from its base; cell broad; discocellulars outwardly oblique and slightly angled at the middle, the discoidal veinlet being emitted within the cell from the angle; radial vein four-branched, angled at the branches; a submedian vein. Body small, slender; abdomen not extending beyond anal angle of hind wing, slightly and finely pilose; head nearly naked; legs long, very slender, naked; palpi minute, pilose; antennæ bipectinate, the pectinations wide and delicately plumose.

BARANDRA FUMATA, n. sp.

Wings nearly naked, pale fuliginous-grey; body yellowish, sparsely pilose, hairs grey; thorax above in front and behind black; antennæ pale brown, shaft yellow; legs yellow.

Expanse $\frac{9}{10}$ inch.

Hab. Dharmsala. In coll. British Museum.

"A case-bearing larva; on rocks, June 7, 8000 feet. Moth emerged July 11." (*Hocking.*)

DASARATHA, n. g.

Wings broad, short, sparsely clothed with short fine hairy scales. Fore wing trigonal; costa slightly arched near the end, apex convex; exterior margin very oblique, slightly concave in middle; posterior margin slightly convex at the base; costal vein extending to two

thirds the margin; subcostal five-branched, first and second branches arising before end of the cell, third trifurcate beyond the cell; discocellulars inwardly-oblique; cell shortest hindward; radial starting from middle of discocellulars; two discoidal veinlets emitted from lower discocellular, coalescing in the middle and extending to base of the cell; median vein four-branched, the two upper branches on a footstalk beyond end of the cell, lower branches wide apart; submedian vein with an inner branch to the base, from below which starts a short, outwardly-oblique spur. Hind wing bluntly ovate; exterior margin slightly convex; subcostal vein two-branched, first branch before end of the cell; cell short and broad; discocellulars angled in the middle; radial from their angle; two discoidal veinlets within the cell, as in fore wing; median vein four-branched, the two upper branches from end of the cell; a submedian and two internal veins. Body small; abdomen short, slender; antennæ bipectinate, finely plumose; legs nearly naked, fore tibiæ with a long parallel spur.

DASARATHA HIMALAYANA, n. sp.

Wings sparsely clothed with short fuliginous-brown delicate hairy scales: body fuliginous-brown; thorax blackish above; antennæ brown; legs yellow.

Expanse $\frac{9}{12}$ inch.

Hab. Dharmsala. In coll. British Museum.

"A case-bearing larva; on oak (*Q. alba*), May, 6200 feet. Moth emerged June 16." (*Hocking.*)

MAHASENA HOCKINGII, n. sp.

Male. Wings dark fuliginous-brown; hind wing blackish posteriorly; thorax fuliginous-black in front, the lower part slightly ochreous-brown; abdomen and anal tuft clothed with longish laterally-divergent black hairs. Fore wing beneath ochreous-grey broadly along posterior border. Antennæ fuliginous-brown, shaft ochreous; femora and tibiæ clothed with brown hairs.

Expanse $1\frac{2}{12}$ inch.

Hab. Dharmsala. In coll. British Museum.

"July, 4000 feet. On Toon tree (*Credela toona*). When the larva changed, the pupa had the power of moving up and down the silky passage in which it had lived. When the moth was coming out, it projected the tail-end of the pupa and let itself down by a silken thread, *in the chrysalis*, from which it then emerged and to which it clung with two pairs of legs until the wings expanded and dried, whilst the first pair of legs held on to the silken thread by which it hung from the leafy case." (*Hocking.*)

Fam. LIPARIDÆ.

LACHANA, n. g.

Male. Fore wing elongate, narrow; costal vein extending two thirds the margin; first subcostal emitted at one half and second at one fifth before end of the cell, second trifurcate; third starting at a

short distance from above its base and terminating at the apex, fourth at two thirds from base of the third; fifth from end of the cell, curving upward and touching third near its base; cell broad, extending nearly two thirds the wing; discocellular concave; radial and upper median from lower end of the cell, middle median from angle close to end of the cell, lower median at one third before the end; submedian at a wide distance from the median. Hind wing short, triangularly-ovate; apex and exterior margin convex; abdominal margin short; costal vein looped to subcostal near its base; subcostal bent upward to costal at one third from its base, two subcostal branches on a footstalk one third beyond end of the cell; discocellular oblique, radial from slight angle near its lower end; cell broad; two upper medians from immediately beyond end of the cell; lower median at one fourth before the end; submedian and internal vein straight. Body short, densely pilose; antennæ bipectinated; palpi laxly pilose; legs thick, slightly pilose.

LACHANA LADAKENSIS, n. sp.

Male. Brownish-ochreous; fore wing numerously covered with dark sepia-brown scales, which are most thickly disposed on the basal and external area, across which extends a darker subbasal and a discal zigzag fascia; a distinct dark-brown lunular spot at end of the cell: hind wing sepia-brown, darkest externally and indistinctly forming a darker marginal band; cilia brownish-ochreous. Body umber-brown, hairs brownish-grey; frontal tuft and palpi grey; antennæ reddish-brown, shaft greyish; fore and middle tibiæ and tarsi reddish-brown.

Expanse 1 inch.

Hab. Ladak. In coll. British Museum.

PROCODECA UMBRINA, n. sp.

Male. Fore wing reddish umber-brown, with a curved discal series of six small black spots: hind wing and abdomen dull sepia-brown; thorax reddish umber-brown; palpi, fore legs above, and tarsi brownish-ochreous. Underside dull umber-brown.

Expanse $1\frac{3}{10}$ inch.

Hab. Kullu. In coll. British Museum.

Larva violet-grey, each segment tufted with similar coloured hair, except the dorsal tufts on fourth to eighth segments, on which the hairs are blackish at the base and pale ferruginous at the tip; head shining black.

"Found under stones, March." (*Hocking.*)

EUPROCTIS ABDOMINALIS, n. sp.

Male and Female. Cream-white; abdomen blackish; anal tuft ochreous; legs white.

Expanse, ♂ $1\frac{1}{10}$, ♀ $1\frac{3}{10}$ inch.

Hab. Dharmsala. In coll. British Museum.

Allied to *E. postica*. Wings comparatively longer and narrower.

ARTAXA SULPHURESCENS, n. sp.

Allied to *A. trifasciata* (Moore, Desc. Lep. Coll. Atkinson, p. 51): fore wing comparatively longer and narrower. Wings dull sulphurescent-yellow; hind wings palest, and in female almost white; fore wing with a few brownish scales above middle of the posterior margin. Anal segments and tuft ochreous-yellow; anal segments beneath black; second joint of palpi blackish at the side.

Expanse, ♂ $1\frac{5}{12}$, ♀ $1\frac{11}{12}$ inch.

Hab. Dharmsala. In coll. British Museum and F. Moore.

DASYCHIRA DALBERGIÆ, n. sp.

Allied to *D. inclusa*. *Male* differs in having the fore wing longer and narrower, of a darker tint and greyer-speckled, transverse markings similar, excepting that the discal sinuous line is more oblique in position: hind wing pale cinereous brown. *Female* also differs in the shape of the fore wing, which is also darker and greyer-speckled; the hind wing also being paler.

Expanse, ♂ $1\frac{5}{8}$, ♀ $2\frac{3}{8}$ inches.

Hab. Dharmsala (*Hocking*), Masuri (*Lang*). In coll. British Museum and F. Moore.

Larva mottled with pale and dark brown; two white oblique dorsal streaks on hind part of fourth segment, and a small white dorsal spot on tenth and eleventh segments; each segment thickly tufted with brown radiating hairs, those on the second segment longest and projected over the head; on the fifth to eighth segments the dorsal tuft is ferruginous and more dense. Cocoon brown.

"Feeds on the Sissoo (*Dalbergia sissoo*); May 5 to June 7, 3000 feet." (*Hocking.*)

LYMANTRIA CARNECOLOR, n. sp.

Allied to *L. concolor*. *Male and female* of a vinaceous-white tint: fore wing with similarly disposed but more slender and less distinct markings: hind wing whitish, with a very slight pale dusky interrupted sinuous submarginal fascia, and marginal and cilial spots. Abdomen yellow above.

Expanse, ♂ 2, ♀ $3\frac{1}{4}$ inches.

Hab. Dharmsala. In coll. British Museum and F. Moore.

LYMANTRIA NIGRA, n. sp.

Allied to *L. marginata* and *L. pusilla*. *Male*: fore wing with deep black transverse sinuous bands and spots, their interspaces dark vinaceous umber-brown: hind wing entirely black. Head and thorax slightly spotted with ochreous; abdomen ochreous, with black dorsal bands, lateral spots, and anal tuft. *Female*: fore wing with broad deep black confluent sinuous bands, their interspaces white: hind wing white, with a broad black marginal band, and a more or less distinct angular discocellular streak; cilia alternated with white. Thorax white above, with black collar and central spots; head white in

front; vertex ochreous; abdomen ochreous, with black dorsal band and lateral spots.

Expanse, ♂ 1 $\frac{8}{10}$, ♀ 2$\frac{1}{2}$ inches.

Hab. Kangra Valley. In coll. British Museum.

"Taken *in copulâ*, on the bark of a mango-tree." (*Hocking.*)

Fam. Notodontidæ.

Heterocampa basistriga, n. sp.

Male and Female. Fore wing ochreous-grey, black-speckled; crossed by a subbasal zigzag grey-speckled duplex black line, from which an oblique black streak extends below the cell to base of wing; an oblique discal zigzag grey-speckled black fascia, a submarginal row of similar dentate spots, and a marginal row of larger quadrate spots; a lunule also at end of the cell: hind wing cinereous-white in male, darker in female, costal border brownish. Thorax, head, palpi, and legs hoary; abdomen cinereous-brown; tarsi with pale bands.

Expanse, ♂ 1$\frac{7}{8}$, ♀ 2$\frac{1}{8}$ inches.

Hab. Dharmsala. In coll. British Museum. Taken at sugar. Rare.

Stauropus berberisæ, n. sp.

Dark grey: fore wing with a subbasal-outwardly oblique zigzag duplex black line traversed by pale grey; a pale grey-speckled black discocellular lunule, a small spot within the cell, and a spot below it, a submarginal zigzag series of black dentate spots, and a marginal row of similar spots, both series with inner grey-speckled borders: hind wing pale grey on posterior half, the anterior half dark grey traversed by black sinuous marks; a marginal row of pale-bordered darker lunules. *Female* darker grey; markings as in male. Body dark grey.

Expanse, ♂ 1$\frac{6}{10}$, ♀ 2$\frac{1}{10}$ inches.

Hab. Dharmsala (6200 feet, *Hocking*), Umballa district (*Reed*). In coll. British Museum and F. Moore.

This is a darker insect than *S. alternus*, the markings of which differ in being reddish-brown. It is also distinct from *S. indicus*.

Larva brownish-ochreous, minutely spotted with dark brown, forming a darker band along the back, which is traversed by a central pale yellow slender line, and bordered by a lateral line; and on the side are two dark bands angulated downwards towards the claspers; sides of head dark brown; penultimate swollen segment edged with black spines; fore legs black banded; some larvæ are entirely dark brown.

"July 16, 6200 feet. Larva on wild barberry, Khaint and Kusmul, the wild pear. Other larvæ on August 3rd. Remained in pupa 18 days." (*Hocking.*)

Cerura himalayana, n. sp.

Allied to *C. vinula*. Differs in being of a slightly darker grey tint: fore wing with the transverse subbasal series of black spots

nearer the base, the antemedial duplex sinuose macular line nearer the middle of the wing, and the discal acutely sinuous marks being composed of a discal line only, whereas in both *C. vinula* and *C. erminea* these marks are composed of three lines; a marginal row of spots on each wing in both sexes. Body darker grey; the black thoracic spots and abdominal bands less prominent.

Expanse, ♂ 2⅜, ♀ 4 inches.

Hab. Dharmsala. In coll. British Museum.

"Larva on willow. Very like that of *Cerura vinula*." (*Hocking.*)

PHEOSA FASCIATA, n. sp.

Pale whitish-ochreous: fore wing with an oblique antemedial and a postmedial suffused greyish-ochreous and chestnut-brown shade, the former traversed by two transverse blackish irregular sinuous lines, and the latter by a curved discal less distinct but acutely sinuous line, the points of which are more prominently seen on the veins; a similar-coloured zigzag basal transverse streak, and an oblique apical costal streak; cilia alternated with ochreous-brown: hind wing paler; the costal and marginal border slightly suffused with ochreous-brown, and a darker patch at anal angle; cilia alternated with brown. Body hoary, thorax fringed with chestnut-brown; tarsi banded with chestnut-brown.

Expanse, ♂ 1½, ♀ 2 inches.

Hab. Dharmsala (6200 feet). In coll. British Museum.

Larva green; an elongated dorsal protuberance on fifth segment; fifth to anal segment with oblique lateral red slender streaks and dots; a dorsal red-streaked band from head to anal segment; head and legs pale red.

"Feeds on cherry, June 20. Imago out July 16." (*Hocking.*)

Fam. DREPANULIDÆ.

DREPANA HYALINA, n. sp.

Male and Female. Creamy-white; semitransparent: fore wing with five more or less indistinct greyish-brown sinuous transverse lines, two of which are subbasal, two discal, and the other submarginal; the three middle lines sometimes slightly suffused inwardly with greyish-brown; a greyish-black spot at lower end of the cell: hind wing with similar but less distinct sinuous lines, which are visible only towards the abdominal margin. Palpi and legs yellowish; pectinations of antennæ brownish.

Expanse 1⅘ to 1⅝ inch.

Hab. Dharmsala. In coll. British Museum.

DREPANA LILACINA, n. sp.

Male and Female. Lilacine-grey: both wings crossed by an antemedial and a postmedial straight, slender, ochreous-brown line; the antemedial line on fore wing slightly dilated at the costal end, beyond which is a small brown costal spot between the two bands; both wings with two or three small indistinct black submarginal spots on middle of the exterior border. Extreme edge of the costa

on fore wing, a slender collar in front of thorax, and palpi, pale ochreous; front of head and legs dusky grey; shaft of antennæ steel-blue.

Expanse, ♂ $1\frac{3}{10}$, ♀ $1\frac{6}{10}$ inch.

Hab. Dharmsala. In coll. British Museum.

"Taken at sugar in September." (*Hocking.*)

DREPANA SIMILLIMA, n. sp.

Closely allied to *D. lilacina*. *Male and female* of same shape: pale brownish-ochreous: both wings crossed by a similar antemedial and a postmedial line, but both these lines are of a paler tint than the ground-colour of the wings, and they are also more irregular; the costal spots are larger, and there is a small spot at lower end of the cell, as well as those on the outer margin of both wings.

Expanse, ♂ $1\frac{4}{10}$, ♀ $1\frac{5}{10}$ inch.

Hab. Dharmsala. In coll. British Museum.

Fam. SATURNIIDÆ.

SATURNIA HOCKINGII, n. sp.

Intermediate between *S. lindia* and *S. grotei*. From *S. lindia* it differs in its much darker greyish-brown colour. On the fore wing the transverse subbasal band is more acutely angulated outward on the median vein, the ocellus is larger and more oval in shape, the transverse zigzag lines are nearer the ocellus, thus giving a broader brown outer border, the submarginal border of which is more waved in the male and straighter in the female. On the hind wing the ocellus is larger and rounder, the transverse discal lines both uniformly waved and nearer the ocellus, the submarginal line being also waved.

From *S. grotei* it is at once distinguished by its difference of colour, *S. grotei* being ochraceous, larger ocelli and more acutely zigzag discal lines.

Expanse, ♂ $3\frac{3}{4}$, ♀ 4 inches.

Hab. Kullu. In coll. British Museum.

"Cocoon under stones. Cocoon pyriform, dark brown, hard, pointed, and lax at upper end."

ANTHERÆA FRATERNA, n. sp.

Male. Dull deep ochreous; yellowish below costal border and on basal areas, and brownish ochreous on discal areas, with darker discal lunular fascia; subbasal bands distinct; submarginal red band broad, prominently white-bordered; ocelli oval, talcose centre small.

Female greyish ochreous, palest on outer borders, slightly yellowish on apical area; discal area dusky; discal lunular fascia brownish ochreous; ocelli larger, oval, subbasal and submarginal bands as in male.

Expanse, ♂ $4\frac{3}{4}$, ♀ $5\frac{1}{2}$ inches.

Hab. N.W. Himalaya (*type*, Kussowlee); Kangra. In coll. F. Moore and British Museum.

A comparatively smaller insect than *A. sivalica*, and distinguish-

able from it by the discal fascia being distinctly lunular and traversing the wings across the inner half of the ocelli; the submarginal transverse red band is much nearer the ocelli on both wings, the interspace being only half the distance of that in *A. sivalica*.

Fam. Limacodidæ.

Miresa suffusa, n. sp.

Male. Very pale brownish-ochreous: fore wing with a transverse submarginal slender brown slightly curved line; the basal area to the line suffused with pale reddish-ochreous. Thorax, head, palpi, and legs above pale reddish-ochreous.

Expanse $\frac{3}{4}$ inch.

Hab. Dharmsala. In coll. British Museum.

Miresa quadrinotata, n. sp.

Pale greyish-ochreous: fore wing sparsely speckled with brown scales; apical area suffused with pale brownish-ochreous; a small black-speckled spot at end of the cell, and another spot within the cell: hind wing and body greyish-ochreous.

Expanse $\frac{3}{4}$ inch.

Hab. Kangra; Kullu. In coll. British Museum.

Parasa hockingii, n. sp.

Wings brown: fore wing with a broad, medial, erect, excurved, transverse, green band. Thorax and front green.

Expanse $1\frac{1}{8}$ inch.

Hab. Kangra Valley (3000 feet). Larva, November, on Toon (*Cedrela toona*).

Larva limaciform, pale green, wrinkled at the sides; above the spiracles two lateral rows of very small tubercular tufts of fine short yellowish hairs, the anterior and posterior tufts being a little larger; four subdorsal anterior and four posterior larger tubercular tufts of rigid black hairs; a dorsal blue-bordered crimson band with black angular lateral marks; a subdorsal and two lateral slender blue lines. Length $\frac{5}{8}$ inch.

Aphendala fasciata, n. sp.

Male. Umber-brown: fore wing very sparsely black speckled; with a transverse subbasal, a medial, and a marginal lilacine-grey silky fascia; a minute black spot at end of the cell. Cilia lilacine-grey.

Expanse $1\frac{2}{16}$ inch.

Hab. Dharmsala. In coll. British Museum.

Fam. Lasiocampidæ.

Bhima, n. g.

Wings semitransparent towards the outer border in male, less so in female; basal area hairy: fore wing narrow, elongated, triangular; costa slightly depressed in the middle, almost pointed at the apex; exterior margin very oblique and slightly convex; posterior

margin short; costal vein extending to two thirds the margin; cell extending to nearly one half the wing; first subcostal emitted at one fourth before end of the cell; second trifid, emitted immediately before the end, third at one half and fourth at one fourth beyond base of the second, the third terminating at the apex; fifth and sixth (or upper radial) on a footstalk beyond end of the cell; discocellular inwardly oblique, lower radial from slight angle above end of the cell; middle median at one third, and lower median at two thirds before end of the cell; submedian slightly depressed in the middle. Hind wing very short obovate; costa lobate at the base; lower end of the cell extending to one half the wing; costal vein deeply recurved, its base very convex, extending to only half the margin, furnished with two short ascending bifid spurs, the first (or precostal vein) starting straight upwards from its base, the second spur ascending obliquely from above middle of the basal arch; first subcostal emitted at one half the upper length of the cell and anastomosing with the concave portion of the costal for a short distance and then proceeding to the apex; discocellular oblique; two upper median veins from end of the cell, middle at one sixth and lower at one third before end of the cell; submedian and internal vein recurved. Body densely clothed with hair, abdomen extending half beyond hind wing in male, anal tuft very dense in female; head small, hairy in front; palpi short, pointed at tip, densely, but compactly clothed; legs densely hairy above; antennæ bipectinated, the pectinations plumose, and longest at the base in male.

Type, *B. undulosa*.

Allied to genus *Taragama* (*Megasoma*, Boisd.).

BHIMA UNDULOSA.

♀. *Pœcilocampa undulosa*, Walker, Catal. Lep. Het. B. M. vi. p. 1477 (1855).

Male. Semitransparent. Wings fuliginous-black externally, fuliginous-bronze basally: fore wing crossed by two contiguous inwardly-oblique waved antemedial, and two lunular discal fuliginous-grey lines, and a submarginal zigzag black-bordered grey fascia; a grey lunule at end of the cell: hind wing with two indistinct grey discal fasciæ. Body fuliginous-brown; front of head ochreous; antennæ and legs black.

Female. Less semitransparent. Wings fuliginous ochreous-brown; the transverse markings ochreous-grey. Body and front of head ochreous-brown; anal tuft ochreous.

Expanse, ♂ $1\frac{1}{8}$, ♀ $3\frac{3}{5}$ inches.

Hab. Darjiling (*Atkinson*), Cherra Pinyi (*Austen*), Dharmsala (*Hocking*).

"Reared from a curious moss-like larva." (*Hocking*.)

Cocoon of pale rusty-brown silk, intermixed with short sharp spiny black hairs.

TARAGAMA CASTANOPTERA, n. sp.

Female. Differs from *T. ganesa* in its larger size. Both wings of

a dark chestnut vinaceous-red, with ochreous-white ciliæ: fore wing with similar, but more prominent ochreous-white transverse bands, the outer band being uniformly undulated, not angulated, and not showing the discal spot seen in *T. ganesa*; exterior border slightly greyish speckled: hind wing with a distinct ochreous-white transverse discal narrow fascia. Head, palpi above, front and top of thorax ochreous-white; tegulæ and abdomen dark chestnut-red, the latter with very slight greyish segmental fringe.

Expanse, ♀ 3½ inches.

Hab. Kangra Valley. In coll. British Museum.

"Reared from pupa, spun in fern." (*Hocking.*)

Varmina, n. g.

Fore wing elongated, triangular; costa almost straight, slightly arched at the end, apex somewhat acute; exterior margin oblique and slightly convex; posterior margin convex towards the base; costal vein straight, extending to two thirds the margin; cell long and broad, extending to two thirds the wing; first subcostal emitted at one half before end of cell; second at one fifth, third thrown off at a little beyond one half from its base and terminating before the apex; fourth from end of the cell, curving upward and anastomosing with third for a short distance and thence recurved upward and terminating before the apex; fifth from below fourth at a little beyond one half between its base and juncture with third; discocellular angled close to each end, concave in the middle, radials from the angles; middle median from angle close to end of the cell, lower median at nearly one third before end of the cell; submedian straight. Hind wing short; costa arched, apex and exterior margin convex: cell broad, extending to two thirds the wing; two subcostals from end of the cell; discocellular concave, radial from below its middle; two upper medians from lower end of the cell; lower median at nearly one third before the end; submedian and internal vein slightly recurved. Body clothed with long, lax, silky hair, anal tuft somewhat long in male, thick in female; thorax stout; antennæ minutely pectinated in male; palpi laxly pilose; femora, tibiæ, and tarsi laxly pilose.

Varmina indica.

Glyphisia indica, Walker, Catal. Lep. Het. B. M. v. p. 1039 (1855).

Male and Female. Fuliginous-grey: fore wing with five transverse oblique zigzag dusky-black fasciæ, the first, third, and fifth most distinct; the interspaces from base of wing to the fifth fascia numerously covered with minute orange-yellow spots, the outer border being bare: a grey-bordered black lunule at end of the cell, a spot in middle of the cell, and a submarginal row of short longitudinal linear grey-bordered black spots: hind wing uniformly fuliginous-grey, with an indistinct black lunule at end of the cell. Thorax greyish-white in male, pure white in female, with two transverse

rows of black spots; abdomen covered with blackish silky hair, anal tuft greyish; head, palpi, and legs covered with silky grey hair.

Expanse, ♂ $1\frac{2}{10}$, ♀ $1\frac{6}{10}$ inch.

Hab. Dharmsala (*Hocking*); Umballa District (*Capt. Reed*). In coll. British Museum and F. Moore.

Larva purple-black, sparsely spotted with minute ferruginous-white dots; a lateral row of more distinct spots, white spiracles, and contiguous ferruginous speckles; the segments sparsely tufted with long hair, the lower and subdorsal rows from sixth to last segment whitish, the others pale ferruginous, each tuft arising from a bright ferruginous turbercle; two black dorsal longer and denser tufts on the fifth and one on the twelfth segment, also a long slender black tuft on each side of second segment projecting in front of the head; head black, face yellow.

"Larva on plum, April; pupa April 28; imago May 14."

EUPTEROTE FRATERNA, n. sp.

Male. Clear reddish-brown; fore wing crossed by a distinct blackish medial sinuous line and three indistinct more slender discal sinuous lines, each line being bent inward at the costal end; these are followed by two parallel outer discal straight but slightly recurved lines, and a submarginal indistinct zigzag line, the latter terminating in two greyish-speckled spots at the apex; between the medial line and base of wing are some scarcely distinguishable sinuous lines: hind wing crossed by three inner discal very indistinct slender sinuous lines, two parallel recurved distinct lines, and a submarginal, less distinct zigzag line. Underside slightly paler, the medial and the two parallel discal lines only being indistinctly visible.

Expanse $3\frac{1}{2}$ inches.

Hab. Dharmsala. In coll. British Museum.

Allied to *E. invalida*, Butler (Types Lep. Het. B. M. v. pl. 96. f. 3). Distinguished from it by all the sinuous lines on fore wing being bent inward towards the costal end.

Fam. CYMATOPHORIDÆ.

THYATIRA COGNATA, n. sp.

Differs from *T. batis* in the fore wing being comparatively narrower and longer, the ground-colour greyish brown, the peach-coloured patches are duller but of a darker tint, and the medial patch on the posterior border is absent, the basal patch is more angular, being almost pointed below the cell, the transverse black sinuous lines between the patches are mostly with greyish-white borders. Hind wing and abdomen also greyer brown.

Expanse $1\frac{5}{10}$ to $1\frac{7}{10}$ inch.

Hab. Kangra. In coll. British Museum.

HABROSYNE FRATERNA, n. sp.

Paler than *H. derasa*. Differs on the fore wing in the outwardly-oblique subbasal white band being more curved towards the base of

the costal margin at its upper end, the white costal area being there also broader, the bordering ferruginous sinuous lines are narrower in extent, and the complex sinuous lines extending up the discal area are more distinctly defined, the white submarginal fascia is also somewhat more curved, and the marginal ferruginous lunules broader; both the orbicular and reniform spots are more constricted in their middle.

Expanse $1\frac{7}{10}$ to $1\frac{8}{10}$ inch.

Hab. Kangra. In coll. British Museum.

This is quite distinct from *H. indica*, being distinguished from that species by its smaller size, wider space between the base of fore wing and the outwardly oblique transverse line, the space within the base of the cell being pure white instead of ferruginous, as in *H. indica*.

Fam. Bombycoidæ.

Genus Karana, Moore.

KARANA SIMILIS, n. sp.

Differs from the Darjiling *K. decorata* in its smaller size. Fore wing black, grey-speckled, with similar silvery-white markings, the subbasal comparatively narrower and more zigzag, the antemedial transverse band more erect, narrower, and with the two contiguous spots nearer the band, the reniform mark is narrower and more obliquely disposed, the discal transverse sinuous black line is more distinct and has grey-speckled borders, the submarginal black dentate points less conspicuous. Hind wing pale cinereous-white basally and pale cinereous-brown externally; cilia alternately cinereous-white and brown. Palpi and legs white-speckled.

Expanse $1\frac{5}{12}$ inch.

Hab. Kangra. In coll. British Museum.

PALIMPSESTIS RENALIS, n. sp.

Purplish brownish-grey. Fore wing with a slender, black, erect, sinuous, antemedial line, and an outwardly-angulated postmedial line; contiguous to the latter are two or three less distinct lines, followed by a more distinct submarginal denticulated line and a marginal row of short linear spots; between the medial bands the area is grey, the orbicular and reniform spot is pinkish, and both are bordered posteriorly by a raised tuft of brown scales. Hind wing dusky brown. Legs with indistinct brownish bands.

Expanse $1\frac{6}{12}$ to $1\frac{8}{12}$ inch.

Hab. Kangra. In coll. British Museum.

PALIMPSESTIS ORBICULARIS, n. sp.

Male and Female. Dusky brownish-grey. Fore wing with a slender, distinct, black, transverse antemedial and a postmedial waved line; orbicular and reniform spot black-lined, the former with a whitish centre; between the antemedial line and the base are four or five transverse, indistinct, pale-bordered, blackish sinuous lines, and

beyond the postmedial line are two similar but wider-separated discal lines, the outer lines being most distinct and ending at the apex; a less distinct line also contiguous to the postmedial line; along the extreme outer margin is a fine black lunular line. Hind wing greyish-brown, indistinctly paler across the middle; cilia cinereous. Thorax, head, palpi, and legs, above, greyish-brown; legs with black bands.

Expanse, ♂ $1\frac{6}{12}$, ♀ $1\frac{8}{12}$ inch.

Hab. Kangra. In coll. British Museum.

PALIMPSESTIS ALBIDISCA, n. sp.

Fore wing greyish olive-brown, the posterior base and disc slightly suffused with pink, crossed by a medial, waved, sinuous, distinct black line, followed by five or six paler sinuous lines, each of which are angulated outward at the upper median vein; beyond these is a more distinct but less sinuous line, which is blackest at the apical end; marginal line also black; between the medial line and the base are three indistinct waved black lines with slight whitish-speckled borders, and at the base is a short longitudinal black-crested streak with white lower edge; the area between the medial line and the third discal line is white below the cell. Hind wing pale greyish brown. Thorax, head, and palpi olivaceous hoary; legs with black bands.

Expanse $1\frac{6}{12}$ inch.

Hab. Kangra. In coll. British Museum.

DIPHTERA FASCIATA, n. sp.

Fore wing pale green; with a black basal costal streak, a basal posterior streak which is bent upward below the cell, two small costal streaks, followed by a broad costal streak which is continued across end of the cell, beyond this are two smaller costal streaks and a larger dentate spot, from the latter extends a dark green waved fascia, which has a slender, black, sinuous, inner-bordered line, the exterior border being sparsely speckled with minute black scales; cilia with an alternate white and black sinuous border. Hind wing bluish-white. Body pale green; palpi and legs greenish-white with black bands.

Expanse $1\frac{6}{10}$ inch.

Hab. Kangra. In coll. British Museum.

Genus TRIÆNA.

TRIÆNA DENTICULATA, n. sp.

Male. Fore wing brownish-grey; crossed by slender, sinuous, indistinct blackish lines with grey-speckled borders, of which the basal is acute and the discal lines are most apparent; a marginal row of black points; orbicular mark oblique, with greyish-white centre; from the base below the cell extends a longitudinal black streak to the antemedial line, and a similar streak from the postmedial line to the exterior margin. Hind wing white; veins dusky-brown; with a

marginal row of brown lunules, which also extend across the cilia. Thorax, head, palpi, and legs brownish-grey; abdomen paler. *Female.* Fore wing greyer than in male, the transverse lines slightly more distinct, the longitudinal black streak continued from the base to exterior margin.

Expanse $1\frac{1}{2}$ inch.

Hab. Kangra. In coll. British Museum.

Genus Hyboma, Hübner.

Hyboma divisa, n. sp.

Allied to the European *H. strigosa*, much larger in size. Fore wing dark grey, with a slight violaceous tint; the transverse antemedial black double line less sinuous, the postmedial sinuous double line blacker, the intermedial area being outwardly crossed by a zigzag, blackish, fasciated band, the longitudinal blackish streak below the cell is in a continuous line from the base to outer margin. Hind wing greyish-brown. Thorax, head and palpi, and legs above, dark hoary-grey; palpi and legs with black bands; abdomen greyish-brown.

Expanse, ♂ $1\frac{3}{8}$, ♀ $1\frac{4}{8}$ inch.

Hab. Kangra. In coll. British Museum.

Fam. Leucaniidæ.

Genus Tympanistes, Moore.

Tympanistes rubidorsalis, n. sp.

Fore wing pale pinkish whitish-ochreous, densely but indistinctly irrorated with minute brown scales; reniform mark small, with brown-speckled border; a marginal row of minute black dots. Hind wing pinkish-white, the abdominal border suffused with pale pink. Thorax, head, palpi, and legs above very pale brownish-ochreous; abdomen white beneath, pinkish-red above.

Expanse $1\frac{7}{8}$ inch.

Hab. Kangra. In coll. British Museum.

Genus Axylia, Hübner.

Axylia triseriata, n. sp.

Fore wing greyer in tint of colour than in *A. putris*; the costal border and markings darker, the transverse subbasal zigzag lines less acutely angled, the two transverse discal rows of dots situated nearer towards the outer margin; between the inner rows of dots and the reniform mark is a distinct third row of very similar dots, the marginal row of dentate points are also less distinct. Hind wing pale purplish cinereous-brown.

Expanse $1\frac{4}{10}$ inch.

Hab. Kangra. In coll. British Museum.

Leucania irrorata, n. sp.

Fore wing pale greyish-ochreous, sparsely irrorated with minute

black scales, some of which are clustered somewhat linearly below base of the cell and beyond its end; a black spot at lower end of the cell, and a marginal row of minute black dots. Hind wing pale cinereous-brown; cilia white. Body greyish-ochreous; palpi and legs above darker; tip of abdomen cinereous-brown.

Expanse $1\frac{4}{10}$ inch.

Hab. Kangra. In coll. British Museum.

LEUCANIA PERCISA, n. sp.

Fore wing greyish pinkish-ochreous, with a conspicuous white line extending along the median vein from base to exterior margin, the line bordered on both sides by purplish-black, most strongly beneath at the base, the black also extending upward to the apex; a black spot at lower end of the cell, and a discal and marginal row of less distinct minute black dots. Hind wing cinereous-white, with pale cinereous-brown outer border; cilia white. Body greyish-ochreous; a blackish collar across the thorax; head ochreous-brown; palpi and legs dusky-brown.

Expanse, ♂ $1\frac{3}{8}$, ♀ $1\frac{4}{8}$ inch.

Hab. Kangra. In coll. British Museum.

LEUCANIA BIFASCIATA, n. sp.

Fore wing pale purplish-red, with a pale yellowish fascia along base of the costa and another along the posterior margin; median and outer veins to the margin whitish, the former with a slightly black border, and the latter with an indistinct intermediate black streak ascending to the apex; an indistinct discal row of minute black dots. Hind wing pale cinereous-brown, suffused with red on the margin and cilia. Body pale yellow, tip of abdomen ochreous; thoracic crest tipped with red; palpi and legs purplish-red.

Expanse $1\frac{3}{10}$ inch.

Hab. Kangra. In coll. British Museum.

Allied to *L. griseifasciata*.

ALETIA FRATERNA, n. sp.

Allied to *A. albicosta*, both the fore and hind wing and the body being of a dark purplish reddish-ochreous colour. Fore wing with paler short transverse strigæ; median veins and discoidal streak greyish; the orbicular and reniform spot obsolete. Underside of both wings and body also much darker coloured.

Expanse, ♂ $1\frac{3}{4}$ inch.

Hab. Kangra. In coll. British Museum.

ALETIA EXANTHEMATA, n. sp.

Fore wing yellowish-ochreous, speckled with purplish ochreous, the speckles being more or less confluent along the costal border; across the wing is a curved antemedial and a waved postmedial blackish-speckled line, followed by a similar speckled discal line and a marginal row of dots; between the latter is a dusky submarginal

waved line; orbicular and reniform spot almost free from the darker speckles. Hind wing pale yellow, with a suffused dusky-brown margin; cilia pale yellow. Thorax and head yellowish-ochreous; palpi and legs purplish-ochreous.

Expanse $1\frac{3}{10}$ to $1\frac{5}{10}$ inch.

Hab. Kangra. In coll. British Museum.

ALETIA RUDIS, n. sp.

Allied to *A. obscura*. Fore wing brownish-ferruginous, very sparsely irrorated with minute blackish scales and with indistinctly darker brownish-ferruginous short transverse strigæ, which are most apparent in the female; veins greyish; a small whitish spot at lower end of the cell, at base of upper medians, the spot with black-speckled border; a very indistinct pale reniform spot, which in the female is slightly bordered with black scales; a very indistinct, transverse, discal, black-speckled line, the points only of which are seen in the male. Hind wings ferruginous-brown, palest at the base.

Expanse, ♂ $1\frac{4}{10}$, ♀ $1\frac{6}{10}$ inch.

Hab. Kangra. In coll. British Museum.

Fam. CARADRINIDÆ.

CARADRINA FARINACEA, n. sp.

Fore wing minutely white-speckled; crossed by a very indistinct basal, subbasal, medial, and a discal, sinuous, slender, blackish line, followed by a submarginal lunular line; the orbicular spot indistinct; reniform spot with black-speckled border and central dots. Hind wing greyish-white, with a slight greyish-brown border; cilia white. Body and legs grey; tarsi with brown bands.

Expanse $1\frac{1}{4}$ inch.

Hab. Kangra. In coll. British Museum.

Fam. HELIOTHIDÆ.

Genus PRADATTA, Moore.

PRADATTA BIMACULATA, n. sp.

Male. Fore wing pale straw-yellow, the veins indistinctly lined with ochreous-red; a minute, black, discocellular dot at upper end of the cell: hind wing white. Body pale straw-yellow; thorax in front and palpi brighter; fore legs above ochreous-brown, tibial claws black.

Expanse $\frac{3}{4}$ inch

Hab. Dharmsala. In coll. British Museum.

Genus MASALIA, Moore.

MASALIA TOSTA, n. sp.

Female. Fore wing ochreous-red, with a slight pale yellow streak extending through end of the cell to near the outer margin; costal edge also pale yellow; cilia slightly edged with white. Hind wing

pale straw-yellow; veins and outer border slightly speckled with minute red scales; cilia with a pale red inner border. Underside pale ochreous-yellow; veins of fore wing and costal border of hind wing ochreous-red. Thorax, front of head, palpi, and legs above ochreous; fore tibial claws black; abdomen pale straw-yellow.

Expanse $1\frac{1}{4}$ inch.

Hab. Dharmsala. In coll. British Museum.

Fam. Anthophilidæ.

Genus Metachrostis, Hübner.

(Syn. *Leptosia*, Guénée.)

Metachrostis contingens, n. sp.

Dark grey. Fore wing with a basal and three equidistant transverse more or less interrupted brown waved bands; the third band broadest at end of the cell and there forming a reniform spot; before which is an orbicular spot; a submarginal sinuous pale line. Hind wing cinereous-grey, with short, posterior, sinuous, brown-speckled bands; a marginal black lunular line to both wings. Body, palpi, and tarsal bands dark grey; legs cinereous.

Expanse $\frac{9}{12}$ inch.

Hab. Dharmsala. In coll. British Museum.

Fam. Acontiidæ.

Genus Canna, Walker.

Canna splendens, n. sp.

Male. Upperside: fore wing with a large, broad, waved-bordered, pale emerald-green patch, which terminates in a small lower spot on hind margin near the base, both with dark brown speckled margins; outer area of wing pale green, crossed by a white lunular discal line; a white-centred brown anterior spot and a white posterior spot on exterior margin; two minute spots also on costa before the apex; cilia green, alternated with brown; hind wing pale pinkish-brown; margin palest. Body pale brown: front of thorax and vertex emerald-green, hind part of thorax and dorsal tuft on middle of abdomen black-fringed.

Expanse $1\frac{2}{5}$ inch.

Hab. Dharmsala, 6200 feet; August. In coll. British Museum.

November 20, 1888.

Prof. Flower, C.B., LL.D., F.R.S., President, in the Chair.

The Secretary read the following reports on the additions made to the Society's Menagerie during the months of June, July, August, September, and October, 1888:—

The total number of registered additions to the Society's Menagerie during the month of June was 107, of which 9 were by birth, 29 by presentation, 6 by purchase, 3 by exchange, and 60 were received on deposit. The total number of departures during the same period by death and removals was 85.

The most noticeable additions during the month were:—

Three specimens of Pallas's Sand-Grouse (*Syrrhaptes paradoxus*), captured out of the many flocks of this Asiatic bird that have lately visited the British Islands. One of these (received June 2nd) was taken near Berwick-on-Tweed, and presented by Mr. Howat Crane, the two others were obtained on the Island of Tiree, Argyllshire, and presented (June 16th) by Lieut.-Col. Irby and Capt. Saville Reid.

The registered additions to the Society's Menagerie during the month of July were 148 in number; of these 64 were acquired by presentation, 18 by purchase, 3 by exchange, 37 by birth, and 26 were received on deposit. The total number of departures during the same period by death and removals was 122.

The registered additions to the Society's Menagerie during the month of August were 145; of these 80 were acquired by presentation, 12 by purchase, 20 by birth, 6 by exchange, and 27 were received on deposit. The total number of departures during the same period by death and removals was 106.

The registered additions to the Society's Menagerie during the month of September were 81; of these 54 were acquired by presentation, 9 by purchase, 3 by exchange, 9 were bred in the Gardens, and 6 were received on deposit. The total number of departures during the same period by death and removals was 92.

The registered additions to the Society's Menagerie during the month of October were 93, of which 12 were by birth, 43 by presentation, 8 by purchase, 3 by exchange, and 27 were received on deposit. The total number of departures during the same period by death and removals was 144.

The following extracts were read from a letter addressed to the Secretary by Prof. J. B. Steere, C.M.Z.S., dated Manilla, Philippines, June 25th, 1888:—

"Since the receipt of your letter I have been in the interior of the little-known island of Mindoro, and have had the satisfaction of procuring specimens of a strange animal there, which, though generally talked of throughout the Philippines, is little known to

scientific men[1]. This is the 'Tamaron.' From the native reports I could make out nothing but that it was a large fierce beast with sharp horns, which attacked all who came near it. While in this city last July I saw a professed example mounted in the Dominican College of Santo Tomas. From what I could make out of it at that time I thought the head was that of a calf of the species, and that the skin of a young Buffalo had been used for the remainder of the specimen. I now know that the first part of my impression was correct. I am not now so certain of the second part, as to the skin of a young Buffalo having been used, and shall examine the specimen again.

"In Mindoro I procured three full-grown individuals (two males and one female) of the Tamaron, and have preserved the skins and skeletons.

"The following is my description, as taken from the animals when first killed :—

"General colour of skin and hair black, hair short and rather fine. A greyish-white stripe running from near the inner corner of the eye towards the base of the horn (this stripe three inches long by one inch wide), a greyish-white spot above each hoof on all feet, and a greyish-white patch on inner side of lower fore leg ; skin and hair of groin white ; bare skin of nose and lips black ; horns and hoofs black ; tips of horns pointed and polished ; horns triangular, with a tendency in the bulls towards thickening and flattening at the base ; lower part of the horns with deep irregular pits ; several of the last vertebræ of the tail aborted. Size of No. 1, an old bull :—length from point of nose to tip of tail eight feet one inch ; length of tail one foot five inches ; length of tassel of hairs at end of tail two and a half inches ; height at shoulder three feet six inches ; from breast-bone to sole of fore foot one foot eight inches ; length of horns one foot two inches ; circumference of horns at base thirteen inches ; horns, distance apart at base one and a half inch, at points ten inches ; length of head, before skinning, one foot four inches.

"No. 2, an old cow, differed but little in measurements, being eight feet in length ; height at shoulder three feet five inches ; the horns were weaker and rounder at the base.

"No. 3, a full-grown young bull, was eight feet two inches long ; height at shoulder three feet five inches, at hip three feet six inches ; horns little worn and one foot five inches long.

"The body of the Tamaron is very round and muscular, as are the legs.

"The horns run downwards and backwards until they reach the line of the eye and upper edge of the nose, and then pass nearly straight backwards, turning towards each other moderately at the points.

"The animals are Buffalo-like in habits ; they come out upon the sandy reaches of the rivers at night to fight and to escape the insects,

[1] See communications from Mr. A. B. Everett, Dr. A. B. Meyer, and Mr. Bartlett on this subject, P. Z. S. 1878, pp. 792, 881, 882 ; also Dr. Meyer's letter, 'Nature,' xxxix. p. 9 (1888) ; and Dr. Hoffmann's article in Abh. k. Zool. Mus. zu Dresden, 1886–87, no 3, p. 27.

and gather together in bands of some size. They separate by day going two or three together, or solitarily, into the low bottoms at the back of the streams, feeding on the wild cane and making their way to the little forest-streams and pools, in which they bathe in the water and mud like the Buffaloes.

"The domestic Buffalo (*Bubalus indicus*), the only beast of burden here, has escaped from its owners in the island of Mindoro in large numbers, and is now found wild, and is called 'Cimmarone.' The Tamaron and these come in frequent conflict, the Tamaron being said to attack it at first sight, and, though much smaller, being quicker and stronger, to drive the Buffaloes back. The 'Tamaron,' from all I can make out, is nearest to the Anoa of Celebes, and raises a new problem in distribution. If Mr Wallace's generic name stand it might be called *Anoa mindorensis*, if not already named, or if that of Reichert is adopted, *Probubalus mindorensis*."

Mr. Edgar Thurston, C.M.Z.S., exhibited and made remarks upon a fine series of Corals and other marine animals which he had collected on islands in the Gulf of Manar, Indian Ocean.

Mr. Henry Seebohm, F.Z.S., exhibited examples of *Phasianus shawi* collected by General Prejevalski in the upper valley of the Tarim River, and an example of a new species of *Phasianus* from the shores of Lob-Nor, respecting which he communicated the following note by Herr Theodore Pleske:—

"Amongst the collection of bird-skins which General Prejevalski brought from Lob-Nor is a fine series of a species of Pheasant which he provisionally determined as *Phasianus shawi* (Prejevalski, "Von Kuldscha über der Tian-Schan an der Lob-Noor," Isvest. Imp. Russ. Geogr. Obsch. xiii. p. 275, 1877). He afterwards described it as a new species under the name of *P. tarimensis* (Prejevalski, Dritte Reise in Central Asien, aus Saissan über Chami nach Thibet und an die Quellen des Gelbe Flusses, p. 95. A review of this work, which was published in 1883, will be found in the 'Journal für Ornithologie,' 1886, p. 524.)

"*Phasianus tarimensis* is very closely allied to *P. shawi*, but differs from it in two important particulars:

"*a*. The wing-coverts are yellowish brown instead of ashy grey;

"*b*. The margins of the feathers of the rump and of the upper tail-coverts are green and buff instead of copper-red.

"It ranges from Karaschar, in the lower valley of the Tarim River, and the valley of the Tschertsche Darya to the shores of Lob-Nor."

Mr. Seebohm added the following remarks:—

"General Prejevalski obtained examples of *P. shawi* in the valleys of the Aksu-Darya and the Khoten-Darya near their confluence with the middle stream of the Tarim River, and in the oasis of Sa-tschen, which do not differ from those obtained by Dr. Scully near the city of Kashgar. They were originally described by him as *P. satchenensis*, a name subsequently withdrawn in favour of *P. insignis*, both names being synonyms of *P. shawi*.

"The green and buff upper tail-coverts of *P. tarimensis* distinguish it both from *P. colchicus* and its allied races, in which the upper tail-coverts are copper-red, in some examples alternating with green in certain lights; and from *P. torquatus* and its allied races, in which they are green and slate-grey. Both in its geographical range and in its coloration it is intermediate between these two groups; but on the whole its affinities seem to be with the latter if we attach importance to the characters of the tail-feathers, which are narrowly barred with dark brown between buff rather than olive spaces."

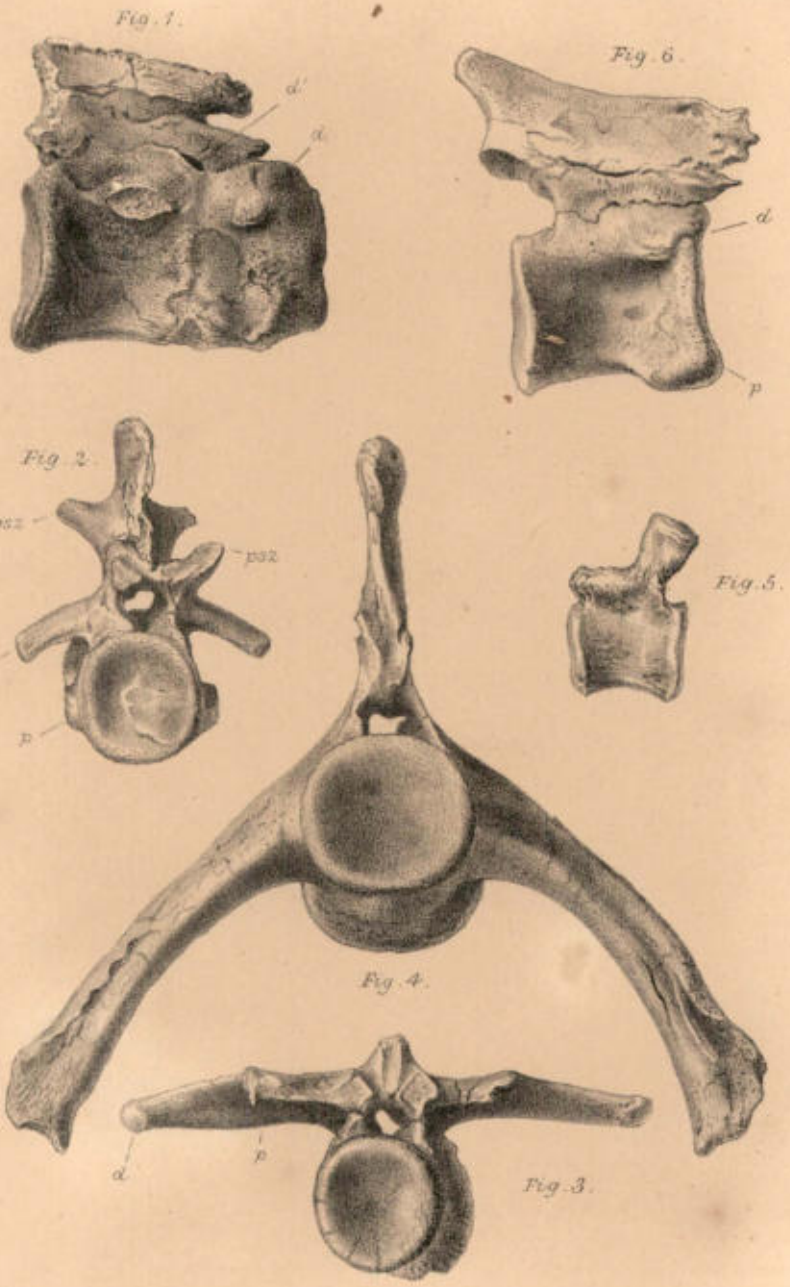
Mr. Henry Seebohm, F.Z.S., exhibited a specimen of the Sociable Lapwing (*Vanellus gregarius*) which had been shot in Lancashire about twenty-five years ago, and was the only example of this species which had been known to have occurred in the British Islands. Mr. Seebohm made the following remarks:—"The specimen now exhibited was shot by a farmer named John Jackson out of a flock of Peewits in autumn, and was preserved by a gamekeeper of the name of John Isles, who placed it in a case of stuffed birds belonging to another gamekeeper of the name of Joseph Frankland. It remained for many years in this case, which contained about sixty other birds, and was taken care of by a farmer of the name of William Frankland, a brother of the gamekeeper, who lived at Holcombe, near Bury.

"Whilst it was in Frankland's possession it was erroneously identified as a Cream-coloured Courser, and was recorded as such (Mitchell, 'Birds of Lancashire,' p. 175). It is now in the possession of Mr. W. H. Doeg, of Manchester, who has kindly sent it up for exhibition.

"The bird was shot some time between the years 1860 and 1866, at Whitehall, about two miles from St. Michael's on Wyre, and nearly ten miles south-east of Fleetwood, not far from the celebrated Pilling Moss, where the Black-headed Gulls used to breed.

"The pedigree of the specimen appears to be perfectly satisfactory, and the appearance in this country of a species which breeds in South-west Siberia only adds another case to many similar accidental occurrences. It is in immature plumage, probably about a year old. There are no signs of the dark streaks on the breast nor of the buff streaks on the back so characteristic of young in first plumage; but the black on the crown and on the belly and the chestnut on the thighs are only beginning to appear. Its shortest primaries are black on the outer webs and white on the inner webs, a character which separates the species at all ages from its thirteen allies. It has a small hind toe; the outer tail-feather on each side is entirely white; the other tail-feathers are crossed by a dark band, and the secondaries are entirely white. The combination of the four last-mentioned characters is also diagnostic of the species."

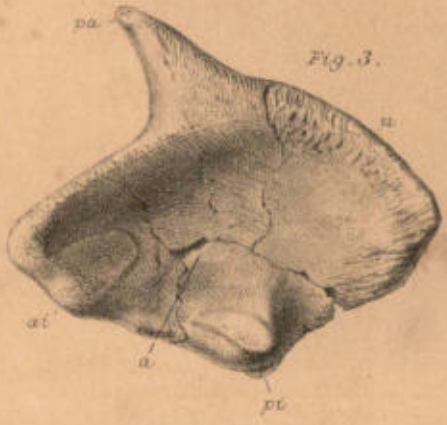
The following papers were read:—

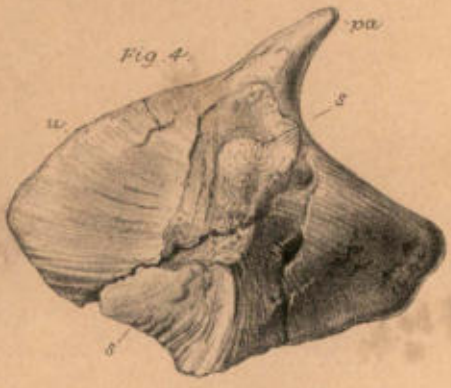


J. Smit lith.

Hanhart imp.

FOSSIL CROCODILIA.





J. Smit lith.

Hanhart imp.

FOSSIL CROCODILIA.

I. Contribution to the Skeletal Anatomy of the *Mesosuchia* based on Fossil Remains from the Clays near Peterborough in the Collection of A. Leeds, Esq. By J. W. Hulke, F.Z.S.

[Received July 14, 1888.]

(Plates XVIII. & XIX.)

The primary divisions of the Order Crocodilia laid down by Cuvier (1), and extended by R. Owen (2) and by T. Huxley (3), are so true to nature that they have been substantially adopted by all subsequent writers and have proved insusceptible of material modification. However, within these great divisions the classification of the Crocodilia has, as Strauch truly remarks with reference to its extant members, ever constituted one of the more difficult tasks of the systematic herpetologist (4). This he rightly attributes principally to the small amount of material available for an exhaustive study of the entire skeleton of the several Crocodilian species preserved in our Museums, and in some measure to the mutable nature of those parts from which the systematic herpetologist has mainly taken the distinctive characters he employs, viz.—the skull, in which the proportions of the proper cranial and the facial region notably alter with the age of the individual in all species; and the integument, the scutes of which exhibit, within limits, differences as regards their shape and their arrangement in the same species. Even now, after an interval of more than twenty years since the publication of Strauch's admirable synopsis (5), no public osteological collection in this metropolis, so far as I can ascertain, possesses a series illustrating the changes of form which the Crocodilian skeleton undergoes in its growth from the young to the mature individual in any one species. Indeed as regards one—*Gavialis*, and this not the least important, I find that neither the British Museum nor that of the Royal College of Surgeons contains a single entire skeleton. The latter, however, possesses a few detached bones of this genus (crania are well represented in both collections). Exact and comprehensive anatomical knowledge not limited to external features, but extended to the whole skeleton and to the soft parts, must form the only safe basis of any enduring classification. As regards the extinct members of the Order, the difficulties are for very obvious reasons greatly increased. Highly instructive as are the magnificent skeletons bedded in slabs of rock that adorn our galleries, these often fail to afford information respecting forms and structural details which yet may be of first-rate importance. Obviously many such details can only be apprehended by the study of detached bones that can be separately handled, and be viewed in turn from every side. It is the facility for such study that gives a high value to a large collection of Crocodilian remains from pits opened in

the Oxford Clay [1], near Peterborough, obtained by A. Leeds, Esq., to whom I tender my warm thanks for most courteously affording me an opportunity of studying them at leisure during the past winter. They are easily freed from the clay by washing, after which many of the bones, except for some crushing by earth-pressure, are nearly as complete as freshly macerated osteological specimens. The mode of their occurrence in the rock, their facies, and their relative proportions concur in affording a high degree of probability to Mr. A. Leeds's conviction that each of his series represents one individual, and is not derived from several skeletons. An impression that they help to clear up some points in the skeletal structure of the earlier Crocodilians hitherto obscure and requiring confirmation is my apology for offering an account of these remains. Mr. Leeds's collection contains remains referable to both the primary groups into which Messrs. E. and E. E. Deslongchamps in their classical 'Memoirs' (6) divide the family *Teleosauria*; their genus *Teleosaurus* is exemplified by a member of the subgenus *Steneosaurus*, and their genus *Metriorhynchus* by probably more than one species. Mr. Leeds tells me that *Steneosaurian* remains occur sparingly and they are restricted to the upper beds, whereas those of *Metriorhynchus* are plentiful, and they are distributed throughout the whole series of the beds, from the uppermost to the lowest exposed in the pits.

The cranial characters distinctive of the two genera laid down by Messrs. Deslongchamps (7) are plainly recognizable in the skulls in Mr. Leeds's collection. As, however, these are much crushed and otherwise imperfect, I do not offer any description of them.

Metriorhynchus.

Vertebræ.—All, except the first two and the two sacral, have both terminal surfaces of the centrum more or less concave, the character which stamps the *Protosuchii* of R. Owen (8), the *Mesosuchia* of T. Huxley (9), and distinguishes these from all the more recent Crocodilians, including those of Tertiary age and also the extant members which together compose Huxley's suborder *Eusuchia* (10).

Atlas.—This vertebra (Plate XVIII. fig. 1) is composed of the same elements as in extant Crocodiles, viz.—of an azygos ventral piece ("basilar Stück," Stannius) (11); of a pair of lateral pieces which, in conjunction with the basilar piece, constitute an incomplete ring; of a *pars odontoidea*; and of an upper piece ("pièce supérieure," Cuvier; oberes Schlussstück of German zootomists). The existence of this last element may not be doubted, although it is not preserved in any atlas in the collection, since its presence has been demonstrated in the earlier Crocodilians of the Lias (12), in those of contemporary rocks in Normandy (13), in those of Tertiary rocks (notwithstanding Ludwig's opinion that it is absent from the Crocodilians of the Mayence basin (14)—an idea founded on a misapprehension), as it is also in all extant Crocodilians.

[1] Through misapprehension of information given me respecting these pits, I was formerly under the impression that they were in the Kimmeridge Clay.

In immature individuals all the component elements of the atlas are distinct, but in mature individuals they are often synostosed, as are also the atlas and epistropheus.

Basilar piece (Stannius).—In its form and its connections this part agrees closely with that of extant Crocodilians. Its anterior or cranial surface contributes nearly the lower or ventral half of the articular cup for the reception of the occipital condyle. Its inferior surface is convex transversely; whilst its superior is slightly concave in this direction, and it is adapted to the corresponding surface of the *pars odontoidea*. Its supero-lateral margins unite with the "lateral pieces." Its posterior margin, thin, has at its junction with the lateral margin, on each side, a large articular facet for the first pair of ribs.

"*Lateral pieces*."—These are composed of a thin, compressed, upper part which forms the side-wall of the neural canal, and of a stouter lower half. The division between these two parts is indicated on the median surface by a slight horizontal ridge which marks the former attachment of the "transverse ligament." The anterior border of the stouter lower part is so wide that it deserves the term surface. Smooth, articular, forming a small segment of a circle, it contributes the upper lateral border of the occipital cup. The inferior border of the lateral piece unites with the supero-lateral border of the "basilar piece." The posterior border, and the upper border of the upper part of the lateral piece, that part which bounds the neural canal, are thin; and at their junction they are produced backwards, and they form a rudimentary post-zygapophysis which articulates with a similarly dwarfed præ-zygapophysis on the epistropheus. The outer surface of the "lateral piece" is traversed obliquely by a ridge, which, starting from the angle formed by the junction of the anterior and superior margins of that part of the bone which bounds the neural canal, descends in a backward direction towards the postero-inferior angle, where it ends in a small projection or tubercle situated in the level of the diapophysis on the epistropheus. For reasons presently stated this little tubercle should rank as an upper atlantal transverse process or diapophysis. The median aspect of the stouter, lower part of the lateral piece rests on the *pars odontoidea*.

Pars odontoidea.—This has a slightly skewed cubic or pyramidal form, its inferior or ventral part being slightly smaller than the upper. The posterior surface, plane, is marked by horizontal ridges and furrows indicative of synchondrosis with the cranial, terminal surface of the centrum of the *epistropheus*. In aged individuals it is frequently synostosed with this. The outline of this (posterior) surface of the *pars odontoidea* is an inequilateral four-sided figure, in which the upper is longer than the lower side Upon its upper surface may be discerned (1) a relatively wide, smooth, median tract—the floor of the neural canal; this is slightly encroached upon laterally by (2) a rough synchondrosial impression, marking the attachment of the neurapophysis, which also descends upon the lateral surface. The postero-lateral angles of the upper

surface of the *pars* are truncated by the abutments of the most anterior part of the neurapophysis of the epistropheus. Upon the anterior or cranial surface of the *pars* are discernible:—(1) a smooth upper tract of rhomboidal outline, of which the upper angle is truncated by the neural canal; this area contributes the upper, central, and deepest part of the occipital condylar cup; and (2) a lower, larger tract looking downwards and forwards, stamped by wrinkling denoting synchondrosial union with the "basilar piece."

Epistropheus (Axis).—This bone (Plate XVIII. fig. 1) differs from all the vertebræ posterior to it, (1) in the great antero-posterior extent of its spinous process and of its neurapophysis, which latter, prolonged in advance of its proper centrum, abuts slightly upon the *pars*; and (2) in the flatness of the anterior terminal surface of its centrum, which in immature individuals bears the stamp of synchondrosis, and in aged individuals is often synostosed with the *pars*. The posterior terminal surface of the centrum is concave. In the level of the neurocentral suture, not quite equidistant from the two ends of the centrum, but rather nearer to the cranial, is a stout, upper, downward slanting, transverse process (diapophysis); its cross section is oval in outline, the major axis horizontal; and at the lower, anterior angle of the lateral surface, where this joins the under surface of the centrum, is an inconspicuous facet (parapophysis) for the *capitulum costæ*. Below the neural suture the middle of the centrum is compressed, and its sides here inclining inwards meet ventrally in a narrow edge or keel.

The morphology of some of the component parts of the atlas has been much discussed, nor have the last words been spoken. The correspondence of the *pars odontoidea* to the odontoid process of the epistropheus in higher Vertebrates was recognized by Cuvier (15). If the body of a vertebra be defined as that part of it which is traversed by the notochord, then, beyond doubt, embryology demonstrates that the *pars odontoidea* is a vertebral centrum, and also that it belongs to the atlas, since in an early embryonic stage the notochord may be seen piercing it, and it evidently, together with the pair of "lateral pieces" and the basilar piece, forms one undifferentiated "continuum." These views of the morphology of the *pars* have been held by nearly all writers. E. Deslongchamps alone, I think, regarded the *pars* as representing the centrum, not of the atlas, but of a vertebra once ancestrally present between the atlas and the epistropheus, but now reduced to a rudiment. He appears to have been led to form this opinion by the occurrence of a notch in the free border of the spinous process of the epistropheus, and by the great antero-posterior extent of the neurapophysis of this latter. These facts appeared to him to hint that the neural arch of the epistropheus comprises two parts originally distinct,—one posterior, the proper arch of the epistropheus, the other anterior, the neural arch of a vertebra immediately anterior to the epistropheus which, its own centrum being reduced to a rudiment, has coalesced with that of the epistropheus (16). This conception of the *pars* is untenable.

That the pair of "lateral pieces" which, above, form the side-walls of the neural canal, below join the basilar piece, in front contribute to the supero-lateral part of the cup for the occipital condyle, which internally rest on the upper part of the antero-lateral aspect of the *pars*, encroaching slightly on the upper surface of this latter, are the morphological equivalents of the neurapophyses of other vertebræ is universally accepted. It is probable that they also comprise that part which in Mammalia, under the guise of the expanded root of the neurapophysis, contributes the dorso-antero-lateral portion of the body of the vertebra which P. Albrecht has named *hemi*-centroid (17). This part of the atlas retains its individuality throughout the vertebral column in some early reptiles, of which *Actinodon* is an example. Gaudry, who has given excellent figures of the vertebræ of this Saurian in his admirable 'Enchaînements,' very appropriately named this part *pleurocentrum* (18); and this term has been adopted by E. D. Cope, who originally had designated the same part *centrum* in his accounts of *Trimerorhachidians* from homotaxic rocks in N. America (19).

No part of the atlas has been the subject of more discussion than the azygos "*basilar piece*" which inferiorly completes the ring. Cuvier regarded this as the body of the atlas (20). R. Owen considered it to be "the inferior part of the centrum of the atlas" (21). He also regarded it as homologous with the ventral spur or carina present in the cervical and in the foremost thoracic vertebræ in extant Crocodiles, from which it differs, he remarked, in being autogenous. Further, this author identified it with the foremost of the "subvertebral wedge-bones" which in *Ichthyosaurus* supplements inferiorly the atlantal cup for the occipital condyle (22). To the "subvertebral wedge-bones," to the ventral spur of the cervical vertebræ of extant Crocodilians, and to the Crocodilian atlantal basilar piece, R. Owen applies, alike to all, the term *hypapophysis*. But are all these morphologically equivalent structures, and is this term properly applicable to all? Apparently R. Owen himself has not invariably used the term *hypapophysis* in the same sense, since he evidently has applied it to a part which in one instance is a downward extension of the centrum, and in another instance he has connected it with a part having an autogenous origin distinct from the centrum. Now in embryos of extant Crocodilians it is easily demonstrable that the ventral spur of the cervical vertebræ is a downward production of the centrum, with the tissues of which it is always continuous (23). To this the term *hypapophysis* strictly applies. The cervical vertebræ in many extant lizards have a ventral spur of identic origin, but together with this there is frequently present another element, intercalated ventrally between the vertebral centra, originating independently of these, though later it not unusually coalesces with the genuine hypapophysis, commonly of the posterior of the pair of vertebræ between which the primitively separate piece lies. Instances of such intercalated pieces are common. They are shown in the two annexed sketches of cervical vertebræ of *Iguana* sp. and *Trachyosaurus*

rugosus. In the former the '*intercalary*' or *intercentrum* only is present; in the latter lizard it coexists with a genuine *hypapophysis*. In any comparison of the Crocodilian atlantal basilar piece with the foremost of the "subvertebral wedge-bones" of *Ichthyosaurus*, the morphological significance of the pair of long, slender hypaxonic styles attached to the former may not be ignored. These styliform bones were regarded by Cuvier as "*apophyses transverses*" (24). Their separate ossification is unfavourable to this view, which is not now maintained by anyone. Their inferior position might seem to suggest their being a form of chevron. Is this a tenable supposition? The individual distinctness of each style, the absence of union of their ventral ends, is not sufficient, of itself, to refute this idea, since *Ichthyosaurus* and *Plesiosaurus* furnish familiar examples of the complete separateness of the two styles constituting their caudal chevrons. It is scarcely necessary to state that the reptilian caudal chevron originates in a downward extension of an intercentrum. This, as Dr. G. Baur has mentioned, is plainly demonstrable in *Sphenodon* (25). The development of the intercalated part seems often to be inversely proportioned to that of the freely ventrally dependent part that forms the chevron. The former may be reduced to a mere rudiment, or it may even disappear, whilst the latter may persist in its perfect form. I do not call to mind an example of the concurrence of an intercentrum and of a chevron, each being distinct, and both not forming a *continuum*. The pair of styles dependent from the posterior border of the basilar pieces do not, then, lend any support to the identification of the basilar piece of the Crocodilian atlas with an (Ichthyosaurian) intercentrum.

The obvious formal resemblance of the atlantal styles to the next posteriorly situated pair of similarly-shaped pieces, by all writers regarded as riblets, is a valid reason for regarding the styles also as riblets.

The chief and almost only difference is the simple form of their vertebral end, and their consequently *single* vertebral articulation. In estimating the value of this it should be borne in mind that the division of the vertebral end of the rib, which is so marked a feature in those of the other cervical vertebræ behind the epistropheus, is in *Eusuchia* usually indicated only by a shallow notch in the ribs of the vertebra just named. The ventral angle of the notch, which represents the *capitulum costæ*, is borne directly on a parapophysial facet or tubercle; whilst the upper angle of the notch, answering to the *tuberculum costæ*, is commonly only connected by ligament with the diapophysis. From the rudimentary condition of the costal tubercle in the second pair of riblets, it is easy to conceive that a slight further reduction of it might cause its complete suppression in the first pair, and this appears actually to have occurred as regards the atlantal styles in the *Eusuchia*. *Mesosuchia*, however, retain a trace of a costal tubercular articulation in the little process which projects from the outer surface of the atlantal neurapophysis (*cf.* Plate XVIII. fig. 1, *d*). The position of this little process in serial line with the upper transverse processes of the other cervical verte-

bræ speaks distinctly in favourof its diapophysial character. The common acceptance of the pair of atlantal styles as *riblets* seems, then, well founded.

The origin of the ribs in connection with the myocommata, their primitive independence of the permanent vertebræ, and their intervertebral position as regards the latter suggest the inquiry whether instances of ribs being borne on intercentra are known.

It has been thought that an affirmative answer to this is to be found in the vertebral column of *Rhachitomidæ* (E. D. Cope). In support of this Dr. G. Baur (26) cites Prof. E. D. Cope, who describes the capitellum of the furcate rib of a *Pelycosaurian—Embolophorus fritillus*—as being borne on an "*intercentrum*" (27). But the significance of this turns on the true morphology of the part here termed "*intercentrum*" by Cope. Now in stating the generic characters of *Trimerorhachis* this author writes:—"The centrum is represented by three cortical ossifications of the chorda sheath, a median inferior, and two lateral. The lateral pieces are quite distinct from one another, and are in contact with the neurapophyses above, and the posterior border of the median segment in front. The neural arch joins chiefly the lateral elements, but is in slight contact with the lateral summits of the inferior element." "The median element I call intercentrum" (27). Again, referring to *Rhachitomus valens*, this author states: "Each vertebra consists of two segments, an *intercentrum* and a neural arch. The true centrum is wanting in the specimens at my disposal, and the intercentrum supports portions of two adjacent neural arches. With these it shares the intervertebral articular face usually borne by the centrum" (28). It is evident from these passages that Cope's "*intercentrum*" (as is mentioned in an earlier part of his paper) is Gaudry's "*hypocentrum*." Again, in E. D. Cope's definition of the *Ganocephala* the following statement occurs:—"Vertebræ consisting of centra and intercentra, the former not extending to the base of the vertebra, the latter not rising to the neural canal. The centrum consisting of two parts distinct from the superior neural arch, viz. a lateral piece on each side" (29). Here *centrum* is used not as equivalent to *body*, for this latter term in its general application comprises also the inferior piece. It would appear that Cope's application of the term *centrum* to the inferior piece was consequent on his interpretation of the pair of lateral pieces (Gaudry's pleurocentra) as composing the centrum. I do not gather from any of his writings that Prof. Cope has, in any of the Ganocephala described by him, found intercalary pieces concurrently with vertebral bodies of the construction just mentioned, and the argument based on his observations in relation to this subject, viz. Gaudry's *hypocentrum* is an *intercentrum*, is not, I submit, conclusive; and, this being so, the inference drawn from the supposed costal articulation with the *intercentrum* in *Trimerorhachis*, viz. that the atlantal basilar piece is really an intercentrum, appears to me to want confirmation. Lower in the vertebrate scale instances are known, of which *Spatularia* is an example, where, together with vertebræ consisting of a neural

arch (the expanded root of which, descending laterally on the notochordal sheath, represents a pleurocentrum), and of an inferior or ventral ossicle lying vertically beneath it, and so representing Gaudry's *hypocentrum*, there are also present distinct inferior ossicles in the notochordal sheath, intercalated one between each pair of composite vertebral bodies, and thus intruded between the hypocentra. Similarly superior intercalaries occur between the neural arches. To such inferior "intercalaria" the term *intercentra* is strictly pertinent.

In the Ganoid *Amia calva* the cartilaginous tips of the transverse processes are structures having some correspondence to ribs. Now Dr. G. Baur mentions that in *Amia calva* the lateral (or transverse) process (Basalstumpf, Götte) at a certain point in the vertebral column, near the end of the body-cavity, passes from the centrum of a vertebra to the intercentrum next immediately following (30). In the only skeleton of *Amia calva* accessible to me (one prepared by Hyrtl preserved in the Museum of the Royal College of Surgeons), I find that behind the 6th vertebra following the body-cavity archless and arch-bearing centra alternate regularly; and, except for a slight difference of size, these two kinds of centra are barely distinguishable. The lateral or transverse process, which in that part of the vertebral column which corresponds to the body-cavity is borne by the arched centra, alone present there, is not, in this skeleton, in the region behind the body-cavity transferred from the arch-bearing to the here intercalated archless centra (or *intercentra*); but the transverse process continues to occur only on the arch-bearing centra, until at the caudal end of the column, through reduction of bulk and through crowding, the distinctness of the component pieces of the column is lost.

Ascending in the vertebrate scale, *Hatteria*, as shown by Dr. G. Baur, furnishes in its anterior vertebræ an example of the connection of a rib with a true intercentrum Here the capitulum of the furcate rib, mostly represented by ligament, is ligamentously connected with the intercentrum, whilst the tuberculum rests on the centrum. I find this arrangement present in the three anterior pairs of ribs in two skeletons of *Hatteria* now before me. The secondary connection of the ribs with the permanent vertebræ, and the arrangement in *Hatteria* demonstrating the connection of the *capitulum costæ* and the *intercentrum*, would seem to favour the idea that the Crocodilian basilar piece is morphologically an intercentrum. The body of evidence, however, is I think, unfavourable to this conception; and this, together with the fact that in the early embryo the basilar piece is continuous with the *pars odontoidea* and with the neurapophysis (including the hemicentroids, Albrecht), gives very great probability to the hypothesis that the basilar piece is really that which R. Owen termed it—the inferior part of the centrum of the atlas. This is also C. K. Hoffmann's view of it (31).

The morphological equivalence of the Crocodilian basilar piece to the foremost of the subvertebral wedge-bones in *Ichthyosaurus* does not seem to me proven, but rather the contrary. Probably in the Enaliosaur the "body" of the atlas is the equivalent of the Croco-

dilian basilar piece + the two pleurocentra + the *pars odontoidea*. As bearing on this it is not without significance that the lateral surface of the atlas in *Ichthyosaurus* is impressed by a diapophysial and a parapophysial pit, for the double costal articulation, as occurs in the axis and the other vertebræ behind it.

There remains for discussion the inverted V-like piece that caps and superiorly closes the neural arch. As already said, this is missing in Mr. Leeds's specimens, but of its former presence no doubt may be entertained. What is its morphological import? Cuvier's view that it represents the *proc. spinosus* of other vertebræ was the doctrine generally accepted until about 10 years ago, when P. Albrecht advanced reasons for regarding it as a vestige of a vertebra ancestrally present between the atlas and the skull, but since suppressed. To this he attached the name *proatlas*. Albrecht's principal ground for this conception of the nature of the "pièce supérieure" appears to be the emergence of the first spinal nerve in front of the neural arch of the atlas, for which reason it is by some named suboccipital nerve, whereas all the other spinal nerves escape from the neural canal behind or through the neurapophysis of the vertebra to which they serially correspond. An approximately vertical plane laid through the point of emergence of a spinal nerve will divide the neurapophysis into an anterior part bearing the præzygapophysis, and a posterior portion supporting the postzygapophysis and the spinous process. The neurapophysis appears to have two roots, of which the posterior may be ligamentous, and the nerve passing out between these leaves the neural canal not, Albrecht says, intervertebrally as commonly taught, but vertebrally by piercing through the neurapophysis, which point of exit is morphologically intervertebrally situated. Now the vertebral complex called the atlas lies behind the first spinal nerve, and since the serial correspondence of the spinal nerves and vertebræ expressed in numerical order is not as 2 : 2 or 3 : 3, but as 2 : (2 − 1), or 3 : (3 − 1); or, to express the same circumstance another way, since the second and third spinal nerves correspond respectively to the vertebræ next in front of them, it follows that the first spinal or suboccipital nerve does not correspond to the atlas, but to a vertebra serially in advance of this. A vestige of such an anterior vertebra Albrecht discovers in Cuvier's *pièce supérieure*. This he regards as representing the neural arch of the ancestrally present, now suppressed, vertebra once interposed between the atlas and the occiput (31 *a*). This superior element was subsequently discovered by Albrecht in *Hatteria* (32). Dr. G. Baur has found it present in *Chameleo*, sp. (33). Prof. O. C. Marsh has observed its presence in *Morosaurus* and *Brontosaurus* (34). L. Dollo also has noticed it in *Iguanodon* (35). Its presence seems always associated with incomplete coalescence and synostosis of the two sides of the neural arch, and with the absence of a normal spinous process; and this is not without significance, for it hints that after all Cuvier's view respecting it may express the truth. The development of the "pièce supérieure" in two halves and its discontinuity from the atlantal neurapophyses are not irreconcilable with such

supposition, since instances of such plan of structure are common. Thus in Fish the spinous processes are built up by the apposition of a pair of flat styles primitively distinct, and this composite process is segmentally separate from the summit of the neural arch to which it is attached by the medium of soft tissue.

The Crocodilian atlas is not to be regarded as a degraded vertebra, but as one retaining the plan of construction common in the earliest reptiles and their progenitors. *Actinodon* needs but the addition of an internal ossification enclosing the axial part of the notochord to furnish a close parallel.

Remaining Cervical Vertebræ (Plate XVIII. fig. 2).—All behind the two foremost possess an upper and a lower transverse process, the former borne upon the arch, the latter upon the centrum. The former (*diapophysis*) is always longer than the lower, and projected outwards and downwards. Its root is in or slightly above the level of the neuro-central suture, and it is nearly equidistant from both ends of the centrum. The *parapophyses*, shorter and stouter, approach closely the anterior terminal surface of the centrum. In vertebræ closely following the *epistropheus*, the parapophyses occur at the junction of the lateral with the inferior surface of the centrum, thus augmenting the breadth of this. Between the parapophyses, anteriorly, the ventral surface is depressed, whilst posteriorly, in the same direction (transversely), the surface presents a low keel. Both terminal surfaces of the centrum have a roughly circular outline; the anterior is nearly plane, and the posterior is distinctly concave. As the trunk is approached the parapophysis ascends on the side of the centrum, and the diapophysis rises on the neural arch. The antero-posterior extent of the sutural attachment of the neurapophysis to the centrum nearly equals that of the latter. The spinous process is compressed, its outline square. The zygapophyses spread considerably, and the articular surfaces of the anterior have an upward slant.

Trunk Vertebræ (Plate XVIII. fig. 3).—In the front of the thoracic region of the vertebral column the parapophysis leaves the centrum, and the capitular costal facet appears on the anterior border of the upper transverse process, just external to the præzygapophysis, as in now living Crocodiles. The transverse process is long, it is directed nearly horizontally outwards, and it bears at its free extremity the costal tubercular joint. The figure of the centrum is cylindroid, its middle is constricted. Towards the loins the parapophysial or, as it may be preferably named, the capitular costal articulation moves outwards towards the free end of the transverse process, where it finally coalesces with the tubercular facet, both forming there one single costal articulation.

Sacrum (Plate XVIII. fig. 4).—There are two sacral vertebræ. These may be distinguished from all others by their greater massiveness, also by the stoutness and length of their transverse processes. These latter are composed (1) chiefly of an inferior element which ossifies independently of the centrum (with which it is united by a suture that long continues distinct), and in virtue of this claims to

rank as a rib; and (2) of a much smaller component which, descending from the neural arch upon the upper surface of the sacral rib, thins out on this, and ends at a short distance from the base of this. The long sacral ribs have a strong downward slant. Their distal end is dilated, thus increasing the extent of the iliac articulation. In a cross section through the middle of a sacral rib, the vertical exceeds the horizontal diameter. The rib of the first sacral vertebra is attached by a large base to the lateral surface of the centrum close to its anterior end, but it does not contribute any portion to the anterior, terminal, articular surface of the centrum. The neurapophysis encroaches slightly on this surface. The anterior terminal surface of the first and the posterior terminal surface of the second sacral vertebra are distinctly concave. Their dimensions exceed those of the applied surfaces of the vertebræ, which are nearly plane, with a slight central depression. The rib of the second sacral vertebra is attached to the side of the centrum nearly equidistantly between the two ends, and no part of the costal suture approaches either terminal surface of the centrum. The spinous processes are tall, their antero-posterior extent is less than in the thoracic vertebræ.

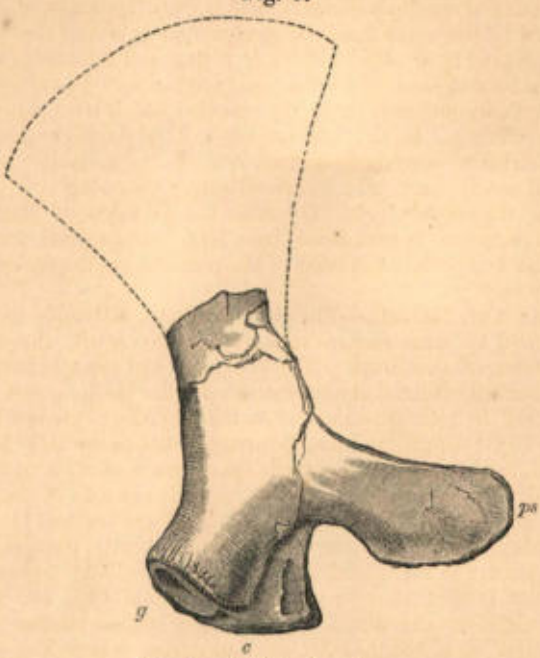
Caudal Vertebræ (Plate XVIII. fig. 5).—Their centrum is laterally compressed. The lower border of the posterior terminal surface is truncated by a double chevron facet. Their transverse process, present in the front part of the tail, ossifies independently of the centrum with which it is suturally connected, and thus is morphologically a rib.

Pectoral Girdle.

The series of remains bearing the Cat. No. 30 comprises both coracoids and the right humerus. Both scapulæ are preserved in series No. 31. Unfortunately no series contains both the coracoid and the scapula.

Scapula (fig. 1, p. 428).—Of the right only the ventral half is preserved. The left comprises the whole bone, but both its ends are defective. Together they give the form of the entire bone. This is broader, shorter, stouter, and flatter than the scapula in extant Crocodiles. The shaft is short and contracted. Above this narrow part the antero-posterior dimension rapidly augments, chiefly by the backward inclination of the posterior border. The outline of the dorsal extremity is an arc of a large circle. The ventral end is deeply indented by a notch which separates off a stout posterior part (*g c*) from a thin flattened process (*ps*), which in the articulated skeleton appears to have been directed downwards and forwards. This latter appears to correspond to the process termed *acromial* on the anterior border of the scapula in some Anomodonts, and it suggests the presence of a precoracoid element in these Mesosuchia, of which the Eusuchia do not retain any trace. The stout process (*g c*) is subdivided into:—(*g*) a posterior subcircular, smooth, hollowed portion, obviously the scapular component of the glenoid fossa; and

Fig. 1.

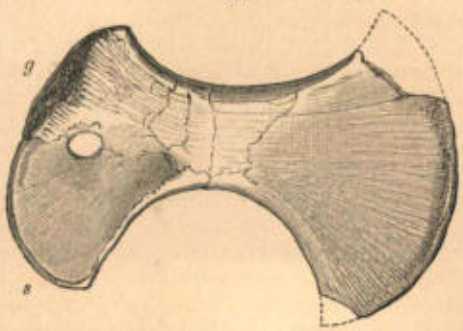


Scapula of *Metriorhynchus*.

g, glenoid articulation; *c*, coracoid border; *ps*, prescapular process.

N.B.—The dotted outline is copied from the other scapula of the same individual.

Fig. 2



Coracoid of *Metriorhynchus*.

g, glenoid portion; *s*, scapular border.

(*c*) an anterior compressed portion, of which the edge is rough and suggestive of synchondrosial junction with the coracoid. This is separated by the notch from the præscapular or acromial process.

Coracoid (fig. 2, p. 428).—This is a flattened bone with a contracted middle and expanded crescent-shaped ends. The sternal end is undivided; its outline is an arc the chord of which is 40 mm. in the right and 42 mm. in the left scapula. The dorsal or scapular extremity exhibits posteriorly a stout subtrihedral articular portion, the glenoid complement (*g*); and anteriorly a thin rough margin for union with the scapula (*s*). Opposite the junction of these two parts, the coracoid is perforated by a large submarginal foramen. The anterior and posterior borders of the coracoid are deeply concave, the former most so.

Humerus (Cat. No. 30).—The right humerus, although flattened and fractured by compression subsequently to death, shows very well the form of this bone. The proximal end bears a long oval articular surface, situated almost entirely behind the long axis of the shaft, convex in both directions from the dorsal or extensor to the ventral or flexor aspect, and also from the radial to the ulnar border. The radial border inclines forwards for a space of 22·5 mm., and beyond this it curves slightly inwards towards the axis of the bone, thus, by change of direction, forming a salient (deltoid?) crest; beyond this it passes in a nearly straight line nearly parallel to the posterior border to the distal end of the bone. The posterior or ulnar border is first concave near the proximal end, and thence nearly straight to the distal end. On the dorsal surface in its proximal half is a rough axial swelling, from which the surface declines towards the radial and ulnar borders. The ventral or under surface is sinuous, being gently convex in the direction of its long axis and concave in the preaxial portion, corresponding to the deltoid crest. The distal end shows the usual condylar division.

Dimensions.	millim.
Length	57
Proximal articular surface, long axis	16
„ „ „ short axis	7
From proximal end to deltoid angle	23
Breadth at deltoid angle	21
Breadth midway between angle and distal end	13
Breadth at distal end	14

Pelvic Girdle (the sacrum is already described).

Ilium (Plate XIX. figs. 1, 2).—This is a flat roughly quadrilateral bone. The acetabular hollow (*a*) is shallow; its upper limit is indistinct. Its lower border presents two synchondrosial surfaces separated by a low prominence. Of these, the posterior (*p.i*) is stout and trihedral; it projects at the junction of the inferior and the posterior border. The anterior of the two synchondrosial surfaces (*a.i*) is compressed and of oblong figure. Both articulated with the *ischium*, the posterior directly, the anterior doubtless by the interposition of

a cartilaginous band, as in extant Crocodilians. The posterior border of the *ilium* is short, and it is slightly encroached upon by the sutural pit for the attachment of the second sacral rib. The upper border widens anteriorly, and it ends in a short spur (*pa*) directed forwards. This overhangs the anterior border, which is long and straight. The median surface is indented, above, by two rough pits (*s*) for the attachment of the sacral ribs. The upper limits of these are slightly overhung by the inner lip of the upper border. Below these sutural impressions is a larger trihedral, relatively smooth area, corresponding to the acetabular hollow in the outer surface. No portion of the median surface lies above the level of the sacral articulations, a feature which sharply distinguishes the ilium of *Metriorhynchus* from that of *Steneosaurus*, and also from those of *Eusuchia*.

Ischium.—This is a large, flat, triangular bone. The median border (*m*), which met that of the other side as a ventral symphysis, and the posterior border are almost straight. The anterior border (*a*), shorter, has a concave outline. The anterior median angle is acute, the posterior is rounded off. The outer angle, bearing the coxal articulation, is the stoutest part. It is subdivided by a notch into (1) a wide oval posterior portion, and (2) a narrow anterior salient process, corresponding to the two divisions of the iliac component of the joint.

Os Pubis (Plate XX. fig. 6).—This bone is long, flat, spatulate or paddle-shaped, being very similar in form to that in extant Crocodiles.

The acetabulum in these Mesosuchia was composed, as in Eusuchia, by the *ilium* and *ischium* alone, to the exclusion of the *os pubis*, which presumably was connected only with the ischiatic process and the cartilage intercalated between this and the ilium.

The morphology of these three components of the pelvic girdle has occasioned almost as much discussion as that of the component parts of the atlas.

As an excellent summary of it has lately appeared in Bronn's Klassen, Rept. S. 53 u. f., by C. K. Hoffmann, and as now there is a general agreement that the ilium and the ischium in Crocodilia are respectively simply the equivalents of the bones so named in higher Vertebrates, it is unnecessary here to review the opinions which different writers have formerly expressed of the essential nature of these two bones. But the morphology of the part here named *pubis* requires consideration because very recently proof has been offered by Prof. H. G. Seeley that it cannot properly be identified with the os pubis of higher Vertebrata, and that it must be regarded as "a distinct element of the skeleton, which is connected with the pubic portion of what I (Prof. H. G. S.) term *ischio-pubic*[1] *bone* and is in the position of the *præ-pubic bone*" (37). Here Prof. H. G. Seeley apparently adopts Fürbringer's views respecting the dual composition of the bone, by most writers considered to be the ischium only. He also, in the paper from which the above quotation is taken, cites with approval Hoffmann's (*earlier*) interpretation of the pubis

[1] Italics are mine.—J. W. H.

as præpubis. Further, Prof. H. G. Seeley homologizes this præpubis with a bone having similar relations to the other elements of the pelvic girdle thought to be present in *Ornithosauria*. But C. K. Hoffmann has abandoned his earlier interpretation of the bone, and he, in a more recent publication, says that he now considers as *pubis* the bone which once he regarded as *præpubis* (36). Prof. H. G. Seeley finds that the bone commonly accepted as the Crocodilian pubis is much more slender, and it is much less expanded at the anterior end in all the species from the Lias and Lower Oolite rocks; and he refers to "some undescribed types in the collection of A. Leeds, Esq., in which it is reduced to a mere bony style without expansion at either end, comparable in form and substance to a lucifer match" (37).

It is manifest that the bone here described by Prof. H. G. Seeley in the above quotation cannot be identified with that bone which, from its constant association with the other pelvic bones, and from its close resemblance to the Eusuchian pubis, I have described and figured as the os pubis of these Peterborough Mesosuchians. Although I have some knowledge of Mr. Leeds's collection, I have not seen in it such pubic (*præbubic*, S.) bones with undilated ends; and Mr. Leeds assures me that he has not any such as those to which Prof. Seeley refers. The only bones in the collection at all corresponding to Prof. Seeley's description, I have ventured to interpret as the detached styliform atlantal riblets. R. Owen, referring to a Liassic Teleosaur preserved in the Whitby Museum, writes, "Both ischium and *pubis* are relatively more expanded than in the Gavial" (38).

In the Liassic Crocodilians, so far as these are known to me, the ossa pubis are similar in form, they have similar connections, and they are essentially identical with the ossa pubis of the Eusuchia. As regards the pelvic element in Ornithosauria, by some authors termed *præpubis*, with which Prof. H. G. Seeley (in this matter following Quenstedt) homologizes this Crocodilian bone, I have for some time had doubts of its existence as a separate, distinct element. In illustration of the view he adopts concerning it, Prof. Seeley reproduces Quenstedt's representation of the bones in question, as displayed in Quenstedt's plate of *Pterodactylus* (*Cycnorhamphus*) *suevicus* (39). But these parts are, I suggest, susceptible of another reading; the paddle- or fan-like bone as H. v. Meyer described it, with narrow short shaft and expanded opposite end, is not, I submit, a bone complete in itself, but merely the ventral symphysial portion of an *os pubis* constructed and associated with the other pelvic elements after the common Lacertilian plan. Quenstedt's figure represents the two paddle-like pieces detached from their connections, flatly extended, as he conceived their natural position beneath the abdomen, in advance of the acetabulum (43). My first suspicions of the inaccuracy of this arrangement were aroused by observing that in those figures of Pterodactyles given by H. v. Meyer in his 'Rept. a. d. lith. Schiefer,' in which both ossa pubis (*præpubis*) are displayed in side or oblique view, the right or left bone (as the case

may be) lies in a deeper plane in the slab of rock, it is more distant from the observer, as would naturally occur were the surfaces, and not the median edges only, inclined towards each other. Taf. i. fig. 2., Taf. iv. fig. 5 show this point. This hint receives confirmation from Zittel's very instructive plate of a specimen of *Pterodactylus suevicus* from Nusplingen (42). In this is displayed the left half of the pelvic girdle (seen in side view), showing the three pelvic bones still maintaining their normal relations, all contributing to form the acetabulum. The ilium and ischium are apparently entire, but the os pubis, in form of a narrow bar, ends abruptly, as if by fracture, at a short distance below the acetabulum. In front of the pubic piece is seen a paddle-like or fan-like piece, which is obviously the part regarded by some authors as *præpubis*. The close proximity of this to the part denoted to be pubis by its relation to the acetabulum and the correspondence of its stalk-like end to the apparently fractured end of this suggest that the paddle-like piece originally formed part of the pubic bone. The probability of this view finds strong confirmation in H. v. Meyer's figure of *Pterodactylus micronyx* (*op. cit.* Taf. iv. fig. 5), in which the two portions of the os pubis, as I incline to regard them, are shown in their normal connection, a slight apparent break of continuity in the pubic bar marking the point where the paddle-like portion usually becomes detached. Why should the separation of the two parts of the os pubis so commonly occur at this point? The form of the pubis in *Rhamphorhynchus* may elucidate this. The os pubis in this genus has the form of a flattened bar bent angularly near its middle; one limb of it passes from the acetabulum downwards and forwards in an approximately vertical plane, roughly parallel to that laid through the median axial plane of the pelvis; whilst the other limb, passing transversely to this axis, meets the corresponding limb of the os pubis of the other side, and unites with it in a median symphysis (42). It is manifest that such an angular bend in the direction of its long axis would be a weak point in the construction of the pubic bar, and would favour its fracture at this point, under stresses acting in any other direction than perpendicular to the plane which contains both the limbs.

In *Dimorphodon*, another genus, the evidence as yet available is not opposed to the idea that its pubis is constructed on a similar plan to that of *Rhamphorhynchus*, only the large foramen present in this latter between the pubis and the ischium is in *Dimorphodon* reduced to a narrow cleft. The larger of the two bones, marked 64 in R. Owen's figure of *Dimorphodon*, and identified by him as pubis (præpubis), may with probability be regarded as the right pubis detached from its normal connections and displaced, the left pubis lying in advance of the ischium, from which it is separated by a very narrow interval.

If, then, in Ornithosauria the bone frequently termed the præpubis is not such but only a detached part of a pubis of a common Lacertilian plan, no corroboration can be found in it that the Crocodilian bone in question is a præpubis.

The principal stumbling-block to the acceptance of the anterior of the two ventral bars in the Crocodilian pelvis as *os pubis* would seem to be its exclusion from the acetabulum. Should this constitute an insuperable difficulty? The *os pubis* is notably the more variable of the three components of the pelvic girdle. Its ossification is a later phylitic event than that of the ilium and ischium. Not to refer to Labyrinthodonts, in which fuller information about the pelvic girdle is still wanting, it is well known that in some extant Amphibia—for instance, in *Cryptobranchus japonicus* and in *Salamandra maculata*—the ischium is well ossified, whilst the pubis is still cartilaginous. This is so too in *Rana esculenta*; and in *Dactylethra capensis* the osseous pubis is a small disk surrounded by cartilage, whereas the ischium is perfectly ossified. Even in higher Vertebrates differences in the degree of development of the *os pubis* occur, and this in nearly allied forms. Thus in the genus *Lepus*, in *L. timidus* the pubis enters into the formation of the acetabulum; but not in *L. cuniculus*, in which, by dominant growth of the ilium and ischium, the pubis is excluded from the acetabular cavity. Its exclusion from this may also result from the great development of a distinct ossicle ("*os acetabulare*"), which may become so large as not to leave space for the pubis in the acetabulum. Of this, *Talpa europæa* supplies an instance. Even in *Homo* an approach to this is exceptionally to be found. Thus, in the Osteological section of the Museum of the Royal College of Surgeons there is a skeleton of a youth (Cat. No. 54 *a*, Ost. Series) in which both acetabula contain, each, a large distinct ossicle of this kind, by which the area normally occupied by the *os pubis* is much reduced, the areas contributed by the ilium and ischium being much less encroached upon. Here we, as it were, seize the pubis in process of being excluded. Does its exclusion vitiate its claim to pubis? I submit that it has not this force; and, further, that the corresponding bone in Crocodilia, notwithstanding that it has no share in the acetabulum, is also pubis; and this identification is in harmony with the fact that in the embryo it forms with the ilium and ischium one continuous piece of cartilage.

Steneosaurus.

Vertebral Column.—The plan of this in *Steneosaurus* being the same as in *Metriorhynchus*, those details only will be noticed at length in which they differ.

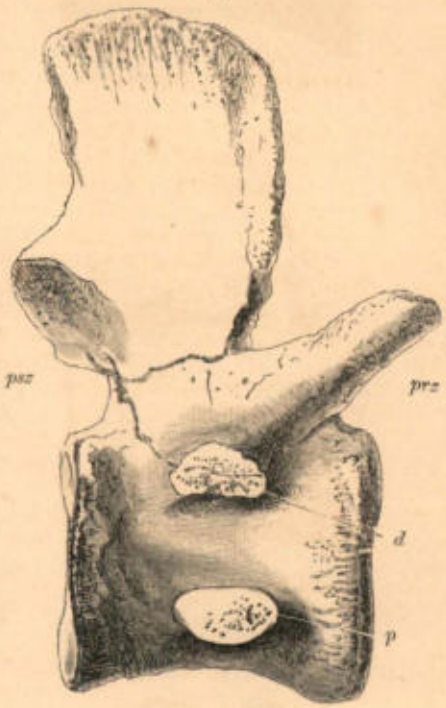
Atlas.—The same elements similarly combined and without evident formal differences are present. In aged individuals they synostose, and the *pars odontoidea* synostoses with the epistropheus.

Epistropheus (Plate XVIII. fig. 6).—Reduction of its diapophysis, the flatness of the lateral and the inferior surface of its centrum, and the absence from this latter of the low keel or ridge, are the most obvious differences.

In vertebræ referable to the front of the neck behind the epistropheus (fig. 3, p. 434), in which the parapophysis is placed very low, the figure of the centrum nearly resembles that of the epistropheus.

With the ascent of the parapophysis on the lateral surface of the centrum, the ventral surface of this becomes narrowed and a low keel arises here at its middle. The terminal surfaces of the centrum have a subcircular outline. In vertebræ referred to the anterior region of the thorax, the centrum assumes a cylindroid form. In a few, in which the parapophysis is passing off the centrum on to the neural arch, the antero-posterior dimension of the centrum is slightly less than in the neck, and in the succeeding vertebræ in the posterior part of the trunk. In these last the centrum is nearly cylindric, contracted at

Fig. 3.



Cervical vertebræ of *Steneosaurus*.

its middle, and dilated at both its ends (fig. 4, p. 435). In the anterior caudal vertebræ the centrum is laterally slightly compressed, its ventral aspect cylindroid. The transverse process in these vertebræ is suturally attached in the level of the neuro-central suture, the sutural impression being shared by the centrum and the neurapophysis. In vertebræ deemed by their smaller size to be situated posteriorly to the above, the centrum is much more compressed laterally, which, with the flatness of the under surface, gives the centrum a parallelopipedal figure (fig. 5, p. 435). In these vertebræ the

transverse processes are dwarfing, and they are borne wholly on the neurapophysis distinctly above the neural suture; no trace of sutural attachment of the transverse process is here discernible, and the process appears to be an outgrowth from the arch. Vertebræ posterior to the above are devoid of the transverse process; their centrum retains the flattened angular form, their spinous process is more compressed, and its antero-posterior dimension is relatively greater than in the corresponding vertebræ of *Metriorhynchus*.

Sacrum.—The two sacral vertebræ differ so much from those of *Metriorhynchus* that they require detailed notice.

1st Sacral (fig. 6, p. 435). The centrum has a subcylindric shape. In its anterior half the transverse horizontal dimension is enlarged by the attachment of the transverse process. The anterior terminal surface has an obtusely elliptic outline, of which the longer diameter is horizontal. Its surface is distinctly concave in the horizontal and nearly plane in the vertical direction. The lateral lip and the adjoining part of this surface is contributed by the root of the stout transverse process, and between the upper limit of this and that part of the circumference which bounds the neural canal the lip of this surface is formed by the neurapophysis. The transverse process consists (1) of a large, stout piece of rudely trihedral, slightly fluted cross section, directed nearly horizontally outwards. This is suturally attached to the entire height of the side of the centrum in the anterior half of this latter. Upon the upper surface of this part of the process there descends from the neurapophysis a minor, thin, splint-like part which ends with a serrated margin at a little distance from the arch. The posterior surface of the centrum is nearly circular in outline and nearly plane.

2nd Sacral vertebra. Its sacrum is cylindroid. The anterior face is nearly plane, its outline circular. The posterior face is larger; its outline is less elliptic and more nearly circular than is the anterior face of the 1st sacral vertebra. It is nearly plane in the vertical and distinctly concave in the horizontal direction. Its transverse process is suturally attached to the whole vertical extent of the lateral surface of the centrum. This attachment is separated by an interval from both ends of the latter, the terminal surfaces being formed of centrum only. The structural plane of the transverse process resembles that of the 1st sacral vertebra. Thus the sacral transverse processes rank in respect of their chief component element as ribs, so agreeing with those of *Metriorhynchus*; and this remark applies also to the transverse processes of the anterior caudal vertebra.

Compared with that of *Metriorhynchus*, the sacrum in *Steneosaurus* differs notably in the more nearly horizontal direction of the transverse processes, which are also stouter and relatively shorter The concavity of the anterior face of the first, and that of the posterior face of the centrum of the second, sacral vertebra is less than that of the same faces in *Metriorhynchus*, and the composition of these faces is also different.

(No part of the pectoral girdle or fore limb has been yet procured by Mr. Leeds.)

Pelvic Girdle.

Ilium (Plate XIX. figs. 3, 4).—A flat, rudely rhombic bone, the longer diameter of which is directed obliquely upwards and backwards. The acute antero-inferior angle is truncated by an oblong surface (*a.i*), to which was attached the cartilage that connected it with the anterior ischiatic process. The supero-anterior angle projects forwards as a sharp spur (*pa*). The anterior border is stout, the posterior thin. The upper border is rough and narrow, it widens as the spur is neared. The acetabulum (*a*) is wide and shallow, its postero-inferior angle (*p.i*) is the stoutest part of the whole bone. The median surface is strongly impressed by the sutural attachments of the ends of the sacral ribs (*s, s*). These impressions do not, as in *Metriorhynchus*, rise to the level of the upper border, but they are separated from this by a relatively wide, smooth surface comprising an area of nearly $\frac{1}{3}$ of the whole extent of this surface.

Ischium (Plate XIX. fig. 5).—This resembles very closely that of *Metriorhynchus*, from which it differs slightly by the rather greater excess of its antero-posterior over its transverse dimension.

Os Pubis (Plate XIX. fig. 6).—A paddle-like bone having a long, slender, cylindroid shaft, and a flat dilated ventral extremity. The anterior border is slightly concave, the posterior or inner border still more so. The anterior, abdominal end is thin, and its outline curves outwards and backwards. The pubis is more slender in general form than that of *Metriorhynchus*.

Dimensions.

Ilium (left). (No. 2 Leeds's Cat.)

	millim.
Length, upper border	51
,, including spine	78
,, anterior border	53
,, posterior border	57
,, inferior border	57
Longer diameter	87

Ischium. (No. 2 Leeds's Cat.)

	millim.
Length of median border	102
Chord of anterior border	70
,, of external border	100
Longer diameter of acetabular hollow	27

Os Pubis.

	millim.
Length	111
Breadth of ischiatic end	·20
Maximum thickness of ischiatic end	7·5
Appropriate breadth of abdominal end	40

Femur (right).—This presents the usual *f*-curve of the Crocodilian

plan. Its length, measured in a straight line, is 248 millim. The proximal articular surface is convex, subtrigonal, borne directly without neck on the proximal end of the bone. The base of the trigone is dorsad, the apex ventrad. The antero-posterior chord is 41 millim., the dorso-ventrad chord is 271 millim., the sagitta is about 2·5 millim. The tuberculum majus and t. minor are more feebly developed. A low, indistinct trochanter is situated on the ventral surface, at about 60 millim. from the proximal end. The distal end presents the usual condylar form.

Tibia (right).—Its length is 113 millim. The proximal end is stout. It is obscurely divided into two areas—(1) a narrower, corresponding to the inner femoral condyle, and (2) a wider, outer or posterior area, answering to the outer femoral condyle, the outer border of which is slightly emarginate, as if for the fibula. The distal end is set obliquely on the shaft, so that its postero-external angle is in a lower level than the antero-internal angle. Its articular surface is narrow, of rhomboidal outline, with shallow trochlear groove. The lengths of the tibia and femur are as 113 : 248, so that the tibia relatively to the femur is much shorter than in Eusuchia.

Integumental Armour.

The collection does not contain, I believe, any scutes which, by associated interment, can claim to belong to *Metriorhynchus*; but it includes some fine examples which were found buried with bones of *Steneosaurus*. The largest and best preserved of these scutes are of oblong figure, with rounded-off angles. A low keel divides their outer surface into two unequal areas, of which the wider is 44 millim., the narrower 18 millim. across. In a second specimen, these dimensions are 42 millim. and 17 millim. The larger area is quadrilateral. It is indented with a pattern of lines and long pits which radiate from the highest point of the keel, diminish as they recede from this, and cease near the border of the scute. The anterior border is thin, and a submarginal tract of the surface within it is smooth, unornamented, and plainly articular, being, where in undisturbed natural position, overlaid by the posterior border of the scute next in front of it. The lesser one is crescentic, quite smooth, and it was doubtless overlaid by the applied border of the adjoining scute. The smooth submarginal band of the larger area and the crescentic lesser area meet in a tongue-like projection, in which the keel runs out anteriorly. This tongue, when the scutes are articulated, is received in a corresponding hollow in the deep surface of the scute next in front. The whole of the deep surface is smooth, its grain radiates from a point beneath the highest part of the keel, where the scute is thickest.

In their form and in their plan these scutes correspond so closely to those placed in single series along each side of the dorsal middle line of the trunk in D'Alton and Burmeister's figure of the '*Gavial of Boll*,' that there cannot be any doubt of their having also occupied

this position, and formed a buckler covering the back from the neck to the tail, as in *Teleosaurus temporalis*, with which E. E. Deslongchamps identifies the above-mentioned 'Gavial.' Whilst their imbricated arrangement permitted some gliding of the scutes on one another, and thus gave some degree of flexibility to the trunk, the tongue-like processes must have imparted great security when the limits of this mobility were approached. In their form and in the position of their tongue these scutes differ from those of the Purbeck Wealden *Goniopholis*. From those of the Wealden *Bernissartia* they differ in having one and not a double keel, and in having a tongue, which the scutes of *Bernissartia* want.

The skeletons of these Peterborough Mesosuchians, so far as their plan is illustrated by their remains in the Leeds Collection, differ from those of the Eusuchia (1) in the amphicœlous character of all their vertebræ except the two foremost and the two sacral; (2) in the absence of the largely developed carina which so strongly characterizes the cervical vertebræ in Eusuchia; (3) their atlas differs in possessing a diapophysis placed on its pleurapophysis; (4) their epistropheus differs in having a well-developed diapophysis in the level of its neuro-central suture, and a parapophysis on its centrum.

In *Gavialis gangeticus* I find the capitular and the tubercular costal articulations both placed wholly on the *pars odontoidea* and the second cervical riblet to articulate exclusively with this. In *G. gangeticus*, *Crocodilus niloticus*, and in *Alligator mississippiensis* I do not find any trace of a diapophysis on the atlantal neurapophysis. In *C. niloticus* the capitulum of the second rib rests wholly on the *pars odont.*; and the tuberculum costæ is borne chiefly on this, but to a very small extent also on the centrum of the epistropheus. In another example of this Crocodile the capit. and the tuberc. costæ are both wholly borne on the *pars odont.* In *C. americanus* the second rib articulates wholly with the *pars odont.* In *Alligator lucius* I find the *capit. costæ* resting on the *pars odont.*, and the *tuberc. costæ* articulating with a rudimentary diapophysis situated on the neural arch of the epistropheus just above the neuro-central suture. The plan of the articulation of the second rib is plainly subject to variation in individuals of the same genus and even species. Dr. G. Baur, in an example of *Gavialis gangeticus* examined by him, found the capitulum only of the second rib articulating with the *pars odont.*; and a minute diapophysis on the neural arch of the epistropheus, with which the tubercle of the rib was probably connected by ligament. Dr. Baur also found in *Alligator mississippiensis* the *capit. costæ* articulating chiefly with the *pars odont.* and by a minute facet with the true centrum of the epistropheus. In *Croc. americanus*, Schneid., Baur also found the *capit. costæ* articulating with the *pars odont.*; and the *tuberc. costæ* touching the neurapophysis of the epistropheus, but without articular facet on this latter (43). These discrepancies and those observed by Koken (44) make it very desirable that these details should be examined in larger numbers of individuals of the same species. So far as the

limited material accessible to me shows, the plan of connection of the second rib in *Allig. lucius* approaches that in these Mesosuchia more closely than does that in *Crocodilus* and *Gavialis*. This I had not expected, and, in association with it, it should be remarked that in *Alligator*, as was noticed by D'Alton and Burmeister (45), the division of the vertebral end of the rib is better marked than it is in *Crocodilus* and *Gavialis*.

The structural differences of the sacral vertebræ in the two *Mesosuchian* genera which form the subject of this paper have been already described; it remains to compare their plan with that occurring in the *Eusuchia*. In *Steneosaurus*, as also in *Gavialis*, *Crocodilus*, and *Alligator*, the anterior terminal surface of the first sacral vertebra, whilst principally composed of the true centrum, receives a considerable lateral accession from the root of the sacral rib, and a smaller complement from the neurapophysis. In *Gavialis*, *Crocodilus*, and *Alligator*, the posterior terminal surface of the second sacral vertebra also receives a large lateral accession from the root of the second rib, and in *Alligator* also a small complement from the neurapophysis; but in *Steneosaurus* and in *Metriorhynchus* (as illustrated by these remains) no part of the posterior surface of the second sacral vertebra is contributed by the rib. In *Metriorhynchus* the rib does not contribute any part of the anterior terminal surface of the first sacral vertebra; and the accession to this surface from the neurapophysis is minute and inconstant. In *Steneosaurus* the accession to the posterior terminal surface from the neurapophysis is also a vanishing quantity.

Thus in the plan of the sacral vertebræ there is a close agreement between that in *Steneosaurus* and in the *Eusuchia* mentioned which is not observed in *Metriorhynchus*. In *Steneosaurus* the plan of the sacral ribs also is very similar to that in *Eusuchia*, whilst in *Metriorhynchus* there are obvious differences, notably their greater length and slenderness, and their pronounced downward bend.

The near resemblance in several skeletal details between these Mesosuchia and *Alligator*, to which attention has been called, and the very near resemblance of the dermal armour to that of *Jacare* is interesting as suggesting that the Alligatoridæ may not have descended through the Gavials and Crocodiles; that these three genera may not represent successive phases of evolution, but rather three distinct lines of descent. This is not the generally accepted view, and it appears not to accord with the supposed first appearance of the three genera in time.

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Since writing the above, my attention was lately most kindly called to some remains of *Geosaurus* in the Nat. Hist. Mus., Cromwell Road, by Mr. Lydekker, who at the same time pointed out to me such close structural correspondences between these and certain Metriorhynchian remains from the Oxford Clay, collected by Mr. Leeds, identical with those here described, as are suggestive of a very near affinity between these Saurians.

Oct. 27, 1888.

EXPLANATION OF THE PLATES.

Plate XVIII.

Metriorhynchus.

Fig. 1. Side view of synostosed atlas and epistropheus (axis). *d'*, diapophysis of axis; *d*, diapophysis of atlas.
2. Anterior view of a cervical vertebra. *d*, diapophysis; *p*, parapophysis; *prz*, prezyapophysis; *psz*, postzygapophysis.
3. Anterior view of trunk vertebra.
4. Posterior view of second sacral vertebræ.
5. Caudal vertebra.

Steneosaurus.

6. Side view of epistropheus.

Plate XIX.

Metriorhynchus.

Fig. 1. Ilium; left, outer view. *pa*, preacetabular process; *a.i*, anterior ischiatic process; *p.i*, posterior ischiatic process; *s*, *s*, sacral impressions; *u*, upper border; *a*, acetabular hollow.
2. Inner view of same bone.

Steneosaurus.

3. Ilium; left, outer view. Lettering as in figs. 1 and 2.
4. Inner view of same bone.
5. Ischium. *a*, anterior border; *m*, mesial symphysial border.
6. Os pubis.

2. On the Small Mammals of Duval County, South Texas.

By OLDFIELD THOMAS.

[Received July 25, 1888.]

Mr. William Taylor, a resident of San Diego[1], the capital of Duval County, South Texas, has for many years past occupied himself in the useful task of studying and collecting the small mammals of that county, transmitting the specimens obtained to the British Museum, and at the same time making many valuable observations on the habits of the different species. These observations are embodied in the notes attached to the names of the several species below, and distinguished by having Mr. Taylor's initials appended to them.

Considering our ignorance of the variation and exact distribution of most small mammals, the value of such work as Mr. Taylor's cannot be exaggerated, and it is to be hoped that he will continue his observations, and, perhaps, extend his area of research into neighbouring counties, and even into North-western Mexico, where he has already made some preliminary expeditions. Mr. Taylor has been successful in discovering one new species, a diminutive Vesper-Mouse, besides adding no less than six species to our National Collection of Mammalia, a result for which Mammalogists in this country have every reason to be grateful. In all, of Insectivora, Chiroptera, and Rodentia, Mr. Taylor has obtained examples of seventeen species within the limits of Duval County, a number that would no doubt have been largely augmented had not his attention been mainly concentrated on the most difficult, and therefore the most important, group of all, that of the rats, mice, and other Myomorpha.

INSECTIVORA.

1. SCALOPS AQUATICUS, L.

a. ♀, 4/86.

Head and body 107 millim., tail 29, hind foot 14·5, head 40, tip of muzzle to eye 17·6.

"Is common throughout the county. Although blind it is very cunning, and it is the only animal I have had in confinement that found out the way to lift the fastening of the cage-door and escape."—W. T.

2. SOREX (SOREX) PERSONATUS, Geoffr. (?).

a. ♂.

Head and body 49 millim., tail 36, hind foot 10·5, ear 3·1.

I am not fully satisfied as to the determination of this specimen, but the dimensions agree so closely with those of *S. personatus* that I hesitate to distinguish it without seeing a larger series.

[1] About 98° 25' W. and 27° 50' N.

3. Sorex (Notiosorex) crawfordi, Baird; Coues, Bull. U. S. Geol. Surv. iii. p. 651 (1877).

a–e. In al., ♂ ♀.
f. Skin and skull.

	Head and body.	Tail.	Hind foot.	Ear.
a. ♂	59	28	9·9	4·0
b. ♀	60	26·5	10·0	4·4
c. Imm.....	50	30	10·0	4·0

"Lives rather an exposed life and is generally found in heaps of rubbish and old piles of firewood."—W. T.

4. Blarina (Soriciscus) berlandieri, Baird, Mamm. N. A. p. 53 (1859).

a–c. In al.

	Head and body.	Tail.	Hind foot.
a. ♂	59	20	10·0
b. ♂	54	16	10·0
c. ♀	59	20	10·1

Chiroptera.

5. Vesperugo georgianus, F. Cuv.

a. ♂. Forearm 33 millim.
"Rare; only occasionally found, and then in pairs."—W. T.

6. Atalapha noveboracensis, Erxl.

a. ♂. Forearm 38 millim.
"Fairly common. Lives mostly in and about trees."—W. T.

7. Nyctinomus brasiliensis, Geoffr.

a. ♂. Forearm 43 millim.
"Infests the houses."—W. T.

Rodentia.

8. Spermophilus spilosoma, Benn.

a. ♀.
Head and body 155 millim., tail 69, hind foot 30, forearm and hand 42, head 42·5, ear 3. Mammæ 10.

9. Neotoma floridana, Ord.

a. Yg. al., ♂.
"Is the largest of the Cricetinæ here. They are called 'house builders' by the Mexicans. Their houses are large holes in the ground covered over with a heap of dry sticks, cactus-leaves, pieces of bark, &c. Their underground rooms are extensive, and have rude grass nests in the corners of them. The species varies a good

deal in colour, especially in the underparts not being very white at times and the line of demarcation being very indistinct. They are sometimes ten inches long, and weigh one pound."—W. T.

10. Sigmodon hispidus, Say & Ord.

"A family."

a–c. ♂ ♀ and yg., 4/86.

	Head and body.	Tail.	Hind foot.	Forearm and hand.	Ear.
♂	128	111	28·8	34	14
♀	132	112	28·5	36	16

Mammæ 2—2=8.

"This species is very common here, and one may see their rude nests at the foot of bushes everywhere. Besides these nests they make a good many burrows. They are sometimes gregarious, as I have seen fourteen killed at one place. They often have five young. They are very fierce and bite severely."—W. T.

11. Cricetus[1] (Onychomys) leucogaster, Wied.

a. ♂ ad., 4/86.
b. ♀ sk.
c. ♂ skull.

	Head and body.	Tail.	Hind foot.	Forearm and hand.	Ear.
a. ♂	114	54	23·8	31·5	13·5

The present is the most southerly locality that has been yet recorded for this species. The specimens differ from the ordinary northern ones in their slender feet and less densely pilous soles, but do not appear to be specifically or even varietally separable.

12. Cricetus (Vesperimus) leucopus, Raf.

a–e. ♂ ♀, 12/85 and 4/86.

	Head and body.	Tail.	Hind foot.	Forearm and hand.	Ear.	Heel to front of last foot-pad.
a. ♀	81	68	19·3	23·4	13·3	8·8
b. ♂	81	76	21	25·3	13·4	9·9
c. ♀	92	82·5	21·3	25·5	14	10·4
d. ♀	81	77	20·5	24·8	13	10·0

"This species is abundant in the neighbourhood. It varies greatly in colour, from whitish grey to the colour of old mahogany; but the colours of the underparts and feet are constant. The lightest specimens I have seen were caught in December. Its weight is about three times that of *C. taylori*."—W. T.

[1] My reasons for using this name instead of "*Hesperomys*" have been fully explained, P. Z. S. 1888, p. 133.

13. CRICETUS (VESPERIMUS) TAYLORI, Thos. Ann. Mag. N. H. (5) xix. p. 66 (1887).

a. Skin and skull, ♂, 24/11/86. *Type*.
b. Skin and skull, ♀, 2/87.
c–n. In al., ♂ ♀.

	Head and body.	Tail.	Hind foot.	Forearm and hand.	Ear.	Head.	Heel to front of last foot-pad.
c. ♂	60	40	12·8	15·5	7·6×8·2	20·5	5·5
b. ♂	60	—	13·0	15·8	8·3×8·3	20	5·6
c. ♀	67	44	13·4	17·0	8·0×8·2	21	5·8
d. ♀	68	43	13·2	16·7	7·5×8·5	21	5·4

Skull (♀):—Basal length 15·7 millim., greatest breadth 10·3; nasals, length 7·1; interorbital breadth 3·5; interparietal, length 2·1, breadth 4·8; palate, length 9·2, breath outside m.^{1} 4·0, inside m.^{1} 2·3; anterior palatine foramen, length 3·7; upper molar series, length 3·1.

Since my original description of this species was published, Mr. Taylor has sent home many well-preserved specimens of it in spirit, and I am therefore able to draw up a more complete description of this diminutive Vesper-Mouse.

Size very small; general appearance very like that of *Mus musculus*. Whole of upper surface grizzled brownish grey, exactly of the tone of the common house-mouse. Ears small, evenly rounded, about as broad as long; laid forward (in spirit-specimens) they reach to the posterior canthus of the eye; their anterior margin without any marked central projection; their surface very thinly clothed with minute greyish hairs. Chin white; throat, chest, and sides of belly greyish white, the hairs slaty grey basally, white terminally; centre of belly, in all the fourteen specimens examined, with a narrow pure white patch running from the sternum to the anus. Arms and legs like body; hands and feet white or greyish, thinly haired; palms and soles naked, the former with five, the latter with six small but prominent pads; fifth hind toe, without claw, reaching to the middle of the first phalanx of the fourth. Tail short, barely as long as the body without the head, thinly haired, brown above and white below; its scales very fine, the rings averaging from 25 to 30 to the centimetre. Mammæ 0—2=4.

Skull in its general shape and proportions curiously similar to that of a miniature *Mus musculus*, especially as its interorbital region has precisely the smooth upper surface and evenly divergent, square, but unbeaded, supraorbital edges so characteristic of that species. Interparietal very small. Outer wall of infraorbital foramen without an anterior projecting plate. Anterior palatine foramen extending nearly to the level of the middle of m.^{1}

Teeth as usual in the subgenus *Vesperimus*.

No detailed comparison is needed of this little mouse with its nearest allies, as it is at once distinguished from all by its diminutive size, its *Mus musculus*-like colour and shape of skull, and its small number of mammæ.

"These mice live in single families in well-sheltered places in woods and fields. They build neat nests of fine curly grass, corn, silk, or any soft substance they can find. They also build little houses of refuge away from the main dwelling. Their nests are firm and elastic, very unlike the rude nests of *Sigmodon hispidus*. If other mice live in the same place, they watch till the others disappear, then suddenly steal part of the other nest and run to their own with it. They again return slowly and repeat the same quick theft. They are somewhat like shrews in their movements. They creep under anything that is in their way, instead of bounding over it like *Cricetus leucopus* and *Ochetodon mexicanus*. They are very industrious, making many streets and alleys, and clearing off any obstructions that may get on to them. They do not like to eat in exposed places. They hardly ever try to bite when handled, and can hardly draw blood when they do bite, their jaws are so weak. The female has generally two, but sometimes three young at a time. This is remarkable, as many of the allied species have often five young ones at a time.

"Besides the females with young that I caught in different localities, I had three sets born in confinement, in a small box. They are bluish black before the hair begins to grow, which takes place at about five days after birth, and then they are sooty black. When danger is near the mother runs off carrying one in her mouth, like a cat, and not only the mother, but the male also takes one in his mouth, though somewhat awkwardly, and carries it to a safe place. When eight days old they have a fair covering of hair and take notice of what is going on. When twelve days old one of them ran away to protect itself, and commenced to wash its face like the old ones when perplexed. After the first week of their life, when danger is near, the mother gives them a sign to catch on to the teats, which they do, then she runs off, even jumps, with them both dangling behind her like the tender of a locomotive, and I never saw one fall off. When twenty days old each weighs 45 grains, they begin to eat, and assume the appearance of the grown ones except that they are much darker in colour. When one month old they are weaned, nearly half-grown, and foraging for themselves. In twenty days after the same female had another set of young. Full-grown *C. taylori* weighs 150 grains, about one third of an ounce. Their voice is a sharp squeak, very different from the yelping noise of *Cricetodipus flavus*."—W. T.

14. Ochetodon mexicanus, De Sauss.

a–g. ♂ ♀, 3/86.

	Head and body.	Tail.	Hind foot.	Forearm and hand.	Ear.
a. ♂	66	90	19·2	22	10·5
b. ♂	66	92	19·1	21·3	11·0
c. ♂	62	90	18·7	21	10·5
d. ♀	62	97	18·1	21	10·7

Mammæ 1—2=6.

"This species is rare in Duval County, and I have not seen more than one pair in one place; they build very comfortable nests of grass lined with feathers, cotton, or wool; these nests are very firmly put together, and look like those of some birds except that they have two openings; they are easily seen placed high on the top of some prickly cactus, or on a branch of some smooth tree or bush, where skunks and weasels seldom try to climb. I had a few of them in confinement, but they did not breed. They are the most active animals I ever saw—monkeys are slow compared with them; they can jump from the wires on one side of the cage, turning as they spring, and catch on the other side again and again, as fast as one can count. They vary greatly in colour, independently of season or locality, being sometimes as bright as *Cricetodipus flavus* and sometimes as sombre as *Mus musculus*."—W. T.

15. Dipodomys agilis compactus, True[1].

a. Ad. al., ♀.
b. Skull and dried foot.

	Head and body.	Tail.	Hind foot.	Forearm and hand.	Ear.
a.	98	122	33[2]	27	10·1

Mammæ 1—2=6.

Skull—Basal length 26 millim; greatest length from tip of nasals to back of bullæ 36·4; greatest breadth (across bullæ) 22·1; nasals, length 13·5; interorbital breadth 13; interparietal, length 3·0, breadth 2·6; greatest diameter (oblique) of bullæ 14·4; palate, length 16; diastema 8·5.

These specimens appear to represent a race of *D. agilis* so decidedly smaller than the typical form as to merit subspecific distinction, especially as the reduction in size is correlated with a decided difference in the relative development of the bullæ.

As to the difference in size, Mr. True[3] has given a table of the measurements of all the alcoholic specimens of *Dipodomys* preserved in the United States National Museum. In this table only one of the eleven five-toed specimens has a hind foot measuring less than 39 millim., and this one, No. 2621, comes from Coahuila, Mexico, and therefore probably belongs to the present subspecies. All the other specimens have hind feet ranging from 39 to 45 millim. in length, including the claws.

[1] The above account was in type when I received Mr. F. W. True's "Description of *Dipodomys compactus*, a new species of Rodent from Padre Island, Texas" (P. U. S. Nat. Mus. xi. p. 159, 1888). The form described by Mr. True and that obtained by Mr. Taylor are, no doubt, the same, although no mention of the skull-characters is made by the former.

[2] With claw, 35. The dried foot of specimen *b* measures 31 millim. without and 33 with its longest claw.

[3] P. U. S. Nat. Mus. ix. p. 411 (1886). In this admirable paper the distinction in the number of toes between *D. phillipsi* and *D. agilis* is first pointed out, and useful series of measurements and localities are given for both forms.

In the skull the most marked difference, apart from its smaller size, is in the lesser development of the bullæ, and the consequent increase of the space between them, as specially marked by the much greater breadth of the interparietal bones. These latter are very nearly as broad as long, while in all the specimens of *D. agilis* that I have seen their length is at least double and is often three times their breadth. The muzzle also is rather shorter and slenderer, the front edge of the anterior zygoma-root starts out from it at a sharper angle, and the supraorbital margins are much more nearly parallel to one another, and less divergent posteriorly, than they are in *D. agilis*.

In all these characters, both cranial and external, *D. agilis compactus* seems to stand on one side of *D. agilis typicus* exactly where *D. deserti*, Stephens [1], does on the other, for just as *D. compactus* is distinguished by its smaller size, smaller bullæ, and broader interparietal, so is *D. deserti* distinguished by its larger size, larger bullæ, and narrower interparietal; the three forms apparently therefore represent three stages in one single series of development.

16. PEROGNATHUS FASCIATUS, Wied.

a–j. ♂ ♀, 12/85 and 4/86.

	Head and body.	Tail.	Hind foot.	Forearm and hand.	Ear.
a. ♂	96	98	22·2	26·5	6·3
b. ♂	99	97	23	26·5	7·0
c. ♂	90	90	22·7	26·6	6·1
d. ♀	107	104	24·4	29	6·6
e. ♀	99	99	22·9	27	6·5
f. ♀	101	99	23·5	27	6·5

Mammæ 1—2=6.

"These pocket-mice are found all over the county, but individuals are scarce. They remain in their burrows during winter, but live a rather exposed life when grass and weeds cover the ground. They are strong and active, and the ones I had caged were very silent, but made a considerable fuss filling and emptying their pockets. I placed a heap of corn near their nest to see how fast they would remove it; I think a pair could move a peck one yard in six or seven hours. They appear to fight a good deal, as I often find them with scars and broken tails."—W. T.

17. CRICETODIPUS FLAVUS, Bd.

a–e. ♂ ♀, 12/85 and 3 & 4/86.

	Head and body.	Tail.	Hind foot.	Forearm and hand.	Ear.
a. ♂	52	50	13·5	16·0	4·7
b. ♂	51	48	14·2	16·3	5·2
c. ♂	52	52	14·1	17	4·4
d. ♂	51·5	52	13·7	16·4	4·5

[1] Am. Nat. xxi. p. 42 (1887). The author unfortunately does not state whether his species has fou or five hind toes.

	Head and body.	Tail.	Hind foot.	Forearm and hand.	Ear.
e. ♀	49	52	13·3	16	4·6
f. ♀	53	49	14·2	16·6	4·0
g. ♀	52	51	14·0	16·7	4·5
h. ♀	50	49	14	16·5	4·1
i. ♀	49	48	13·0	16	4·0
j. ♀	50	46	13·5	16·7	4·0

Mammæ 1—2=6.

Besides the measurements of this species recorded in Dr. Coues's Monograph (p. 518), a set of those of the allied *C. parvus*, Bd., have been given by Mr. True[1], who has pointed out the distinguishing characters of the two species.

"These pigmy pocket-mice are found in all parts of the county, although they are scarce. They build their little nests in holes in the ground, or among old cactus-leaves. They have often seeds in their pockets when caught. I have had single ones in confinement, but never a pair, so I do not know if they readily breed; they have seldom more than two young at a time. This is the smallest mouse here, weighing only one quarter of an ounce."—W. T.

3. Liste supplémentaire des Oiseaux recueillis en Corée par M. Jean Kalinowski[2]. Par M. L. Taczanowski, C.M.Z.S.

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Notre voyageur a continué encore ses travaux en Corée depuis la moitié de mars 1887 jusqu'à la fin de janvier 1888; puis le 5 février il se mit en route de retour à pieds vers la Mantchourie russe, chassant et collectionnant tant qu'il lui était possible pendant cette traversée pénible et dangereuse, qu'il a accompli dans deux mois jusqu'à la frontière russe.

Le point le plus méridional qu'il a visité dans ce pays est éloigné de 60 kilomètres au sud de la capitale; mais comme il y a trouvé la contrée plus pauvre encore en végétation et en gibier que dans les environs de Séoul il a résigné à s'avancer plus loin dans cette direction. Toute la contrée septentrionale du pays jusqu'à la frontière est également non boisée, et habitée partout par une population dense, même dans les montagnes au sommet des quelles il y a aussi des habitations. Les plus grands bois qu'il a vus et qui ne sont pas nombreux dans ce pays, ne dépassent pas une dizaine d'hectares; tous les renseignements qu'il a pu recueillir s'accordent qu'il n'y a point de plus grandes fôrets nulle part dans le fond du pays. De tout ce qu'il a vus la meilleur contrée pour la chasse aux mammifères et aux oiseaux est située entre Séoul et Ginzan dans les environs d'Ara-Sambo, où il y a des sangliers, des cerfs, des chevreuils, le

[1] P. U. S. Nat. Mus. iv. p. 475 (1882).

[2] See P. Z. S. 1887, p. 586.

musc, l'*Antilope crispa*, la zibeline, l'écureuil et autres, ainsi que plus d'oiseaux qu'ailleurs.

La pauvreté en oiseaux qu'on rencontre en général dans toute la Corée est amenée principalement par la population très nombreuse pour un territoire aussi restreint. Les Coréens mangent tous les oiseaux sans exception ; dans les marchés du gibier on trouve presque toutes les espèces grandes et petites, les outardes et les faisans en compagnie de cigognes, de hérons, de grand-ducs, des corbeaux et autres, mais qui tous sont aussi maltraités qu'on ne peut pas même s'en servir pour la collection. Le petit nombre d'oiseaux qui reste pour nicher dans le pays est également persécuté que les autres, et c'est la raison pour laquelle on y trouve très rarement des nids avec des œufs.

Je commence cette liste supplémentaire par l'énumération des espèces du dernier transport qui n'ont pas été fournies dans l'envoi précédent.

108. HALIAETUS BRANICKII, sp. n.

H. *brunneo-niger ; plumis colli striga mediana longissima pallida, rectricibus tectricibusque caudæ superioribus et inferioribus pure albis ; rostro, cera pedibusque aurantiaco-flavis ; iridibus lutescenti-albidis.*

♀ ad. Plumage général de tout le corps est noir brunâtre, tirant légèrement au schiste dans les plumes fraiches du manteau et des ailes, tandis que dans les plumes de la robe précédente la nuance est brunâtre ; la couleur du dessous du corps est plus brunâtre et uniforme sur toute la poitrine et l'abdomen ; la plus noirâtre elle est sur les pantalons, sur tout le dos inférieur et le croupion, sur la partie emplumée des côtés de la tête et sur la gorge ; tandis que sur tout le sommet de la tête et sur tout le cou toutes les plumes sont traversées dans toute leur longueur par une raie grise fine prolongée jusqu' au bout de ces plumes, sur celles du front ces raies médianes sont très peu distinctes ; les rectrices avec les tectrices supérieures et les inférieures de la queue sont d'un blanc pur. Bec, cire, peau nue des côtés de la tête et les pieds sont d'un jaune orangé vif ; ongles cornés ; iris blanc tirant légèrement au jaunâtre.

Longueur totale 980, vol 2260, aile 600, queue 340, bec depuis la commissure 96, bec depuis la cire en courbe jusqu'au bout 80, de la cire depuis les plumes frontales 31, hauteur du bec prise à la base des narines 55, tour de la mandibule supérieure à la base des narines entre les deux tranchants 95, longueur du tarse 87, doigt médian 90, ongle en courbe 42, ongle du doigt interne également en courbe 54, ongle du doigt externe 35, ongle du pouce 56, queue dépassant le bout des ailes de 115 millim.

Cet aigle ressemble complètement au *H. pelagicus* (Pall.), par son habitus, sa taille, par la forme du bec, la forme de la queue, par la formule alaire et par la longueur relative des ailes à la queue, mais en outre de la coloration il s'en distingue par plusieurs détails caractéristiques, comme :—le bec distinctement plus élevé et plus épais, tour de

la mandibule supérieure à la base des narines pris entre les deux tranchants est beaucoup plus long (95 millim. tandis que celui du pélagique n'a que 87) ; l'extrémité de cette mandibule moins prolongée et moins courbée en arrière ; la nudité latérale de la face plus prolongée jusqu'au milieu des yeux, tandis que chez l'oiseau cité elle dépasse peu le bord antérieur de l'œil, et est beaucoup plus faiblement garnie de poils moins développés, de sorte que la peau nue conserve sa couleur naturelle et paraît être parfaitement nue à une petite distance ; les ongles sont moins longs ; les scutelles cornées au dos des doigts non partagées sont moins nombreuses, il n'y a que quatre terminales sur le doigt médian, tandis que chez le *H. pelagicus* il y a au moins 7, quelquefois jusqu'à 14, les plumes de la région interscapulaire plus acuminées, etc.

L'unique exemplaire qui sert à cette description fut tué par M. Kalinowski à Tsiempion, le 28 février 1888, pendent son retour de Séoul à Wladiwostok. Puis le voyageur a vu encore 6 ou 7 individus, qui tous étaient aussi noirs que le précédent, sans rien de blanc excepté la queue, et qui frappaient de loin par le jaune orangé de leur bec et des pieds ; il a vu aussi un jeune à queue foncée. Précédemment il a observé aussi deux oiseaux qui tournoyaient dans une grande hauteur aux environs de la capitale, et a vu aussi deux peaux sus-

Fig. 1.

Tête de *Haliaetus branickii*.

pendues chez les indigènes, mutilées, sans ailes, sans queue et sans bec, auxquelles il n'a pas fait attention. Après son arrivée à Wladiwostok, lorsque le voyageur a montré son exemplaire à M. Jankowski, cet explorateur de la Mantchourie russe a assuré qu'il a déjà vu deux pareils à Sidemi, dont la couleur toute foncée sans rien de blanc, sauf la queue, l'a frappée au premier coup d'œil. M. Godlewski, ancien compagnon du Dr. Dybowski, après l'examen de cet aigle Coréen prétend qu'il a vu aussi deux pareil posés sur le sable au bord de l'Onon en Daourie, qui l'ont frappés par leur couleur générale foncée, la queue blanche et le jaune intense du bec et des pieds, mais qui se sont envolés de loin devant lui. M. Kalinowski assure que pendant

tout le temps de son séjour en Corée il n'a pas vu le *H. pelagicus* typique.

Notre voyageur prétend que cet oiseau remarquable habite la contrée septentrionale de la Corée, au voisinage des rivières très poissonneuses, d'où les indigènes transportent tous les ans dans les contrées plus méridionales de la péninsule une grande quantité du poisson séché.

Cet aigle qu'on pourrait prendre pour une variété nègre de l'aigle pélagique me paraît constituer une forme locale constante, peu nombreuse et confinée dans un territoire assez restreint dans le sud même de la vaste région habitée par l'aigle pélagique. En outre de la différence dans la coloration et dans les autres caractères plastiques, que je viens d'indiquer, peut servir de preuve la circonstance qu'entre beaucoup d'aigles pélagiques observés et recueillis à Kamtschatka

Fig. 2.

Tête de *Haliaetus pelagicus*.

par MM. Dybowski et Kalinowski tous étaient en plumage normal, et qu'entre beaucoup d'individus qui ont été recueillis et observés par les autres voyageurs au Kamtschatka et partout ailleurs on n'a rien trouvé de pareil.

Je dédie se remarquable oiseau à M. le Comte Xavier Branicki, qui a hérité de son père l'amour de l'Histoire Naturelle et l'amitié des Naturalistes. Il commence jeune sa carrière, je lui souhaite donc de tout mon cœur que les résultats de son entreprise soient correspondants à l'empressement avec lequel il s'est pris à l'œuvre. Ce sera le meilleur hommage rendu à la mémoire de son père, qui désirait ardemment que son fils continue à s'intéresser de la science.

109. Haliaetus albicilla (L.).

Deux jeunes oiseaux tués à Séoul et au nord de Ginzan.

Nulle part M. Kalinowski n'a pas rencontré ce pygargue aussi nombreux qu'il l'est dans les contrées septentrionales de la Corée pendant la migration de printemps. Au voisinage de la frontière de la Mantchourie russe notre voyageur a vu sur un lac convert de glace une centaine de ces rapaces qui se reposaient sur la glace et sur le rivage.

110. Archibuteo hemilasius (Temm. et Schl.).

Une femelle ad. tuée à Séoul le 15 janvier 1888, semblable en tout à celle que le Musée de Varsovie possède de Tsourouchaitoui en Daourie, mais qui a la tête toute blanche avec une grande tache cervicale brun pâle, des stries brunes très fines au front et sur le vertex, ainsi que sur la gorge, une moustache brune malaire. Cet exemplaire a les tarses parfaitement dénues dans le tiers inférieur, sauf une fine bande emplumée sur le devant même d'un de ces tarses. Longueur totale 676, vol 1612, queue dépassant le bout des ailes de 25 millim. Iris blanc sale, avec une légère teinte jaunâtre, à moitié inférieure parsemée de points roux.

L'espèce n'y est pas commune.

111. Scops japonicus, Temm. et Schl.

Une femelle du 27 octobre 1887. Iris jaune orangé. Longueur totale 203, vol 530, le bout des ailes atteignant l'extrémité de la queue. Deux exemplaires ont été rencontrés aux environs de Séoul.

112. Asio accipitrinus (Pall.).

Deux mâles tués aux environs de Séoul, en janvier, un d'eux le 29 de ce mois lorsque la terre fut couverte de neige ; en général on ne le voit qu'en petit nombre en hiver.

113. Cotyle sinensis (Gr. et Hardw.).

Une femelle adulte du 21 septembre et un jeune oiseau de la même date des environs de Séoul, à dimensions semblables à celles des oiseaux de Sidemi. On rencontre cette hirondelle aux deux passages.

114. Halcyon coromandus (Lath.).

Un mâle tué le 28 août 1887 aux environs de Séoul, et c'est le seul qui a été vu pendant tout le séjour de deux ans et demi dans le pays. Longueur totale 289, vol 460, aile 122, queue 68, bec depuis la commissure 66, tarse 15, doigt médian 28 avec l'ongle, queue dépassant le bout des ailes de 40 millim.

115. Upupa epops, L.

Une femelle tuée à Séoul le 30 juin. La huppe est rare en Corée, mais elle niche dans le pays, et quitte la contrée en hiver.

116. Turdus obscurus, Gm.

Une paire de Séoul, tuée le 21 mai ; oiseau de passage aux deux migrations.

117. Turdus pallidus, Gm.

Une femelle de Séoul, tuée au printemps ; on ne la voit qu'aux époques des deux migrations.

118. PHYLLOPNEUSTE SCHWARZI, Radde.

Un mâle tué à Séoul le 11 mai 1887 ; iris brun foncé. Cet individu ressemble en tout à la pluralité des oiseaux en robe de noces de la Daourie et du Baical méridional ; mais il se distingue de tous ceux avec lesquels je l'ai comparé par le blanc plus répandu sur les parties inférieures du corps, qui n'est interrompu sur le milieu de la poitrine que par une teinte fauve très légère ; l'ocreux des sous-caudales très pâle ; il se distingue aussi de tous ceux avec lesquels il a été comparé par des macules fauve blanchâtres terminales dans les tectrices alaires moyennes et les grandes secondaires. Longueur totale 130, vol 195, aile 59, queue 46 millim. On le trouve en été mais en petit nombre.

119. LOCUSTELLA FASCIOLATA (Gr.).

Trois mâles tués le 15 juillet à Chimulpo sur des petits ilôts, éloignés d'un kilomètre de la côte, couverts de buissons et d'herbe élevée, où il niche ; au reflux ces ilôts sont réunis au continent ; l'oiseau quitte le pays en hiver. Le voyageur a entendu aussi l'oiseau chantant au bord de la rivière Séoul, mais n'a pas pu le retrouver.

Dimensions :—Longueur totale 180, vol 223, aile 72, queue 65, bec 22, tarse 24, queue dépassant le bout des ailes de 52 millim.

Dans un autre exemplaire longueur totale 181, vol 227, aile 71, queue 65, bec 22, tarse 26, queue dépassant le bout des ailes de 50 millim.

120. LARVIVORA SIBILANS, Swinh.

Un mâle ad. de Séoul tué le 11 mai 1887, semblable en tout à ceux de Sidemi il de la Daourie ; iris brun foncé. L'oiseau est rare et de passage.

121. REGULUS JAPONICUS, Temm.

Deux mâles et deux femelles tués le 27 et le 30 octobre 1887 aux environs de Séoul ; dans cette saison ils ont moins de nuance cendrée sur les côtés de la tête et au cou que les oiseaux d'avril, cette couleur est remplacée par une nuance olivâtre. Très commun en automne et pendant tout l'hiver dans les forêts de pin.

122. PARUS ATER, L.

Une femelle de Séoul du 13 octobre 1887. Mésange très commune dans les forêts de conifères pendant tout l'automne, en hiver et au printemps ; rare en été.

123. PIPASTES AGILIS, Blyth.

Une femelle ad. en robe fraiche d'automne complète, tuée à Séoul le 11 octobre 1887 ; cet individu a une nuance rousse forte sur la gorge et la poitrine. Cet oiseau est assez rare dans les époques des migrations ; peu nombreux en été.

124. EMBERIZA RUSTICA, Pall.

Une paire tuée le 27 octobre 1887 ; l'espèce hiverne en grand nombre, reste en petit nombre en été.

125. Euspiza rutila, Pall.

Deux mâles adultes, tués à Séoul le 11 mai 1887. On ne le voit point en été et en hiver.

126. Eophona melanura (Gm.).

Un jeune mâle tué le 26 août 1887 aux environs de Séoul. En automne on voit longtemps ce gros-bec.

127. Otis dybowskii, Tacz.

Une femelle adulte tuée au nord de Ginzan le 27 février 1887, et un jeune mâle des environs de Séoul. L'outarde est commune pendant tout l'hiver depuis Séoul jusqu'à la frontière de la Mantchourie Russe, dans les environs de la capitale on peut voir quelquefois des troupes composées jusqu'à une centaine d'exemplaires; au sud de Séoul elle est plus rare, en été on ne la voit point.

Comme la femelle de cette outarde orientale, qui jusqu'à nos jours est confondue avec l'espèce européenne, n'est pas encore décrite, je donne donc sa description.

La femelle est beaucoup plus petite que le mâle, à manteau également foncé mais à dessin roux moins régulier; la tête et le cou sont d'un cendré bleuâtre assez intense, en laissant la gorge largement d'un blanc pur, sommet de la tête plus obscur parsemé de macules fauves, milieu du cervix noir maculé de fauve; le cendré collaire se termine en arrière dans la moitié de la hauteur du cou, tandis que sur le devant il descend jusqu'au bas de la région jugulaire; tectrices supérieures des ailes rousses rayées de noir dans la moitié supérieure de l'aile pliée, dans la moitié inférieure de l'aile elles sont d'un gris cendré mélangé avec du roux rayé de noir, toutes terminées par une grosse tache blanche, ce qui forme une grosse maculature de cette dernière coleur sur la partie postérieure de l'aile, tandis que ces macules sont beaucoup moins grandes dispersées sur un fond cendré du devant du bas de l'aile; grandes tectrices alaires noires terminées par une grande tache blanche, ainsi que les rémiges primaires; rémiges secondaires postérieures rayées de brun, de roux et en partie de blanc; le blanc des rectrices externes fort coloré de roux, dans la moitié terminale, à 2 ou 3 bandes transversales noires; les médianes semblables à celles du mâle.

Longueur totale 795, vol 1700, aile 475, queue 195, bec 80, tarse 120, doigt médian 45, ongle 15 millim.

128. Charadrius fulvus, Gm.

Un jeune mâle tué à Séoul le 25 septembre 1887; assez commun dans les temps des migrations.

129. Ægialitis mongola (Pall.).

Deux mâles tués à Chimulpo le 2 juin 1887; rare au printemps.

130. Squatarola helvetica (Linn.).

Jeune oiseau tué à Séoul le 27 septembre 1887; on l'observe en petit nombre aux époques des deux migrations.

131. Lobivanellus inornatus, Temm. et Schl.

Une femelle tuée entre Séoul et Chimulpo le 27 septembre 1887. Iris et bec d'un jaune orangé, extrémité du bec noir; pieds d'un jaune pâle. En été peu nombreux, absent en hiver.

132. Tringa subminuta, Midd.

Une femelle tuée à Séoul en septembre; bécasseau assez commun dans les deux migrations.

133. Tringa acuminata, Horsf.

Deux mâles tués à Chimulpo en mai; c'est les seuls qui ont été rencontres sur la côte pendant tout le temps de l'exploration de notre voyageur. Dimensions:—

Longueur totale 235, vol 464, aile 143, queue 63, bec 28, bout des ailes atteignant l'extrémité de la queue.

Longueur totale 232, vol 456, aile 140, queue 63, bec 28, bout des ailes atteignant l'extrémité de la queue.

134. Heterosceles incanus (Gm.).

Un mâle en robe de l'hiver tué aux environs de Séoul le 27 septembre; peu nombreux en automne.

135. Actitis hypoleucos (L.).

Une paire tuée à Séoul en septembre. Peu nombreux en été, niche dans les environs de Séoul, commun partout en automne, absent en hiver.

136. Totanus glottis (Lath.).

Un mâle de Chimulpo du 3 mai, deux femelles de Séoul tuées en septembre, Ce chevalier ainsi que les suivants communs au passage d'automne, rares au printemps dans les champs de riz.

137. Totanus calidris (L.).

Un mâle en plnmage d'hiver tué à Séoul le 19 septembre.

138. Totanus ochropus (L.).

Un mâle et deux femelles pris à Séoul en septembre et en octobre de 1887.

139. Totanus glareola (L.).

Un mâle et une femelle tués à Séoul èn septembre et en octobre.

140. Limosa lapponica baueri (Naum.).

Une femelle en robe d'hiver de Séoul, tuée le 22 octobre; très rare en automne dans les rizières.

141. Numenius phæopus variegatus (Scop.).

Une femelle tuée à Chimulpo le 3 mai 1887. Commun au passage de printemps sur la côte et partout dans les montagnes.

142. Rhynchæa sinensis, Swinh.

Une jeune femelle commençant à changer le plumage tuée aux uvirons de Séoul le 6 septembre, et c'est le seul exemplaire trouvé dans une rizière. Iris verdâtre sale, pieds gris avec une teinte verdâtre. Longueur totale 278, vol 510, aile 136, queue 45, bec 53, tarse 47, doigt médian 35, ongle 4, queue dépassant le bout des ailes de 18 millim.

143. Porzana pusilla (Pall.).

Une femelle tuée à Chimulpo le 29 mai 1887 ; iris orangé.

144. Ardetta sinensis (Gm.).

Une femelle tuée à Chimulpo le 29 mai.

145. Larus cachinnans, Pall.

Un mâle de Ginzan du 16 février. Iris gris clair; pieds carné pâle. Longueur totale 675, vol 1590 millim.

146. Chroicocephalus saundersi, Swinh.

Une femelle de Ginzan du 16 février, il y avait une quinzaine au bord de la mer, puis le voyageur a rencontré plusieurs à l'embouchure des petites rivières. Iris brun foncé ; bec noir ; pieds d'un rouge sale. Longueur totale 340, vol 910, aile 285, queue 110, bec 30, culmen 26, tarse 40, doigt médian 27, ongle 7 millim.

147. Cygnus olor (Gm.).

Jeune femelle tuée à Ginzan le 27 février. Longueur totale 1287, vol 2140 millim. Le voyageur n'a vu dans cette contrée que des jeunes en hiver ; les adultes vont plus loin au sud, mais reviennent vers le 20 février.

148. Anas zonorhyncha, Swinh.

Un mâle adulte tué à Chimulpo le 3 mai 1887. Iris brun foncé ; longueur totale 617, vol 990, aile 296, queue 104 millim. Peu nombreux en général, au printemps et en automne, le plus souvent on le rencontre par paires ; au printemps ce canard apparaît avant les autres espèces.

149. Anas falcata, Pall.

Un mâle adulte de Ginzan, on le trouve aussi à Séoul en passage.

Liste des espèces non recueillies mais que le voyageur a eu en main, ou qu'il a vu pour sûr.

150. Pandion haliaetus (L.).

On ne le voit qu'en exemplaires solitaires, au printemps et rarement en automne.

151. Pernis apivorus (L.) ?

Depuis le mois d'août jusqu'en automne dans les environs de Séoul.

152. Falco communis (Gm.).

Sédentaire, plus commun en hiver.

153. Falco subbuteo, L.

Rencontré rarement au printemps et en automne entre Séoul et Chimulpo.

154. Astur palumbarius (L.).

Rencontré dans les contrées septentrionales du pays.

155. Surnia nyctea (L.).

Rencontrée à la fin de février dans les environs de Ginzan.

156. Acanthylis caudacuta (Lath.).

Rare aux passages.

157. Bombycilla garrula (L.).

Observée en février à Siongno à 100 kilomètres au nord de Séoul.

158. Corvus orientalis, Eversm.

Observé au passage de printemps, ne reste pas pour nicher.

159. Plectrophanes nivalis (L.).

Rencontré en février aux environs de Ginzan.

160. Hæmatopus osculans, Swinh.

Rare au printemps dans les environs de Séoul.

161. Numenius cyanopus, Vieill.

Rencontré dans toutes les saisons, rare en hiver.

162. Scolopax rusticula, L.

Une seule rencontrée en automne.

163. Gallinago hyemalis (Eversm.).

Rare en hiver au nord de Ginzan.

164. Rallina mandarina, Swinh.

Rare en hiver dans les rizières.

165. Anser segetum (Gm.).
Observée aux passages.

166. Cygnopsis cygnoides (Pall.).
Observée aux passages.

167. Cygnus musicus, Bechst.
Le plus commun en hiver.

168. Aix galericulata (L.).
Observée aux deux passages.

169. Anas boschas, L.
Niche en petit nombre et hiverne.

170. Anas crecca, L.
Hiverne.

171. Anas formosa, Georgi.
Observée aux deux passages.

172. Dafila acuta (L.).
Observée aux deux passages.

173. Spatula clypeata (L.).
Observée aux deux passages.

174. Mareca penelope (L.).
Observée aux deux passages.

175. Fulix fuligula (L.).
Rare en hiver, manque en été.

176. Fulix marila (L.).
Observée aux deux passages.

177. Mergus merganser, L.
Hiverne.

178. Mergus serrator, L.
Hiverne.

179. Mergus albellus, L.
Hiverne.

Additions aux espèces de la liste précédente.

MILVUS MELANOTIS.

Très commun dans toutes les saisons de l'année.

BUTEO PLUMIPES.

Ne se trouve qu'en hiver.

ASTUR CUCULOIDES.

Assez rare, niche et quitte le pays pour l'hiver. Il se nourrit principalement de gros coléoptères et surtout de longicornes qu'il prend au vol ou sur les branches.

ACCIPITER NISUS.

Sédentaire et assez commun dans toutes les saisons.

FALCO HENDERSONI.

Sédentaire mais rare ; sa rareté est certainement amenée par les indigènes qui s'en servent pour la chasse, ce qui s'applique aussi au Faucon Commun et à l'Autour.

FALCO SUBBUTEO.

Rare dans les temps des migrations.

DENDROFALCO ÆSALON.

Rare et observé seulement en hiver.

TINNUNCULUS JAPONICUS.

Sédentaire, le plus commun des rapaces diurnes.

CIRCUS CYANEUS.

Sédentaire, assez commun.

NINOX JAPONICUS.

Assez commun en été, absent en hiver.

SCOPS SEMITORQUES.

Rare en hiver, absent en été.

BUBO IGNAVUS.

Sédentaire, assez commun ; on le voit souvent en vente au marché entre le gibier. Dans le dernier transport d'oiseaux il y a une paire de grand-ducs, recueillis dans les environs de Séoul. La femelle est semblable en tout à celle de l'envoi précédent et au mâle de Sidemi ; elles ont la même nuance du fond abdominal et presque la même grosseur des stries noires centrales dans les plumes, et les raies transversales semblables. Le mâle tué le 4 novembre 1887 a le fond des parties supérieures du corps, des côtés du cou et de toutes les parties supérieures du corps d'un roux aussi intense et même plus fort que dans la pluralité des oiseaux européens, les flammèches pectorales et les stries abdominales noires aussi grosses que dans les

femelles ; le dessin noir sur le fond du manteau plus délicat que dans les femelles. Iris jaune orangé.

Tous ces exemplaires présentent entre eux une grande différence dans la rayure foncée de la queue ; la femelle de ce dernier transport a sur la page inférieure de toutes les rectrices, sauf les médianes et les submédianes, les raies noires transversales fines, et très peu de petites taches au voisinage de l'extrémité des pennes ; chez le mâle les raies transversales sont encore beaucoup plus fines, la maculature subterminale subtile ; la femelle de l'envoi précédent a les bandes larges, la maculature dense, plus grossière et plus prolongée vers la base des pennes. Dimensions de ces deux exemplaires :—

♂. Longueur totale 615, vol 1583, aile 430, queue 250, queue dépassant le bout des ailes de 80 millim.

♀. Longueur totale 615, vol 1583, aile 480, queue 276, queue dépassant le bout des ailes de 80 millim.

Syrnium nivicolum.

Sédentaire et rare.

Caprimulgus jotaka.

Rare en été.

Cecropis daurica.

Rare en été, elle nichait en 1886, tandis que dans l'année suivante on ne la voyait point.

Hirundo gutturalis.

Commune en été, niche et quitte le pays pour l'hiver.

Eurystomus orientalis.

Assez commun en été, niche et quitte le pays pour l'hiver.

Halcyon pileatus.

Assez commun en été, niche et quitte le pays pour l'hiver.

L'unique nid de ce martin-chasseur, trouvé par M. Kalinowski, fut pratiqué dans une parois sablonneuse verticale d'un ravin, à 4 mètres au dessus du fond de ce ravin. Le trou fut semblable à celui du martin-pécheur de l'Europe, également régulier, à ouverture externe également elliptique, mais aussi large qu'on a pu facilement introduire la main ; le canal d'un mètre de profondeur, presque horizontal et courbé, élargi et aprofondi dans le fond, était tapissé d'une épaisse couche d'os de grenouilles et de lézards, mélangés avec des débris des gros insectes, qui sont certainement de la provenance semblable que les boules composées d'os et d'écailles de petits poissons, avec lesquelles les martin-pécheurs garnissent leur nid. D'après l'examen des matériaux du tapis on peut supposer que l'oiseau se servait de ce canal depuis plusieurs années. Les œufs au nombre de six furent déposés sur cette couche.

Les œufs sont un peu plus oblongs que ceux de l'*Alcedo ispida*, à surface de la coque moins glabre et moins luisante, même ondulée

assez fortement dans certaine endroits ; couleur superficielle blanche pure et blanche en transparence. Dimensions : 33·2 × 28·3 ; 33·2 × 28·8 ; 33·6 × 28·4 ; 33 × 29·2 ; 34 × 28·2 ; 35 × 28·5 millim.

CERYLE LUGUBRIS.

Rencontrée seulement en hiver aux environs de Ginzan ; le long d'un ruisseau il y en avait quatre : tous furent tirés et blessés, mais un seul retrouvé ; puis on ne les voyait plus.

ISPIDA BENGALENSIS.

Commune, il niche, mais on ne le voit point en hiver.

CERTHIA FAMILIARIS.

Commune en hiver.

SITTA AMURENSIS.

On ne le rencontre qu'en hiver.

TROGLODYTES FUMIGATUS DAURICUS.

Commun et sédentaire.

CINCLUS PALLASI.

Commun en hiver, mais on ne le commence à rencontrer qu'à 60 kilomètres au nord de Séoul, d'où on le trouve partout jusqu'à la frontière russe.

ACCENTOR MONTANELLUS.

Commun en hiver, rare en été.

TURDUS FUSCATUS.

Observé aux passages.

TURDUS NAUMANNI.

Commun dans les temps des migrations.

OREOCINCLA VARIA.

On n'a rencontrée qu'une paire au printemps.

MONTICOLA SOLITARIA.

Commune et niche, quitte le pays pour l'hiver.

RUTICILLA AUROREA.

Sédentaire et assez commune.

PHYLLOPNEUSTE BOREALIS.

Commune au printemps et en automne, rare en été.

PHYLLOPNEUSTE CORONATA.

Comme la précédente.

PHYLLOPNEUSTE SUPERCILIOSA.

Comme les précédents.

MICROSCELIS AMAUROTIS.

En hiver de 1866 sur 7 il fut commun aux environs de Séoul et se tenait et nourrissait principalement sur les genévriers, l'hiver suivant il manquait complètement.

MOTACILLA LEUCOPSIS.

Rare en été et niche en petit nombre ; commune et nombreuse en automne ; quitte le pays pour l'hiver.

MOTACILLA OCULARIS.

Commune en automne, rare en hiver.

CALOBATES MELANOPE.

Commun, niche, non trouvé en hiver.

LIMONIDROMUS INDICUS.

Commun, niche, quitte le pays pour l'hiver.

ALAUDA ARVENSIS.

Commune toute l'année.

GALERIDA CRISTATA COREENSIS.

Sédentaire mais peu nombreuse dans la partie méridionale du pays, elle manque au nord de Séoul.

PARUS VARIUS.

Commun toute l'année.

PARUS MINOR.

La plus commune des mésanges, mais rare en été.

PŒCILIA PALUSTRIS CRASSIROSTRIS.

Sédentaire, rare en été.

MECISTURA TRIVIRGATA.

Sédentaire, la plus commune aux environs de Ginzan.

SUTHORA WEBBIANA.

Sédentaire et commune.

ORIOLUS DIFFUSUS.

Observé dans les époques des migrations.

LANIUS SPHENOCERCUS.

Sédentaire, plus nombreux en hiver qu'en été.

PHONEUS BUCEPHALUS.

Assez commun en été, niche, absent en hiver.

OTOMELA LUCIONENSIS.

Plus commune en été que le précédent, manque en hiver.

BUTALIS LATIROSTRIS.

Commune aux passages de printemps et d'automne.

ERYTHROSTERNA LUTEOLA.

Comme la précédente.

XANTHOPYGIA TRICOLOR.

Commune en été, niche, absente en hiver.

CYANOPTILA CYANOMELÆNA.

Une seule femelle rencontrée au printemps.

PERICROCOTUS CINEREUS.

Niche en petit nombre, absent en hiver.

CYANOPOLIUS CYANUS.

Sédentaire et commun ; rare au sud de Séoul.

GARRULUS BRANDTI.

Commun en hiver, rare en été.

PICA CAUDATA JAPONICA.

Sédentaire et commune ; gibier favori des Coréens.

MONEDULA DAURICA.

Très commune aux deux passages, manque en hiver et en été.

CORVUS JAPONENSIS.

Commun et sédentaire ; gibier favori des Coréens comme beaucoup d'autres oiseaux qu'on ne mange pas ailleurs.

FRUGILEGUS PASTINATOR.

Très nombreux au printemps, rare en automne, manque en été et en hiver.

NUCIFRAGA CARYOCATACTES.

Deux fois rencontré solitaire en automne.

STURNUS CINERACEUS.

Commun mais assez rare, niche, absent en hiver.

EMBERIZA FUCATA.

Commune au printemps, niche en petit nombre, absente en hiver.

EMBERIZA CASTANEICEPS, Moore.

Commune en hiver, niche en petit nombre. Les deux paires qui sont fournies de Séoul appartiennent à cette forme, peu distincte, mais, comme il paraît, constamment de la forme sibérienne. Probablement entre les nombreux oiseaux qui viennent hiverner en Corée on trouvera aussi les oiseaux de la grande race, comme cela a lieu dans le sud de la Mantchourie russe.

Emberiza spodocephala.

Assez commune au printemps, niche en petit nombre, absent en hiver.

Schœnicola polaris.

Niche en nombre médiocre, hiverne en plus grand nombre.

Passer montanus.

Très commun et très nombreux dans toutes les saisons.

Fringilla montifringilla.

Hiverne dans les forêts de conifères, absente en été ; en hiver elle est fort abondante et se nourrit principalement de semence de pin.

Chlorospiza sinica.

Sédentaire et commune.

Chrysomitris spinus.

Commune au printemps, rare en été.

Coccothraustes vulgaris japonicus.

Rare.

Propasser roseus.

Commun en hiver, non recontré en été.

Uragus sanguinolentus.

Rare. Probablement les trois femelles de l'envoi précédent appartiennent à l'*U. lepidus*, David et Oust., et non au *U. sanguinolentus*.

Loxia curvirostra albiventris.

Commune en automne et en hiver, absente en été.

Pyrrhula orientalis.

Rare en hiver.

Cuculus canorus telephonus.

Commun en été. Notre voyageur a constamment entendu le chant du mâle semblable à celui du coucou de l'Europe, et jamais celui du *Cuculus indicus*.

Gecinus canus.

Sédentaire et commun.

Picus major.

Sédentaire et rare.

Picus leuconotus.

Sédentaire et rare.

Iyngipicus dörriesi.

Sédentaire et rare.

IYNGIPICUS SEEBOHMI.

Sédentaire, le plus commun des pics.

THRIPONAX KALINOWSKII.

Rare.

COLUMBA RUPESTRIS.

Sédentaire et commune, habite en grand nombre dans la résidence royale.

TURTUR RUPICOLA.

Sédentaire et commun.

TURTUR TORQUATA.

Sédentaire et commun.

BONASIA BETULINA.

Sédentaire et assez commune entre Séoul et Ginzan, non rencontrée plus au nord de cette dernière localité; manque dans le sud de la péninsule.

COTURNIX VULGARIS JAPONICA, Temm. et Schl.

Très abondante en hiver entre Séoul et Ginzan, plus rare plus au nord. Les cinq exemplaires, dont 3 ♂ et 2 ♀, fournis par notre voyageur dans son envoi précédent, et que j'ai indiqué dans la première liste sous le nom de *C. communis*, ne sont pas faciles à déterminer. Ils sont tous en plumage d'hiver et ne présentent pas de caractères différentiels entre ces deux formes. Comme M. Kalinowski n'a pas jamais entendu en Corée le chant caractéristique de la caille d'Europe, mais toujours la voix sourde, propre aux cailles de la Daourie et de la Mantchourie russe, qu'il connaissait parfaitement, on peut supposer que toutes les cailles qui hivernent en Corée appartiennent à cette forme, qui est en été très abondante dans les plaines herbeuses et humides des bords du lac Chanka et de la Soungatscha, ainsi que dans les autres contrées de la Mantchourie russe. Dans les derniers temps le Prof. Bogdanoff fut d'avis que cette caille continentale est différente de la race japonaise et l'a distinguée sous le nom de *C. ussurianus*, dans son fascicule du 'Conspectus Avium Imp. Rossici.' Mais comme cette caille ne se distingue de la description et de la figure de la 'Fauna Japonica' que par la couleur de la bande sourcilière, et comme la coloration de la tête est fort variable dans les différents détails chez les mâles des steppes de la Daourie et de la Mantchourie russe, je ne crois pas que l'opinion de Bogdanoff soit décisive.

PHASIANUS TORQUATUS.

Abondant depuis Séoul jusqu'en Mantchourie, mais en nombre inégal dans les différentes contrées; rare au sud de Séoul.

ÆGIALITIS MINOR.

Assez commune en été, absent en hiver.

ÆGIALITIS PLACIDA.

Commune en automne et au printemps, rare en hiver, manque en été.

VANELLUS CRISTATUS.

Rare dans les temps des deux migrations.

TRINGA CINCLUS.

Rare au passage d'automne.

TRINGA MINUTA.

Commune aux deux migrations.

GALLINAGO SCOLOPACINA.

Très commune en automne dans les rizières, rare au printemps, manque en été et en hiver. Toutes ces bécassines adultes de la collection de notre voyageur se distinguent des européennes par les bandes claires du dessus du corps considérablement plus larges, ce qui est particulier à toutes les bécassines de la Sibérie orientale.

GALLINAGO STENURA.

Presque aussi commune que la précédente en automne dans les rizières.

GRUS VIRIDIROSTRIS.

Commune en hiver depuis la frontière russe jusqu'à Séoul, plus rare plus au sud ; en été non rencontrée nulle part.

GRUS LEUCAUCHEN.

Moins nombreuse que la précédente, mais se trouve partout en hiver.

IBIS NIPPON.

On commence à le rencontrez en hiver et au printemps à 50 kilomètres au nord de Séoul, le plus commune dans les environs de Ginzan, on y voit souvent des troupes d'une cinquantaine d'exemplaires ; rare plus au nord de Ginzan.

IBIS NIPPON SINENSIS.

Au printemps on le trouve à Séoul et ailleurs jusqu'à la frontière russe ; en été on ne le voit pas en Corée.

CICONIA BOYCIANA.

Se trouve, mais peu nombreuse, dans toute la Corée, niche, plus rare en hiver.

ARDEA CINEREA.

Assez rare, niche dans les colonies des hérons blancs, en février une a été rencontrée.

ARDEA ALBA MODESTA.

Commune en été, quitte la contrée pour l'hiver.

GALLICREX CINEREA.

Niche en nombre médiocre dans les rizières, quitte le pays pour l'hiver. Un mâle adulte tué à Oricoul à 20 kilomètres de Séoul, a eu l'iris blanc avec un léger reflet jaune roussâtre ; bec jaune verdâtre à base carnée : scutelle frontale rouge sale, à sommet du tubercule carné tirant au bleuâtre ; pieds gris verdâtre obscur. Longueur totale 413, vol 716, aile 210, queue 85, bec 39, tarse 73, doigt médian 73, ongle 14 millim.

STERNULA SINENSIS.

Commune au printemps, rare en été, manque en hiver.

CAIRINA RUTILA.

Peu nombreuse en hiver, au printemps et en automne, manque en été ; très nombreuse au printemps dans les rizières de la Corée septentrionale.

CLANGULA GLAUCION.

Assez commune au printemps et en hiver, sur la mer, moins sur les rivières.

OIDEMIA AMERICANA.

Ne trouvée qu'en hiver sur la mer aux environs de Ginzan[1].

December 4, 1888.

Prof. Flower, C.B., LL.D., F.R.S., President, in the Chair.

Mr. Howard Saunders, F.Z.S., exhibited an adult male specimen of the American Green-winged Teal, *Querquedula carolinensis*, the property of Mr. H. Nicholls, of Kingsbridge, South Devon, shot out of a flock (perhaps of Common Teal) at the mouth of the Dart, on December 23rd or 24th, 1879. The white crescentic band in front of each wing (the principal specific characteristic) was fully defined. A letter from Dr. Edmund Elliot, giving full details of the occurrence, was read. This, he observed, was the only British-killed example which had been submitted to public examination ; but a male of this species had been recorded as having been shot near Scarborough in November 1851 (Zoologist, p. 3472), and it had been stated that another was killed in Hampshire nearly fifty years ago. It was worthy of notice that up to the present time this species was not known to have been introduced on any ornamental waters in Great Britain or on the Continent.

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[1] Dans la première liste imprimée dans les 'Proceedings' du 1887 au lieu de Gouran il faut lire partout *Ginzan* sur les pages 611 et 596.

The following papers were read :—

1. The Mammals of the Solomon Islands, based on the Collections made by Mr. C. M. Woodford during his Second Expedition to the Archipelago. By Oldfield Thomas, Natural History Museum.

[Received July 25, 1888.]

(Plates XX.–XXII.)

In the Proceedings of the Society for last year [1] I had the pleasure of describing a collection of Bats which Mr. C. M. Woodford had formed at Shortland and Fauro Islands, at the western end of the Solomon Archipelago, and the present paper gives an account of a second collection made by the same gentleman in the eastern islands of the group. This second collection is larger and more important than the first, for, apart from the considerable number of duplicates, the set acquired by the British Museum consists of 42 specimens belonging to 19 species. Two species only of the ten previously found are not represented in it, and by the inclusion of these and of a Rat described by Mr. E. P. Ramsay from Florida Island, the present paper is made a complete list of the Mammals known to occur in the group.

Of the specimens now described a few were collected at Rubiana, New Georgia, but the great mass of them, and all the new species, were obtained at Aola, on the north-east coast of Guadalcanar, where Mr. Woodford resided for several months [2].

The total number of mammals now known from the Solomons is brought up by the present collection from 13 to 22, and of these no less than 8 have been discovered by Mr. Woodford, the previous collection having contained 2 and the present one 6 new species. There are also two new genera of Bats to add to the one previously described.

All the specimens are beautifully preserved in spirit, and Mr. Woodford is to be congratulated on the fact that the care and trouble he must have expended on the collection have been rewarded by the addition of so large a number of new and interesting species to the Mammalian fauna of the Australian region.

CHIROPTERA.

1. Pteropus grandis, Thos.

Pteropus grandis, Thos. P. Z. S. 1887, p. 320, pl. xxv.

a. ♂. Rubiana, New Georgia.

Forearm 163 millim.

This fine species was one of Mr. Woodford's previous discoveries, the original specimens having been obtained by him at Alu,

[1] P. Z. S. 1887, p. 320.

[2] Mr. Woodford has given an account of his wanderings and personal experiences in the Solomon Islands in Proc. R. Geogr. Soc. 1888, p. 351.

1.

2.

3.

J. Smit, del. et lith.

Mintern Bros. imp.

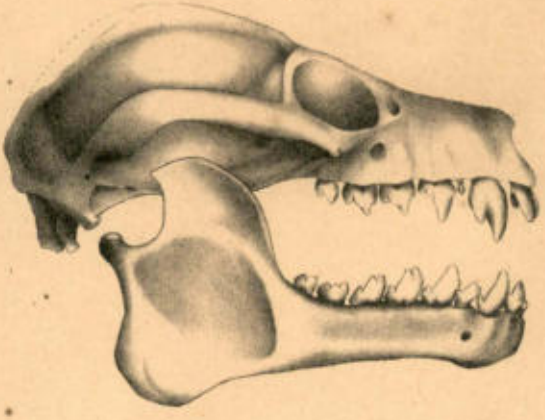
1. PTEROPUS WOODFORDI.
2. PTEROPUS CORONATUS.
3. PTERALOPEX ATRATA.

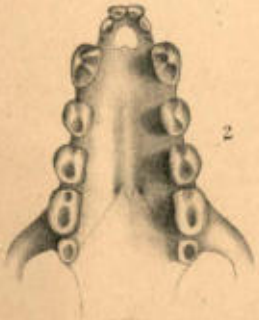
1

3.

6

4.





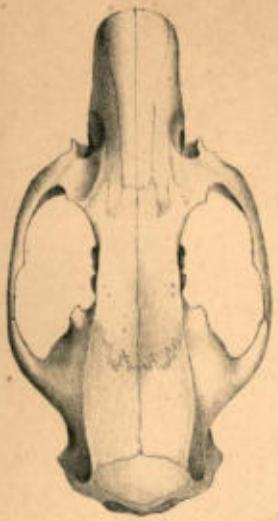
2

7

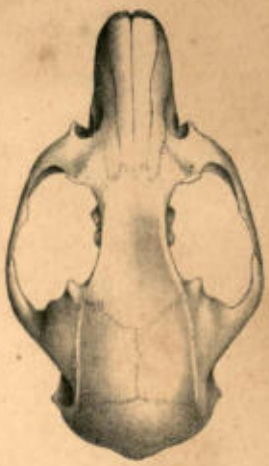
5

M. H. Fisher del. et lith. Mintern Bros. imp.

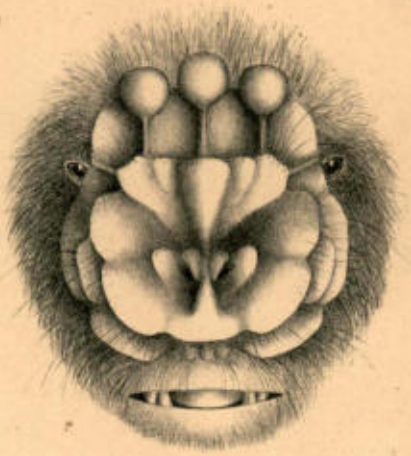
1. PTEROPUS WOODFORDI. 2,3 PTEROPUS CORONATUS.
4–7. PTERALOPEX AIRATA.



2.



4.



1.

3.

6.

5.

M. H. Fisher del. et lith. Mintern Bros. imp.

1. ANTHOPS ORNATUS. 2,3. MUS IMPERATOR.
4,5. M. REX. 6. M. PRÆTOR.

Shortland Island. The present individual agrees in every respect with the type.

2. PTEROPUS [1] HYPOMELANUS, Temm.

No further specimens of this species were obtained, and Shortland Island remains therefore its only known locality within the group.

[1] The following new species of *Pteropus* from the Duke of York Archipelago may also be conveniently described here:—

PTEROPUS CORONATUS, sp. n. (Plate XX. fig. 2, Plate XXI. figs. 2, 3.)

Ears of medium length, naked, projecting much beyond the rather short fur; their anterior edges far less convex than their posterior, their tips bluntly pointed. Wings arising on the back only about half an inch apart. Interfemoral membrane narrow, concealed in the centre by the fur.

Whole of head and neck very pale buff, nearly white on the crown between the ears and above the eyes. Face ornamented with a prominent brown T-shaped mark, of which the cross-line runs transversely across the forehead halfway between the eye and ear, and the upright runs down the centre of the face between the prominent white supraorbital patches, and extends forwards about one third of an inch in front of the anterior canthus of the eye. Eyelids and muzzle nearly naked, brown. Cheeks and chin dark blackish brown. Front of neck, chest, and centre of belly very pale brown, scarcely darker than the nape. Sides of belly and pubic region darker brown. Posterior back blackish brown, mixed with dull yellowish; the fur closely adpressed, and only about one inch broad at the narrowest part. Fore limbs and membranes nearly naked above, a few hairs only extending along the upper side of the humerus and forearm; upper and posterior sides of the thighs thickly furry; lower leg naked. Below the fur covers the antebrachial membrane, the humerus, femur, and the wing-membrane internal to them, and also passes along the outer side of the forearms in a band about one inch wide.

Teeth (Plate XXI. figs. 2, 3) unusually strong and heavy, smoothly rounded, without basal cusps. Canines very long and sharp, their basal ledges obsolete. Anterior upper premolar very minute, but still persistent in the type. Other premolars very short horizontally, their breadth almost equal to their length. Last molars, both above and below, comparatively large, above about one fourth and below about one third of the penultimate molars. Anterior lower premolar about half the size of the last molar, separated from the canine and next premolar by diastemata each about equal to its own diameter.

Dimensions of the type, an adult male in spirit:—Head and body 243 millim.; head 77; tip of muzzle to eye 29; ear 24×16; forearm 167 (=6·6 in.); thumb without claw 66; lower leg 76; calcaneum 26; foot 56·5.

Skull:—Basal length 69; greatest breadth 38·3; interorbital breadth 9·9; palate, length 43, breadth outside m.^{2} 21·3, inside m.^{2} 12·5; basi-cranial axis 22·2; basi-facial axis 49.

Teeth:—Combined breadth of upper incisors 7·7; vertical length of upper canine, from cingulum to tip behind 10·6; horizontal length of large anterior premolar 5·0, of posterior premolar 5·0, of first molar 6·5, of second molar 3·8.

Hab. Mioko Island, Duke of York group (*Dr. O. Finsch*), 13/3/85.

This very handsome species has a certain superficial resemblance to *Pt. ocularis*. Peters *, of which I have examined the type, an old male, in the Berlin Museum. That animal, however, is distinguished by having a forearm only 137 millim. long, by its much smaller teeth †, and by many detailed differences in coloration, among which may be specially mentioned its wholly black underside, the black extending all over the front of the neck.

* MB. Ak. Berl. 1867, p. 326.

† Combined breadth of four upper incisors 5·7 millim.; length of upper canine 6·9, of last upper premolar 3·6.

3. Pteropus rayneri, Gray.

a–c. 2 ♂, 1 ♀. Aola, Guadalcanar. [2[1].]
Forearms 138, 132, and 120 millim.

4. Pteropus woodfordi, Thos. (Plate XX. fig. 1, Plate XXI. fig. 1.)

Pteropus woodfordi, Thos. Ann. Mag. N. H. (6) i. p. 156 (1888).

a–d. 2 ♂ and 2 ♀. Aola. [3.]

Size small. Fur soft and woolly, not adpressed on the back. Ears small, hairy, scarcely projecting beyond the fur of the head. Wings arising about half an inch apart on the back; the fur rather more than an inch wide on this part. Hind limbs below knees entirely naked. Interfemoral membrane narrow, almost obsolete in the centre, concealed by the fur. Face and chin brown or black, becoming in old specimens quite grey. Collar dull rufous or yellow, markedly different in colour both from the head and back. Tufts on shoulder-glands deep orange, not dissimilar in colour to the rest of the neck. Back and belly deep brown, mixed with a few shining grey hairs, which markedly increase in number in old age.

Skull (Plate XXI. fig. 1) as in *Pt. molossinus*.

Teeth small and light; canines long and slender. Upper anterior premolar persistent, about equal in cross section both to the last lower molars, outer lower and all the upper incisors. Last upper molar and anterior lower premolar about equal, and double the size of the last-named set of teeth; $\overline{p.^3}$ with an antero-internal basal cusp.

Dimensions of a male and female, the first being the type, a very old specimen with a grey head and back:—

	♂ millim.	♀ millim.
Head and body	(c.) 150	(c.) 145
Muzzle to eye	16	16
Ear	11·5	11·5
Forearm	99	98
Thumb	34	33
Lower leg	48	46
Depth of interfemoral behind knee	15	13

Forearms of two additional specimens, ♂ 96; ♀ 92.

Skull, ♀:—Basal length 36; greatest breadth 24·2; supraorbital foramen to tip of nasals 17·8; interorbital breadth 6·6; intertemporal breadth 9; palate, length 20·6. Teeth:—Combined breadth of upper incisors 4·1; vertical length of canine, from cingulum to tip behind 4·6; greatest antero-posterior diameter of canine 2·4; horizontal length of $p.^3$ 2·5, of $p.^4$ 2·2, of $m.^1$ 2·5. Height of lower canine 3·4; horizontal length of $\overline{p.^3}$ 2·8; of $\overline{p.^4}$ 2·3.

This species is most nearly allied to *Pt. molossinus*, Temm., of the Caroline Islands, with which, alone among the smaller woolly-haired

[1] The figures placed in brackets show the number of specimens obtained by Mr. Woodford additional to those retained for the Museum series, these latter being represented by the letters *a*, *b*, *c*, &c.

members of the genus, it agrees in the entire nakedness of the upper surface of its legs. From that animal, however, it is readily distinguishable by having a bright-coloured collar, by its hairier and less sharply pointed ears, and by its much more delicate teeth, the canine especially being far slenderer and lighter.

Pteralopex, Thos.

Pteralopex, Thos. Ann. Mag. N. H. (6) i. p. 155 (1888).

External characters as in *Pteropus*. Ears short, hairy. Wings arising from the centre line of the back.

Skull (Plate XXI. fig. 4) with a peculiarly short muzzle and flattened frontal region; planes of the orbits much more nearly parallel to each other, and directed more upwards and less forwards, than in *Pteropus*. Orbits completed behind by bone (as previously recorded in *Pteropus leucopterus* alone of Chiroptera[1]). Sagittal crest more developed than in any *Pteropus*.

Teeth (Plate XXI. figs. 5, 6) remarkable for their extraordinary cuspidate character. Upper incisors with broad posterior ledges. Upper canines (fig. 7) short vertically, enormously thick antero-posteriorly, each with one stout secondary cusp halfway up its posterior edge, and two smaller postero-internal basal cusps. Premolars and molars short and broad, their anterior and posterior basal ledges so developed and their main cusps so conical as to destroy all the appearance of longitudinal grooving characteristic of the genus *Pteropus*. Lower incisors extremely disproportionate in size, the outer not less than about twenty times the bulk of the inner. Canines very short vertically, with a simple posterior basal ledge. Cheek-teeth markedly cuspidate, the general longitudinal grooving quite obliterated. Posterior premolar and first molar each with three high anterior cusps, and a low posterior basal ledge, a form of tooth strikingly similar to that called "tuberculo-sectorial" by Prof. Cope, and found in the primitive members of several of the orders of Mammalia, and, notably, in the Insectivora.

This remarkable genus is decidedly the most interesting of Mr. Woodford's Mammalian discoveries, both on account of its very striking dental characters, and especially for the fact that it seems to form an important link in the phylogeny of the Chiroptera. At first sight it might appear to be merely a highly specialized offshoot of *Pteropus*, but a careful comparison of the other members of the family has convinced me that this is not the case, and that it is more probably an isolated survivor from the time when the ancestors of the modern Pteropodidæ still possessed cuspidate teeth—such teeth, which are still characteristic of nearly all the Microchiroptera, having been inherited from the Insectivora by the Palæochiroptera[2], or common ancestors of all the living Bats.

[1] Since the above was written, the British Museum has received, as a donation from the Genoa Museum, a specimen of *Pt. nicobaricus*, from Pulo Nias, with the orbits complete behind. Other specimens obtained at the same island, however, have their orbits incomplete, as usual, and the completed orbits of the first-named specimen are evidently due to its extreme age.

[2] *Cf.* Dobson, Mon. Asiatic Chiropt. pp. 7 to 10, and diagram (1876).

To this view I have come chiefly by finding that such rudiments of the distinguishing characteristics of *Pteralopex* as are present in other Pteropodidæ are not confined to one or two species of *Pteropus*, but are found scattered about in the different genera of the family, as though they had been independently inherited from common ancestors. Thus, while *Pteropus leucopterus*, in addition to its completed orbit, resembles *Pteralopex* in having basal ledges on the posterior sides of its incisors, and *Pteropus aneiteanus* in having its cheek-teeth so grooved transversely as well as longitudinally as to recall those of the new genus, yet *Cynopterus* has frequently bicuspid upper canines; and, above all, the nearest and most significant resemblance is presented by the otherwise very different genus *Harpyia*. There, not only do the upper canines have a distinct postero-external secondary cusp of the same relative development as that found in *Pteralopex*, but the three chief lower cheek-teeth, *i. e.* the two posterior premolars and the anterior molars, have absolutely the same primitive "tuberculo-sectorial" form as those of *Pteralopex*, the individual cusps homologizing perfectly with those of that animal. In addition, the upper cheek-teeth of *Harpyia* present something of the same primitive character; and therefore, judging merely by dentition, that genus should be looked upon as being in a still more generalized state than even *Pteralopex*.

Should this view of the origin of the dental characters of *Pteralopex* be even approximately correct, it is clear that the reputed relationship of the *Macroglossi* with the *Glossophagæ* must have no real foundation in fact, since the common ancestors of the Macro- and Microchiroptera having had cuspidate teeth, and, no doubt, insectivorous habits, these groups, whose likeness lies in their small non-cuspidate teeth and frugivorous habits, cannot be little modified descendants of the Palæochiroptera, but must be independent and comparatively recent offshoots from the two great groups to which they respectively belong.

I imagine, then, the history of the evolution of the present groups of Chiroptera to have been somewhat as follows[1]. The earliest Bats, or Palæochiroptera, would have been cuspidate-toothed and insectivorous like their ancestors the terrestrial Insectivora. Among them there would presently have arisen a form like *Harpyia*[2], fruit-eating, but still with cuspidate teeth and no doubt markedly "tuberculo-sectorial" premolars and molars. Then, while the modern *Harpyia* would have arisen in one direction by the reduction of the incisors, in another there would have followed some form like *Pteralopex*, still retaining to a certain extent cuspidate teeth. Then the cusps would have more and more tended to disappear, the result being *Pteropus* and its allied genus, of which some few species (e.g. *Pteropus*

[1] Compare also Prof. W. Leche's learned and philosophical remarks on the phylogeny of *Galeopithecus*, an animal which, according to him, is a much modified representative of the ancestors of the Chiroptera at a time when they were, so to speak, just learning to fly. (K. Vet. Ak. Handl. xi. no. 11, 1886.)

[2] Of course this ancestral *Harpyia* would have had well-developed incisors above and below, as in the majority of *Pteropodidæ*.

aneiteanus and *leucopterus*, and *Cynopterus*) retain remnants of the ancient cuspidate structure, while others (e. g. *Pteropus coronatus*, Plate XXI. figs. 2, 3) have lost all trace of molar-cusps. Finally, as the most specialized of all would have arisen the genera with rudimentary cuspless molars, forming the group *Macroglossi*.

On the other hand, in the Insectivorous line the Palæochiroptera would have divided themselves into the Vespertilionine and Emballonurine alliances as described by Dr. Dobson[1], the latter again independently giving rise in South America to a small-toothed fruit-eating group, the *Glossophagæ*, which take in that region the place occupied by the *Macroglossi* in the Old World.

5. Pteralopex atrata, Thos. (Plate XX. fig. 3, Plate XXI. figs. 4–7.)

a, *b*. ♂. Aola.

Besides the characters already mentioned, this species may be readily recognized by the deep black colour of its fur and membranes, only relieved by white mottlings on the under surface of the wing-membranes, by its thick and clumsy-looking muzzle and its short furry ears. The measurements of one of the two fine male specimens collected by Mr. Woodford are as follows:—

Head and body 240 millim.; head 78; tip of nostril to eye 26; ear, above crown, 15; forearm 143 (=5·65 in.); thumb, without claw, 48; second finger 100; third finger—metacarpus 97 first phalanx 67, second phalanx 110; fifth finger—metacarpus 100, first phalanx 41, second phalanx 40; lower leg 62; foot 41; calcaneum 15; greatest depth of interfemoral behind knee 24.

Skull:—Basal length 62·3, greatest breadth 38·5; tip of nasals to supraorbital foramen 26·5; interorbital breadth 9·0; intertemporal breadth 5·7; palate—length 36·5, breadth between outer sides of canines 17, inside canines 9·0, outside $\underline{p.}^4$ 19·8, inside $\underline{p.}^4$ 11·0; basi-cranial axis 21·2, basi-facial axis 42·4.

Teeth:—Combined breadth of upper incisors 9·6; vertical length of canine 8·0, horizontal length 5·5; horizontal length of $\underline{p.}^3$ 5·1, of $\underline{p.}^4$ 5·1, of $\underline{m.}^1$ 4·5, of $\underline{m.}^2$ 3·0. Lower teeth—breadth of $\underline{i.}^2$ 3·2; height of canine (from basal ledge behind) 4·6; horizontal length of anterior premolar 3·0, of $\overline{p.}^3$ 4·5, of $\overline{p.}^4$ 4·6, of $\overline{m.}^1$ 4·1, of $\overline{m.}^2$ 3·6, of $\overline{m.}^3$ 2·8.

The second specimen is slightly larger than the type, having a forearm 146 millim. in length.

It is unfortunate that Mr. Woodford is unable to give any information about the habits and food of this interesting Bat, as both specimens were brought to him dead by his native collectors. The semi-fluid contents of the stomach and intestines, however, do not appear on a microscopic examination to be essentially different from those of *Pteropus woodfordi*.

6. Cynonycteris brachyotis, Dobs.

No further specimens obtained. See previous paper, p. 323.

[1] *L. c.*

7. HARPYIA MAJOR, Dobs.

a. ♀. Aola.
Forearm 80 millim.

8. CEPHALOTES PERONII, Geoff.

a, *b*. ♂ and separate head. Rubiana, New Georgia.
Forearm 103 millim.

9. MACROGLOSSUS AUSTRALIS, Peters.

Macroglossus minimus, var. *australis*, Peters, MB. Ak. Berl. 1867, p. 13 (footnote).
Macroglossu australis, id. *t. c.* p. 871.

a, *b*. ♂ ♀. Aola.
Forearms 38 and 39 millim respectively.

This form appears in be undoubtedly distinct from *M. minimus*, although Dr. Dobson has only recognized a single species of the genus in his Catalogue. It was distinguished by Dr. Peters merely on account of its smaller size, and neither he nor Dr. Dobson appear to have observed that[1] its rhinarium is deeply and distinctly grooved to the upper lip, in marked contrast to the typical species, in which the slight groove between the nostrils does not pass down to the upper lip. The whole face also in *M. australis* is decidedly shorter than in *M. minimus*, and the forward projection of the upper lip with the corresponding prominence of the premaxillary bones of the skull, so characteristic of the latter, is much reduced in the former. The difference in size is also considerable, the forearm in the ten specimens of the southern species before me ranging from 38 to 43 millim., while in five Javan individuals it varies from 45 to 48 millim.

As to the respective ranges of the two forms I have no material to enable me to determine which of them inhabits the Malay Peninsula; but *M. australis* certainly extends as far westward as the Philippines, whence the Museum possesses several specimens collected by Mr. Hugh Cuming and Mr. Alfred Everett. A skin obtained by Mr. Wallace in Mysol and several examples found by the Rev. G. Brown in the Duke of York Group also belong to *M. australis*.

10. NESONYCTERIS WOODFORDI, Thos.

Nesonycteris woodfordi, Thos. P. Z. S. 1887, p. 324, pl. xxvi.

a. Ad. ♂. Aola.

The specimens of this beautiful and interesting species previously obtained having been dried skins, it may be useful to give the full dimensions of the present individual, which is properly preserved in spirit.

Head and body 95 millim.; head 34; ear, above crown, 10; forearm 53; thumb, without claw, 18·5; second finger 39; third finger—metacarpus 41, first phalanx 29, second phalanx 42; lower leg 23·7; foot 17; calcaneum 4·3; depth of interfemoral membrane behind knee 5.

[1] As was pointed out to me by Mr. Blanford.

Anthops, Thos.

Anthops, Thos. *t. c.* p. 156 (1888).

Like *Hipposiderus*, but with the tail rudimentary, consisting merely of three or four vertebræ hidden in the base of the interfemoral membrane and not reaching halfway towards its posterior margin. Nose-leaf (Plate XXII. fig. 1) very complicated, its upright transverse portion emarginate above, the projections, however, not thickened and pointed as in *Asellia*, but rounded and hollowed out behind and their substance quite thin. Premolars $\frac{2}{2}$.

11. Anthops ornatus, Thos. *l. c.* (Plate XXII. fig. 1.)

a–f. ♂ ♀. Aola.

Posterior nose-leaf tridentate, the projections each forming a little spherical cup, opening backwards; front surface of the leaf divided into four compartments by three very distinct vertical ridges, each running up to the lower side of one of the cups above. Sella with a blunt projecting central point. Horizontal horseshoe-leaf narrow, not emarginate anteriorly; sides of the muzzle with two secondary leaves, the upper very short, the lower long, extending backwards to join the outer corners of the posterior erect leaf. Centre of upper lip notched below. Supraorbital projection distinct. Frontal gland transverse, very small and almost rudimentary; a peculiar fleshy point, about 2 millim. long, projecting upwards from its centre. Ears large, laid forward they reach quite to the end of the muzzle, their inner edge evenly convex, their tip sharply pointed, their outer edge slightly concave above, strongly convex below. Limbs and membranes naked. Wings from the ankles.

Fur long, soft, and silky. Colour, so far as can be judged from specimens in spirit, greyish buff, the bases of the hairs slaty grey, their terminal halves buff, their extreme tips brown.

Dimensions of a pair, male and female, of which the female was the one originally selected as the type:—

	♂.	♀.
Head and body	53	51
Head	22	21
Muzzle to eye	7	6·8
Ear, above crown	16·5	17
Forearm	50	51
Index-finger	41	40
Third finger, metacarpus	37	37
,, ,, 1st phalanx	18	18
,, ,, 2nd phalanx	19	18
Lower leg	23	22·5
Foot	9·3	9·5
Calcaneum	9·0	8·0
Interfemoral membrane, depth in centre	20	20

The forearms of the other four specimens are 48·0, 48·5, 49·0, and 49·4 millim. respectively.

Skull (♂):—Basal length 15·1, greatest length 19·7; greatest

breadth 9·8; intertemporal constriction, breadth 2·0; front of upper canine to back of m.^{3} 6·8.

This Bat is evidently more nearly allied to *Hipposiderus* than to either *Triænops*, *Rhinonycteris*, or *Cælops*, although the last-named is the only one of the subfamily that agrees with it in the rudimentary state of the tail. To no particular member or group of *Hipposiderus*, however, does it show any special affinity, since its agreement with *Asellia* in the emarginate state of the posterior nose-leaf is probably no evidence of genetic relationship, the differences between it and that subgenus in the essential structure of the nose-leaf and in the reduction of the tail being quite as marked as in the case of the other members of the genus *Hipposiderus*.

The presence of a peculiar insectivorous Bat in Guadalcanar is a most interesting and unexpected fact, since, as a general rule, oceanic islands are characterized by the large proportion and great specialty of their frugivorous as compared with their insectivorous Bats, a general rule otherwise well exemplified in the Solomon Islands, as shown below in the table, p. 483.

12. Hipposiderus tricuspidatus, Temm.

a, *b*. ♂ ♀. Aola. [10.]
Forearms 37 and 40 millim. respectively.

13. Hipposiderus diadema, Geoffr.

a, *b*. ♀. Aola.
c. ♂. Rubiana.

These specimens differ in size to a remarkable extent, the forearm in both *a* and *b* being 79 millim. long, while in *c* it is no less than 96. Other specimens in the Museum collection, however, connect these two extremes, and show that the difference in size cannot be looked upon as a specific character. Thus a Cinghalese female has a forearm 94 millim. long; several specimens have them about 86 or 88; a male from the Philippines one 82 long, while a female from the same locality has one only 76, this latter being the least observed in adult animals.

14. Hipposiderus cervinus, Gould.

♀. Aola. [5.]
Forearm 44 millim.

15. Vesperugo abramus, Temm.

a. ♀. Aola. [11.]
Forearm 33 millim.

16. Miniopterus schreibersi, Kuhl.

a, *b*. ♂ ♀. Aola.

These specimens belong to one of the small races of this widely-spread species, their forearms measuring only between 40 and 41 millim., exactly as in the forms called "*M. schreibersi*, var. *pusillus*," and "*M. australis*" by Dobson[1]. Their characters are on the whole

[1] Cat. Chir. B. M. p. 351 (1878).

confirmatory of Prof. Leche's opinion [1] that the specific distinction of the latter is very doubtful, since they combine the small size and the southern habitat of *M. australis* with the nearly naked interfemoral membrane of the true *M. schreibersi*.

17. EMBALLONURA NIGRESCENS, Gr.

♂. Aola. [35.]

Forearm 35 millim.

Judging by the large number of specimens contained in each of Mr. Woodford's and in Dr. Guppy's collections, this is evidently the commonest insectivorous Bat of the Solomons.

RODENTIA.

18. MUS IMPERATOR, Thos. (Plate XXII. figs. 2, 3.)

Mus imperator, Thos. *t. c.* p. 157 (1888).

a, *b*. ♂ ♀. Aola.

Size very large, exceeding that of any other true *Mus*. Fur rather short and woolly. General colour uniform grizzled ashy grey above, dirty white below: the longer hairs of the back black, the shorter softer hairs grey, with shining ashy tips; no elongated piles on the posterior back; whiskers very long, from three to four inches in length. Ears thick, short, and rounded; laid forward they do not nearly reach to the eye, falling short of the posterior canthus by about one third of an inch. Mammæ 4 only, all inguinal. Feet (Plate XXII. fig. 3) broad and stout; palms and soles naked, the pads large, but far smaller than in the next species; posterior pad elongate. Fifth hind toe, without claw, reaching just to the end of the first phalanx of the fourth. Tail decidedly shorter than the head and body, naked, scaly, the scales averaging from 9 to 11 to the centimetre, unusually smooth and little prominent; tip of tail almost scaleless.

Skull (Plate XXII. fig. 2) stout and heavily built. Frontal processes of premaxillæ projecting backwards some way beyond the posterior edge of the nasals. Interorbital space flat, parallel-sided, its edges square but not beaded or ridged. Interparietal proportionally small. Outer plate of infraorbital foramen but little developed, its anterior edge convex forwards above, slightly concave below. Palatal foramina short, their posterior end about 5 millim. in front of the level of m.[1] Bullæ small and low, scarcely inflated.

Incisors very deep antero-posteriorly, narrow transversely, their enamel deep orange above, dull pale yellow below; the lower pair each with a very indistinct shallow groove down its anterior surface. Pattern of molars as usual.

Dimensions (in spirit):—

	Head and body.	Tail.	Hind foot.	Ear.	Forearm and hand.	Heel to front of last foot-pad.	Last foot-pad, length.
♂	350	258	66	19	83	35	13
♀ (*type*)	340	250	64	20	83	34	12·5

Skull (♀):—Basal length 60 millim., greatest breadth 35; nasals,

[1] P. Z. S. 1884, p. 53.

length 24, greatest breadth 8·2; interorbital breadth 11·1; interparietal, length 6·8, breadth 12·5; depth of anterior zygoma-root 7·8; palate, length 36·3, breadth outside m.^{1} 13·1, inside m.^{1} 5·6; length of palatal foramina 7·0; length of upper molar series 12·0.

The most remarkable thing about this Rat is its gigantic size, there being only two Rodents at all allied to it, viz. *Nesokia bandicota* and *Cricetomys gambianus*, which equal it in this respect. Its relations to its only really close ally, *Mus rex*, are noted below.

Its habits, according to Mr. Woodford, are entirely terrestrial.

19. Mus rex, Thos. (Plate XXII. figs. 4, 5.)

Mus rex, Thos. *l. c.*

a–d. 2 ♂ and 2 ♀. [7.]

Size very large, although markedly less than in the last species. Colour, character of fur, lengths of ears, proportions of toes, and number of mammæ all quite as in that species. Sole-pads (Plate XXII. fig. 5), however, much larger and broader, less sharply defined. Tail exceedingly long, longer than the head and body combined, naked, scaly, the scales not overlapping, but forming prominent projections, which give to the whole tail an extraordinary roughened rasp-like character, most marked, however, on the underside, and gradually fading off towards the tip. These projecting scales are arranged in rings, which average from 7 to 9 to the centimetre. The base of the tail is hairy like the body for about one inch.

Skull (Plate XXII. fig. 4) strong and stout, the zygomata proportionally more expanded than in *M. imperator*. Tips of nasals not projecting in front beyond the level of the front of the incisors. Frontal processes of premaxillæ scarcely extending backwards beyond the nasals. Supraorbital edges square and sharp, not beaded. Interparietal bone absolutely, as well as relatively, larger than in *M. imperator*. Outer plate of anterior zygoma-root markedly projecting forwards. Palatal foramina and bullæ as in the last species.

Teeth as in *Mus imperator*, but the last upper molar rather larger in proportion.

Dimensions (in spirit):—

	Head and body.	Tail.	Hind foot.	Ear.	Forearm and hand.	Heel to front of last foot-pad.	Last foot-pad, length.
♂ (*type*)	290	296	55	18	76	30·2	16·3
♂	280	300	57	16	76	30·5	16·5
♀	270	285	54	16	73	29·5	15
♀	255	277	54	14	73	30	16

Skull (♂):—Basal length 54 millim., greatest breadth 33; nasals, length 20, greatest breadth 6·8; interorbital breadth 9; interparietal, length 7·0, breadth 13·2; depth of anterior zygoma-root 7·0; palate, length 33, breadth outside m.^{1} 11·3, inside m.^{1} 5·0; length of palatal foramen 6·8; length of upper molar-series 11·1.

Habits entirely arboreal (*fide* Woodford).

I am quite unable to say to which of the known species of *Mus* these two large Rats are most nearly allied. While clearly differing from

each other specifically, they have a great many characters in common, as for example their considerable size, the general forms of their skulls and teeth, and, notably, their very unusual mammary formula, 0—2=4, a formula only found, so far as I know, in two other members of the genus, namely *Mus trivirgatus*, Temm., and *M. delicatulus*, Gould, both quite small species, and the latter nearly, if not quite, the most diminutive member of the genus.

It is, however, in their relation to each other that their chief interest lies, for they seem to be clearly the slightly modified descendants of one single species that, once introduced, has been isolated in Guadalcanar for some considerable time, while it has apparently died out elsewhere. Of this original species some individuals would have adopted a terrestrial, and others an arboreal life, and their respective descendants would have been modified accordingly. In this way I would explain the fact that at the present time we have in Guadalcanar two genuine species, agreeing with each other in their essential structure, and yet separated by a considerable number of characters all having a more or less direct relation to a climbing or non-climbing habit of life. Of these, of course by far the most striking are the broad foot-pads and the long, rasp-like, probably semi-prehensile tail of *Mus rex*, as compared to the smaller pads and short smooth tail of *Mus imperator*.

20. Mus salamonis, Rams.

Mus salamonis, Rams. P. Linn. Soc. N. S. W. vii. p. 43 (1882).

I know nothing more of this species than is contained in the original description. Its hind foot is stated to be 44 millim. in length, and its locality is Florida Island. The length of its hind foot, curiously enough, exactly fills in the gap between that of *M. rex* and of the next species, so that the four Solomon Island Rats have the lengths of their hind feet just in the progressive series 34, 44, 54, and 64 millim.

21. Mus prætor, Thos. (Plate XXII. fig. 6.)

Mus prætor, Thos. *t. c.* p. 158.

a, *b*. ♂ ♀. Aola.

Size about that of *Mus rattus*. Fur short, mixed with numerous spines, and with a few much longer piles on the posterior back. General colour coarsely grizzled grey, the longer piles and the spines black-tipped, the ordinary fur with yellow tips; the bases of all pale slaty grey. Underside dirty white, in old specimens yellow; the hairs all grey at base. Ears rounded, rather short, laid forward they just reach to the posterior canthus of the eye. Mammæ 2—2=8. Hands and feet greyish white, a darker patch on the terminal part of the metatarsus. Hind feet (Plate XXII. fig. 6) rather short in proportion to the size of the animal; fifth toe reaching to the middle of the first phalanx of the fourth; soles naked, the pads rounded, rather small. Tail short, not so long as the body without the head, thinly haired and coarsely scaled, the rings of scales averaging about 10 to the centimetre; its colour wholly deep black.

Supraorbital edges of skull finely ridged, the ridges prolonged backwards to the outer corners of the interparietal. Outer plate of anterior zygoma-root well developed, projecting forwards. Palatine foramina long, rather longer than the molar series, ending behind just on a level with the front of m.[1] Bullæ low and small, comparatively rough and opaque.

Teeth as usual; molars rather broad and rounded.

Dimensions:—

	Head and body.	Tail.	Hind foot.	Ear.	Forearm and hand.	Heel to front of last foot-pad.	Last foot-pad, length.
♂	188	134	35·5	15·5	47	19·0	6
♀ (*type*)	168	118	33·5	15·0	43	17·5	5

Of this species, in addition to the pair brought by Mr. Woodford from Guadalcanar, there is a skin in the Museum from Kabahadai, New Britain, collected by the Rev. G. Brown, and agreeing with Mr. Woodford's specimens in every respect.

Mus prætor has a strong superficial resemblance to *M. terræ reginæ*, Alst.[1], from which, however, it may be readily distinguished by its shorter ears, shorter and darker-coloured feet, much shorter and wholly black tail, and, especially, by its possession of two pairs of pectoral mammæ instead of only one.

MARSUPIALIA.

22. PHALANGER ORIENTALIS BREVICEPS, Thos.

Phalanger orientalis breviceps, Thos. Cat. Mars. B. M. p. 204 (1888).

a, *b*. Skins, Aola. *c*. In spirit, Rubiana, New Georgia.

As I have elsewhere (*l. c.*) pointed out, the Solomon Island Cuscus proves, in common with the Duke of York form, to be referable to a distinct subspecies of the ordinary Papuan Grey Cuscus, distinguishable by its smaller size, and, especially, by its much smaller last premolar (p.[4]). Of the three specimens obtained, two (*b* and *c*) belong to a much darker-coloured race, believed by Mr. Woodford to be a distinct species, but they appear to me to be quite inseparable from the greyer form.

Concerning this animal, Mr. Woodford writes to me as follows:—"At Alu, Shortland Island, only the grey variety is found, and the same at Fauro, but the natives told me of a dark-coloured Cuscus being found on Bougainville. I first met with the dark variety at Rubiana, where one specimen was brought off to the ship with some others of the grey variety. I again met with it in Guadalcanar during one of my expeditions up the Kobua River, where we caught one, which the natives ate. They assured me it was not uncommon at Aola, and by offering a good price I secured five alive, and three of the grey variety, all of which I took away with me to bring to Sydney, and if possible, home. I never met with anything

[1] P. Z. S. 1879, p. 646 (= *Acanthomys leucopus*, Gray, P. Z. S. 1867, p. 598).

intermediate in colour between the grey and brown varieties. The grey is far the commoner of the two."

Cuscuses seem to be common on all the islands of both the Duke of York and Solomon groups, and extend in the latter to San Christoval, whence several specimens were sent to the British Museum by Dr. F. M. Rayner, and Mr. W. Macgillivray, of H.M.S. 'Herald,' who visited that island in December 1854.

The following table gives a complete list with localities so far as is known of all the land mammals of the Solomon Islands, and may be usefully compared with that given previously (P. Z. S. 1887, p. 327) in connection with the further range of these mammals into the Duke of York group of islands. The names of those peculiar to the group are printed in heavy type.

	Shortland and Fauro Islands.	New Georgia.	Guadalcanar.	San Christoval.	Remarks, or other localities.
CHIROPTERA.					
MEGACHIROPTERA.					
1. **Pteropus grandis**	*	*			
2. —— hypomelanus	*				
3. —— **rayneri**	...	...	*	*	
4. —— **woodfordi**	...	...	*		
5. **Pteralcpex atrata**	...	...	*		[Celebes.
6. Cynonycteris brachyotis	*	...	...	...	Duke of York and
7. Harpyia major	*	*	*		
8. Cephalotes peronii	*	*	...	*	Ugi.
9. Macroglossus australis	...	...	*		
10. **Nesonycteris woodfordi**	*	...	*		
MICROCHIROPTERA.					
11. **Anthops ornatus**	...	...	*		
12. Hipposiderus tricuspidatus	...	...	*		
13. —— diadema	*	*	*		
14. —— cervinus	*	...	*		
15. Vesperugo abramus	*	...	*		
16. Miniopterus schrebersi	...	...	*		
17. Emballonura nigrescens	*	...	*	...	Ugi.
RODENTIA.					
18. **Mus imperator**	...	...	*		
19. —— **rex**	...	...	*		
20. —— **salamonis**	...	...	...	...	Florida Island.
21. —— prætor	...	...	*	...	Also Duke of York.
MARSUPIALIA.					
22. Phalanger orientalis breviceps	*	*	*	*	Duke of York group.

For the sake of comparison it may also be useful to give a revised list of the Mammals as yet known from the Duke of York group, by way of which the Solomon Islands must have at one time or another received all their mammalian immigrants.

The species are :—

CHIROPTERA.

1. Pteropus melanopogon, *Schleg.*
2. —— hypomelanus *, *Temm.*
3. —— **coronatus,** *Thos.*
4. —— **capistratus,** *Peters.*
5. Cynonycteris brachyotis, *Dobs.*
6. Harpyia major, *Dobs.*
7. Cephalotes peronii, *Geoff.*
8. Macroglossus australis, *Peters.*
9. **Melonycteris melanops,** *Dobs.*
10. Hipposiderus diadema *, *Geoff.*
11. —— tricuspidatus, *Temm.*
12. —— cervinus, *Gould.*
13. Vesperugo abramus *, *Temm.*
14. —— **angulatus,** *Peters.*
15. Kerivoula hardwickei, *Gr.*
16. Miniopterus schrebersi *, *Natt.*
17. Emballonura nigrescens, *Gr.*

RODENTIA.

18. Mus prætor, *Thos.*
19. —— browni, *Alst.*
20. Uromys cervinipes, *Gould.*

MARSUPIALIA.

21. Macropus browni, *Rams.*
22. Petaurus breviceps papuanus, *Thos.*
23. Phalanger orientalis breviceps, *Thos.*
24. **Perameles cockerelli,** *Rams.*

Of the 22 Mammals inhabiting the Solomon Islands there are therefore no less than 9 peculiar species, while in the Duke of York group, with a total of 24, there are only five. Twelve are common to both groups, of which two only, *Mus prætor* and *Phalanger orientalis breviceps,* are peculiar to the two groups combined.

EXPLANATION OF THE PLATES.

PLATE XX.

Fig. 1. Head of *Pteropus woodfordi*, p. 472.
2. Head of *Pteropus coronatus*, p. 471.
3. Head of *Pteralopex atrata*, p. 475.

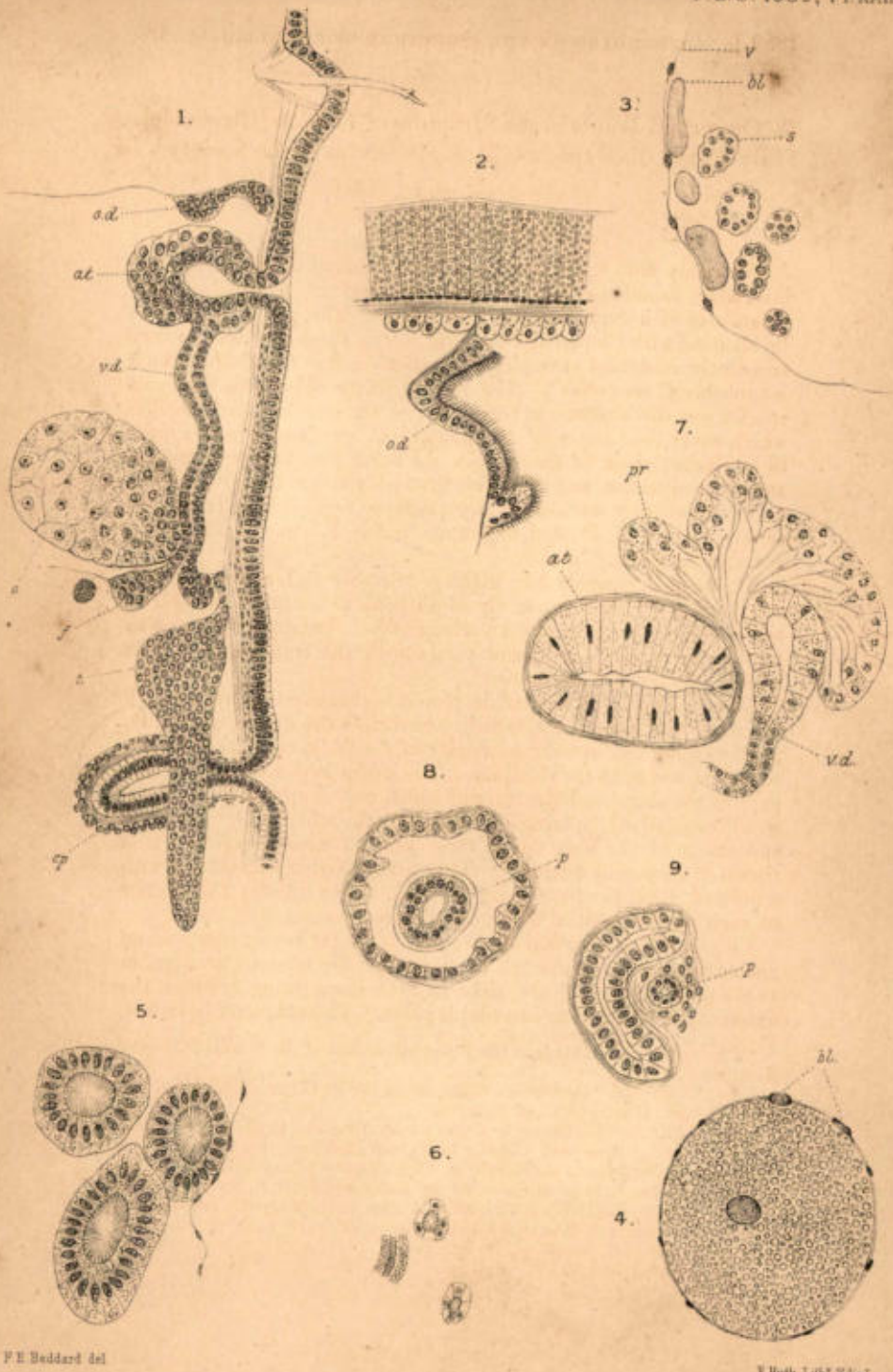
PLATE XXI.

Fig. 1. Skull of *Pteropus woodfordi*, p. 472.
2, 3. Upper and lower teeth of *Pteropus coronatus*, p. 471.
4. Skull of *Pteralopex atrata*, p. 475.
5, 6. Upper and lower teeth of do.
7. Canine of do., inner aspect.

PLATE XXII.

Fig. 1. Nose-leaf of *Anthops ornatus* (× 4), p. 477.
2, 3. Skull and hind foot of *Mus imperator*, p. 479.
4, 5. Skull and hind foot of *Mus rex*, p. 480.
6. Hind foot of *Mus prætor*, p. 481.

* These four species have not as yet been actually recorded from the group, but as they occur in the islands on both sides of it, their presence there is assumed.



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ANATOMY OF CLITELLIO.

2. On certain Points in the Structure of *Clitellio* (Claparède).

By Frank E. Beddard, M.A., Prosector to the Society [1].

[Received September 5, 1888.]

(Plate XXIII.)

The sandy mud upon the shores of the Sound at Plymouth was invariably found to contain large numbers of a small slender Oligochete of a dark greenish-grey colour. The worm appears to be identical with Claparède's *Clitellio ater* [2]; the same mud also very frequently contained examples of another species of *Clitellio*, which is probably *C. arenarius* [3]. The obvious difference between these two species was the absence, in the latter, of the peculiar dark papillæ which cover the surface of the body in *C. ater*, and which appear to be characteristic of that species. I never found these worms in any other situation, and they were invariably absent from the coarser sands, which were exclusively occupied (as regards Oligochæta) by certain species of *Pachydrilus*, upon which I hope to offer some notes to the Society later.

Although Claparède has given a tolerably full account of the structure of *Clitellio*, especially of *Clitellio arenarius*, I am able to add some few facts to our knowledge of the worm; my remarks partly deal with *C. ater*, and partly with the transparent species which I shall call *C. arenarius* [4].

Clitellio ater is, as Claparède remarks, characterized by the dark colour of the integument, which, however, is not developed (fig. A, p. 486) upon the anterior extremity of the body, upon the last few segments, and upon the clitellum. The colour is due to innumerable papillæ the shape and structure of which do not appear to me to be well illustrated in Claparède's drawing [5]; on the other hand, the general appearance of the body due to these peculiar structures is very well shown in Claparède's figure [6]. They are somewhat leaf-shaped with a pointed apex, the base being attached to the cuticle; the interior of each papilla is filled with greyish-green granules.

Claparède's description of the setæ is, so far as my observations enable me to state, incorrect; he states that the setæ are arranged in two double rows, and are alike in both rows, being bifid at the extremity or terminating in a simple point. This character is, in fact,

[1] From observations made at the Plymouth station of the Marine Biological Association.

[2] Ed. Claparède, "Recherches anatomiques sur les Oligochètes," Mém. Soc. Phys. Genève, t. xvi. (1862), p. 253.

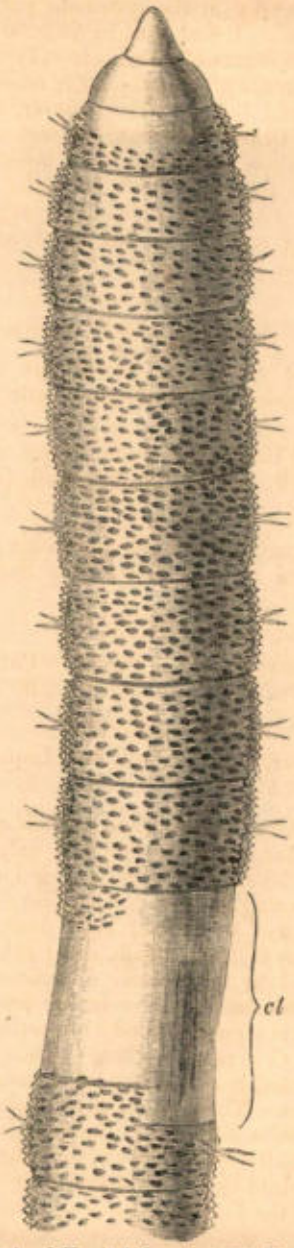
[3] Ed. Claparède, "Études anatomiques sur les Annélides &c.," *tom. cit.* p. 102.

[4] Several other species of *Clitellio* have been described, for a list of which see Vejdovsky's 'System u. Morph. d. Oligochaeten,' Prag, 1874, p. 45; the majority of these have been described by Czerniavsky (Bull. Soc. Imp. Nat. Moscou, t. lv. pt. ii. (1880), p. 324, &c.). I am not able at present to determine what are the points of difference between these species and *C. arenarius*.

[5] Recherches, &c., *loc. cit.* pl. iv. fig. 10.

[6] *Loc. cit.* pl. iv. fig. 9.

Fig. A.



Anterior segments of *Hemitubifex ater* (*Clitellio ater*, Clap.).
cl, clitellar segments.

the principal one which differentiates the genus from *Tubifex*, and is recapitulated by Vejdovsky in the systematic part of his great work upon the Oligochæta[1]. I find that in *Clitellio ater* the setæ of the dorsal pair are sometimes of two kinds—(1) bifid setæ, (2) long slender setæ (Haarborsten). On the other hand, the ventral setæ belong only to the bifid form. This, however, is not always the case; individuals of *C. ater* are frequently met with which possess only the bifid setæ; these individuals were indistinguishable in any other character from those in which hair-setæ were also present. The character of the setæ must therefore be regarded as variable. As to the number of setæ per bundle, I find that there are usually two, though sometimes more.

§ 1. *Remarks on some other Marine Species of Tubificidæ.*

Besides these two species, a considerable number of marine Tubificidæ have been described from the Western European coasts. These are:—

Tubifex benedii, d'Udekem, "Nouv. Class. Annélides Sétigères Abranches," Bull. Ac. Roy. Belg. t. xxii. (1855), p. 544.

T. hyalinus, id. ibid.

T. papillosus, Claparède, Beobachtungen über Anat. und Entwick. wirbellos. Thiere an der Küste von Normandie angestellt. Leipsic, 1863.

T. lineatus, Müller, Zoologia Danica.

T. bilineata, Montagu, MS.; Parfitt, "Catalogue of Annelids of Devon," Trans. Devon. Assoc. 1867, ii.

T. pellucidus, Montagu, MS.; id. ibid.

Peloryctes inquilina, Zenger, Bull. Soc. Imp. Nat. Moscou, xliii. pt. 1 (1870), p. 221.

The first two species are considered by Tauber[2] to belong to the genus *Limnodrilus*, for the reason that they only possess bifid setæ, a fact noted by d'Udekem in his brief description of the species. I believe him to be wrong in this identification; there is nothing in d'Udekem's description to prevent both these species from being included in the genus *Clitellio*, which, and I can confirm Claparède, is also characterized by the absence of hair-setæ. Furthermore *Clitellio* and *Limnodrilus* also agree in the possession of two pairs of "hearts," situated in segments 7 and 8 respectively. Claparède only observed one pair in *C. arenarius*, whose position he was unable to fix with accuracy. I have, however, seen two in living specimens, where they are very distinct. The presence of two pairs of specially dilated vascular arches has been described in the European species of *Limnodrilus*, and I have had the opportunity of verifying this character of the genus in a New-Zealand species, which may or may not be identical with one or other of the European species. The two genera can only

[1] System u. Morphologie der Oligochaeten, p. 45.
[2] 'Annulata Danica,' p. 71.

in fact be distinguished by the characters of the reproductive organs (see p. 490). These points are evidently appreciated by Vejdovsky[1], who suggests that *Tubifex benedii* may be a synonym of *Clitellio arenarius*. This is probably an error in printing; there can be little doubt that Vejdovsky meant to place *T. benedii* as a synonym of *Clitellio ater*, an identity which has been pointed out by Vaillant[2].

D'Udekem gives a woodcut illustrating the papillæ of his *Tubifex benedii*, and there is no doubt in my mind about the identity of this species with Claparède's *Clitellio ater*, which, however, as will be pointed out later, is not a *Clitellio* at all.

The remaining species—*Tubifex hyalinus*—is very probably the same as *Clitellio arenarius*. There is at any rate nothing to be said against this identification; and it is more probable that the species is a *Clitellio* than a *Limnodrilus*, for the reason that the latter genus is, so far as is certainly known, an inhabitant of fresh water[3].

The preliminary list of the marine fauna of Plymouth, published in the second number of the 'Journal of the Marine Biological Association,' contains a single Oligochete, *Tubifex lineatus*. This species, if it be identical with that described in Johnston's 'Catalogue of British Non-parasitical Worms' (p. 66), is certainly not a *Tubifex*, since the setæ are there stated to be entirely *f*-shaped, but not bifid; this may be due to wear, and the species is perhaps a *Clitellio*, possibly the same as *Clitellio arenarius*. This species, however, as well as *Tubifex bilineata* and *T. pellucidus*, all of which are recorded from Devon in Parfitt's 'Catalogue of the Annelids of Devon,' require investigation. Parfitt mentions the occurrence of *Clitellio arenarius*[4].

Peloryctes inquilina has been described somewhat fully by N. Zenger[5]; the species is not referred to by Vejdovsky in his account of the Tubificidæ, though the paper is quoted in his list of literature. Having been at some trouble to translate certain portions of Zenger's paper from the Russian, I can offer the following remarks upon its systematic position.

The species occurs in the "Kieler Bucht" at a depth of 12 fathoms, either living freely in the mud or sand or upon the shell of *Mytilus edulis*. Prof. Möbius, who first found the worm, considered it to be identical with Claparède's *Clitellio ater*. It is of a dark red colour, owing to its red blood and the dark papillæ on the surface. Zenger considers that the papillæ distinguish this species from *Clitellio ater*, both in their distribution and in their structure. In *C. ater* "the first head-segment is never covered by papillæ, and half the second segment as far as the setæ is also free from papillæ; papillæ are in addition absent from the space extending from the 10th to the 12th segment, which is occupied by the clitellum .... ;

[1] Syst. u. Morph. d. Oligochaeten, p. 45.

[2] Essai de Classification des Annélides Lombriciens," Ann. Sci. Nat. (Zoologie), t. x. (1868), p. 251.

[3] Forel (Bull. Soc. Vaud. xiii.), however, describes a *Clitellio* from the Lake of Geneva (*cf.* footnote to p. 494).

[4] Trans. Devon. Assoc. 1867, vol. ii.

[5] Bull. Soc. Imp. Nat. Moscou, 1870.

in *Peloryctes inquilina* the extent of the clitellum and the distribution of papillæ is variable. I had fully developed sexual individuals in which there was not a trace of clitellum; all the area of segments 10–12 was covered with papillæ like the rest of the surface of the skin; in others, on the contrary, either segments 9 and 10 or 10 and 11 were devoid of papillæ. In the anterior part of the body all the first three segments were sometimes devoid of papillæ, sometimes only the head. Finally the last 10 or 11 segments were often without papillæ."

It does not appear to me that these facts are necessarily opposed to the view that *Peloryctes inquilina* is synonymous with *Clitellio ater*. It is a well-established fact that the clitellum is variable in its appearance; and I have myself observed specimens of *Clitellio ater* in which the clitellum was fully developed and without papillæ, or not developed and with papillæ. The hinder end of the body in my specimens was generally, if not always, devoid of papillæ. Claparède does not apparently mention this fact, but his description of the species is very brief and incomplete. With regard to the absence of the papillæ on some of the anterior segments, I may state that in my specimens the papillæ commenced rather gradually and that those upon the anterior segment were, at least in some individuals, considerably smaller than the papillæ of the following segments; this may perhaps account for the discrepancies between Zenger's observations and those of Claparède. There may be something in the structural differences between the papillæ of *Peloryctes inquilina* and those of *C. ater*; the papillæ of the former species are stated by Zenger to resemble very closely those of *Pachydrilus verrucosus*. The setæ of *Peloryctes inquilina* are all bifid, but they are alleged to differ from those of *Clitellio ater* in the number per bundle—a character which I cannot admit to be valid, as I have found great differences in this respect between individuals of *C. ater*, and indeed of other species of Oligochæta; it is, I think, recognized that in those forms with a large number of setæ in the bundle the number is variable.

Another point which Zenger raises is the characters of some of the transverse branches which unite the dorsal and ventral trunks in some of the anterior segments. In the 7th, 8th, and 9th segments of *Peloryctes inquilina* these trunks are specially dilated, and this difference from other Tubificidæ is regarded, in conjunction with the other points of difference, as sufficient to necessitate the establishment of a new genus. The generic name is Leuckart's, and was originally applied to *Clitellio arenarius* until the latter was shown to be identical with Savigny's *Clitellio arenarius*; Zenger therefore, and this proceeding of his will not be admired by those who regard zoological nomenclature as a serious subject, resuscitates the name *Peloryctes* to apply it to his species.

In the examples of *Clitellio ater* which I studied I found it to be by no means so easy as in *Limnodrilus* to distinguish any of the vascular arches of the anterior segments as specially enlarged; in some specimens, however, the vascular arch of the 8th segment, as in *Tubifex*, was decidedly stouter than the rest; in other specimens this difference was not so striking, and then the arches of 6, 7, and 8

appeared to be equal and stouter than the more anteriorly situated trunks. The description which Zenger gives of the reproductive organs is, as he himself admits, imperfect. The most important point which he mentions is the presence of spermatophores, which were little known at the time when he wrote. There is nothing in his description of the reproductive organs to distinguish *Peloryctes inquilina* from *Clitellio ater*.

On the whole the identity or non-identity of *Peloryctes inquilina* with *Clitellio ater* must be for the present regarded as an open question, though I am disposed to think that they are identical.

§ 2. *Anatomy of* Clitellio.

Generative Organs.—Claparède's account of the reproductive organs of *Clitellio* is by no means complete.

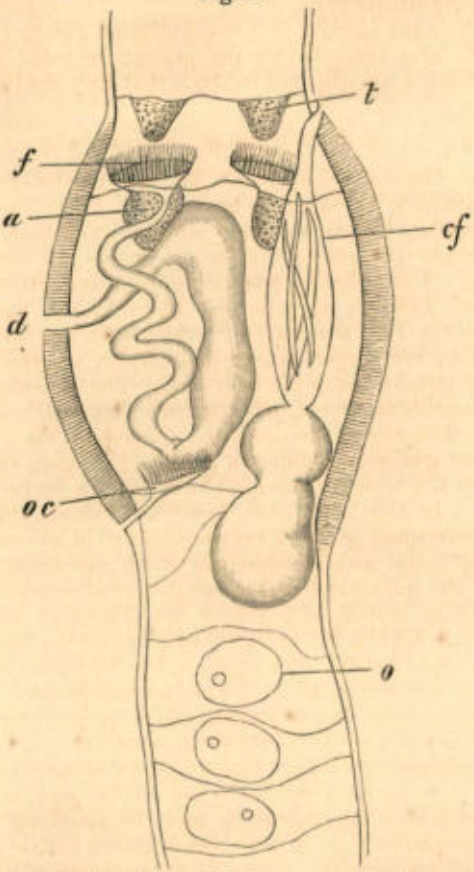
He has confounded, as so many writers have done, the *testes* with the *vesiculæ seminales*; the former organs are not described by Claparède. I find that the testes differ in no important particular from those of *Tubifex*; they lie (see Plate XXIII. fig. 1), as in that genus, in the 10th segment, into which open the funnels of the vasa deferentia; each organ is long and narrow, somewhat swollen at the base of attachment to the body-wall. The *vesiculæ seminales* (testes of Claparède) were not, judging from Claparède's description, fully developed in any of the specimens studied by me. The 10th segment in one specimen contained a mass of developing spermatozoa about equal in size to a similar mass occupying a large portion of segment 11. In the latter case, however (Plate XXIII. fig. 3), the mass of developing spermatozoa was enclosed in a thin-walled sac abundantly furnished with blood-vessels which was confined to this segment, and did not extend back through several segments.

The generative system of a young example of *C. arenarius* is depicted in Plate XXIII. fig. 1; it will be seen that the funnels of the vasa deferentia open into the 10th segment, but the cells of which they are composed are not ciliated. The *vasa deferentia* pass in a slightly sinuous course to the atrium, which opens externally, not far from the posterior border of the 11th segment. The *atrium* in the undeveloped condition is lined by a simple non-glandular columnar epithelium; it is invested externally by a thin coat of muscles, outside of which is a tolerably thick layer of glandular peritoneal cells. The *spermathecæ* lie in the 10th segment, and at this stage are simple pyriform vesicles. Upon the anterior face of the septum which separates the 11th from the 12th segment, and corresponding exactly in position to the funnel of the vasa deferentia, is a disk-shaped layer of columnar cells, which is evidently the *oviduct*; the cells at this stage are, like the cells of the vasa deferentia funnels, not ciliated. In the sexually mature animal the oviduct-funnels are extremely conspicuous (fig. B & Plate XXIII. fig. 2) cup-shaped organs, with abundant cilia. At the time that I made this observation, I was not acquainted with any observations upon the structure of the Tubificidæ later than those of Vejdovsky[1]; I concluded

[1] System u. Morph. d. Oligochaeten. Prag, 1884.

therefore that I should have the pleasure of recording for the first time the presence of oviducts in the Tubificidæ, and finally exploding the very improbable hypothesis that in these worms the penis-sheath is the homologue of an oviduct. I find, however, that Dr. Stolé has already [1] demonstrated these organs in *Ilyodrilus* and *Psammoryctes*;

Fig. B.



Genital segments of *Clitellio arenarius*. The atrium of the right side and the left spermatheca have been removed. *t*, testes; *f*, vas deferens funnel; *d*, male genital orifice; *a*, ovary; *oc*, oviduct; *cf*, spermatheca, containing spermatophores; *o*, ripe ova in egg-sacs.

my own discovery of the oviducts occupying an identical position in *Clitellio* and in *Hemitubifex ater* (=*Clitellio ater*, see below p. 494) lends further support to Dr. Stolé's contention that these organs will be found to be invariably present in the Tubificidæ.

The *ovaries* are situated in the 11th segment on the anterior mesentery, close to where this is perforated by the vas deferens.

[1] Zool. Anzeig. Bd. viii. p. 660.

The sexual organs of the mature worm, with a fully developed clitellum, differ to a certain extent in the two species which I have studied.

In *C. ater* there is a distinct and large *prostate gland* (Plate XXIII. fig. 7), which opens into the distal extremity of the glandular part of the atrium. In *C. arenarius* I have been unable to find such a gland, and Claparède states that it is absent in that species; he makes no remark about the prostate gland of *C. ater*, but, as he prefixes to his brief account of this species a generic definition of *Clitellio*, the gland evidently, if present, escaped his notice. Furthermore, in *C. ater* the glandular part of the atrium, although exhibiting the same structure, is relatively smaller than that of *C. arenarius*; it is entirely contained within the 11th segment, and is not curved upon itself. The *vas deferens* is very long and much coiled; it opens into a rounded chamber at the extremity of the atrium, the cells of which (Plate XXIII. fig. 7) are different from those of the atrium and more like those of the vas deferens. In *C. arenarius* the vas deferens is much shorter and wider (*cf.* Plate XXIII. figs. 5, 6), while the atrium is much larger; on one side of the body, in the single mature example of this species which I investigated by sections, the atrium was bent upon itself and entirely contained in the 11th segment; on the other side of the body the atrium extended back beyond this segment.

The funnels of the vasa deferentia in both species are cup-shaped and furnished with abundant long cilia.

As in the Tubificidæ generally the mature ova are of very large size (half the diameter of the body), and loaded with yolk-spherules: I found them in *C. arenarius* so far back as segments 13–15; in the first and last of these segments was a single ovum, in the middle one two; the ova were not freely floating in the body-cavity, but were enclosed in distinct sacs (Plate XXIII. fig. 4), furnished with blood-vessels; these sacs were perfectly independent of each other, there was no communication that I could trace between the ovisacs of adjacent segments.

In *C. ater* there appeared to be a similar arrangement. The *spermathecæ* of the sexually mature worms offer a valuable differential character; they are most complicated in *C. arenarius*. Claparède, in his figure of the spermatheca of this species[1], has correctly indicated the division of the spermatheca into two parts by a median constriction; in the part which communicates with the exterior only are found the spermatophores. The distal pouch in my specimen contained a liquid deeply stained by the colouring reagent; its walls, moreover, were lined by an epithelium of a different character to that found in the proximal part of the spermatheca. In *Tubifex rivulorum* [2] there is a corresponding specialization of the lining epithelium, but here there is no constriction developed between the different regions of the pouch.

In Claparède's figure this constriction is not sufficiently marked; in my specimen (see fig. B, p. 491) the two halves of the spermatheca are joined by an extremely narrow neck.

[1] Études, &c., *loc. cit.* pl. iii. fig. 4.
[2] Vejdovsky, *loc. cit.* pl. ix. fig. 17.

The spermatheca extends beyond the 10th segment, in the sexually mature individual it reaches back as far as the 13th segment; where it traverses the boundary-line between the 11th and 12th segments, the next septum, *i. e.* that which divides segments 12 and 13, comes into close relations with the septum dividing segments 11, 12 (see p. 491, fig. B); at this point the two septa almost fuse and the spermatheca passes directly from segment 11 into segment 13; where it traverses the two mesenteries there is another constriction, but the epithelium does not change in character. In *Spirosperma*, according to Eisen [1], the spermatheca occupies in the same way several segments.

In *C. ater* the spermatheca is not differentiated into two regions and it only occupies one segment (the 11th).

§ 3. *Systematic Position and Affinities of the Genus* Clitellio.

In the remaining part of this paper I propose to discuss the affinities and systematic position of *Clitellio*.

In the first place, it is perfectly clear that these worms have been rightly assigned by Claparède and Vejdovsky to the Tubificidæ. Vejdovsky's definition of the family, translated into English, is as follows:—"Normally segmented Annelids of red colour, with a large number of setæ which are disposed in four bundles. The seta-bundles consist of 3–10 bifid setæ, and occasionally, in the dorsal bundles, of hair-like setæ; the lateral vascular trunks communicate directly with the ventral vessel. Testes in the 9th, ovaries in the 10th segment. Vasa deferentia, one pair opening on to the 10th segment. Spermathecæ, one pair opening on to the 9th segment. Ova probably escaping between the 9th and 10th segments. Spermatophores present in the spermathecæ. Aquatic." In all these particulars *Clitellio* resembles the other Tubificidæ, and there are no structural peculiarities that I have been able to discover by which the genus can be said to be allied to any other family.

The genus *Clitellio* itself is briefly defined by Vejdovsky, his definition being compiled from the account of the genus given by Claparède in the two papers which I have already so frequently had occasion to quote.

The two facts upon which Vejdovsky lays stress in his generic definition of *Clitellio* are the characters of the setæ and the absence of a prostate gland.

So far as the first of these characters is concerned, *Clitellio ater* agrees with Eisen's genus *Hemitubifex* [2], and it has a prostate gland. It is, in fact, clear that the two species which I have investigated differ in so many particulars, that they cannot, as the family is at present divided, belong to the same genus.

The principal characters of the two species are as follows:—

[1] G. Eisen, "Oligochætological Researches," Report of Commissioner for Fish and Fisheries for 1883 (Washington, 1885), p. 922.

[2] G. Eisen, *loc. cit.* p. 889.

	C. arenarius.	*C. ater*.
1. *Setæ*	Bifid setæ only present.	Bifid and hair-like setæ in the dorsal bundle; only bifid setæ in the ventral bundle. Sometimes no hair-setæ.
2. *Vas deferens*	Short and wide.	Long and slender and much coiled.
3. *Atrium*	Long and bent upon itself, or extending through several segments.	Short and straight, confined to the 11th segment. Extremity of vas deferens dilated into a special chamber.
4. *Prostate*	Absent.	Present.
5. *Spermatheca*	Specialized into two regions; extending through several segments.	Not specialized; confined to one segment.

Clitellio ater agrees in Nos. 1, 2, 3, 4 with *Hemitubifex*, and the spermathecæ only differ in being without the glandular appendices which Eisen figures in *Hemitubifex insignis*. This latter point is one which I should regard as being only of specific value. It is only by the occasional absence of the hair-setæ in the dorsal rows, and the dilatation of the vas deferens, that this species differs from *Tubifex*. I have not mentioned in the Table the fact that the penis is chitinous, because this character does not differentiate the two species which are compared in that Table; it does, however, distinguish *Hemitubifex* from *Tubifex*.

Eisen met with *H. insignis* in Sweden, in fresh water, so that its habitat is rather different from that of *Clitellio ater* [1].

Clitellio arenarius agrees with *Ilyodrilus* in having a short thick efferent duct, but it does not appear to resemble that genus in much else except perhaps in the absence (?) of prostate glands. Stolé was unable to find these glands in *Ilyodrilus coccineus*; Eisen, however, figures them in several species, though apparently their presence is not referred to in the text of this paper. On the whole it seems advisable to retain the generic name *Clitellio* for *C. arenarius*, and it may be thus characterized:—

Clitellio, Claparède.

Clitellio, Claparède, "Etudes anatomiques, &c.," Mém. Soc. Phys. Genève, t. xvi. 1862, p. 102.

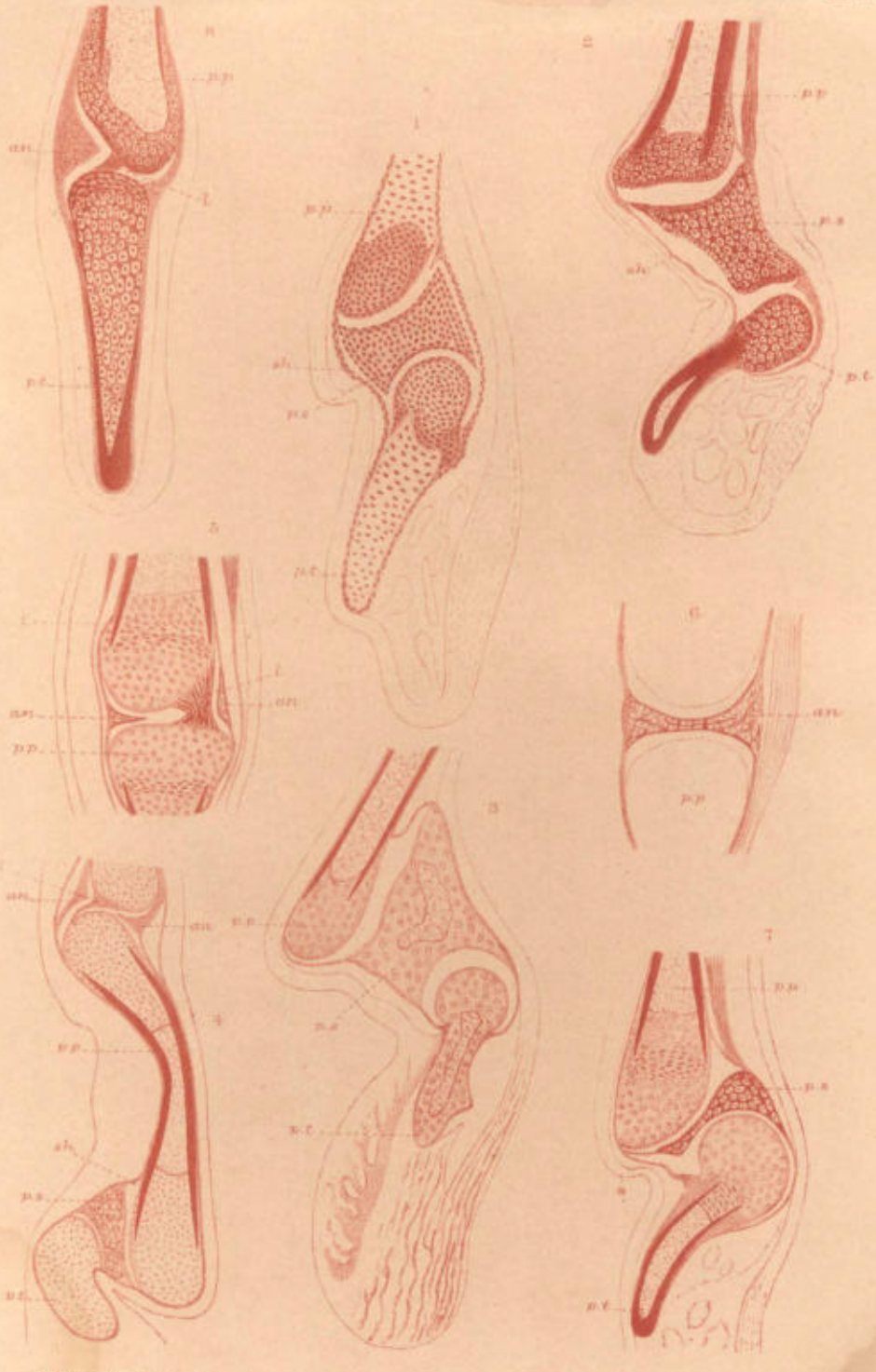
Marine Tubificidæ of an elongate slender form. Bifid setæ only. Vas deferens wide and short; atrium very long; no vesicula seminalis; no prostate glands; penis with a chitinous covering. Oviduct present in 11th segment. Egg-sacs in segments 13, 14, 15. Spermathecæ very large, occupying several segments, differentiated into two regions, separated by a constriction. Spermatophores elongate.

This genus will only contain *C. arenarius* [2].

Clitellio ater must, I think, be included in Eisen's genus *Hemitubifex*.

[1] It should be mentioned that the effect of the two rivers which enter the Sound at Plymouth, and the breakwater which extends across its mouth, is to render the water somewhat brackish.

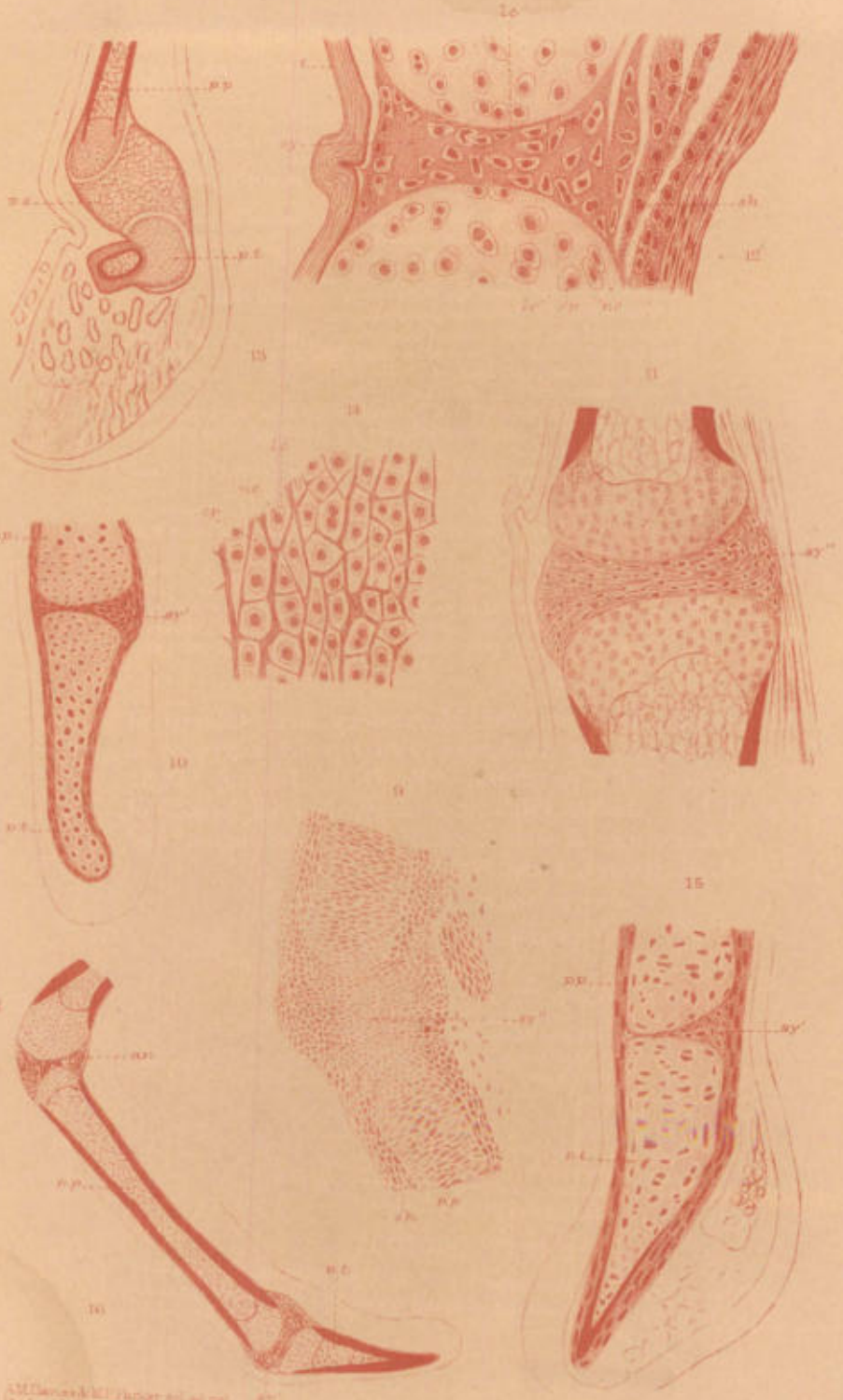
[2] The other species of the genus must be regarded with Vejdovsky as "*incertæ sedis*."



A.M.Dennes & M.J.Parker del. et lith.
Parker & Barnard lith.

West, Newman & Co. imp.

Supernumerary phalanx & syndesmoses in Amphibia.



Supernumerary phalanx & syndesmoses in Amphibia.

observation of Peters's (16), as to the existence of "a small additional phalanx between the ultimate and what is normally the penultimate" one in his *Polypedatinæ*. Peters's description was very meagre, and it is to Boulenger that credit is due for having placed the matter on a sound footing. The conclusions arrived at by the two authors differ in important respects, and these we shall duly consider. Both deal exclusively with the *Ranidæ*. The presence of a structure in the *Hylidæ* which at once suggests that in question had been previously noted by one of us, while engaged upon an allied investigation (7), and as we had, in pursuit of the same, accumulated material sufficient for a fuller elucidation of the problem, we decided to work it out.

We give in Section IV. a complete list of the animals examined. Our sincere thanks are due to Dr. Günther, F.R.S., for certain of these, and to Mr. Boulenger for others and for ever generous assistance and advice.

Method.—The digits were, if necessary, first decalcified in ½ p.c. chromic-acid solution, with a few drops of nitric acid. When soft they were transferred to an aqueous solution of $NaHCO_3$ until the acid was for the most part removed. They were then dehydrated with alcoholic solutions of increasing strengths and stained in borax-carmine, the excess of stain being subsequently removed by 75 p. c. alcohol, to which a few drops of HNO_3 were added. They were then finally dehydrated in absolute alcohol and transferred, *vid* turpentine, to paraffin, and cut with the Rocking Microtome.

Staining was, in many instances, resorted to without dehydration. We found that a couple of hours sufficed in most cases for decalcification in chromic and nitric acids. The preparations were removed from this as soon as possible, for it was found that if allowed a prolonged immersion therein the chances of successful staining became reduced.

In deciding upon the above method we found Whitman's 'Methods of Research' of great service, and we gladly acknowledge the help afforded us by that work.

II. GENERAL AND ANATOMICAL.

The supernumerary phalanx was, as seen by both Peters and Boulenger, ossified, and in such a condition that, had it been found fossil, would have left no doubt of its value as such, except perhaps for its small size. It will be shown later on that the structure is subject to a wide range of modification anatomically and histologically; and its fundamental relationships may best be studied in detail in such a form as the tree-frog (*Hyla arborea*, Plate XXIV. fig. 1). Neither Peters nor Boulenger were aware of its existence in this family; and we find that our own discovery of the same was anticipated by Leydig in 1876. He writes (14. p. 166), "von Andern und mir wurde bei *Hyla arborea* ein sich zwischen die letzte und vorletzte Phalanx einschiebender Knorpel erwähnt." This author, then, has a long priority of claim to the first discovery.

The supernumerary phalanx is, in the adults of most forms in which

it attains an adequate development as such, disposed ventrally (cf. *Hyla freycineti*, *p.s*, Plate XXIV. fig. 3), and there is a constancy of relationship between it and the adjacent head of the terminal phalanx (*p.t*, of fig. 3), the two generally coming to underlie, more or less completely, the distal epiphysis of the penultimate phalanx. This is, moreover, generally enlarged and invested in a fold of skin which projects freely forwards in the manner of a prominent lip, the whole giving to the antero-dorsal extremity of the digit a very characteristic aspect, to which Boulenger's fig. 1 does full justice. On comparison with *Nototrema* (fig. 7, *), in which the supernumerary phalanx attains but a small development, it is seen that this fold (*, fig. 7) is wholly related to the enlargement in question[1]; and it will be found, in all cases, that the parts are so disposed as to allow of an upward rotation of the terminal phalanx. When the latter is fully displaced its long axis is seen to lie at right angles to that of the penultimate phalanx. It will be found on manipulation that the degree of ventral displacement of the supernumerary phalanx is here proportionate to that of the upward rotation of the terminal one, and that when the extremity of the digit is in contact with an applied surface, these two phalanges lie in the same plane, the former receiving, together with the base of the latter, the more direct thrust under the weight of the falling body. Such an arrangement would manifestly result in a distinct functional advantage, especially in the platydactyle forms, and the terminal phalanx would be the better able to support, undisturbed, the adhesive integument.

When examined microscopically, the supernumerary phalanx is seen, in its fully differentiated condition, to consist in most cases of true hyaline cartilage (ex. *Hyla arborea*, fig. 1, and *Rhacophorus*, fig. 2), differing in no respect from that forming the epiphysial extremities of the adjacent phalanges. It remains in this condition long after the other phalanges, including the terminal one, have become ossified (cf. *Rhacophorus*). It invariably ossifies quite late; and among the large series of specimens examined we have met with it in the bony condition only in *Hyla freycineti* and *Rhacophorus maximus*. In the former instance it is seen (fig. 3) to be replaced in a true endostosis.

It might appear from the foregoing that its first development takes place subsequently to that of the other phalanges, and that its ossification sets in at a period relatively proportionate to that of the same. Examination of the tadpole of *Hyla arborea* (fig. 1) shows that this is not the case, for it is there as fully differentiated as with the adult, and that at a stage in which the periosteal growth of the adjacent elements is dawning. Nor must it be imagined that its conversion into bone is in any way determined by its relative size, for in *Rhacophorus eques* (fig. 2, *p.s.*) it is, while still unossified, relatively larger than in any species with which we have dealt.

On passing from the ossified type to that of the other extreme of the series (to those forms, that is, in the adults of which anything

[1] In the larva the conditions are otherwise, cf. *Hyla*, fig. 1.

like a conspicuous structure is interposed between the terminal and penultimate phalanges) we meet (*ex.* the common Frog, Plate XXV. fig. 16) with a pad of loose fibrous tissue, which is closely bound down to the applied epiphysial surfaces, such as would appear to have nothing to do with the undoubted phalanx under consideration. In *Nototrema*, however (fig. 7), the pad, while never truly hyaline, has all the fundamental relations described for the phalanx in the culminating term of the series; and in *Hyla peronii* (fig. 13), while histologically identical with that of *Nototrema*, it has the proportions, detailed shape, and relationships seen in *H. arborea*. *Hyla cærulea* bridges over the gap histologically between *Nototrema* and *Hyla arborea*; and when to this it is added that, in those *Ranidæ* the adults of which bear the supernumerary phalanx, the same early becomes hyaline as in *Hyla arborea*, it is clear that all stages between the two extremes afore described are forthcoming.

Minor modifications are met with, but these may, together with the consideration of lesser detail, preferably be dealt with later.

Seeing that, upon a purely structural analysis, the fibrous pad of the Common Frog must be looked upon as the homologue of the skeletal supernumerary phalanx of the higher *Ranidæ* and *Hylidæ*, we are next led to inquire what, if any, structural community the two may possess in the embryo. On examination of the larvæ of *Hyla arborea* and *Rana temporaria*, at a stage at which the hind limbs are becoming differentiated, it is found that the places of the phalanx of the former, and of the pad in the latter, are alike occupied by a fibrous mass which is largely cellular and loosely interposed between the applied epiphysial extremities. It is well known that, in most Urodeles, there are interposed between the corresponding parts of the limb-skeleton fibrous masses which take the place of the synovial capsules of the higher Vertebrata; and these are found, on examination, to be indistinguishable from those above described. They have long been termed by Hyrtl (8) "*syndesmoses*."

The foregoing is not all. Hyrtl, in describing the manus of *Salamandra maculosa*, writes (p. 61): "phalanges inter se, et cum ossibus metacarpi, textu fibroso conjunguntur." We find that these syndosmoses are structurally identical with the supernumerary phalanx of the Anura in its least modified condition (*cf.* figs. 11, 12), and, seeing that in many Anura similar pads are interposed between the proximal phalanges themselves, it follows that the structures in question in them are not in any sense to be regarded as peculiar to the terminal segments of the digits, and that the supernumerary phalanx would appear to be a specialized counterpart of the interphalangeal syndesmosis. In other words, may not the community of structure between the developing supernumerary phalanx and the syndesmosial pad be indicative of a community of origin? Should this be the case, there would open up a new and promising departure for the reconsideration of the questions of origin and morphology of supernumerary phalanges in general. To these we shall return.

III. HISTOLOGICAL AND DEVELOPMENTAL.

Dixey, in a paper on the ossification of the terminal phalanges (3), incidentally describes and figures the syndesmosis in *Proteus*. He deals with that interposed between the penultimate and terminal phalanges—with that, that is to say, which would appear to represent the supernumerary phalanx of the Anura. He writes (p. 68): "another instance of arrested development in the digit of *Proteus* is afforded by the inter-phalangeal joint . . . . the cartilage, with a slight alteration in the size and relative number of its cells, is seen to be quite continuous between the heads of the two phalanges, nor does it exhibit the least sign of an articular cavity." He believes his specimen to have been "fully adult" (p. 70); but in this he was mistaken, for in the larger of our specimens of the same (*cf.* p. 504) ossification had proceeded much further than in his.

Microscopic examination of this syndesmosis with its associated parts in *Proteus* reveals, under the treatment which we have adopted (p. 496), the following facts. The matrix of the epiphysial cartilages of the phalanges stains uniformly and feebly, while that of the less resistant syndesmosis takes the dye much more readily, becoming thereby sharply differentiated (*cf.* Plate XXV. fig. 12). The latter shows traces of a fibrillar structure, but it is for the most part homogeneous. The cells which are present are well defined, and their peculiarities in structure, disposition, and size are common to both epiphysis and syndesmosis. Each is irregular in contour, and carries a large nucleus, while it is seen to lie within a spacious lacuna, the boundary of which is smooth and well defined; and such differences as are met with between the corpuscles of the epiphyses and of the syndesmosis are seen to be entirely due to pressure under apposition of the first named. The cells of the syndesmosis are more numerous and more closely aggregated than those of the hyaline epiphyses, and the intensity of colour of the former under the action of reagents is, to a large extent, due to this crowding. The details of histological structure here described hold good, with but slight modifications, for all conditions in which the supernumerary phalanx and its homologue remain non-hyaline (cf. *Proteus*, fig. 12, and *Hyla peronii*, fig. 14). Its cells are cartilage corpuscles, and the tissue to which they give rise is, in its most elementary form, a nascent cartilage.

The whole digital skeleton is invested in a continuous and well-differentiated fibrous tunic, and in *Proteus* this is, at any rate ventrally, incompletely marked off from the syndesmodial pad. There lie buried up in the former at this point (*sh.*, fig. 12) cells which closely resemble those of the syndesmosis in size and structure; the question, therefore, naturally arises as to whether some of these might not have migrated into the inter-phalangeal region, there to give rise to the pad in question, or that that might conceivably have been an ingrowth of the tunic itself. It will be seen, however, that the corpuscles of the tunic lie buried in a coarsely fibrous matrix, in which there is a total absence of the lacunæ so charac-

teristic of the syndesmosis. Apart, however, from this important structural difference between the two things, there are certain other considerations which point to the conclusion that the syndesmodial pad is not, as might appear, a late infolding of the investing membrane. In many instances, especially in its phalangeal condition, it enters into that which is, at best, a loose connection with the same at all points (*p.s.h.*, *Hyla arborea*, fig. 1), and there are developed true synovial surfaces at its points of contact with the penultimate and terminal phalanges. All this being so, the question next in need of solution is that of the primary origin of the syndesmodial pad—Is it, as its histological structure in the larvæ of *Hyla* and *Rana* would suggest, related to the phalanges?—or is it, as its condition in *Proteus* would seem to indicate, a derivative of the investing tunic?

The base of the terminal phalanx is, in some Anura, greatly enlarged and swollen, giving rise (ex. *Hylodes*) to an immense tubercle which underlies the distal extremity of the penultimate one. In certain others the opposite ends of the phalanges are severally expanded, in a somewhat similar fashion; and, when first our attention was drawn to the subject, it appeared not unlikely that the supernumerary phalanx might represent the dismembered tubercle of either the penultimate or terminal one—more probably that of the latter. The coexistence of the two things in *Nototrema* and other *Hylids* is, in itself, fatal to this supposition; while it shows the structure in question to be of independent origin. Choice seemed then to lie between two alternatives; it appeared to be either an intercalary structure of comparatively late origin, or a sesamoid. We have already given reasons (*supra*) for doubting the former hypothesis. Our chief reason for supposing it to be a sesamoid lay in the assumption of a similarity of relationship with the proximal end of the terminal phalanx to that so common among the higher Vertebrata. This, however, is inconstant, for in many instances (ex. *Rhacophorus eques*, fig. 2) the structure is disposed lineally with the penultimate phalanx. Appeal to the details of muscular insertion proved fruitless, as the tendons become, for the most part, merged into the investing tissues proximally to the structure under consideration.

The youngest stages examined by us were those of *Rana temporaria* and *Hyla arborea*. In the former, at a period at which the tail is almost absorbed, the condition of the joints recalls that of *Proteus*; this is especially the case with the most distal joint (*sy.*, *sy.'*, fig. 10), which is strictly similar to that of the Urodele, except for the possession of a triangular projection from one side of the outer membrane. A similar condition is met with in *Hyla arborea*. Examination of our youngest specimen of this species shows, however, that, at a stage at which the parts in general are first becoming differentiated (fig. 9), the syndesmodial pad is centrally histologically identical, to minute detail, with the adjacent incipient phalanges; while, peripherally, it graduates off into the surrounding indifferent tissue. Thus it is seen that the phalanges and syndesmoses are, together with their investing sheath, differentiations of a continuous

and common blastema[1]; and that the syndesmoses, while intimately related to the sheath, are formed, not as ingrowths of the same, but as differentiations of that mass from which the phalanges are derived, and that they differ from these, initially, only in degree of elongation.

A mode of origin similar to the foregoing has long since been recorded for the parts of the joints in the Mammalia, including Man. Kölliker, quoting Henke and Reyher (6), to whom we owe the observation, likens[2] the changes undergone, not inappropriately, to those realized in the differentiation of the vertebral and intervertebral bodies.

These facts, when viewed in conjunction with those adduced in the foregoing section, show that the supernumerary phalanx, the normal phalanges, and the syndesmoses are all on a developmental equality. The last named must then be looked upon as structures which, despite secondary changes, would be liable to take on, more or less completely, the condition of a phalanx. Indications of this are not wanting; for Leydig, in describing the supernumerary phalanx (his 'Zwischengelenkknorpel') in *Hyla arborea* asserts (14. p. 166): "Er fehlt selbst bei Reptilien nicht, wo ich denselben früher übersehen hatte: gegenwärtig kenne ich ihn bei *Lacerta* (*L. muralis*)[3] und *Platydactylus mauritanicus*."

IV. INDIVIDUAL AND CLASSIFICATORY.

In the course of our work we have met with certain variations and departures from the predominant types afore described. For sake of clearness, we deferred consideration of these while dealing with questions of general morphology; and we now describe them in detail, discussing the structures in hand in their bearing upon classification. We deal with the several families in that order most convenient to the circumstances of the case. The list given at the head of each family refers only to specimens examined in detail. The measurements include the tail in tadpoles and in the Urodeles, in the older Anura they denote the length of the body from mouth to vent.

A. PHANEROGLOSSA.

a. Hylidæ.

Examined:—

Hyla arborea (tadpoles), 40–45 millim.
H. cærulea, 30, 73 millim.
H. freycineti, 25 millim.
H. lichenata.
H. peronii, 42·5 millim.
Nototrema marsupiatum, 40 millim.

[1] For other details concerning this generally *cf.* Strasser (18) and Jordan (9).

[2] Entwicklungsgesch. des Menschen, Zweite Aufl. p. 493. "So wie dann aber diese Hartegebilde deutlich zu werden beginnen, fangen auch die Zwischenglieder an einen bestimmten Charakter anzunehmen in ähnlicher Weise, wie bei der Differenzirung der knorpeligen Wirbel und der *Lig. intervertebralia*."

[3] We are unable to detect any trace of such a structure in this species.

The supernumerary phalanx reaches an altogether special development in this family, and all stages in its histological structure are represented (*cf. ante*). In *H. peronii* it attains the maximum bulk observed in the entire Anuran order, the total length of its ventral border (fig. 13) exceeding that of the terminal phalanx. It is very surprising that, in spite of this, it does not even become hyaline in this species.

The remaining joints exhibit minor structural differences, but they are all modifications of a condition fully exemplified in *Nototrema* (figs. 5, 6). The place of the syndesmodial pad is occupied by a powerful annulus which, although generally dense and fibrous, never becomes converted into hyaline cartilage. Looked at in tangential sections this is seen (fig. 6) to be well defined and in close connection with the synovial capsule; it furnishes articular surfaces for the dorso-lateral portions of the apposed phalanges, and, as seen from this aspect, it bears an astonishing resemblance to the supernumerary phalanx of the same genus (*p.s.*, fig. 7) as viewed in median section. In median longitudinal section it is found to be perforated (fig. 5), mainly for transmission of a strand of elastic tissue (*inter-articular ligament*, *l.*), the fibres of which pass, in a somewhat complicated manner, between the ventral borders of the adjacent epiphysial cartilages. When analyzed in detail, this ligament is seen to be largely cellular, and in a condition which admits of little doubt that it represents the modified central portion of the original syndesmosis.

b. Bufonidæ.

Examined:—

Pseudophryne bibronii, 23 millim.

In the genus above named the syndesmodial pad is met with in the distal joints alone. Structurally it is little modified, but it gives the appearance of being subdivided medially into two strands which are completely confluent ventro-laterally with the adjacent epiphysial cartilages and pass ventrally downwards, converging, for attachment to the investing tunic. None but feeble traces of the pads are met with in the other joints, and these may be either converted into comparatively unimportant ligaments or reduced to an absolutely vestigial condition.

Kölliker, in describing the development of the Mammalia, writes[1], on the authority of Henke and Reyher (6), "wandeln sich die Gelenkstellen in ihren äusseren Theilen je länger um so deutlicher in Fasergewebe um, worauf dann in einem gewissen Stadium auch die Gelenkhöhle in Form einer engen Spalte erscheint." Henke and Reyher's "Zwischenscheiben," in which these changes go on, is identical in the main with our syndesmosis; and in view of these facts it becomes exceedingly probable that the splitting above recorded in the Bufonid may represent a persistence, in a slightly modified form, of the initial stage in formation of the typical synovial capsule.

[1] Entwicklungsgesch. p. 493.

c. Cystignathidæ.

Examined :—

Hylodes martinicensis, 24 millim.
Lymnodynastes tasmaniensis, 40 millim.

Hylodes is especially interesting in the fact that, while possessed of expanded digital extremities, it shows no trace of a distinct supernumerary phalanx.

This combination lends additional support to Boulenger's deduction, that the phalanx in question bears no definite relation to the platydactyle type.

d. Ranidæ.

Examined :—

Ixalus schmardanus (juv.), 11 millim.
Megalixalus madagascarensis, 32 millim.
Rana arvalis (juv.), 27 millim.
Rana maximus, 90 millim.
Rana temporaria, adult, and 14 millim. (tail just gone).
Rappia marmorata, 27 millim.
Rhacophorus eques, 42 millim.

We have already dwelt in sufficient detail (p. 500) upon the supernumerary phalanx in this family; all stages are represented, from the completely ossified one (Peters and Boulenger, *ll. cc.*) to that of a degraded syndesmosis (*Rana temporaria*, Plate XXV. fig. 16).

The syndesmoses of the remaining joints are, in the adults of all species examined by us, with the exception of *Rana arvalis*, modified to form, more or less efficiently, the ligament and annulus apparatus of the *Hylidæ*. *R. arvalis* would appear to be less conspicuously modified than the other members of this family, in that the ordinary syndesmosis is retained for both the terminal and penultimate joints. We have, however, only examined a young specimen.

e. Discoglossidæ.

Examined :—

Alytes obstetricans, 30 millim.
Bombinator bombinus, 41 millim.
Discoglossus pictus, 62 millim.

In all three genera the phalanges are united, in both fore and hind limbs, by syndesmoses. Those of the terminal joints are in no way in excess of at least that of the penultimate one.

These syndesmoses are (*cf.* fig. 11), for the most part, closely bound down to the faces of the apposed epiphysial cartilages. In the hind limb of *Bombinator* there is a suggestion of a loss of direct connection between the two, with the development of a shallow articular cavity, while, in the proximal joint of the same, the syndesmosis is in a loose and somewhat degenerate condition. These modifications are, however, exceedingly feeble and unimportant, and, making all due allowance for them, the *Discoglossidæ* are seen to

stand alone among Anura in the life-long retention of the inter-phalangeal syndesmoses.

f. Pelobatidæ.

Examined :—

Pelodytes punctatus, 39 millim.
Xenophrys monticola, 48·5 millim.

In *Xenophrys* the syndesmoses are feebly represented. That of the terminal joint is complete and ventrally enlarged, but reduced and feebly ligamentous in its middle. The fibres of the latter portion (*l.*, fig. 8) pass from the distal face of the penultimate phalanx obliquely upwards and forwards, to be inserted into the proximal face of the terminal one. It will be obvious that there is here an approximation towards the condition of the inter-articular ligament of the *Ranidæ* and *Hylidæ*; and this species is particularly interesting as showing that there is no leading modification undergone by the proximal syndesmoses for which a counterpart cannot be found in the terminal one.

The syndesmoses of the proximal joints are annular and largely absorbed, exhibiting traces of the inter-articular ligament of the above-named families.

Pelodytes, the affinities of which with this family have been called into question [1], while most nearly Pelobatoid, shows, with respect to its proximal syndesmoses, a tendency towards a condition intermediate between the *Pelobatidæ* and *Discoglossidæ*; for these, while more independant of the apposed surfaces of the phalanges than in the Discoglossidæ, are still imperforate.

B. AGLOSSA.

Examined :—

Pipa americana, adult ♂.
Xenopus lævis, adult ♀.

The terminal joint of the hind limb was alone examined in each case. It was found to consist, in both genera, of a coarsely fibrous syndesmosis, showing no trace of special differentiation and most nearly suggestive of the condition seen in *Pelodytes*.

C. URODELA.

Examined :—

Molge cristata, 135 millim.
M. palmata (larvæ), 25 millim.
M. waltlii, 175 millim.
Proteus anguinus, 135 and 220 millim.
Salamandra atra, 130 millim.
S. maculosa, 140 millim.
Spelerpes fusca, 130 millim.

In this Order the syndesmoses are throughout uniform in structure;

[1] *Cf.* this vol. p. 125.

and, except for a slight thickening of the distal one (most marked in *Proteus*), there is nothing demanding general consideration beyond that already given (*ante*).

Spelerpes is particularly instructive in the fact that while its digits terminate in well-marked and cup-shaped disks, its distal syndesmoses are normal and comparatively thin, and in no way in excess of the proximal ones (*sy.'*, fig. 15).

There are one or two matters concerning this Order, in respect to which our results are not in harmony with those of our predecessors. Hyrtl, in dealing (8. p. 70) with the pes of *Salamandra maculosa* writes: "Cartilago primae seriei, cum illa secundae, fibrosis vinculis cohaeret, quod etiam de metatarsi primi cum cartilagine secundae seriei conjunctione valet. Omnes reliquae articulationes normales." The last statement we cannot confirm; some of our sections show a slit in the syndesmosis in question, but that is, almost to a certainty, artificial. Leydig, in his short description of our supernumerary phalanx (his "Zwischengelenkknorpel"), writes (14. p. 166):—"Endlich sei an dieser Stelle bemerkt, dass auch bei *Salamandra* in der bindegewebigen Substanz der Sehnen des Zehenbeugers langgestreckte Nester von Knorpelzellen vorhanden sind, wie solches von ungeschwänzten Batrachiern seit langem bekannt ist." Our specimens show nothing of the kind, and the syndesmoses are, in them, throughout, uniform and simple. The figure which Leydig publishes (*l. c.* pl. xi. fig. 26) in illustration of this statement greatly excited our curiosity—for, did it hold good, it would follow that *S. atra* would be, in respect to its joints, in advance of the *Discoglossidæ*. The fig. more nearly recalls the condition of the parts in a Hylid; and if it delineates that which it purports to do, it must be either a bad drawing of a crushed or ill-preserved specimen or that of an abnormal one.

Peters undoubtedly regarded the supernumerary phalanx as a correlation of the platydactyle condition. He did not actually state this, but it is to be inferred from his classification. Boulenger shows that his (Peters's) *Polypedatinæ* was an unnatural group and (2. p. 205) that "*Cassina*, though oxydactyle, and therefore placed by Peters in his *Raninæ*, has the additional phalanx." This investigator's demonstration that (*l. c.*) all the species of his genus *Rana* "have the normal phalanges, irrespective of the presence or absence or size of the digital expansions," goes far towards disproving a supposed connection between the supernumerary phalanx and the expanded digit. Our own researches reveal the presence of a fully developed supernumerary phalanx in families other than the *Ranidæ*, and they fully bear out Boulenger's deduction; while the discovery that the syndesmosis does not become converted into a true phalanx in the platydactyle *Hylodes*, *Nototrema*, and *Dendrobates*, amounts to a substantiation of the same.

The condition of the parts in *Spelerpes* is especially interesting in both its morphological and physiological aspects. The expansions

of the digits in this animal are more markedly sucker-like than are those of other Amphibians. Each terminates in a well-differentiated cup-shaped extremity; but notwithstanding this, there is, as before said, no supernumerary phalanx. Looked at at first sight, each of the afore-named expansions, with its circular contour, would appear to differ from that of the typically platydactyle Anura in being uniformly developed around the free border of the phalanx. When examined in section such is seen not to be the case (Plate XXV. fig. 15), for the disk, while truly circular and sucker-like, differs in no important relationship from that of the Anura. *Spelerpes* is a crawling animal, inhabiting the walls and recesses of a cave, while the *Anura* in question are saltatorial and arboreal. We have shown (p. 497) reason for believing the supernumerary phalanx of the latter to be functional in receiving a direct thrust in saltation, and the discovery of the absence of that structure in *Spelerpes* is as welcome as it is intelligible, on this view.

Attention has been drawn (p. 503) to the degraded condition of the syndesmodial pads in *Rana temporaria* (fig. 16), and such is especially the case with that representing the supernumerary phalanx. The same exceeds the more proximal ones in thickness and bulk, despite its degenerate condition; and it might therefore appear to represent a degraded vestige of the fully formed supernumerary phalanx, rather than of the simple syndesmosis. The facts of development do not support this idea, for the terminal pad in this species is, to begin with, a true syndesmosis (indistinguishable from that of the lower forms) which, in its subsequent transformation, exhibits no sign of a phalanx-like stage.

The condition of the parts in the *Discoglossidæ* substantiates, more forcibly than anything hitherto recorded for them, their lowly affinities[1]. They are, in respect to all structures yet investigated which are of service in unravelling their pedigree, by far the least modified of living Anura. The unmodified condition of the syndesmoses, which, in them, persists for life, is, among the higher forms examined, most nearly realized in *Pseudophryne bibronii* and *Rana arvalis*.

V. GENERAL CONSIDERATIONS.

The observations herein recorded have an important bearing on questions of general morphology of parts of the appendicular skeleton. On reviewing the literature of the subject, it is impossible to avoid the conclusion that while, of late, too much importance has been attached to sundry gristly fragments in their supposed relationships to variation in structure and to the delusive "archipterygium," there has been a lamentable neglect of the study of those leading facts of development, by which these would-be relationships must, in the end, stand or fall.

A new interest has been recently awakened in the question by the discoveries of Lebouc q (12) and Baur and Gadow (1). The former

[1] *Cf.* this vol. p. 178.

shows that the phalanges of the fœtal Cetacean manus exceed in number those of the adult [1]; while the latter record the appearance of a supernumerary phalanx in that of the Sirenia. All subsequent investigation has confirmed Leboucq's observation, but it is at present uncertain how far the process of abbreviation may be the result of absorption or of concrescence. It is most interesting to recall, in view of this, Götte's observations upon the limbs of *Molge* (his *Triton*). He shows (5. p. 12):—"Es wurde schon hervorgehoben, dass diese Endphalangen, namentlich an den Larven von *T. cristatus*, durch ihre Länge auffallen; anfangs übertreffen sie darin nicht selten die andern Glieder desselben Fingers, Metacarpus und Phalangen zusammengenommen. In der späteren Sommerzeit wachsen sie weniger schnell, sogar langsamer als die anderen Glieder, behalten aber ein lang und spitz ausgezogenes Ende, welches auch der ganzen Fingerspitze die gleiche Form verleiht. Sie erhalten auch wie die übrigen langen Knorpel eine äussere Knochenhülle, welche aber den dickeren proximalen Teil des Gliedes nicht überschreitet, so dass die grössere Hälfte des Knorpelfadens daraus frei hervorhängt." He further shows that these filamentous terminal phalanges become abbreviated by atrophy (? absorption)[2]. Leboucq, commenting on this, writes (13. p. 533): "diese Angaben glaube ich mit den von mir bei Cetaceen nachgewiesenen Thatsachen parallelisieren zu dürfen"; but all subsequent observation does not fully bear this out, for Kükenthal has more recently shown (10. p. 639) that adjacent proximal segments may coalesce[3]. These important observations indicate, when viewed in conjunction with our own, a general shuffling (if the comparison may be admitted) among the terminal phalanges, and their interest increases when it is said that Peters records (16. p. 6) a reduction in number, by concrescence, of the phalanges in the Chelonian *Pelomedusa*.

Significant as are the above-cited discoveries, they do not help us towards an understanding of the *primary* origin of the supernumerary phalanges themselves. They deal only with metamorphoses and not with original development.

It is well known that while, in the *Odontocetes*, the phalanges bear terminal epiphyses which articulate by means of imperfect synovial joints, in the Whalebone Whales they are less differentiated and united by fibrous tracts [4]. The only serious attempt yet made to grapple with the question of primary origin of these parts is that of Ryder (17); he concludes (p. 1015) "that it has been through a Seal-like ancestry, with prolonged integuments to the manus, in which the nails were not terminal but dorsal, beyond which the ungual phalanges were extended as bars of cartilage, which gave

[1] Max Weber has denied this (19) on examination of *Globiocephalus*; but Kükenthal has shown more recently (10. p. 643), upon examination of more extensive material, that he was in error.

[2] Mr. Boulenger informs us that he has observed a similar phenomenon in certain other Amphibia.

[3] His discovery that a similar fusion may go on between elements of the carpus not hitherto recognized is no less striking than Leboucq's.

[4] *Cf.* Flower, 4. p. 272.

rise, by transverse segmentation and subsequent ossification, to extra terminal distal segments as found in existing Cetacea." His chief ground for this belief is the assertion that (p. 1014) in *Globiocephalus*, "while the metacarpal elements and first three or four phalangeal segments of the second and third digits ossify simultaneously, the four to six extra distal segments ossify in succession towards the distal periphery, the terminal elements of the digits being the last in which ossific centres appear." It must suffice to state here that all recent advance is opposed to this extravagant hypothesis, and that it finds no support in fact (*cf.* Leboucq and Kükenthal). Baur, in criticising Leboucq's deduction (12. p. 208) that "la main des cétacés a conservé des caractères tout à fait primitifs, et ne peut être dérivée par adaptation de celle d'aucun mammifère actuel," naively remarks (1. p. 493): "wenn also die Embryonen verschiedener Cetaceen mehr Phalangen besitzen als das erwachsene Tier, so beweist dies nur, dass die nächsten Ahnen der Cetaceen, *welche aber schon wahre Cetaceen waren*, mehr Phalangen besessen haben." Here is, in other words, the refrain of our own contention, and we regard Leboucq's retort (13. p. 534) that it "versetzte einfach die Frage, ohne dieselbe zu lösen" as based on a misinterpretation of its meaning[1].

Supernumerary phalanges have been supposed to represent the products of subdivision, or elongation, of shorter predecessors, and this conceived mode of origin would find a close parallel in the paired ossification, under lateral expansion, of the supra-occipital and inter-parietal in the Cetacea themselves if not in the occasional replacement of greatly expanded bones in Wormian elements. Dixey, describing the ossification of the terminal phalanges in the Mammalia, furnishes some reason for believing that (3. p. 65) "the distal extremity of the ungual phalanx corresponds morphologically with the centre of the diaphysis in other long bones;" and this deduction might conceivably lend support to the above-named supposition. We are not of this opinion. We hold such differences as exist between the terminal and penultimate phalanges to be purely adaptive.

Our researches record, for the first time, the initial stages in the actual *primary* development of a supernumerary phalanx, and it is deserving of note that the most complete differentiation undergone by such is realized in the animals with which we deal. That it arises as an intercalary structure and is a direct derivative of the syndesmosis, is irrefutable. In seeking to apply these facts to the Cetacea, we quite agree that the "*Hyperphalangie*" is "an adaptive phalanx-like segmentation" (Kükenthal, 10. p. 641); but we would be inclined to substitute for the words "of an elongated cartilaginous ray borne upon the third phalanx"—of a blastema productive of both phalanges and inter-phalanges, and that argument from analogy to the only known facts of development would lead us

[1] A knowledge of the early condition of the digits in *Platanista* is much to be desired, for specimens in my teaching collection and one in the Museum of Natural History show conspicuous traces of a fourth bony phalanx.—G. B. H.

to regard the supernumerary elements as primarily intercalary, and in all probability derivative of the inter-phalanges (inter-articular syndesmoses—the "Zwischenscheibene" of Henke and Reyher, 6). We accordingly accept, so far as it might bear upon primary differentiation of the parts, Lebouc̨q's declaration (13. p. 532) that "alle Phalangen [in the Cetacea] wie gross ihre Zahl sein möge, denselben morphologischen Wert haben."

The condition of the limbs in the living Sirenia referred to (*ante*, p. 507) suggests that the numerical increase of the phalanges may have been associated with the loss of the ungues, and it is interesting to reflect here that elongation by *regular* segmentation of the cartilaginous rays of the paired fins of the *Batoidei* would, as compared with those of the *Selachii*, appear to have been somewhat similarly associated with the suppression of the horny fin-rays. The condition of the parts in *Squatina* and *Zygæna* would seem to be transitional in this respect. We put this forward as a mere suggestion, deduced by argument from structural analogy.

It would be exceedingly instructive, in the light of the preceding, to ascertain if the syndesmosis-like pads of the toothed whales pass through a synovial stage during development. Henke and Reyher's observations already cited (p. 502) show that in their 'Zwischenscheiben' we have to deal with a derivative of the syndesmosis. Our attention was early arrested by the general similarity between the proximal syndesmoses in the Hylids and Ranids and the knee-joint in the higher Vertebrata. Comparison of the parts in the latter with those of the former as represented by *Nototrema* (p. 502) reveals a striking uniformity between the two; and, should it be found that the semilunar cartilages are, with their ligaments, differentiations of a syndesmosis, a complete reconsideration of the morphological value of the former will be imperative. We have examined some Mammalian embryos in respect to this, but we withhold, for the present, further comment thereon. It is pertinent to recall here Parker's assertion (15. p. 487) that in *Aves* (*Apteryx*) the rudiment of the mesotarsal semilunar pad bears in its centre "a rounded nodule of hyaline cartilage," which he takes to be "the representative of the centrale tarsi, an element not hitherto recognized in birds."

VI. CONCLUSIONS.

1. That the supernumerary phalanx of the *Anura* is a true phalanx, and, at the same time, structurally identical with the inter-phalangeal syndesmosis of these and the other Amphibia, all transitions between the two being represented in adults of the living forms.

2. That the syndesmoses and phalanges are differentiations of a common blastema.

3. That the supernumerary phalanx of the *Anura* is probably

functional as an accessory to saltation, receiving the direct thrust under the weight of the falling body; and that the structural variations met with throughout the Amphibia are in complete harmony with this view.

4. That the *Discoglossidæ* are exceptional among the Anura, in the retention for life of the undifferentiated inter-articular syndesmoses; and that herein is afforded additional proof of their lowly affinities.

5. That the facts of development herein recorded indicate a possible intercalary origin, from inter-articular syndesmoses, for supernumerary phalanges in general.

6. That the numerical increase of the phalanges in the Cetacea may have been associated with the loss of the ungues, in a manner similar to that in which elongation, by regular segmentation, of the cartilaginous rays in the paired fins of the Batoidei would appear to have been connected with the disappearance of horny fin-rays.

7. That, in view of the facts of structural identity between the modified syndesmoses of certain Anura and the apparatus of the knee-joint of the higher Vertebrata, a reconsideration of the morphological value of the latter is demanded.

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VIII. EXPLANATION OF THE PLATES.

The figures are mostly drawn from tracings of photographs made for us by Mr. R. Chapman, and to him our thanks are due for the care bestowed upon their production.

All the figures represent digits of the hind foot. Unless otherwise stated, they represent median longitudinal sections, as seen under a low power.

Plate XXIV.

Fig. 1. *Hyla arborea*, late tadpole.
2. *Rhacophorus eques*, adult.
3. *Hyla freycineti*, adult.
4. *Hyla cærulea*, not fully grown.
5. *Nototrema marsupiatum*, adult; penultimate joint, to show its ligament and annulus apparatus.
6. The same; lateral section.
7. The same animal; to show distal joint.
8. *Xenophrys monticola*, adult.

Plate XXV.

Fig. 9. *Hyla arborea*, tadpole; to show the primary differentiation of the parts of the digital skeleton. Zeiss D, Oc. 2.
10. *Rana temporaria*, larva; to show syndesmosis of terminal joint. Zeiss D, Oc. 2.
11. *Bombinator bombinus*, adult.
12. *Proteus anguinus*, syndesmosis of terminal phalanx. Zeiss D, Oc. 2.
13. *Hyla peronii*, adult.
14. Portion of the supernumerary phalanx in the same, more highly magnified. Zeiss F, Oc. 3.
15. *Spelerpes fuscus*, adult.
16. *Rana temporaria*, adult.

Reference Letters.

an. Annulus. *cp.* Cartilage corpuscle. *l.* Inter-articular ligament. *lc.* Lacuna. *nc.* Nucleus. *p.p.* Penultimate phalanx. *p.s.* Supernumerary phalanx. *p.t.* Terminal phalanx. *sh.* Fibrous tunic of digital skeleton. *sy'.* Syndesmosis of terminal joint. *sy''.* Syndesmosis of penultimate joint. *t.* Extensor tendon.

4. On the Natural History of Christmas Island, in the Indian Ocean. By J. J. Lister, M.A., F.Z.S.

[Received October 15, 1888.]

(Plates XXVI. & XXVII.)

I. Introduction, p. 512.
II. Physical Features, p. 513.
III. Geological History, p. 515.
IV. Vegetation, p. 515.
V. Mammals, p. 516.
VI. Birds, p. 517.
VII. Reptiles, p. 529.
VIII. Crustaceans, p. 529.
IX. Conclusion, p. 530.

I. INTRODUCTION.

H.M. Surveying-vessel 'Egeria' left Batavia early on the morning of the 27th September, 1887, to carry a line of deep soundings across the Indian Ocean to Mauritius and to visit Christmas Island on the way.

In January of the same year a short visit had been paid to the island by H.M. Surveying-vessel 'Flying-Fish.' The collections which were made on that occasion exhibited a remarkable degree of peculiarity in the animal inhabitants [1] and showed that a longer visit to the island would probably yield some interesting results.

I was appointed by the Lords of the Admiralty to join the 'Egeria' as naturalist during this part of her cruise, and went out from England to Colombo, where I found that she had already arrived.

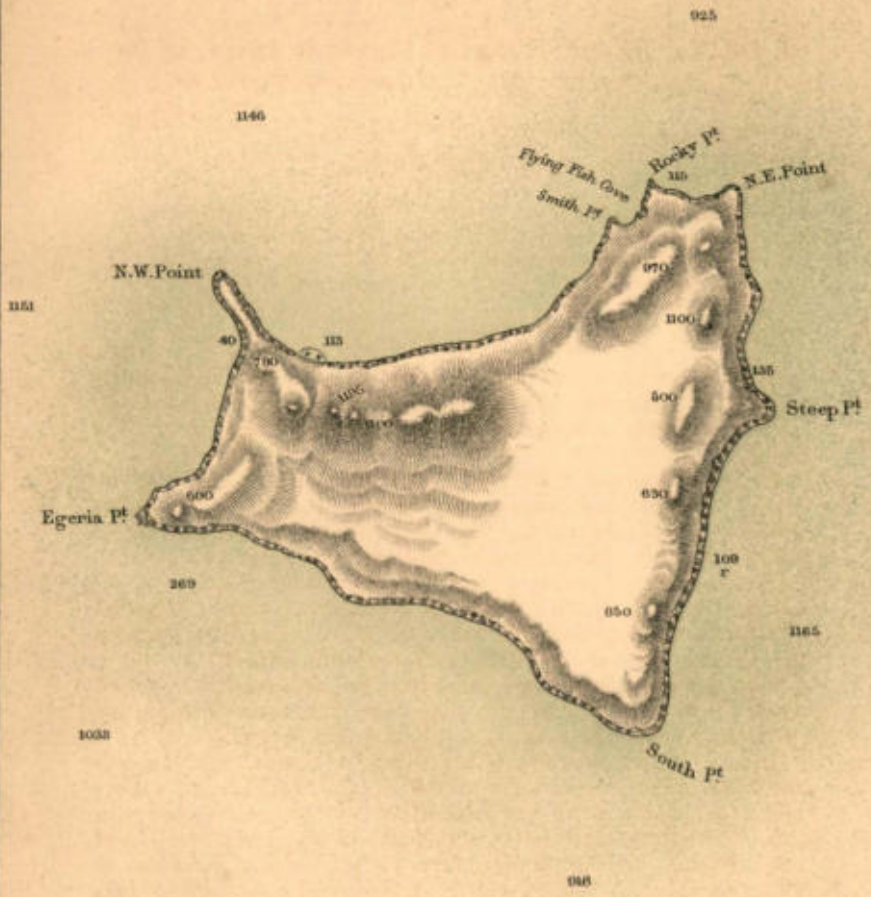
On the way to Batavia we crossed the Bay of Bengal and passed along the Straits of Malacca to Singapore, and thence through the narrow channel between Banca and Sumatra to Batavia.

Leaving Batavia we entered the Straits of Sunda. To the east the Javan hills sloped steeply to the sea, scored with many valleys and ridges, and the rich red volcanic earth brightly variegated with green crops. At their feet was the town of Anjer and the line of coast which suffered so terribly from the explosion of Krakatao in 1883, while above the first of the great conical mountains of Java now and then loomed out from the clouds. To the westward and more distant a high volcanic peak on Sumatra rose above the nearer islands, and later in the day Krakatoa itself was seen, a simple conical mass with a white cloud drifting away from the top, appearing and disappearing at intervals.

The next day we had left the smooth, shallow, green seas through which we had passed ever since rounding Acheen Head at the N.W. end of Sumatra and were bouncing about in deep blue water as the 'Egeria' steamed slowly south against the wind. That day a sounding was made and bottom reached at 1400 odd fathoms.

At daylight on Friday, September 30th, Christmas Island was in sight. In the distance it appeared as a long dark strip against the sky with the sides rising moderately steeply, a shallow saddle in the

[1] A Report on the collections made on that occasion, including Captai Maclear's Report, appeared in the Proceedings of this Society for 1887 (p. 507



CHRISTMAS ISLAND

From sketches made in H.M. Ships "Flying Fish" & "Egeria"

1887.

N.B.— The inland cliffs are not represented.

Scale of Sea Miles

0 5 10

Figures on the land are heights in feet

J. Smit del. et lith. Mintern Bros. imp.

ZOSTEROPS NATALIS.

middle, and two low rounded elevations, the highest part near the western end. On nearer approach the whole island was seen to be uniformly covered with bush, except where a line of inland cliffs showed a bare grey face in places.

II. PHYSICAL FEATURES.

The general physical features of the island are treated of in Captain Aldrich's Report[1] and in a paper by Captain Wharton, R.N., read before the Royal Geographical Society in June, 1888. I may here recapitulate some of the more important details.

Christmas Island, as will be seen by the map exhibited (Plate XXVI.), is of an irregularly quadrilateral shape, the angles being produced into more or less projecting promontories which point roughly to N.N.E., S.S.E., W.S.W., and N.W. The western side is much the shortest, the other sides being of nearly equal length. The northern shore forms a long sweeping curve from N.W. Point on the west to Rocky Point on the east. Just to the west of Rocky Point there is a small sheltered bay, called "Flying-Fish Cove," in which the 'Egeria' remained, made fast to the bottom and to a tree on shore, until she made the tour of the island previous to her departure.

The greatest length measured from Steep Point on the east side to Egeria Point on the west is about 12 statute miles, or half the length of the Isle of Wight. The island rises from deep sea: soundings of over 1000 fathoms were obtained at five points round it, all within four miles of shore.

The island is proved to be of volcanic origin by the presence of stones, found at the foot of a cliff in Flying-Fish Cove, pronounced by Mr. John Murray to be "compact olivine basalt, and of a bed of altered stones near the summit"[2]. No volcanic rock was, however, found *in situ*. Over every part of the island visited, except on the patch of small volcanic stones near the top, the surface rock is a hard limestone. This forms the summit, 1195 feet above the sea, and covers the sides, broadening out at successive elevations into terraces which rise one above another engirdling the island. These terraces have level tops and end to seaward in a rough steep descent, which in some places amounts to a cliff. The rock is traversed by innumerable broad and deep fissures, which run in all directions, isolating tall pinnacles, which may reach 12 or 20 feet in height. The surface is grey and weathered into minute irregular hollows and sharp projecting points and ridges.

On the way up to the summit from the landing-place, near the western end of the northern bay, three terraces are met with; the first is nearly a quarter of a mile from the shore and terminates in a vertical cliff about 85 feet high, the upper ones in steep slopes of less elevation.

[1] Report on Christmas Island (Indian Ocean), H.M.S. 'Egeria,' 1887.
[2] See Report on Christmas Island, pp. 14–15.

I believe that these terraces, though in a general way continuous round the island, except at the headlands, do not correspond at different places terrace for terrace.

It was not easy to settle this question, as the slopes were all covered with trees, and travelling over the sides of the island was most difficult.

I once, however, had a good opportunity of forming an opinion on the matter, on an occasion I shall long remember. I had started about sunrise from the ship in Flying-Fish Cove to go to the western landing. It was a deliciously fresh morning, and as we sped along over the blue water a school of porpoises came plunging alongside of us, while overhead a flock of Frigate-birds, Gannets, and Boobies kept us company, the last often flying so near that the men hit at them with boathooks. As the sun rose over the island the light struck obliquely along the northern side, lighting up the trees on the terraces while the steep slopes were still in shadow. I then saw that the lines of shadow, though in the main horizontal, frequently broke up and joined with one another, showing, as I believe, that the individual terraces are not continuous at the same level on the sides of the island.

At the headlands the higher part of the island generally terminates in a sheer cliff, from the foot of which a gradual slope extends to the sea. This inland cliff and the slope below it are repeated again and again in the contours of the projecting headlands as they are seen looking along the shore. The low foot of rock extends almost all round the island and ends in a shore-cliff, which varies in height from 15 to nearly 60 feet. It has an abrupt vertical face and is much underworn by the waves and traversed by fissures which penetrate far into the rock and in some places give rise to blowholes from which columns of spray shoot up at intervals from among the green bushes which cover the surface.

This shore-cliff is obviously made of coral, but the structure has begun to be obliterated by the deposit of lime in the interstices. This was most clearly seen in one place where some large oval boulders of coral, one of which measured 7 ft. 3 in. in transverse circumference, had been tossed up to the top of the shore-cliff (here about 15 feet from the mean sea-level) and had worn out hollows in the rock. The contrast between the clearly defined structure of the boulders and the partly obliterated characters of the coral which formed the cliffs shows that the change is here in progress which has converted the reefs of the upper terraces into a compact hard rock in which very little sign of their origin is visible.

In many places deep water extends up to the cliffs. At the western landing-place and at Flying-Fish Cove was a beach of rolled fragments and shells, then a narrow flat strip of dead coral strewn with lumps carried by the waves, beyond this a narrow line of growing coral-reef sloping down rapidly to deep water, on which as we approached the shore the beds of living coral could be seen, separated by tracts of white sand.

III. GEOLOGICAL HISTORY.

The geological history of the island appears to be as follows:—The summit of the submarine volcanic mass has been slowly elevated above the sea to a height of nearly 1200 feet, and as it passed through the zone of lime-forming organisms in shallow water these have invested it with a cap of limestone. The upheaval has been arrested at intervals and allowed the formation of reefs which have since been elevated and form the terraces at the sides. At the projecting headland, where the chief stress of the ocean-currents fell, the reefs have grown less than in the intervals between them; and since their elevation the action of the waves has been greatest at these points; hence we find that at the headlands the terraced slopes are replaced by a single abrupt descent. At the head of Flying-Fish Cove, however, there is a single high cliff replacing the terraces, though it is protected by a spur sent down on either side, which end in Rocky Point to the east and Smith's Point on the west. This is, perhaps, due to the conformation of the volcanic basis which underlies the limestone.

Captain Wharton points out (*op. cit.*) that the raised reefs forming the summit of Christmas Island are the highest that are known in the world.

I have already said that the island is covered with dense bush. It extends often from the edge of the shore-cliff, where the branches reach out over the sea, to the summit. Hence, it is impossible to obtain any general view over the island, even from the top, and several interesting points as to its inland conformation remain at present undecided.

There was no sign of standing water or of stream-beds. All the rain that falls, and from the fresh greenness of the vegetation there is evidently an abundant rainfall, soaks at once into the porous limestone-rock and finds its way to the sea below the surface. There is, however, a patch of rounded pebbles near the summit which are described by Mr. Murray as "very much altered volcanic stones, many of them coated on the outside by peroxide of manganese;" they have no earth about them and cover an ill-defined oval area about 38 yards in length, and 10 yards in width, the long axis in the direction of the gentle slope of the surface at this part. It is covered with a bed of tall ferns (*Nephrolepis acuta*). It occurred to me that after heavy rains there may be a spring at the upper part of this area, the water reaching the surface here but sinking in again beyond it.

IV. VEGETATION.

The shores are fringed with widely-spread littoral plants:—*Hibiscus tileaceus*, with its beautiful crimson-edged yellow flowers; *Tournefortia argentea*, a large silvery-green shrub with racemes of closely crowded small white flowers; while on the shore-cliff grew *Scævola kœnigii* in bright green rhododendron-like masses, with white flowers, the favourite haunt of a brown and white Butterfly, *Vadebra macleari*,

which is peculiar to the island. Almost impenetrable thickets of a species of screw-pine grow on the shore-cliff in many places, and beds of another species with long arching leaves, more than six feet in length, often occur in the higher part.

Within the line of shore-plants the high bush begins and extends to the summit. Many of the trees are of great size, frequently, I believe, attaining 200 feet in height. Several of them send out buttresses at the base, which often stretch far out from the tree along the ground. This was particularly noticed in one of the tallest trees, which always went by the name of "the buttress-tree." We only found it in fruit and young bud, but Prof. Oliver tells me that it belongs to the Order Myrtaceæ, and is a species peculiar to the island. Another Myrtaceous tree, *Barringtonia racemosa*, was conspicuous with its beautiful hanging racemes of white flowers. *Erythrina indica*, a Leguminous tree with fine clusters of large crimson flowers, also occurred, and a Rubiaceous shrub, *Randia densiflora*, with small whitish fragrant flowers, was common. Many kinds of epiphytal and climbing plants were abundant, among which a new species of *Hoya* (the wax-flower of greenhouses) was one of the most conspicuous, festooning the trees and rocks with its shining fleshy leaves and hanging umbels of crimson and pink flowers, and its tough though slender stems formed one of the commonest obstacles to our progress through the bush.

The great Birds' Nest Fern (*Asplenium nidus*), with its fine crown of long arching fronds, was one of the greatest ornaments of the woods, growing on a fallen tree or high aloft on a branch.

Altogether some 50 species of flowering plants were obtained. These have been examined at Kew, and several appear to belong to new species. Sixteen kinds of ferns were collected, and two of them, an *Acrostichum* and an *Asplenium*, are peculiar to the island.

In concluding this brief account of the plants of Christmas Island, I may mention a minute myxomycetous fungus which was growing on a damp log. When I brought it home and showed it to my father, he pronounced it to be *Dictydium cernuum*, a specimen of which, as it happened, he had obtained two days before in a wood near London, a remarkable instance of the wide range of these minute spored organisms.

V. MAMMALS.

Pteropus natalis, Thomas, P. Z. S. 1887, p. 511, pl. xli.

Specimens of this fruit-eating Bat were obtained during the visit of the 'Flying-Fish,' and so named by Mr. Oldfield Thomas, who found it to be a new species, most closely allied to one from Lombock. There was a tree in Flying-Fish Cove where they used to hang up during the day, but some were often seen flying over the tree-tops in bright sunlight, and then they appeared of a rich brown colour, owing to the semitransparency of the wings.

A small insectivorous Bat also exists on the island (seen by Dr. Dunlop, R.N., and myself), but no specimens were obtained.

CROCIDURA FULIGINOSA, var. TRICHURA, Dobs.[1]

This small Shrew-Mouse was very abundant in the woods, and their short shrill squeak was often heard all round as one stood quiet among the trees. I caught two in a pitfall at the top of the island, and another near the shore in a trap.

MUS MACLEARI, Thomas.

This Rat abounds all over the island. From dusk till daylight they swarmed about the tents on shore, and Captain Aldrich, who, with his party, spent a night on the high part of the island, found them equally abundant there. They generally keep to the ground, but are able to climb trees.

In the mouth of one of those that I shot I found a small green fruit held between the teeth.

MUS NATIVITATIS, Thomas.

This second kind of Rat was rather less abundant, and I only obtained two specimens. These were shot on the shore among the others, which they seemed to resemble in habits.

VI. BIRDS.

Only seven kinds of land-birds were found on the island. The seventh was added to the list on the fifth day of our visit, and the remaining five days brought no new ones; hence it seems likely that there are not many species remaining to be discovered.

All these seven species are peculiar to the island, though some approach their allies in the archipelago very closely.

MERULA ERYTHROPLEURA.

Turdus erythropleurus, Sharpe, P. Z. S. 1887, p. 515.

This bird was common all through the bush. As one was examining rotten wood for Beetles, &c., they would often come close and watch our operations with a bright curious eye, and Captain Aldrich has described how one picked a grub from within a foot of his hand. It is a handsome bird, with fine ruddy flanks and brown back. The male has an ashy grey breast and a bright yellow bill.

I heard nothing that could be called a song. They often give a shrill sibilant note as they fly off, which may be followed by a *chuck-chuck-chuck*, and they often repeat a short *chick* six or seven times, quickening at the finish.

An old nest was found built in the angle of a number of ascending branches of a sapling. It is made of decayed wood and leaf-mould, caked together into a tenacious mass, covered on the outside with a beautiful green moss-like *Hepatica*, which is common on the tree-trunks, and lined with the black hair-like palm-fibres made use of by the *Zosterops* for the same purposes.

[1] The mammals are described in Mr. Thomas's paper, *infrà*, p. 532.

Unfortunately no birds in young plumage were obtained, though one with a mottled breast was seen.

A partially immature female of this bird was obtained during the visit of the 'Flying-Fish' to the island, and described in the Report on that collection by Mr. Sharpe[1]. We obtained adult birds of both sexes, and from these it is evident that the species must be referred to the genus *Merula*.

The closest ally of the Christmas-Island Thrush is not very easy to determine. *Merula javanensis* is the nearest species geographically, but its uniform dark brown head and breast are very different from the white chin, grey breast, and crown uniform with the "ashy olive brown" back of our bird. *M. chrysolaus* from China, which in winter is said to range as far south as Luzon (the most northerly of the Philippines)—seems to be more closely allied, but the male of this species has a black throat. The bird that most closely resembles it is *M. vitiensis*, from the Fiji Islands, which, indeed, only differs in having the white below the head limited to the chin, not extending as far as the breast.

No member of this group of Thrushes has been hitherto found in the Austro-Malay region or in Australia.

ZOSTEROPS NATALIS, sp. n. (Plate XXVII.)

Supra olivaceo-viridis, ad rostri basin flavescens; tergo vix fuscescentiore; annulo circum-oculari conspicuo; loris nigricantibus, supra pallidiore limbatis; regione parotica cinerescente; subtus albescens, lateribus fuscescentibus; subcaudalibus dilute sulphureis; rostro nigro ad mandibuli inferioris basin plumbeo; pedibus plumbeis.

Bill black, except the base of the lower mandible, which is slate; crown and nape yellow-olive, yellower towards the bill; eye-ring distinct, interrupted at the anterior canthus by the lore; lore black, the black feathers being continued below the eye-ring as far as the middle of the pupil. A short pale yellow band extends along the upper edge of the lores from the bill to the eye-ring; ear-coverts grey, shading into black in front, and into the green nape behind; mantle a slightly browner shade of olive than the crown, passing into the rather yellower rump and upper tail-coverts; throat and middle line of under surface white, shading into pale buff at the sides of the chest, pale cinnamon-brown on the flanks; legs slate; lower tail-coverts pale yellow; tail brown above, yellowish olive on the outer edges of the rectrices, pale brown below; wings above, upper coverts, and outer borders of the quills, except the first, olive-green; the rest of the quills dark brown; shafts black, the inner ones brown. Below: lower wing-coverts white, tinged with green; quills brown, with a pale inner border; shafts white; edge of wing dark brown, nearly black. The feathers on the upper and lower surfaces of the body are dark slaty grey at the base.

[1] P. Z. S. 1887, p. 507. "Report on Collections made by H.M.S. 'Flying-Fish' at Christmas Island."

The plumage of a young bird is similar to that of the adult.

Length of bill (from the front of the crown) ..	11·5 mm.
Base of bill to tip of tail	$4\frac{1}{2}$ in.
Tail	$1\frac{7}{8}$ in.
Wing	$2\frac{5}{8}$ in.

This *Zosterops* is, I suppose, the commonest bird on the island. The first note I heard on penetrating through the line of Hibiscus trees into the higher bush at Flying-Fish Cove was a short chirping proceeding from a party of them busy among the leaves and twigs above my head. I soon held one in my hand, and saw by the white ring round the eye that it was a species of *Zosterops*. I never heard any other note than this. The parties of them included young birds at the time of our visit, so perhaps it was the silent time with them, as some species have quite a melodious song. Two of their nests were found supported on the sides by horizontal branches, to which they were attached by vegetable fibres and the strong yellow web of a large Spider which is common in the bush. They are built of fibres and leaf-skeletons, fastened together with the same yellow material and with the white web of another kind of Spider, and lined with the black hair-like fringes of the leaf-sheaths of a palm (*Didymosperma porphyrocarpa*)[1].

The bird is olive-green above, with grey ear-coverts, and white below, the flanks being pale cinnamon.

The genus *Zosterops* contains over 90 known species, and almost every year adds new ones to the list. These are distributed over a wide area, from Senegal and the Bight of Benin on the west to the Friendly Islands on the east, and from North China to New Zealand, Victoria, and Western Australia. A large number of the islands between these limits have their peculiar species, the Malay Archipelago being richest, while the continental areas, Africa, India, the eastern part of the Palæarctic Region and Australia are inhabited by a few wide-ranging forms.

The great majority of the species have the breast alone, or the breast and belly, bright yellow.

The closest ally of our bird is *Z. mysoriensis*, Meyer, from the Island of Mysori in Geelvink Bay, New Guinea. From this, however, it differs in the following points:—

1. The crown becomes paler towards the base of the tail.
2. The eye-ring is distinct[2].
3. The lore is black and bordered above with a light streak, while *Z. mysoriensis* has the lore obscure and not so bordered.
4. The breast is white in the middle, not grey.
5. The flanks are brown, not grey.

[1] *Cf.* the account of the nest of *Z. palpebrosa* in Legge's 'Birds of Ceylon, p. 584.

[2] The only specimen of *Z. mysoriensis* that I have seen (in Canon Tristram's collection) appears (but the plumage is rather worn) to have no ring of white feathers round the eye. Salvadori makes no mention of the ring, though especially alluding to it in the allied species *Z. fuscifrons* and *Z. hypoleuca*.

6. The ear-coverts are grey, not olive-brown.
7. The edge of the wing is nearly black, not pale.
8. The general colour above is a brighter olive.
9. The bill is longer and more slender.

Z. atriceps, Gray, *Z. fuscifrons*, Salvad., *Z. hypoleuca*, Salvad., which, along with *Z. mysoriensis*, form a small group in the neighbourhood of New Guinea and the Moluccas, have the dark coloration on the crown of the head more strongly marked than the present species, a character which distinguishes them from the rest of the genus. *Z. albigularis*, Gould, from Norfolk Island, is very similar in colouring to our bird, and is, I believe, the only other species which has grey ear-coverts. The olive-brown on the head, and the cinnamon flanks are, however, much more strongly marked than in the Christmas-Island form.

COLLOCALIA NATALIS, sp. n.

C. neglectæ (*Gray*) *similis, sed plumis uropygii limbo albido sublatiore; gula obscurius fuliginosa; areolis albidis subcaudalium minoribus.*

This small Swift was frequently seen hawking along the line of shore-bushes at dusk, or among the tops of the high trees on the summit of the island. No nests of it were seen.

It belongs to the same group as that which builds the edible nests in Java and elsewhere.

This bird is only separable from *C. neglecta*, Gray[1], from Timor, by the following rather small differences:—

1. There is less white mingled with the dark metallic green on the lower tail-coverts.
2. The white spots at bases of the outer rectrices are less sharply defined.
3. The fuliginous colour of the throat is darker.
4. There is rather broader white edging to the rump-feathers.

In the first and third characters it is nearer *C. esculenta* (Linn.), but in the duller and browner metallic green of the upper surface it exactly resembles *C. neglecta*, and is quite distinct from that more brightly coloured species.

CARPOPHAGA WHARTONI, Sharpe, P. Z. S. 1887, p. 515, pl. xliii.

Mr. Sharpe's description of this bird was drawn up from a specimen which had been sent home in spirits of wine and which had lost much of the fine metallic gloss which is present in skins which have not been so treated.

The back and wing-coverts are rich dark bronze and bronzy green, slate when the back is viewed from behind, and held away from the light, and the whole upper aspect of the tail is dark glossy bronze-green, its under aspect being dark brown, with the lateral rectrices pale brown. There are 14 rectrices, as usual in this genus; the crown is slate, varied with iridescent lights, behind shading into

[1] G. R. Gray, "On the Genus *Collocalia*," Ann. Nat. Hist. xvii. 3rd series.

the fine bronze-green of the nape, and in front becoming paler towards the base of the bill, the most anterior feathers being almost white. The nostrils are oval and point upwards and outwards.

Carpophaga whartoni is a very abundant bird on the island, and as it was excellent eating and very tame, a large number were shot. It is about the size of the Wood-Pigeon (*Columba livia*). The general colour is dark, with rich metallic green and bronze lights on the back, dark purplish slate below, and conspicuous chestnut under tail-coverts.

A young bird which was shot resembled the adult in plumage.

They give a long *croo-croo-croo*, rather low. There is another note which we very frequently heard in the woods, and which I do not doubt was made by these birds, though I never succeeded in seeing one make the noise. It was a deep sound, like the distant lowing of cattle, *do-o-o-o-o-o*, and sometimes *dooooo—too-dooo—too-doo—too-doo*.

During the day the birds would often sit motionless for a long time among the high leafy branches, occasionally uttering the low notes. Towards sunset they congregated on the trees that were in fruit to feed. The stomachs (which are thin-walled) contained various fruits.

The oil-gland is bare of feathers. The gizzard is thin-walled, and the lateral opposing surfaces are covered with thin horny scales[1]. The intestine is capacious (the duodenum is 1 inch in diameter when flattened out); it is 27½ inches in length, and the cæca are absent. The *ambiens* muscle, though present, is rudimentary, being reduced to a slender band of muscle, less than 2 millim. in breadth, which arises by a tendinous origin from the pelvis immediately below the acetabulum, and ends in a delicate tendon which traverses the extensor tendon of the knee in the usual manner.

This is a quite distinct species from the others making up the large genus *Carpophaga*. Its closest ally appears to be *C. vanwycki*, Cass., a wide-ranging Pacific form apparently, as it is recorded in Gray's 'Hand-list' from New Island (S.W. of the Society Islands), while a specimen in Canon Tristram's collection is from Duke of York Island (north of the Samoa group). With this it agrees in the shape of the bill and nostrils and the colour and arrangement of the feathers at the base of the bill, in the fine texture of the feathers on the neck, the absence of an abrupt change of colour between the neck and back, and, though this is a common feature, in the chestnut under tail-coverts. *C. whartoni* differs from *C. vanwycki*, however, in the following characters:—

1. The much darker colour of the head, nape, and underparts, which are in *C. vanwycki* delicate pale grey.

[1] Mr. Thiselton Dyer, who has very kindly undertaken the examination of the seeds contained in the gizzard of this Pigeon and of the *Chalcophaps*, tells me that they consist, in this bird, of the fruits of the high "buttressed tree" (*Eugenia*), of a sapotaceous plant, possibly *Sideroxylon*, and of an araliaceous plant not contained in the collection.

2. The dark metallic colours of the back are not washed with grey.

3. It is a larger bird, the wing measuring 10 inches (against 9¾).

C. vanwycki is included in Gray's 'Hand-list' in the section of the genus named *Globicera*, but there is no sign of the tumidity at the base of the bill in it or in *C. whartoni*. This section includes some ten species which, with the exception of *C. myristicivora*, which ranges over the whole Indian Archipelago, are confined to the Austro-Malay and the Pacific Islands.

CHALCOPHAPS NATALIS, sp. n.

Inter C. indicam *et* C. stephani *media*; C. indicæ *similis, sed rostro fortiore, macula pallida alæ minore, feminæ uropygio, supra- et subcaudalibus fuscis, haud nigris. A* C. stephani *differt maris fronte albida, et tergo et alis æneo-viridibus.*

This is also an abundant species; until the last day of our stay in Flying-Fish Cove I had supposed that this was, unlike the others, a shy bird, as we had only come across it now and then, moving restlessly among the trees. I expect, however, we had really overlooked it. On that morning I had gone ashore to shoot good specimens of the *Merula* and *Zosterops* for skinning. On one occasion I stood in one place for about an hour, and during that time I saw three or four pairs of this Pigeon. They were picking up fallen fruits from among the brown and green leaves which were strewn beneath the trees; and here, where their brown and bronze-green plumage rendered them inconspicuous, they were so tame that the only difficulty I had in shooting them was to get far enough off and yet not lose sight of them among the crowded stems by the trees. Thus their habits appear to be strikingly in accordance with their protective colouring. In the trees, where their colour renders them conspicuous, they are restless and easily alarmed; while they appear to regard the ground as a place of safety.

Their note is, I believe, a *cooo-coo-cooo*, with hardly any roll of an *r* sound in it.

This appears to be an intermediate form between *C. indica* (Linn.) and *C. stephani* (Homb. & Jacq.).

Without giving a full account of it, I may point out that it resembles *C. indica*[1], except in the following points:—

1. The bill is stouter.

2. The white and pale slate streak on the shoulder is smaller.

3. The rump, upper and under tail-coverts of the female are brown, not black.

In the last character it agrees with *C. stephani*, but differs from it in the following points:—

1. The crown of the male is white, not uniform with the rest of the head.

2. The metallic green upper surfaces of the wings are united by a broad band of green across the back.

Chalcophaps indica ranges from Ceylon and India as far north as

[1] *Vide* Legge's 'Birds of Ceylon,' p. 714.

Formosa and through Borneo and Celebes to Lombok and Flores. *C. stephani* is found in Celebes, New Guinea, Waigiou, and Mysol.

UROSPIZIAS NATALIS, sp. n.[1]

Ad. *Supra plumbeo nigricans, cervice rufo-brunnea excepta; alis caudaque fusco adumbratis; remigum pogoniis internis et rectricibus obscurius fasciatis; regione malari plumbeo-cinerascente; mento pallido; pectore rufo-brunneo plumbeo transverse striato; abdomine pectore pallidiore, albido conspicue anguste transverse striato; subcaudalibus fasciis albidis latioribus.*

Jr. *Supra obscure fuscus, tergo rectricibusque alarum rufescenti-brunneo maculatis; cervice albida maculosa; remigibus et rectricibus obscurius fusco fasciatis; gula albida, in longitudinem obscure fusco striata; pectore, abdomine, lateribus subcaudalibusque albidis, rufo-brunneo transverse fasciatis, fasciis obscure fusco limbatis; cruribus fulvescentibus albido fasciatis.*

Adult. Crown dark slate; nape rufous brown; back, scapulars, upper wing-coverts, and upper tail-coverts dark brownish slate, paler on the tips and inner webs of the quills. The inner webs of the primaries and secondaries are obscurely barred with a darker shade. Towards the bases of the outer primaries and inner secondaries the interspaces between the bars are white or freckled with white. Tail, above, dark slaty brown, all but the two central feathers slightly paler on the inner webs and obscurely barred with a darker shade towards the bases of the outer rectrices, the intervals between the bars are, as in the wing, white or freckled with white; below, the two central feathers are uniform pale ashy brown. The side feathers are paler and rather obscurely barred with a darker shade, the bars being most distinct near the shafts and towards the ends of the feathers. The outer ones are obscurely freckled with white at the bases of the inner webs. Ear-coverts slate-grey; chin, general effect pale rufous grey, paler in the male; the shafts are black, the webs irregularly barred with slate and pale rufous. Breast fine rufous brown barred with slate; belly paler brown, with narrow pale bars of white more or less freckled with slate; under tail-coverts like the belly, but the white bars broader; flanks and legs like the belly, but the pale bars less distinctly marked, sometimes absent, but the feathers are always tipped with white. Wings, primaries dark grey-brown, pale grey towards the base; secondaries grey, darker towards the tips, and barred and mottled with dark and white in correspondence with the colour on the dorsal aspect; lower wing-coverts white, barred and

[1] Anatomically the species agrees with its allies in the characters mentioned by Garrod. There is a nude oil-gland and 12 rectrices are present. The gall-bladder is absent. The gizzard is very muscular and the lining is raised on the opposing surfaces, which are sharply defined, into nine well-marked regular ridges with their planes in the direction of the axis of the gullet. It contained the hard albuminous seeds of some monocotyledonous plant, partly broken up. The intestine is 20 inches in length and is not provided with cæca.

An ambiens muscle is present, though of extreme tenuity; a small muscular belly not more than 1 millim. in breadth is interposed between the tendinous origin and the long slender tendon which passes over the knee.

mottled with pale rufous and slate; edge of the wing white, little mottled in the oldest specimens.

Young. Crown dark brown in the middle, the feathers of the sides, in a line extending from the cere back to the ear-coverts, and of the ear-coverts dark brown in the centres, pale yellow at the sides; nape, at the upper part mottled dark brown and white (produced by dark brown tips and shaft-streaks to white feathers), at the lower mottled brown and pale yellow; back and upper wing-coverts dark brown, mottled with rufous brown; shoulders rich burnt sienna mottled with dark brown. Quills, the outer webs and the ends are dark brown, the inner web shading from brown through pale reddish brown to pale yellow, the tips of all and the outer margins of the secondaries pale brown, the whole barred with dark brown, the bars fading away before reaching the inner margins of the webs; upper tail-coverts brown, becoming darker towards the ends, tips pale rufous brown. Tail above brown, the outer feathers resemble the wing-quills in the fact that the inner webs and the tips shade off to pale reddish brown; the whole barred with brown; the barring is least on the inner feathers, which have five bars limited to the terminal half of the feathers; on the outer feathers the bars are continued to the base of the web and are closer, amounting to 15–17 in number; below rufous grey, barred with dark as above, two central rectrices greyer. Chin and throat—the feathers are white, yellower towards the tips, with shaft-streaks of dark brown, linear, becoming lanceolate at the lower part of the throat. Breast, belly, lower tail-coverts, and flanks white, boldly barred with rufous brown, the bars are margined with darker brown, and are continued towards the tip of the feathers into an angular process extending a short distance along the shaft. Legs, feathers white or pale yellow, barred with tawny brown. Lower wing-coverts pale yellow, barred with tawny brown. Quills pale reddish brown, barred with brown as on the upper surface; primaries pale brown towards the ends.

Measurements.

	♂.	♀.
	in.	in.
From base of bill to tail-tip	$13\frac{6}{10}$	$16\frac{1}{4}$
Tail	$7\frac{2}{10}$	$8\frac{7}{10}$
Wing	$8\frac{6}{10}$	$10\frac{6}{10}$

Urospizias natalis is a common bird on the island. As we made our way through the bush one would often fly up to a branch or the top of a pinnacle of coral-rock and sit there ignorant of danger, as though inquiring the cause of this unusual disturbance in the woods. If there were two together and one was shot, the other would remain motionless or fly to another branch close at hand. One was knocked over with a stick and captured. It appeared to be little injured, and I kept it alive for some months, but unfortunately it died in fits before my return to England. The stomachs of those that were shot contained feathers of the *Zosterops* and the remains of lizards and large grasshoppers.

The adult birds are dark slate on the upper parts except for a band of rufous brown at the back of the neck. Below they are of a fine rufous brown, barred with white on the belly.

The bird belongs to the genus *Urospizias*[1] (the amended form of *Urospiza*, the name which Kaup applied to this group of Goshawks), which contains some 20 species. They are most numerous in the Austro-Malay region—where the Moluccas and Lombok mark the western limit of the range. Elsewhere species are found in the Marianne Islands, the Fijis, New Caledonia, Norfolk Island, and in Australia and Tasmania. There are several of these species to which the Christmas Island bird is closely related, though it differs from them as much as they differ from one another.

The nearest relation appears to be *U. griseigularis* from the Moluccas, from which it differs in adult plumage in possessing the crown of the head not paler than the back, the slate tinge on the upper breast, and the brown bars on the lower part of the belly and lower tail-coverts, sharply defined and edged with slate, not obscure and plain brown. The difference between the young birds is more marked. The Moluccan bird has the back almost uniform, not mottled, the throat with a median and two lateral lines of longitudinal streaks, the breast longitudinally streaked with brown and the belly with distant transverse bars which are uniform brown, not rufous, in the centre.

In the collection of the British Museum are two skins which, by the slaty tinge on the back and the indications of the rufous nape-band, are evidently acquiring the adult plumage. Among the worn longitudinally streaked feathers at the sides of the breast are new close-webbed ones which are white with brown pale-centred bars very like those on the breast of the immature Christmas Island bird. This appears to be an indication that the transverse barring of the underparts, which is found in the young plumage of several members of the group, is a later acquired character which many species never assume. The longitudinal streaking, on the other hand, which occurs widely in this family of birds, must on this view be regarded as the more primitive character. In our bird this stage appears to be passed over altogether.

NINOX NATALIS, sp. nov.

Supra rufo-fulvescens, cervicis lateribus et supracaudalibus sparse pallide maculatis; fronte, loris et mento pallidis; alis fuscis pallidius fasciatis, et fascia albida obliqua; tectricibus secondariis in pogoniis externis albido fasciatis; rectricibus fuscis, fasciis pallidioribus circa decem; subtus alba, rufo-fuscescente fasciata, fasciis interfasciisque æqualibus; subalaribus subrufo-fuscescentibus, obscurius maculatis; metatarso omnino plumis vestito.

Adult male. Crown, nape, back, upper tail-coverts, and lesser upper wing-coverts uniform red tawny brown, with here and there an

[1] *Cf.* J. H. Gurney, 'List of the Diurnal Birds of Prey,' 1884.

obscure paler spot on the lateral parts of the nape and upper tail-coverts; the hidden bars of the feathers are slaty grey. The fore part of crown and lores clothed with long sparsely barbed white feathers with black shafts, except a narrow line of pale tawny feathers in the middle line, reaching to the base of the bill; ear-coverts duller brown than the nape, with white bases to the barbs; chin-feathers like those of the lores, but pale tawny and with white shafts. Greater secondary coverts same colour as the back, barred chiefly on the outer web with white, the white bars are bounded by darker brown; primary-coverts dark brown, obscurely barred with paler brown; edge of wing pale ochre; primaries dark brown, barred with lighter brown and with paler outer edges; the second to the sixth primaries have one or two interspaces conspicuously paler than the rest—these are so arranged as to form an interrupted line traversing the extended wing from before outwards and backwards. Tail dark brown, barred with ten rufous bands; in the outer feathers the contrast between the colours of bands and interspaces becomes more conspicuous. Throat pale rufous. Breast, belly, and flanks white, barred with scarcely blurred bands of the same tawny brown as the back; the feathers have a narrow shaft-streak of brown; the bars and interspaces are about equal in breadth; vent-feathers long and white. Under tail-coverts like the breast, but paler brown. Legs rufous ochre, mottled with rufous brown; they are clothed with feathers to the end of the metacarpus; toes sparsely covered with pale horn-coloured bristles. Under wing-coverts uniform tawny brown, paler than the back, becoming mottled towards the edge of the wing; the larger coverts are pale brown, changing to white at the tips of the feathers barred with ashy brown. Quills below brown barred with pale brown, the bars obscure towards the tips of the primaries. Cere tumid; the nostrils look forwards and outwards.

Measurements.

	in.
Crown to tip of tail	$10\frac{7}{10}$
Tail	5
Wing	7
Metatarsus	$1\frac{6}{10}$
Third digit to base of claw	$1\frac{1}{10}$

Only one specimen of *Ninox natalis* was obtained.

It is of a fine tawny brown colour on the back, and bars of the same colour alternate with white on the breast. It measures about 11 inches in length. The stomach contained feathers and bones.

A cry up among the woods (*ow-ow-ow*), like the distant barking of a dog, sometimes broke the stillness of the night, as we lay in Flying-Fish Cove. It was probably made by this bird.

This Owl belongs to group C of Mr. Sharpe's arrangement of the genus in the British-Museum Catalogue—a group characterized by the breast being spotted or transversely barred, not longitudinally streaked with brown nor uniform. The group contains 13 species,

which with one exception are confined to the Austro-Malay subregion and Northern Australia. The exception is *N. superciliaris* (Vieill.) from Madagascar, a species which neither in appearance nor geographical distribution seems to be quite at home among the others.

The Christmas Island bird is closely allied to *N. forbesi*, Sclater, from Timor Laut. It differs from it in the following characters:—

1. The shade of the general brown colour of the plumage is a red tawny brown, as distinguished from the yellower duller colour of that bird.
2. The absence of the dusky shade on the crown.
3. The ground-colour of the upper breast is white, not tawny yellow.
4. The breadth of the bars below is equal to that of the interspace, not half their breadth.

N. hypogramma (Gray), from the Moluccas, is another near though more distant ally, the obvious difference being on the upper surface, which is dull brown, becoming ashy brown on the crown. *N. hantu*, from Bouru, and *N. squamipila* (Bp. Consp), from Ceram, are also allied, but sharply separated by the almost barbless bristles on their tarsi, as well as by other characters. *N. variegatus* (Quoy and Gaim.) is the only other species placed in this section of the genus (with crown of head uniform, not spotted). It is readily distinguished by its dull brown colour and spotted back, and by the presence of spots on the forehead.

Of these the first five species form a group which is characterized by similarity of size (10–12 inches in length), the uniform coloration of the crown of the head, and by greater length of the tail. With regard to this last point, if the *length of the tail* is compared with that of the *wing* the figures are as follows:—

	Length of tail. in.	Length of wing. in.	per cent.
Ninox hypogramma ..	5·5	9·0	61·1
N. squamipila	5·3	8·25	60·6
N. hantu	5·8	8·3	69·8
N. forbesi	5·3	7·7	68·8
N. natalis	5·0	7·2	69·7

all over 60%. Whereas among the smaller species with spotted crowns the figures are:—

	Length of tail. in.	Length of wing. in.	per cent.
N. punctulata (Quoy & Gaim.)	3·0	6·8	44·1
N. granti, Sharpe.....	4·1	7·0	58·5
N. jacquinoti	3·8	6·8	55·8

all below 60%. While for *N. variegata*, with its spotted forehead, they are 4·6, 7·9, 58·2. It therefore appears to hold an intermediate position.

ARDEA JUGULARIS, Forster.

Several of these birds were seen, flying along by the shore-cliff, or on the beach following the retreating waves on the look-out for food in the pools on the dead coral; their stomachs contained crabs and small fish. Two skins were brought home, one of a male in white plumage, the other of a female in slaty dress.

CHARADRIUS GEOFFROYI, Wagler.

A pair of these Plovers (females) were shot on the shore-cliff. The bird has a wide range in winter [1], from South Africa along the shores to India and Australia.

TRINGOIDES HYPOLEUCUS (Linn.).

A specimen of this very wide-ranging species was obtained.

PHAËTHON FLAVIROSTRIS, Brandt.

These Boatswain birds in fine golden pink plumage were very beautiful objects, flying among the tree-tops by the shore, or high up, yellow specks against the blue, performing their evolutions with exquisite grace. The two long tail-feathers yielding to the resistance of the air add greatly to the beauty of their flight.

They apparently had nests in the high trees [2]. At Flying-Fish Cove a pair of them were frequently seen flying backwards and forwards to and from one particular tree.

Three were shot and preserved. Both sexes were coloured to the same degree. The stomachs contained the remains of fish and Cephalopods.

In Professor Brandt's Monograph of the genus *Phaëthon* [3] he says (writing in Latin) in the general account of the genus (pp. 5 and 6) :—"In recently killed adult animals, however, the glistening white colour is (perhaps always) more or less tinged with rose or vermilion or red-gold;" and again, "This same colour, however, very quickly vanishes in specimens exposed in Museums."

In the plates the adult birds of *P. phœnicurus*, Gm., and of *P. flaviventris*, Brandt, are represented of the same rosy tinge. The intensity of the colour in these plates is about the same as in the Christmas Island birds.

The suggestion that the adult plumage is always of this colour is not, however, correct, as I happen to know from my own experience; for I obtained a perfectly white specimen of *P. flavirostris* from the Seychelles Islands, from a nest which contained a nearly fledged young bird.

[1] 'The Geographical Distribution of the Charadriidæ,' H. Seebohm, p. 147.

[2] In the Seychelles Islands this species builds in the hollow trunks of the dead Capucin trees as well as in the clefts of the granite rocks on some of the islands.

[3] Tentamen Monographiæ Zoologicæ Generis *Phaëthon*. J. F. Brandt. E commentariis Acad. Scientiarum Petropolitanæ Mémoires, 6e série. Scienc. mathém., phys. et nat. t. v. 2nd part. Sc. Nat.

PHAETHON PHŒNICURUS, Gm.

This species was also seen in white plumage.

FREGATA AGUILA (L.).

A specimen of this Frigate-bird was sent home from the 'Flying-Fish' Expedition. As has been stated, Frigate-birds were very common on the islands.

SULA, spp.

Gannets and Boobies were very abundant along the shore and up among the trees, where their loud harsh notes constantly broke the stillness of the woods, and the air was often tainted by their droppings, which whitened the ground and trunks.

A young Gannet covered with white down was found on the bare stones at the upper part of the beach at Flying-Fish Cove.

VII. REPTILES.

Four kinds of Lizards are known to inhabit the island.

Two of these were very abundant—*Lygosoma nativitatis*, Blgr., and *Ablepharus egeriæ*, Blgr., both peculiar.

Gymnodactylus marmoratus, Kuhl, was found in a semitorpid condition under logs of wood during the day, and one of them with some ants were the only visitors which came to some trees which I had sugared for moths. It is therefore probably nocturnal in its habits, and its large eyes with their vertical slit-like pupils appear to be in keeping with this idea. Whether it had come to feed on the ants or was attracted by the rum and sugar I cannot say.

It is interesting that the other species, a Gecko peculiar to the island, finds its nearest ally on Murray Island in Torres Straits.

The 'Iguana' reported to have been seen during the visit of the 'Flying-Fish' was not observed.

The only snake (*Typhlops exocœti*, Blgr.) known to exist on the island belongs to the Typhlopidæ, small non-venomous burrowing animals. A single specimen was found beneath a log.

A large smooth-backed Turtle (*Chelonia virgata*?) was seen making its way down the beach on the last morning of our visit. The men did their best to turn it over, but it succeeded in reaching the sea before they could get hold of it. The footprints led up to a hollow in the shingle, but no eggs were found on digging; apparently it had been disturbed at the commencement of its operations.

No Amphibians were met with.

VIII. CRUSTACEANS.

The most conspicuous Invertebrate animal is the large land-crab *Birgus latro*. These crabs are abundant all over the island. As we sat at lunch in the bush, three or four of them would come towards us from different directions with cautious advance, with their long stalked eyes erect and their curiously bent antennæ sawing the air.

If they were approached, they brandished their second pair of legs in a threatening manner as though accustomed to be masters of the situation. They were, of course, perfectly harmless. I watched one of them at a tide-pool on the shore apparently replenishing the store of water in the branchial cavities. The movement was similar to that of eating. The end of one of the large chelæ was dipped in the water and lifted towards the mouth, where it was touched by one of the palps and the moisture passed on, whilst the chela descended for a further supply.

IX. CONCLUSION.

The collections from Christmas Island are necessarily very incomplete. The visit of the 'Egeria' only lasted ten days, and owing to the thickness of the bush and the difficult nature of the ground on the sides of the island, a comparatively small part of it was traversed. Among the Invertebrate animals and the plants, especially, many species remain to be discovered.

Incomplete as the collections are, however, there can be no doubt that the island is very poor in species. Thus five kinds of Mammals, seven of Land-birds, four of Lizards, and one Snake, make up the list of Vertebrate animals of the existence of which evidence was obtained.

The most striking feature is the peculiarity of the fauna. Of the mammals, three out of the four which were collected are peculiar species, the other a peculiar variety of a species which extends from the Himalayas to Java.

All the land-birds are peculiar to the island, though some, as has been pointed out, approach their allies in the Archipelago very closely.

Four out of the five reptiles are peculiar.

Turning to the Invertebrate groups, the same proportion of new forms is met with, though here many families have not been sufficiently studied in the Archipelago to justify the conclusion that a new form is a peculiar one.

Of the land-shells five out of eleven species are new, as are six out of ten of the Lepidoptera. Sixteen of the Beetles have been referred to their genera, and six to species, of which six five are new and one constitutes a new genus. Of the other insects, seventeen out of twenty species which have been worked out are new. One of three species of Chilopoda is new, as are both the species of Diplopoda (Millipedes), one belonging to a new genus. Three kinds of Spiders belong to known species, while a small land-crab is new.

The affinities of the Christmas Island fauna and flora are of great interest in relation to the sharp line of separation between the Indo-Malay and Austro-Malay subregions, which, especially as regards their mammals and birds, divides the islands of the Malay Archipelago. The presence of three terrestrial placental mammals appears at first sight to connect the island with the Indian region, and the Shrew-Mouse, a variety, as Mr. Dobson points out, of a species

ranging from the Himalayas to Java, is strong evidence in favour of this view. It may be noted, however, that two species of Shrew-Mouse occur in the Austro-Malay region, viz. *Sorex myosurus*, found in the Moluccan Islands as well as in Sumatra, Borneo, and Java[1], and *Sorex tenuis*, supposed to be peculiar to the island of Timor[2].

The genus *Mus*, to which the two other species belong, is widely spread over the Archipelago.

It is interesting to notice that the fruit-eating Bat has its nearest ally in the island of Lombok.

Turning to the Birds, we find evidence that they have been derived, not from the Indo-Malay region, but from the islands on the Australian side of the separation line, some ten degrees to the east. Thus we have a representative of the genus *Urospizias*, which is limited on the west side of its range by the Moluccas and Lombok. The group of the genus *Ninox*, to which the Christmas Island bird belongs, is confined to the Austro-Malay subregion and Northern Australia. The Thrush has no near ally in the neighbourhood. The *Zosterops* and *Collocalia* belong to widely distributed genera, but the nearest ally of both is found in the Austro-Malay subregion, one in the island of Mysori, north of New Guinea, the other in Timor Laut. The *Chalcophaps* has allies in both the Indian and Australian regions, while the *Carpophaga* belongs to the section of the genus extending from the Malay Archipelago eastward among the Pacific Islands.

It appears probable that Christmas Island has received immigrants from both the Indo-Malay and Austro-Malay subregions; but so far as the birds are concerned, the influence of the latter is much more distinctly marked.

In conclusion, I wish to express my thanks to Capt. Aldrich, R.N., for the manner in which he forwarded my plans in every way during our visit to the island; and to the officers and men of H.M.S. 'Egeria,' who assisted in making collections. Many of the most interesting specimens that were found were obtained by them. I was most fortunate in obtaining the services of Fuller—the blue-jacket whom Capt. Aldrich chose to help me, and who proved a most diligent and able assistant in skinning and in other ways.

At home, I wish to express my thanks to Mr. R. B. Sharpe, for the readiness with which he facilitated my work at the British Museum; to Canon Tristram for the very kind way in which he allowed me access to his collection; and to Mr. Henry Seebohm for assistance given me in many ways.

[1] Wallace, Malay Archipelago, vol. ii. p. 141.
[2] *Op. cit.* vol. i. p. 326.

5. On the Mammals of Christmas Island.

By Oldfield Thomas, Natural History Museum.

[Received October 15, 1888.]

Mr. J. J. Lister has most kindly submitted to me for examination the Mammals he obtained on Christmas Island during the visit of H.M.S. 'Egeria' to that place.

The Collection contains a series of both the Mammals discovered by Capt. Maclear in the previous year, namely, *Pteropus natalis* and *Mus macleari*, the extra specimens supplying considerable additional information about the species. There are also two specimens of another large Rat, representing a second new species, and of a Shrew, which Dr. Dobson considers to be a distinct geographical variety of *Crocidura fuliginosa*, Blyth, a species that extends from the Himalayas through Burma to Java.

1. Crocidura fuliginosa trichura, Dobs.[1], var. nov.

4 specimens.

a (type). Head and body 70 millim., tail 80, hind foot 16·6, lower leg 20·5, forearm and hand 21.

"This variety differs from the typical form in the much greater length of the tail, which also, unlike most specimens of that species, is beset with long fine hairs; it has also a longer hind foot.

"In the shape of the skull and teeth and in all other characters it so closely resembles typical examples of *C. fuliginosa* that I hesitate to consider it more than a local variety of that species."—G. E. D.

2. Pteropus natalis, Thos.

Pteropus natalis, Thos. P. Z. S. 1887, p. 511, pl. xli.

9 specimens.

Forearms of four of them: ♂, 135, 124; ♀, 128, 126 millim.

This species was originally described from female specimens only, and when describing it I expressed the doubt there was as to whether the males would have a yellow tippet or not. This doubt Mr. Lister has fortunately dispelled by obtaining several adult male specimens, which turn out to be precisely like the females, their necks being as absolutely black as are those of the other sex.

3. Mus macleari, Thos.

Mus macleari, Thos. *t. c.* p. 513, pl. xlii.

7 specimens.

The following are the chief measurements of some of the additional specimens of this fine species obtained by Mr. Lister:—

[1] Dr. Dobson is the author of this description, and should be looked upon as wholly responsible for the distinction of the variety.

	Head and body.	Tail.	Hind foot.	Forearm and hand.	Ear.	Heel to front of last food-pad.
	millim.	millim.	millim.	millim.	millim.	millim.
a. ♂..	235	246	50	67	17·5	25
b. ♂..	235	253	50	67	17	25·5
c. ♀..	240	257	49	66	17·5	25
d. ♀..	222	267	50	70	16·7	26

Mr. Lister's numerous specimens of this species agree very closely with one another and with the type, the only point in which they vary being in the degree in which the under surface is white or brown. All the females have the mammary formula 1—1=4.

4. Mus nativitatis, sp. n.

2 specimens.

	Head and body.	Tail.	Hind foot.	Forearm and hand.	Ear.	Heel to front of last foot-pad.
	millim.	millim.	millim.	millim.	millim.	millim.
a. ♂(type)	254	176	54	66	20×17	26·6
b. ♂	264	175	54	65	18×17	27·3

Skull.—Basal length 46·8, greatest breadth 24·8; nasals, length 20·5; interorbital breadth 8·7; interparietal, length 7·1, breadth 12·5; infraorbital foramina—length of outer wall 4·1, breadth from outer corner of one to that of the other, 13·4; palate—length 26·7, breadth outside m.[1] 9·0, inside m.[1] 4·5; diastema 15·5; length of anterior palatine foramina 9·3; length of upper molar series 7·6. Lower jaw—length (bone only) 30, (to incisor-tips) 34·6, greatest height, obliquely, from coronoid to angle, 15.

Size large; form thick and clumsy, the limbs and tail stout and heavy, but the head peculiarly small, slender and delicate. General colour dark umber-brown all over, the belly not, or scarcely, lighter than the back. Ears small, laid forward they barely reach to the posterior canthus of the eye. Fur of back long, thick, and coarse, but without the extremely long piles so characteristic of *M. macleari*, the longest hairs being about 40 or 45 millim. in length. Hands and feet very thick and heavy; the claws, especially on the fore feet, enormously broad and strong, not compressed, more than twice the size of those of *M. macleari*, and evidently modified for burrowing. Palms and soles naked, smooth; the pads broad, low, and rounded, unusually little prominent; last hind foot-pad elongate. Tail shorter than the body without the head, very thick, evenly tapering, nearly or quite naked; its scales triangular, very large, the rings averaging about 7 or 8 to the centimetre[1]; its colour uniform blackish brown throughout, above and below, the white skin, however, showing to a certain extent between the scales.

Skull disproportionally small, light and delicate; compared with that of *M. macleari* it is slightly shorter and very considerably narrower.

[1] 10 to 12 in *M. macleari*.

Supraorbital edges evenly divergent, slightly beaded, but without any marked postorbital thickening. Outer plate of anterior zygoma-root short and weak, scarcely projected forwards. Anterior palatine foramina long, reaching backwards just to the level of the front of m.[1] Bullæ rather larger than in *M. macleari*, but far smaller than in *M. everetti*. Lower jaw very thin and slender, contrasting very markedly with *M. macleari* in this respect.

Teeth small and weak, their structure as usual. Front of incisors orange above, yellow below.

This fine Rat cannot possibly be confounded with any other known species of the genus[1]. Its size, peculiarly small and delicate head, short unicolor tail, large hands and feet, and powerful digging claws, separate it at once from any of its congeners. In some respects it agrees with the description given long ago by Hermann of his *Mus javanus*[2], but its brown underside and naked tail prove that it is not really the same, and it is probable that Hermann's description was merely founded on an unusually large specimen of *Mus decumanus*.

The presence of a second large Rat in such a small island as Christmas Island is a very noteworthy fact, and recalls the state of things existing in Guadalcanar, Solomon Islands, where two still larger Rats, *Mus imperator* and *M. rex*, one terrestrial and fossorial, and the other arboreal, live side by side in the same locality[3].

Mr. Lister is to be congratulated on his discovery of this, the largest member of the indigenous Mammalian fauna of Christmas Island. It is unfortunate that he did not succeed in obtaining a female specimen of it, as its mammary formula, perhaps the most important character within the restricted genus *Mus*, therefore remains still unknown.

6. On the Reptiles of Christmas Island.

By G. A. Boulenger.

[Received October 15, 1888.]

In addition to the three kinds of Reptiles[4] found on the island by the 'Flying-Fish' Expedition, examples of which were also obtained by Mr. Lister, we have to record two new Lizards, viz. a *Gecko*, and a Scink closely allied to the widely-distributed *Ablepharus boutoni*. Thus, of the five species of Reptiles now known to inhabit Christmas Island, four appear to be endemic, whilst the fifth, *Gymnodactylus*

[1] *Mus infraluteus*, a species from Mount Kina Balu, North Borneo, described by the present author (Ann. & Mag. N. H. (6) ii. p. 409) since the above was written, has a considerable superficial resemblance to *M. nativitatis*. Its tail, however, is longer, and its skull is large and heavy, in due proportion to the size of the body.

[2] Obs. Zool. p. 63 (1804).

[3] See *suprà*, pp. 479–81.

[4] *Gymnodactylus marmoratus*, Kuhl; *Lygosoma nativitatis*, Blgr.; and *Typhlops exocati*, Blgr. See P. Z. S. 1887, p. 516.

marmoratus, is distributed over the greater part of the Malay Archipelago.

Gecko listeri, sp. n.

Head moderate, snout once and one third the diameter of the orbit, which equals its distance from the very small, round ear-opening; forehead scarcely concave. Head covered with small granules, which are considerably larger on the snout; rostral quadrangular, more than twice as broad as deep, without cleft; nostril pierced between the rostral, the first labial, and three nasals; twelve upper and ten lower labials; three transverse rows of small hexagonal chin-shields. Dorsal scales uniform, minutely granular; ventrals much larger, roundish hexagonal, subimbricate. Digits with a very slight rudiment of web; seven or eight angularly curved lamellæ under the median toes. A short angular series of twelve præanal pores. Tail cylindrical, covered with uniform small flat scales, which are largest inferiorly. Pale grey-brown above, with a few rather indistinct brown spots and scattered white dots; a brown streak from the nostril to the eye; lower parts white, with small brown spots.

	millim.		millim.
Total length	79	Fore limb	12
Head	12	Hind limb	15
Width of head	8·5	Tail	38
Body	29		

This small species, of which a single male specimen was obtained, is closely allied to *G. pumilus*, Blgr., from Murray Island, Torres Straits, but at once distinguished by its nearly free toes.

Ablepharus egeriæ, sp. n.

Snout pointed, rostral not projecting. Eye entirely surrounded with granules; upper eyelid represented by three or four larger scales. Rostral largely in contact with the frontonasal; præfrontals forming a long suture; frontal small, in contact with the first and second supraoculars; five supraoculars, second largest, fifth smallest; seven supraciliaries; interparietal distinct from the very large, single frontoparietal; a pair of large nuchals. Ear-opening rather small, oval. Scales smooth or feebly striated, two vertebral rows largest; 26 or 28 scales round the middle of the body. Limbs well developed, pentadactyle; the hind limb reaches the axilla in the male, the elbow in the female; digits long and slender, smooth inferiorly. Tail once and a half the length of head and body. Bronzy above, with blackish and pale greenish spots; a light, dark-edged dorsolateral band; end of tail blue; lower parts greenish white.

	millim.		millim.
Total length	113	Fore limb	17
Head	10	Hind limb	21
Width of head	6	Tail	68
Body	35		

Several specimens. Closely allied to *A. boutoni*, Desj., from which it differs in the distinct interparietal shield.

LYGOSOMA NATIVITATIS, Blgr.

This species was established upon a single tailless specimen. Eight specimens were secured by Mr. Lister. The tail, when intact, is two thirds of the total length. Young with the dorsal scales strongly quinquecarinate.

7. On the Terrestrial Mollusks of Christmas Island.

By EDGAR A. SMITH, F.Z.S.

[Received October 15, 1888.]

The only species of Land-shells at present recorded from Christmas Island are the two *Succineæ* and the two forms of *Melampus* obtained by the officers of H.M.S. 'Flying-Fish,' and recorded in the 'Proceedings' of this Society, 1887, pp. 517–518[1].

Only one of these, *Succinea solidula*, Pfr., was obtained by Mr. Lister; who, however, succeeded in discovering seven additional species, four of which appear to be new to science.

The following is a list of all the known species:—

1. ARIOPHANTA (MICROCYSTIS) NORMANI, sp. n.
2. ARIOPHANTA (MICROCYSTIS) MABELÆ, sp. n.
3. ARIOPHANTA (MICROCYSTIS) MILDREDÆ, sp. n.
4. SUCCINEA SOLIDULA, Pfeiffer.
5. SUCCINEA SOLITARIA, Smith.
6. SUCCINEA LISTERI, sp. n.
7. PYTHIA SCARABÆUS, Linn.
8. MELAMPUS LUTEUS, Quoy & Gaimard.
9. MELAMPUS FASCIATUS, Deshayes.
10. TRUNCATELLA VALIDA, Pfeiffer.
11. LEPTOPOMA MOUHOTI, Pfeiffer, var.

The *Pythia*, the two *Melampi*, and the *Truncatella* are all widely ranging species, occurring in the Malay Archipelago and Polynesia. The *Leptopoma*, if I am right in its identification, occurs also in Camboja; and the remaining species, although at present known only from Christmas Island, may also have a wide distribution, as allied forms exist in the Philippines, Moluccas, &c.

[1] I take this opportunity of altering the name of the new species of *Littorina* described P. Z. S. 1887, p. 519. Reeve having already employed the name *grano-costata*, I propose to call the species from Christmas Island *L. insularis*.

Descriptions of the new Species.

ARIOPHANTA (MICROCYSTIS) NORMANI.

Testa depressa, parva, anguste perforata, tenuissima, nitida, subpellucida, olivaceo-cornea; spira leviter conica, parum elevata; anfractus 5–6, *convexiusculi, lente crescentes, sutura marginata sejuncti, utrinque obsolete microscopice spiraliter striati, ultimus ad peripheriam curvatus aut vix angulatus; apertura parva, oblique semilunata; peristoma tenue, margine columellari breviter dilatato. Diam. maj.* 6½ *millim., min.* 6, *alt.* 4⅓.

The form of this species seems to be somewhat variable, some specimens being considerably more elevated than others. The spiral striation is only visible under the microscope, and even then appears very slight.

A. perpolita, Mousson, from Tongatabu, *A. myops*, Dohrn, a Philippine form, and *A. cicercula*, Gould, from the Sandwich Islands, are allied forms, but differ in various respects.

ARIOPHANTA (MICROCYSTIS) MABELÆ.

Testa A. normani *simillima, sed magis complanata, anfractibus fere planis, distinctius striatis, ultimo ad peripheriam angulato. Diam. maj.* 6 *millim., min.* 5½, *alt.* 3½.

This species, if the specimens at hand be adult, seems to be a little smaller than the preceding. It is similarly perforated, of the same texture and glossy appearance, but is more depressed, has flatter whorls, which are a trifle more perceptibly spirally striated; the body-whorl is quite angular, and consequently the form of the mouth is rather different.

ARIOPHANTA (MICROCYSTIS) MILDREDÆ.

Testa A. normani *similis, sed minor, latius perforata, anfractibus magis convexis, utrinque distincte spiraliter striatis. Diam. maj.* 5 *millim., min.* 4⅔, *alt.* 3.

This species is considerably smaller, but more widely perforated than either of the preceding species, and is also more strongly striated, the striæ being visible under a simple lens. The suture is deeper than in either of the others and the whorls more convex, the last being well rounded at the periphery. All these three species are thin, semipellucid, and brownish or olivaceous horn-colour.

SUCCINEA LISTERI.

Testa elongato-ovata, superne acuminata, tenuis, cornea, rubescens; anfractus tres, rapide crescentes, ultimus permagnus, incrementi lineis tenuibus striatus; apertura elongata, ovata, superne acuminata; peristoma tenue, marginibus callo tenuissimo junctis. Long. 13½ *millim., diam. maj.* 8; *apertura* 10½ *longa,* 7 *lata.*

This species differs in form, sculpture, and colour from both the other species of the island. It is smoother, suffused with a reddish vinous tint, and has a shorter spire and a longer body-whorl.

LEPTOPOMA MOUHOTI, var.

Testa conica, tenuis, semipellucida, umbilicata, alba, interdum infra peripheriam fusco tincta, epidermide tenui lutescente induta; spira conica, mediocriter elevata; anfractus 5, *convexi, liris spiralibus filiformibus* (*in anfr. penultimo circiter* 6) *instructi, striisque inter liras sculpti, incrementi lineis obliquis ornati; ultimus liris* 12 (*mediana ad peripheriam cæteris paulo majore*) *succinctus; apertura fere circularis, longit. totius* $\frac{1}{2}$ *paulo superans; peristoma anguste expansum, marginibus callo tenui junctis. Long.* $10\frac{1}{3}$ *millim., diam. maj.* $10\frac{1}{2}$.

Hab. Found on mossy trunks of trees in the upper part of the island (*J. J. Lister*).

In sculpture the specimens from Christmas Island agree exactly with *L. mouhoti*, Pfeiffer, from Camboja. They differ in being broader and in having the spire a trifle less elevated. The peristome also is slightly narrower. Until I have an opportunity of examining a larger series of the two forms, I think it best not to separate them specifically.

8. On the Coleoptera of Christmas Island.

By C. J. GAHAN, M.A.

[Received October 15, 1888.]

The Coleoptera in Mr. Lister's collection consist of about 70 specimens belonging to 20 different species, and to almost as many distinct genera. The genera mostly, and in some cases also the species, are of wide distribution. One genus is new; this, while closely allied to an Indo-Malayan genus, is related also to a distinct Australian genus.

In the following list I have indicated the genera and, as far as possible, the species, but the latter, I have found it impossible in many cases to determine without the expenditure of considerable time. Those which I believe to be new are described below.

MORIO ORIENTALIS, Dejean.

HOLOLEPTA, sp.

PÆDERUS, sp.

PARÆGUS LISTERI, n. g. et n. sp.

LEPTAULAX, sp.

CHRYSODEMA SIMPLEX, C. Waterh.

STIGMATIUM, sp.

MNEPHILUS, sp.

HOPATRUM, sp.

SESSINIA, sp.

Sessinia, sp.

Ceresium nigrum, n. sp.

Monohammus nativitatis, n. sp.

Praonetha perplexa, n. sp.

Micracantha, sp.

Epilachna, sp.

A small Curculionid, and three small Elateridæ, belonging to three distinct species.

Parægus, n. g.

Allied to *Ægus*, from which it differs by the form of the mandibles. These, in the male, are sharply bent inwards and are at the same time directed forwards and upwards, so that their apices, when they meet in the middle line, are on a level with the vertex of the head. In the fully developed male each mandible is armed with a tubercular tooth on its upper (or, in this case, posterior) internal border at a short distance from the apex. The form of its mandibles brings this genus into relation with the Australian genus *Lissotes*; its remaining characters are those of *Ægus*.

Parægus listeri, n. sp.

♂. *Piceo-brunneus, nitidus, mandibulis prope apicem unidentatis; capite supra in medio minute et sparse punctulato, ad latera pone oculos grosse punctato; prothorace supra sparse punctulato, lateribus parallelis; elytris 12-striatis cum intervallis punctulatis.*

Long. corporis 17 millim.; long. mandibuli 4 millim.

The mandibles are provided each with a process on its inner lower side at the base; these processes meet in the middle line when the mandibles are closed, and their posterior border is then concealed beneath the clypeus. The tubercular tooth which each mandible bears near its apex is distinct only in the fully developed males. The head above is minutely and sparsely punctured in the middle, more grossly at the sides, especially behind the eyes. The latter are completely divided by the ocular canthus. The prothorax is sparsely punctured above. The elytra have each six striæ, the outermost of which are feebly marked and consist of rows of closely approximated punctures; the intervals between the striæ as well as the sides of the elytra are punctured. The anterior tibiæ are armed along their outer border with four or five spines; the intermediate and posterior tibiæ have each a single spine below the middle. Six male specimens. The measurements given above are those of the largest.

In the collection of H.M.S. 'Flying-Fish,' from Christmas Island, which was presented to the British Museum, there occurs a single female, which was placed in the genus *Ægus*; it is probably the female of the present species. The mandibles have each a single

tooth at about the middle of their length; the head is strongly punctured above, excepting a smooth space posteriorly, the prothorax is rather strongly but somewhat sparsely punctured above, and its sides are somewhat rounded; the elytra have each about 5 or 6 striæ, but not more than 4 on each are apparent to the naked eye, and even these are not very distinct; the whole surface of the elytra is closely enough punctured.

LEPTAULAX, sp.

This is probably a local variety of *L. timoriensis*, Perch. It differs from that species only, so far as I can find, in the almost entire absence of punctures from the sides of the pronotum. The punctures are restricted to two or three close to the anterior margin, and to a single or double row of small punctures along the lateral margin. The single shallow, rounded depression on each side towards the posterior angle bears in some specimens two or three punctures, in others it is quite plain. The labrum and the surface of the head present the same characters as in *L. timoriensis*; the middle tooth on the margin of the clypeus is a little less distinct, otherwise the margin of the clypeus is similarly toothed.

CERESIUM NIGRUM, n. sp.

Nigrum, subnitidum, antennis, palpis pedibusque ferrugineo-testaceis; prothorace in medio disci et lateribus sparse punctatis, his fulvo-maculatis; scutello fulvo; elytris punctatis, punctis evanescentibus versus medium.

Long. 11–16 millim.

Black and shiny, with scattered pale grey hairs on the middle of the thorax above and on the elytra. The underside of the body and the legs with a faint greyish pubescence not thick enough to conceal the colour of the derm beneath. The fulvous spots form an irregular vitta on each side of the prothorax, similar in pattern to that on *C. simplex*, Gyllh. A feeble tubercle is to be found on each side close to the anterior margin of the thorax. The punctures on the basal half of the elytra are somewhat seriately arranged and are not very close. The last character essentially distinguishes the species from *simplex*, with which otherwise it seems to be closely allied. The colour of the derm is also very distinct.

MONOHAMMUS NATIVITATIS, n. sp.

M. mixto, *Hope, similis, sed differt apicibus elytrorum sinuato-truncatis nec spinosis.*

Long. 21 millim.

The single male example of this species closely resembles small males of *M. mixtus*; but differs in the absence of spines or teeth from the apices of the elytra, in the presence of some scattered punctures on the middle basal part of the front oft he head, and in the proportionately somewhat slenderer third, fourth, and fifth antennal joints. As in *M. mixtus*, the cicatrice of the scape has an almost complete bordering rim, the front of the head is rather narrow,

the prothorax is somewhat uneven and sparsely punctured on the disk, and the elytra are punctate and have a brownish-grey pubescence dotted with numerous glabrous spots.

PRAONETHA PERPLEXA, n. sp.

Pube brunneo-grisea tecta; prothorace punctato, elytris postice gradatim declivibus, dense punctatis, nec cristatis, singulo tenuiter bicarinato, apicibus subrotundatis.

Long. 9–14 millim.

Head covered with a brownish or fulvous-grey pubescence, which is distinctly fulvous on the cheeks and in spots on the front, especially near the base. The pubescence almost conceals the punctures, which are somewhat sparse on the front, cheeks, and vertex. Prothorax with a close brownish-grey pubescence, with its sides apparently feebly rugose, the punctures on the disk scarcely visible beneath the pubescence.

The elytra are distinctly and rather strongly punctured, especially towards the sides, and have a mixed pubescence of brownish grey, fulvous grey, and ashy grey on the anterior two thirds, and a fulvous-grey pubescence on the apical declivous portion. There is also a small distinctly fulvous spot on each side of the rather broad scutellum, the latter is brownish pubescent. The two ridges on each elytron begin at about a third of the length from the base, and end on the posterior declivous part at some distance from the apex, the outer ridge extending back a little farther than the inner. Just in front of the anterior termination of the inner ridge there is on the disk of each elytron a broad and somewhat rounded shallow depression, and in front of this again a broad and feebly raised hump, but no crest.

The underside of the body is covered with a brownish or fulvous-grey pubescence, and each of the first four abdominal segments has a distinctly tawny fringe on the posterior margin. The legs have a somewhat mottled appearance, greyish sprinkled with dark brown.

Antennæ a little shorter than the body, with the basal joint dark brown and sparsely fulvous pubescent, the remaining joints fulvous grey, with their tips somewhat fuscous; the fourth joint is about as long as the second and third together, the fifth about half as long as the fourth, the following joints gradually decreasing in length.

The present species does not agree with any of the descriptions of the numerous species of the genus; but as many of these descriptions are short and inadequate it is impossible to determine it with certainty.

MICRACANTHA, sp.?

A single slightly rubbed specimen, belonging to a species apparently closely allied to, if not identical with, *M. abdominalis*, White. The latter is a widely distributed species; it ranges from N. Australia (Port Essington) to Sumatra, and one specimen in the British Museum Collection (the *Coptops modica* of Dejean's Catalogue) is from the Philippine Islands.

9. On the Lepidoptera of Christmas Island.

By A. G. Butler.

[Received October 15, 1888.]

The Lepidoptera obtained by Mr. Lister are represented by forty-five specimens referable to ten species: unfortunately some of these are more or less injured; but, with one exception, all the species are perfect enough for identification and description: they are equally divided between the Rhopalocera and Heterocera, though the former are more numerous in individuals.

The types are Indo-Malayan in character, but the species are hardly numerous enough to enable one to assert that the fauna more nearly approaches that of one island than another.

RHOPALOCERA.

Nymphalidæ.

Euplœinæ.

1. Vadebra macleari.

Vadebra macleari, Butler, Proc. Zool. Soc. 1887, p. 522, fig. 4.

Sixteen male specimens obtained on the beach in Flying-Fish Cove and on the shore-reef, on October 1st and 3rd.

In all probability the female is on the wing a week later than the male, and consequently was not seen.

Nymphalinæ.

2. Hypolimnas listeri, n. sp.

♂. Rather smaller and with comparatively longer costa to the primaries than the male of *H. alcmene* of Java; the fringes of the wings less prominently white; on the under surface the basal area of the primaries is bright orange tawny, there is an oblique abbreviated white band beyond the cell as in *H. nerina* of Queensland; the fourth and fifth whitish spots of the externo-discal series are absent, the submarginal lunulated spots on all the wings and the discal series of bluish spots on the secondaries are much less prominent, and the white band connecting the costal and anal spots is almost entirely obliterated; the apical area of the primaries and basal area of the secondaries are paler. Expanse of wings 75–87 millim.

♀. Most like the female of *D. nerina*; the abbreviated white band on the primaries being equally prominent and the tawny patch rather more so; the discal series, however, consists of a few minute bluish points; the secondaries show no trace of the large white patch of *D. nerina*, but occasionally there is a small central squamose blue spot on these wings; the submarginal and marginal blue spots are present though indistinct. The under surface agrees with that of the male excepting that the orange basal area of the primaries is more extensive; the externo-discal series of spots complete

though composed of smaller spots than in *H. alcmene*; the secondaries paler, redder towards the outer border, and with larger white marginal and submarginal spots. Expanse of wings 92–99 millim.

Three males and five females, obtained on the 3rd and 4th October. One of the specimens is labelled as having been taken at an elevation of "700 feet on yellow creepers of jungle" and another "caught east of Lunch tree, October 4, 1887."

The perfect constancy of this species interests me, inasmuch as I have recently been accused of making far too many species in this genus:—

At a meeting of the Entomological Society of London (held Nov. 4th, 1885) Mr. Gervase F. Mathew exhibited a number of specimens of this genus of Butterflies from Fiji and other islands of the Western Pacific, and stated that the males varied in no way whatever, but of the females, of which forty-eight were exhibited, scarcely two were alike; he concluded therefore that several species described as new were referable to a single species, and assured the members present that from one brood he had bred individuals agreeing with varieties from the Gilbert, Ellice, and Marshall Islands, the New Hebrides, New Guinea, Tonga, Samoa, &c. Unfortunately the series exhibited to the meeting consisted of females from various localities, corresponding with the forms usually received from those localities, and therefore in no way supporting Mr. Mathew's statement; it would have been interesting if the polymorphic brood described by him could have been exhibited, but the series before the meeting rather tended to prove the constancy of the various island-forms than the reverse.

In a paper read before the same Society on the 7th December, 1887, and published in this year's 'Transactions,' Mr. Mathew associates all the local forms under the name of *Hypolimnas bolina*[1] and observes:—"This butterfly is occasionally to be seen in the vicinity of Sydney, but I never met with it there myself. I have taken it at Brisbane, Cooktown, Claremont Islands, Thursday Island, Fiji, New Caledonia, Friendly Islands, New Hebrides, Rotumah Island, Solomon Islands, Gilbert Islands, Samoa, Pelew Islands, New Guinea, New Britain, and have received it from Norfolk Island." He adds:—"On account of the extraordinary manner in which the females vary, it being extremely difficult to obtain two exactly alike from the same brood of larvæ, a number of new species have been described, among which I may mention *naresii*, *mosleyi*, *pallescens*, *pulchra*, and *montrouzieri* of Butler, and *otaheitæ*, Felder."

At a meeting of the same Society, held on the 4th April of the present year, Mr. Salvin exhibited about sixty specimens, no two of which were alike, of a species of *Hypolimnas* caught by Mr. Woodford near Suva, Viti Levu, Fiji, on one patch of Zinnias. This exhibition, though interesting, really added nothing to our knowledge of the genus, since the varieties shown were those connecting *H. pallescens* with an extremely dark representative of *H. antigone*, which in the Museum collection have been associated since the year

[1] *H. bolina* is an Indian type never yet received from the Australian Region.

1884, when I published an account of a collection of Butterflies made by Mr. Woodford in the Fiji Islands. At p. 345 of the 'Annals and Magazine of Natural History' (5th series, vol. xiii.), under *Hypolimnas pallescens*, I state:—"The series collected by Mr. Woodford shows a series of gradations, commencing with the extremely pale form figured in Brenchley's 'Voyage,' through a series of gradually darkening forms near to *H. antigone* of Batavia, to a smoky brown form in which the markings, excepting the discal series of white spots on the primaries, are much obscured; the general character of *H. pallescens*, apart from the ground-tint, is nevertheless retained throughout the series."

The fact that the males differ as well as the females has been overlooked, and this can only be accounted for on the supposition that Mr. Mathew did not examine the under surface of the wings, where in many nearly allied species the best characters are frequently to be discovered; as will be seen, he states that the males vary "in no way whatever," whereas I have never found any difficulty in assigning the males to their proper females, by looking to the pattern and colouring of the under surface.

That two or three forms, differing in both sexes and each showing some slight degree of variation, exist together in each locality is a truth which cannot be questioned, and that these two or three forms may be seasonal types of one species in each locality is possible; but to associate thirty or forty distinct forms from an area extending from Northern India to Southern Australia (because some of the forms from neighbouring islands are nearly allied), as one extremely variable species, is at once to regard "genus" and "species" as synonymous terms.

It is at any rate pretty clear that only one form, and that distinct from any of those previously received, occurs on Christmas Island.

Lycænidæ.

Lycæninæ.

3. Nacaduba aluta.

Cupido aluta, Druce, Proc. Zool. Soc. 1873, p. 349. n. 16, pl. 32. fig. 8.

Three male examples, taken in the bush, October 1st. This species was described from Bornean specimens: the Museum collection contains a series from Malacca.

Papilionidæ.

Pierinæ.

4. Terias amplexa.

Terias amplexa, Butler, Proc. Zool. Soc. 1887, p. 523, fig. 5.

♂. Flying-Fish Cove, October 1st; 3 ♂ ♂, west end of Christmas Island, October 3rd.

The specimens correspond in every respect with the type previously received.

5. TERIAS PATRUELIS.

♂. *Terias patruelis*, Moore, Journ. Linn. Soc., Zool. vol. xxii. p. 46, pl. iv. fig. 5.

♀. Slightly paler above than the male; the inner edges of the black-brown border of primaries slightly diffused; expanse of wings 38 millim.

♀. Christmas Island, October 1st.

Dr. Anderson collected males on Elphinstone and Pataw Islands, Mergui Archipelago; the species, however, seems to be widely distributed, as we have received it (only differing in being a little smaller) from Bombay and Mhow.

HETEROCERA.

LIPARIDÆ.

6. PORTHESIA IRRORATA?

♀. *Euproctis irrorata*, Moore, Cat. Lep. E. I. Comp. ii. p. 347 (1858–9).

♂. Christmas Island, 2nd October.

Only one worn specimen was obtained; it is probably the male of Moore's species: the primaries are irrorated beyond the middle with brown (not with black) scales. For a *Porthesia* it has unusually large antennæ and rather more prominent eyes.

HERMINIIDÆ.

7. HYDRILLODES, sp. n.

Probably a new species, with palpi as in *H. gravatalis* (*Bocana gravatalis*, Walk.) of Borneo; the example is very badly rubbed, but enough colour remains to show that the basal half of the secondaries below is ochreous, that these wings also have only one band across the disk, and that all the wings have a blackish discocellular spot.

No exact locality given.

EUDRAGANA, gen. nov.

Nearer to *Dragana* than to anything known to me; but differing in its narrower smoother palpi, which are directed obliquely upward and have a pointed terminal joint; the thorax flatter; the head not crested in front, the antennæ longer; neuration similar.

8. EUDRAGANA LIMBATA, sp. n.

♀. General coloration of *Dragana pansalis*, rather less ochraceous; primaries whity brown, slightly inclining to yellowish, with an internally irregularly trisinuated greyish external border edged with black; a marginal series of black dots; orbicular spot punctiform, black, interrupting a zigzag grey line which limits the basal area; reniform spot represented by a black annulus, interrupting a central zigzag band formed by two approximated greyish stripes; fringe shining whity brown; secondaries shining pale whity brown, with a broad internally diffused grey outer border; fringe yellowish as in

the primaries: body whity brown, slightly yellowish; palpi excepting the terminal joint dark grey at the sides; under surface pale whity brown; the wings slightly suffused with grey. Expanse of wings 24 millim.

No exact locality given.

It is unfortunate that the male was not obtained; for, although no genus corresponding with this moth appears to have been described either as a *Noctuid* or a *Deltoid*, the characters of the male would indicate the affinities of the genus with greater certainty than those of the female.

PYRALIDÆ.

9. PYRALIS LISTERI, sp. n.

Allied to *P. gerontesalis* of Ceylon, but decidedly smaller, the outer black-edged white line of the primaries much less irregular and considerably nearer to the outer margin, and those of the secondaries ill-defined and partly obsolete. Expanse of wings 13 millim.

Seven examples, five of which, however, are rubbed clear of scales; without exact locality.

BOARMIIDÆ.

10. BOARMIA COMPACTARIA.

Boarmia compactaria, Walker, Cat. Lep. Het. xxvi. p. 1538 (1862).

Evidently a variable species; three males were obtained, one on a tree-trunk in Flying-Fish Cove on September 30th, the others on the 3rd and 4th October.

The type of *B. compactaria* was received from Penang.

10. On the Insects (exclusive of Coleoptera and Lepidoptera) of Christmas Island. By W. F. KIRBY, Assistant in the Zoological Department, British Museum.

[Received October 15, 1888.]

It is unnecessary for me to preface my paper with remarks on the general affinities of the insects collected by Mr. Lister. Most of the species that he obtained prove to be new, and the greater part even of these exhibit no very great affinity to any already contained in the British Museum. A few species obtained (chiefly small Orthoptera, several of which are immature) are not noticed, as we do not yet possess enough material for descriptions to be useful.

ORTHOPTERA.

FORFICULIDÆ.

LABIDURA NIGRICORNIS, sp. n.

Long. corp. 18–20 millim.

Black; head smooth, not much raised, broad behind, and narrowed

and produced in front; lower mouth-parts sometimes testaceous; antennæ 17-jointed, sometimes inclining to pitchy beneath, but with none of the joints white or yellow; pronotum smooth in front and very finely reticulate behind, nearly quadrate, the hinder edge rounded; a central groove on the front half, on each side of which is a slight elevation; tegmina nearly smooth, broader than the thorax, and $1\frac{1}{2}$ times as long as broad; projecting portion of the wings rather narrow, sparingly punctate, about $\frac{1}{5}$ as long as the tegmina, and very slightly tipped with pale testaceous; femora slightly thickened; tarsi, and sometimes the extreme tips of the tibiæ, ferruginous; abdomen thickly and finely punctured, the hinder margins of the segments appearing as if milled. Under surface more inclining to pitchy. Forceps nearly as long as the abdomen, moderately broad, more or less punctured, and incurved at the extremity; in the male with a tooth at the base, and another, preceded by two or three small denticulations, at two thirds of the length.

Several specimens obtained (October 3, 1887). This appears to be the common Earwig of the island; it has considerable external resemblance to *Chelisoches morio*, Fabr., from which the structure of its legs and its unicolorous antennæ will at once distinguish it.

Blattidæ.

Blatta livida, Fabr.

Blatta livida, Fabr. Ent. Syst. ii. p. 10. n. 23 (1793).

A cosmopolitan species. No record attached to the specimen.

Panesthia javanica, Serv.

Panesthia javanica, Serv. Ann. Sci. Nat. xxii. p. 38 (1831).

"These insects abound under rotten wood and in large holes in it, which they seem to make. In various stages of development. West End, Christmas Island, October 1, 4, 5, 1887."

Phasmidæ.

Clitumnus stilpnoides, sp. n.

Long. corp. 100 millim.

Male. Uniform brown; head and pronotum somewhat more grey; antennæ about two thirds as long as the mesonotum; pronotum hardly longer than the head; mesonotum one fourth longer than the metanotum; two small horns between the eyes; legs long, slender, unarmed, clothed with very fine oblique bristles; outer anal appendages longer and less incurved than in *C. stilpnus*.

Taken October 6, 1887. Also two immature specimens, apparently belonging to the same species. Closely allied to *C. stilpnus*, Westw.

Gryllidæ.

Phisis listeri, sp. n.

Long. corp. 15 millim.

Male. Pale green; head and pronotum darker, with two conspicuous yellow lines, slightly convergent, running from the back of the

eyes to the base of the pronotum; suture of the tegmina yellowish and the antennæ, legs, and under surface of body likewise inclining to yellow; four front femora and tibiæ armed with long slender spines; hind femora considerably thickened before the middle; hind femora and tibiæ with very numerous short spines.

Three specimens, two immature. The adult specimen above described shows only three spines on the intermediate femora; but one of the others has four, showing that this is not a constant character.

One of the immature specimens bears a label "Christmas Island, October 3. Colour grass-green." The colour is now much varied with yellow.

Allied to *P. pectinata*, Guér., but considerably smaller than any of our specimens of that species.

Phyllopteridæ.

Gryllacris rufovaria.

Long. corp. 32 millim.; ovipositor ♀ 12 millim.; exp. al. 65 millim.; long. antennarum circa 110 millim.

Yellowish brown; the head, especially the face, red; the vertex, the neighbourhood of the eyes and of the antennæ, the space between the latter, the lower mouth-parts, and the palpi more or less varied with yellowish; prothorax and sides of abdomen beneath varied with red; spines of the hind legs tipped with black; tegmina yellowish, with yellowish veins. Wings ample, pale grey; the longitudinal nervures yellowish brown; the cross-nervures blackish, bordered with dusky on each side, except the two or three outer rows, the outermost of all being varied with yellowish.

Moderately stout, smooth and shining; face with a few shallow punctures; head and thorax of equal breadth; antennæ, legs, and anal appendages (except ovipositor) sparingly clothed with fine short woolly hairs; hind femora with from nine to eleven short spines, hardly arranged in pairs, on each side; hind tibiæ with six irregular pairs, without counting the apical ones. In the male the last segment of the abdomen terminates in two short stout conical projections; the upper anal appendages are long, tapering, divergent in the middle, and slightly incurved at the tips; the lower appendages are only half the length of the upper ones, and are simply divergent. In the female the upper appendages are stouter at the base and more incurved at the tips than in the male, but are of nearly equal length.

Belongs to the same group as *Gryllacris tessellata*, Drury, but readily distinguished by the total absence of black markings on the head and thorax, and by the colour of the tegmina and wings. It is probably more closely allied to *G. variabilis*, Brunner (Verh. zool.-bot. Ges. Wien, xxxviii. p. 353, f. 40), than to any other described species.

Appears to be a common species on Christmas Island, as one male and four females were obtained.

Taken on leaves on a tall tree-top, October 9.

Locustidæ.

Primnia (?) orientalis.

Exp. al. 44 millim.; long. corp. 26 millim.

Grass-green; antennæ about twice as long as the head and pronotum, yellowish (faded?), the tips brownish; tips of mandibles and palpi dark green; vertex with four dusky lines approximating in front, the inner ones much nearer together than the space between these and the others; the transverse grooves on the pronotum black, the first shorter than the others, and ending in a dusky spot on each side, behind which is another dusky spot (between the second and third grooves); the second groove is angulated forwards at its extremities, ending in blackish spots; before the first groove runs a transverse reddish line, only distinct on the sides. Abdomen blackish above, green on the sides and beneath; a large dark green spot beneath, towards the extremity of the 8th segment. Elytra green, with many of the longitudinal nervures yellowish; the intermediate spaces inclining to hyaline beyond the middle. Wings smoky hyaline, with brown nervures; costal nervure yellow, and the nervures at the base and along the inner margin grass-green. Spines short, tipped with black, as well as the claws.

I refer this insect to *Primnia*, Stål (the type of which is from St. Helena), with some doubt.

"Flew into light in tent, October 9th."

Cyrtacanthacris fusilinea, Walk. (?).

Cyrtacanthacris fusilinea, Walk. Cat. Derm. Salt. iii. p. 564. n. 30 (1870).

I am not quite certain that the specimen from Christmas Island is identical with Walker's species from Ceylon; but it closely approaches it, and as there is only a single specimen from the former locality, and that not in very good preservation, I have been unwilling to describe it as new.

Cyrtacanthacris disparilis, sp. n.

Exp. al. ♂ 90 lin., ♀ 115 lin.; long. corp. ♂ 54 lin., ♀ 80 lin.

Male. Head and body yellow, inclining to reddish above; antennæ with the first two joints yellow, the remainder black above, beneath pitchy or yellowish; tegmina longer than the abdomen, yellow; the longitudinal veins darker; towards the tip the membrane becomes nearly hyaline, and many of the nervures are brown. Wings smoky hyaline, the nervures towards the base and costa yellow, the remainder brown; the nervures immediately at the base incline to reddish. Legs yellow, darker above; tarsi inclining to reddish; the joints sometimes marked with green; claws black at the tips; hind femora with three carinæ above, with short and distant serrations; these and the lower lateral carina are irregularly marked with black; the intermediate space above is slightly reddish, more so at two points than in others, which gives the appearance of two interrupted bands. Sutures of the knee-joint black. Hind tibiæ with a green

spot at the base above, otherwise dull-green; the under surface yellow. Spines yellow, tipped with black; hind tarsi yellowish or reddish.

Female. Reddish brown, inclining to black on the upper part of the head and thorax; antennæ black (including the two basal joints), and pitchy towards the extremity; face reddish. The frontal concavity is black on the sides, but is filled up with yellow, which forms the front of a broad yellow stripe which runs to the extremity of the prothorax, of which the borders, and especially the lower hinder angles, are more or less yellow; the borders of this streak above, the facial carinæ, and a stripe under each eye are darker than the surrounding parts. Four front legs dirty green, varied with yellow; the arolia reddish; middle femora with a double row of yellow spots on the outside. Hind femora brown above and reddish beneath, with two blackish transverse bands above; the space between the lateral carinæ with oblique or oval whitish or pale yellow marks, and a continuous yellow stripe on the under surface. Hind tibiæ black above, with a yellow spot at the base, and brownish yellow beneath; spines yellow, tipped with black. Hind tarsi reddish, with a black carina above; tegmina brown, the interspaces more hyaline towards the tips. Wings as in the male.

Allied to *C. melanocerus*, Serv. (*nigricorne*, Burm.), from Java and Malacca.

I should not have ventured to place these insects together but for a memorandum which accompanied them, stating that they were found *in coitû* by Lieut. Richardson near the shore of Christmas Island on October 1, 1887. Another specimen of the male was met with on October 2 at Flying-Fish Cove.

EPACROMIA RUFOSTRIATA, sp. n.

Exp. al. ♂ 43 lin., ♀ 40 lin.; long. corp. ♂ 20 lin., ♀ 22 lin.

Male. Testaceous, speckled with reddish and black; a small black spot beneath each eye; a black stripe (bordered above by a pale line and suffused below) runs behind each eye to the extremity of the pronotum; it is intersected at the third groove of the pronotum by the pale line which runs below instead of above the hinder part of the black stripe, which is conical and more sharply defined than the rest; hind femora on the inside black for half their length, followed by a long black spot; the inside sutures of the knees are also black; hind tibiæ beneath black at the base and for the last three quarters of their length; spines whitish, tipped with black. Tegula testaceous, subhyaline beyond the middle, with reddish nervures; the basal half of the principal nervure black; wings clear hyaline, with pale nervures; several of the longitudinal nervures before the middle of the wing black for at least part of their length.

Female similar to the male, but much redder, and hardly speckled; edges of the frontal concavity blackish, and from this run two slightly diverging blackish lines between the eyes and as far as the occiput. Markings of the head and pronotum nearly as in the male; sides of pronotum varied with yellowish. Hind femora red

(very bright red beneath), and marked as in the male; hind tibiæ black at the base on the inside and beneath; the basal third otherwise yellow, the middle third black, and the apical third red. Spines white, tipped with black; extreme tip of hind tibiæ, including the base of the terminal spines, and hind tarsi, yellow. Tegulæ and wings nearly as in the male; but the tegulæ, and especially most of the longitudinal nervures, darker; many of the cross nervules, a short stripe before the middle above the principal nervure, and most of the nervures on the inner marginal region are red.

In both sexes the costa is moderately arched at one fourth of its length.

Not very closely related to any species previously represented in the British Museum.

Captured October 1.

HYMENOPTERA.

Formicidæ.

Camponotus melichloros, sp. n.

Long. corp. 7–8 lin.

Worker. Structure nearly of *C. ligniperda*. Thoracic sutures fairly well defined; node of petiole forming a rounded plate. Smooth and shining, sparingly clothed with erect white hairs; thorax honey-yellow; head and tarsi reddish; flagellum paler; abdomen black, with pale sutures; eyes and extreme tips of mandibles black, the latter sexdentate.

The following label was attached to the bottle:—"Two forms from same nest in rotten wood. Flying-Fish Cove, October 2." The specimens differ little, except that some are rather smaller and paler than others, and with conspicuously smaller head.

Poneridæ.

Lobopelta diminuta.

Ponera diminuta, Smith, Cat. Hym. B.M. vi. p. 89. n. 23 (1850).

Four workers from a nest; found near the summit of Christmas Island, October 4. Originally described from Sarawak.

Eumenidæ.

Odynerus polyphemus, sp. n.

Long. corp. 10 millim.; exp. al. 17 millim.

Black, thickly and closely punctured; head with a yellow spot between the antennæ; the orbits opposite the antennæ very narrowly edged with yellow; a yellow streak on each side of the base of the clypeus, just below the antennæ, and a yellow streak behind each eye, above the middle. Prothorax edged in front with a broad yellow stripe, tapering and interrupted in the middle, and cut squarely off on each side. Tegulæ pitchy, with a very small yellow dot in the middle, a triangular yellow spot above, and another, subrotund, on the mesopleura. Scutellum with a broad longitudinal

yellow stripe on each side; postscutellum yellow; metathorax with a broad curved yellow stripe on each side. Abdomen with the first segment yellow above, except in front, a black line interrupted behind on the median line above; second segment yellow above except at the base, and on a wide conical space which extends to three quarters of its length; on the hinder edge of the segment the yellow colour is continued on the lower surface, but does not form a complete ring, being widely interrupted in the middle; the third segment bordered with yellow behind on the upper surface. Wings dirty hyaline, smoky along the costa and in the radial cell.

Allied to *O. confluentus*, Smith, from Sumatra, but differing much in colour from any described species.

No particulars of capture.

Vespidæ.

Polistes balder, sp. n.

Exp. al. 28 millim.; long. corp. 13 millim.

Ochreous yellow, with linear black markings. Head with a black line just above the antennæ, the ends of which run upwards on each side and slightly diverge; below the antennæ the clypeal suture is black, and this curve is sometimes connected with the upper one by a black line on each side within the antennæ; a black line crosses the head just behind the ocelli, over which extends a continuous black spot; the tips of the mandibles are also black, as well as the basal parts of the head and prothorax. Thorax with all the sutures more or less black, sometimes not continuously; the central black line is frequently incomplete behind. Pectus and pleura black, the latter marked with four or five large and small yellow spots. Scutellum, postscutellum, and metathorax yellow; the sutures rather broadly black; groove of the metathorax black. Legs almost entirely yellow or reddish yellow; the trochanters and the extreme tips of the coxæ and bases of the femora black. Abdomen inclining to reddish yellow, but with no distinct markings, except a black spot above at the base of the 1st segment and the suture between the 1st and 2nd segments, which is generally black. Wings smoky hyaline, with brown nervures; costal nervure and costal region yellowish.

Allied to *P. hebræus*, but smaller and differently coloured. The first segment of the abdomen, too, appears to be a little longer and more gradually widened.

Two nests accompanied these Wasps. They are round, and the smaller one is considerably raised in the middle. The upper surface is grey; the outer portion is inky black towards the base, and whitish on the sides above.

One of the Wasps was taken on October 1 at Flying-Fish Cove; a nest, with eggs, larvæ, and cocoons, was found on the underside of a branch at the same place on October 2; and another nest, with Wasps flying round it, on October 5.

HEMIPTERA.

Lygæidæ.

Lygæus subrufescens, sp. n.

Long. corp. 11–13 millim.

Pitchy brown above; the head, pronotum, and base of the elytra bordered with dull red; the ocelli and the space between each eye brighter red; antennæ and legs pitchy brown above and below; head and body dull red beneath (in the female the abdomen is shaded with brown on the sides and towards the extremity, and the legs are of a redder brown beneath than above). Proboscis pitchy, extending to the middle of the third segment of the abdomen.

Allied to *L. longiusculus*, Walk., from Celebes.

The female was taken at Flying-Fish Cove on October 2.

HOMOPTERA.

Cicadidæ.

Oxypleura calypso, sp. n.

Male. Black, with testaceous markings. Head black; front of vertex with a wide testaceous stripe on each side, extending from the inside of the eye to the striated portion of the face. Longitudinal sulcation broad, rather deep, black, surmounted by a trapeziform ochreous spot; the transverse striations, except the upper ones, are marked with ochreous, ending in a continuous ochreous stripe, not striated, on each side of the extremity of the longitudinal sulcation. Sides of face clothed with thick yellowish-grey hair; labrum with a longitudinal testaceous stripe, expanded above and below; proboscis testaceous, black towards the extremity, and reaching as far as the hinder trochanters; antennæ black. Pronotum testaceous, entirely so behind; a dumbbell-shaped black mark in front of this, extending to the front edge, and the central sutures blackish; sides not greatly expanded, with irregular black markings, and clothed with grey hair; mesonotum black, with two short thick tawny stripes on each side, not reaching the front edge, and a spear-headed tawny mark, filled with black in the middle, directed forwards; scutellum with the hinder half and lateral ridges testaceous. Abdomen black; sutures narrowly edged with testaceous, especially on the sides; segment 7 with two testaceous dots in the middle and a larger spot on each side. Sternum mostly black, clothed with greyish hair; legs testaceous; coxæ, four front femora, and tarsi streaked with black above; opercula testaceous, extending nearly to the end of the first segment of the abdomen. Abdomen beneath testaceous; basal segment entirely black, the following segments triangularly blackish on each side at the base, the last two lateral lobes spotted with black. Tegulæ and wings hyaline, with brown nervures; costal nervures and inner marginal nervures testaceous.

Allied to *O. bufo* and *O. polita*, Walk., but differently marked.

An extremely hairy pupa, marked "Dug up, earth, October 8,"

accompanied the specimen, besides an empty pupa-skin, both probably belonging to the same species.

Fulgoridæ.

Ricania flavicostalis, sp. n.

Exp. al. 20 millim.; long. corp. 7 millim.

Male. Head yellow, with four keels; vertex depressed, brown, except at the sides and on the median line; front quadricarinate, the angles of the outer carinæ very prominent, the middle ones hardly projecting on the frontal edge; all the carinæ black, and with a short dark line on the clypeus between them, the middle ones rather wide apart, and meeting in a point at the extremity of the clypeus. Thorax and abdomen blackish brown above, the thorax tricarinate, varied with ferruginous on the sides and along the outer edges of the two outer carinæ; abdomen with the second segment greenish, and the base of the three following segments ferruginous. Under surface of the body and legs yellowish; the four front tibiæ brownish above; abdominal segments edged behind with a green line; the last two segments reddish brown. Wings hyaline; fore wings with the costal space yellow as far as the black stigma, beyond which is a hyaline space; hind margin broadly purplish brown, intersected by a curved line nearly parallel to the hind margin; within the middle of this runs a narrow vitreous stripe covering the outer half of seven cells; one or two very irregular series of transverse cells beyond the middle of the wing, not even uniform on both sides; inner marginal region tinged with yellow, but less strongly than the costa; costal cross-nervures not forked, but most of the apical nervures beyond the stigma and on the hind margin are forked. Hind wings hyaline, brown along the hind margin, the first six or seven marginal nervures from the tip furcate or bifurcate.

The neuration of this and the two following species somewhat resembles that of *R. panorpæformis*, Spin. No dates of capture are attached to any of the specimens.

Ricania affinis, sp. n.

Exp. al. 22 lin.; long. corp. 9 lin.

Male. Very similar to the last species, but darker above, the brown bands on the clypeus beyond the inner carinæ darker; under surface of body yellow, with irregular black markings beneath the wings, and a large spot on the pectus between the first two pairs of legs; abdomen not banded with green above, but with a row of yellow spots on the sides. Wings hyaline, not tinged with yellow on the costa or inner margin, but with a yellow spot on the costa (likewise edged with black within) before the black stigma; below the stigma are some small brown blotches along the line of the inner row of transverse cells; there are also two small brown spots nearer the base on the lower half of the wing; hind margin brown for about one sixth of the width of the wing, and marked with two irregular hyaline spaces, each covering several cells; close to the hind margin runs an interrupted row of small hyaline dots. Hind wings hyaline,

edged with brown, except towards the anal angle. Neuration nearly as in the last species, but the outer row of transverse cells less numerous.

RICANIA HYALINA, sp. n.

Exp. al. 15 millim.; long. corp. 5 millim.

Male. Head yellowish; the carinæ black, the clypeus marked with brown lines between them; the middle carinæ not projecting on the vertex, which is deeply and triangularly depressed in the middle; thorax reddish above, the middle carinæ yellow; abdomen brown above, the sides marked with yellow, and the segments bordered with green behind. Under surface of the body yellow, the femora, the extremities of the first five segments of the abdomen, and a large spot at each side at its extremity green; the base of the first five abdominal segments rich cream-colour.

Allied to *R. pellucida*, Spin., and *R. panorpæformis*, Germ.

DIPTERA.

ASILIDÆ.

LAPHRIA NIGROCÆRULEA, sp. n.

Exp. al. 28 lin.; long. corp. 14 lin.

Head black; the hairs on each side in front within the eyes silvery white; beard and proboscis black; hairs at the back of the eyes slightly greyish. Thorax above inky black, hardly shining; the front, sides, and sutures clothed with white hair, inclining to silvery. Legs inky black, more shining than the thorax, clothed with white hair; pulvilli brown. Abdomen deep purple, shading into green at the extreme ends of the segments, and with three spots formed of white hairs on each side of the first three incisions. The first segment of the abdomen is slightly expanded; the remainder are of nearly equal width to the extremity, the last segment being slightly narrowed and subtruncated. Wings hyaline brown, with a very slight purplish iridescence, and, towards the base, more transparent; halteres of a conspicuous orange-brown.

Allied to *L. aurifacies*, Walk., from Borneo, and to several other species from the Malay Archipelago.

MUSCIDÆ.

STILBOMYIA JUCUNDA, sp. n.

Long. corp. $7\frac{1}{2}$–10 lin.

Head black; middle of face, antennæ, &c. hoary or lead-colour; sides white; mouth-parts reddish; hinder orbits narrowly white. Thorax and abdomen green, strongly punctured; front of prothorax edged with hoary; abdominal segments narrowly edged behind with blue-black; thorax beneath, in the middle and hinder portion, as well as the legs, black; sides of front part of thorax green; wings hyaline (?) (discoloured in all the specimens); halteres white; spines on the body and legs black.

Several specimens, without date of capture.

Allied to *S. decrescens*, Walk., from Morty Island.

11. On the Arachnida, Myriopoda, and Land-Crustacea of Christmas Island. By R. I. Pocock, Assistant Nat. Hist. Museum.

[Received October 15, 1888.]

Although not extensive in numbers either of species or individuals, Mr. Lister's collection of the above-mentioned groups of animals presents some features of no little interest. No Chilopod has ere this been recorded from the island, and amongst the specimens obtained are examples of two species of *Cryptops*, a genus which has never before been reported from any part of the Oriental Region. As might have been expected, one of these is new; while, curiously enough, the other is inseparable from the common *C. hortensis* (Leach), which is tolerably abundant in the neighbourhood of London.

Such wide-spread and well-known Chilopoda as *Scolopendra morsitans* (Linn.) and *S. subspinipes* (Leach) are conspicuous for their absence. The two species of Diplopoda taken are new; one, in addition, constituting a new genus; but this fact, considering the scantiness of our knowledge of the Diplopod fauna of the neighbouring lands, is not surprising. With the exception of one world-wide form the Arachnida belong to species that have been described only from Australia; and it may perhaps be worth while in this connection to call attention to the fact that Capt. Maclear brought back in 1887 one specimen of *Liocheles australasiæ* (Fabr.), a Scorpion that ranges from the Corea to the Fijis (see Proc. Zool. Soc. 1887, p. 520). One species of a land-crab was taken. This, in addition to its being a new species, is of interest inasmuch as it renders justifiable the view that the genus *Limnocarcinus* (De Man) should be regarded as a synonym of *Hylæocarcinus* (Wood-Mason).

CHILOPODA.

Scolopendridæ.

Cryptops hortensis (Leach).

For synonyms and an excellent description of this well-known European species and for references to the literature which treats of it, see Latzel, 'Die Myriopoden der Öster.-Ungar.-Monarchie,' i. p. 153 (Alfred Hölder, Vienna, 1880).

One specimen under a stone in Flying-Fish Cove. Although I have subjected this specimen to a most careful examination, I can find no reasonable grounds for separating it from the common European form.

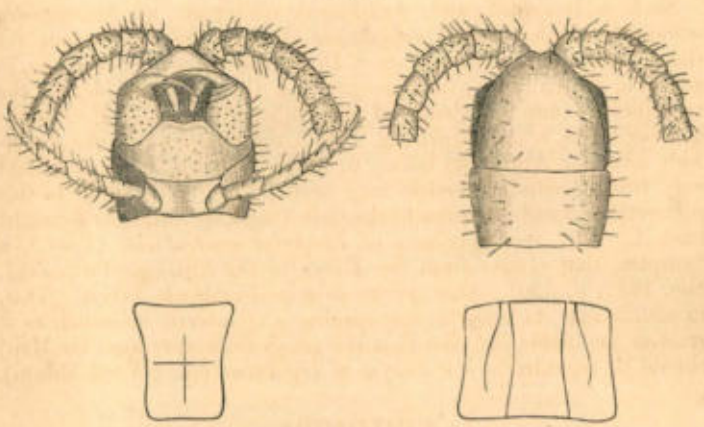
Cryptops inermipes, sp. n.

Colour ochraceous, cephalic and anal segments darker. *Antennæ* long, slender, imperfect, being composed of but sixteen segments; segments cylindrical, the proximal short and thick, and sparsely

hirsute, the distal much more slender and densely pubescent. *Head-plate* cordate, hirsute, without sulci; basal plate not visible. *Maxillary sternite* wide, simple, with toothless but bristly anterior margin; maxillary feet bristly, inner margin not furnished with teeth; claw long and gently curved.

Tergites scantily hairy and sparsely punctured; first without sulci and slightly overlapping the head-plate in front; second with two shallow sulci; the rest, with the exception of the last, bearing four sulci, two median, parallel, complete, and on each side one which, starting anteriorly near the median sulcus of its side, curves outwards and terminates on the surface of the tergite in the anterior region of the body, but reaches, or nearly reaches, the hinder margin of the plate in the posterior region of the body; lateral margins not

Fig. 1.



Cryptops inermipes.

raised. *Sternites*: each, the first excepted, furnished with a median longitudinal sulcus, and most of them with a median transverse sulcus, which cutting the other at right angles makes the form of a cross. The distinctness of this latter sulcus is variable, and it almost disappears in the posterior region of the body. *Anal segment*: tergite with parallel lateral margins and angularly produced posterior margin; anterior portion of pleurite furnished with large, not close-set pores; posterior portion without pores; posterior margins slightly convex and bristly, obtuse below; sternite with a median anterior abbreviated sulcus, slightly curved lateral margins and convex posterior margin. *Legs* (all that remain) remarkably hirsute, but none of the segments spiny or denticulated.

Length about 27, of antennæ 5½ millim.

One specimen beneath a stone in Flying-Fish Cove.

This species may be recognized *inter alia* by its cylindrical antennal segments, and by the absence of denticles upon the under surface of the tibial and proximal tarsal segments of the anal legs.

Geophilidæ.

Mecistocephalus castaneiceps (Haase).

Mecistocephalus castaneiceps, Haase, Die Indisch-Australischen Myriopoden, pt. i. Chilopoden, p. 102, pl. vi. fig. 109.

Six specimens were taken under stones in Flying-Fish Cove.

This species has hitherto only been recorded from Pulo Edam, an island on the north coast of Java.

DIPLOPODA.

Polydesmidæ.

Cylindrodesmus, gen. nov.

Genus generi Strongylosoma *affine*; *eo discrepans quod foramina repugnatoria, absentibus carinis lateralibus, in segmentorum superficie situm habent; labro ad speciem ferme quadratæ laminæ ex anteriore capitis margine prominentis conformato.*

For other characters see under the specific diagnosis.

Cylindrodesmus hirsutus, sp. n. (Fig. 2, p. 559.)

Colour ochraceous or testaceous. *Head-plate* remarkably convex in its upper portion and cleft by a longitudinal median sulcus, which terminates before reaching the interantennal space. This space very narrow. Externally to the point of insertion of each antenna the head-plate is somewhat deeply excavated, to form a groove, which is bounded on the inner side just above the proximal joint of the antenna by a rounded prominence, and on the outer side by a conspicuous ridge which, sharply defined above, merges insensibly with the rest of the head-plate below, and is continuous with the external margin. Beneath the interantennal space the head-plate presents a shallow transverse constriction. The labrum is remarkably prominent and projects as a somewhat quadrate prolongation from the lower portion of the head-plate, its lateral margins cutting the lateral margins of the head-plate at about an angle of 135°. Its anterior margin is almost straight and feebly toothed in the middle, and its antero-lateral angles rounded. Head-plate thickly clothed with short hairs and closely but obscurely punctured.

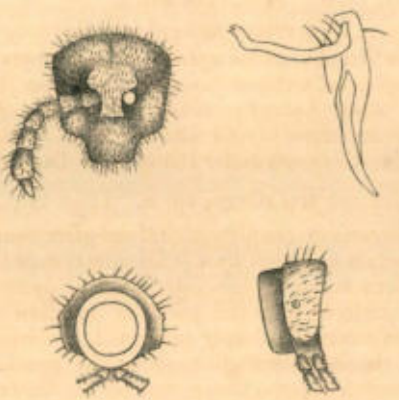
Antennæ short and hairy; segments 2, 3, 4, 5, proximally narrowed, about equal in length and somewhat cup-shaped; sixth segment much larger and more cylindrical than those that precede it; seventh segment cylindrical, small, but conspicuous.

Tergites not shining, dull, rugulose, thickly clothed with short hairs and sparsely with longer hairs: first with simple margins and rounded lateral angles; second widened inferiorly on each side; hinder half of each of the other somites above evenly arched from

side to side; the inferior surface less arched, with its plane meeting the plane of the lateral surface almost at right angles. On the under surface, near the point of junction of the two surfaces, there is a shallow constriction which gives each somite the appearance of being furnished below on each side with a rounded keel-like prominence. These prominences form a continuous series extending from the lateral margin of the first tergite to the posterior end of the body, a series which corresponds with the series of inferior keels found in some (? all) species of *Strongylosoma*.

Foramina repugnatoria small, circular, with slightly raised margins, situated in the middle of the sides of the same somites, as in *Strongylosoma*, but not supported upon even a trace of a keel; those in the anterior region of the body situated in the anterior portion of

Fig. 2.



Cylindrodesmus hirsutus.

the posterior half of each somite, those in the posterior region of the body in the posterior portion of the posterior half of each somite. Anal tergite produced behind into a short rounded prominence which slightly overlaps the anal valves; margins of valves not raised; subanal plate somewhat quadrate, with slightly concave and converging lateral margins, and slightly concave posterior margin, at each end of which is a prominent tooth.

Legs hairy. Copulatory foot of the male consisting of two segments; proximal segment, half of which is inside the body, slender and cylindrical above, stout below, and membranous on the inner surface, where it comes into contact with its fellow on the opposite side; from its distal extremity on the inner surface springs, at right angles to it, the distal segment, which projects forwards parallel to the long axis of the body; this segment has the form of a slightly waving rod which is sharply upturned towards the distal

extremity, where it is bifid; proximally it is furnished with a few longer and shorter hairs.

Total length about 7 millim.

Five males and six females were taken under stones in Flying-Fish Cove.

Julidæ.

Spirostreptus (Nodopyge) exocœti, sp. n.

Species belonging to the immucronate homomorphous group.

Number of somites 54 or 55. Total length about 22 millim.

Head-plate convex from above downwards and from side to side, marked above with a short median sulcus; eyes small, consisting of about sixteen or seventeen ocelli; front sparsely punctured and hirsute; labial margin slightly concave and furnished with five small teeth.

Somites. Anterior and posterior margins of the first tergite converging gradually and meeting at an angle of about 50°; apex of angle rounded, with raised margin; antero-lateral margin as far as the region of the eyes raised; running from the anterior margin of the tergite, from a point on a level with the ocular area backwards and downwards to the posterior margin, is a single sulcus, above the posterior extremity of which there may be a few short sulci. Infero-lateral portions of the hinder half of each somite longitudinally striated, the striæ being somewhat widely separated; foramina repugnatoria small, round, situated in the middle of the plate above the striated portion; upper surface of somites bearing a few setiferous punctures, the hinder half of each divided by a complete sulcus.

Anal tergite hirsute, not posteriorly produced into a process which overhangs the anal valves; anal valves hirsute, not prominent, with margins not compressed; subanal plate evenly rounded.

Colour shining black; hind margins of segments and labial regions lighter; legs testaceous. One specimen, which has in all probability lately undergone a moult, is pale-coloured.

Five specimens (one ♂) taken under stones in Flying-Fish Cove.

ARACHNIDA.

Epeiridæ.

Nephila nigritarsis (L. Koch).

Nephila nigritarsis, L. Koch, Die Arachniden Australiens, &c., i. p. 152, pl. xii. fig. 4.

Seven adult female specimens from the lower slope above Flying-Fish Cove.

This Australian species was described by Dr. Koch from specimens obtained from Rockhampton and Port Mackay.

Received with the above were four immature specimens of *Nephila* which I cannot with certainty identify. Probably they are the

young of *N. nigritarsis*. A note by Mr. Lister refers to them as "spiders forming vertical geometrical webs close together in parallel planes with cross-lines between them."

ATTIDÆ.

HOMALATTUS AURATUS (L. Koch).

Homalattus auratus, L. Koch, *op. cit.* ii. p. 1087, pl. xcv. figs. 4, 5.

Two specimens.

This species was recorded by Dr. Koch from the following localities in Australia—Rockhampton, Gayndah, Peak Downs, and Cape York.

SPARASSIDÆ.

HETEROPODA VENATORIA (Linn.).

For synonyms of this Spider see Keyserling, 'Die Spinnen Amerikas,' Laterigrada, p. 337.

This species is found in all tropical countries.

An adult female, with egg-bag, and several immature individuals were taken in Flying-Fish Cove. Mr. Lister describes the egg-bag as having been found suspended amongst the irregularly crossing threads of the web.

CRUSTACEA.

GEOCARCINIDÆ.

HYLÆOCARCINUS (Wood-Mason).

Hylæocarcinus, Wood-Mason, Journ. As. Soc. Beng. xlii. pt. 2, p. 258, pls. xv., xvi. (1873).

Limnocarcinus, De Man, Notes from the Leyden Museum, i. p. 65 (1879).

For my reasons for considering *Limnocarcinus* synonymous with *Hylæocarcinus* see below.

HYLÆOCARCINUS NATALIS, sp. n.

Carapace thickly and finely punctured above; posterior two thirds nearly flat, anterior third sloping convexly forwards; cardiac region with a low elevation on each side in front, wrinkled behind; branchio-cardiac grooves indistinctly defined; gastric region sharply marked off behind from the cardiac and branchial regions by a groove which curving forwards on each side passes into the hindermost of the three smooth pale spots, termed by Wood-Mason the "tell-tale marks of descent"; running obliquely forwards from each of these spots is the conspicuous cervical groove, which in the middle of its course dilates into the second pale spot and terminates in the third at the external margin of the orbit; epibranchial region separated from the mesobranchial by a groove, which anteriorly breaks up and falls short of the superior margin of the carapace;

protogastric and branchial regions in front marked with squamiform tubercles, which, running into definite series, are continued on to the inferior lateral surface of the carapace; these tubercles become finer as they approach the bases of the legs, and disappear entirely towards the facial region; there is no distinct line, either of tubercles or denticulations, separating the superior from the inflected regions of the carapace, although close to the external margin of the orbit there is a conspicuous tooth, and separated from this by the distance of one millim. another smaller tooth; these teeth together with the external suborbital lobe constitute the upper margin of an almost smooth area, which is bounded below by a finely serrate transverse ridge, running outwards from the margin of the *pistoma*. Anterior half of the gastric region marked with a conspicuous median longitudinal groove, which terminates in front between the slightly prominent epigastric lobes; front vertical, narrow, with raised margin and feebly convex anterior border; orbits a little wider than long, with superior border externally finely serrate, internally smooth; external suborbital lobe obsoletely dentate and separated from the internal suborbital lobe by a space which is about half as great as the space separating the internal lobe from the front.

Ext. maxillipedes. Inner margins scantily hairy; exopodite shorter than the second (ischial) segment and concealed behind it; ischial segment nearly as wide as it is long; the third (meral) segment depressed in the middle of its surface, thickly clothed with hair externally, and with its anterior margin excised; the small apical segments densely hairy and not concealed behind the meral segment.

Chelipedes externally beset with squamiform tubercles and scantily clothed with short black hairs; equal in size and identical in shape; *merus* triangular; anterior border slightly concave; posterior border convex, inferior border flat; antero-inferior angle denticulate, postero-inferior angle and superior angle spinous; *carpus* posteriorly (externally) convex, above anteriorly (internally) armed with three sharp teeth; *propodus* convex laterally, with superior and inferior borders slightly convex from before backwards; *dactylus* gently curved, when closed its teeth are almost in contact with those of the dactylar prolongation of the propodus.

Legs beset with squamiform tubercles and distally somewhat thickly clothed with black hairs disposed in longitudinal series; superior angle of the meral segments slightly spinous distally; propodal and dactylar segments furnished above and below with two series of coarse spines. Sternum and postabdomen closely punctured.

Measurements (*in millimetres*):—Carapace—width 19, length $15\frac{1}{4}$; width of front 4, of orbit $3\frac{1}{4}$, length of orbit $2\frac{1}{2}$; width of posterior margin of carapace 8; width of sternum $14\frac{1}{4}$, length 11 (measured from its anterior apex to the base of the abdomen); length of abdomen $9\frac{1}{4}$; length of chelipede—merus $6\frac{3}{4}$, carpus 5, propodus (above) $3\frac{3}{4}$, dactylus 6; second leg—length of merus $11\frac{1}{4}$, carpus 6; propodus $6\frac{1}{2}$, dactylus 8.

Two male (probably young) specimens taken under a log in the higher part of the island, about two hundred feet from the summit.

In 1873 Prof. James Wood-Mason described a species of Land-Crab which he raised to the rank of a new genus, *Hylæocarcinus*, on the strength of the separation of the front from the internal suborbital lobe, two skeletal pieces which in *Geocarcinus* and *Pelocarcinus* are confluent. An additional differential character is the partial concealment of the apical segments of the external maxillipede behind the inner angle of the merus of that appendage, these apical segments being concealed in *Geocarcinus*, visible in *Pelocarcinus*.

Six years later Dr. De Man established a fresh genus, *Limnocarcinus*, upon a specimen of a Land-Crab which differs mainly from *Hylæocarcinus* in the entire visibility of the apical segments of the external maxillipede and in the smaller space between the front and the internal suborbital lobe. These, at all events, are the characters upon which the genus was founded.

Now there is a two-fold reason for regarding *Hylæocarcinus humii* and *Limnocarcinus intermedius* as referable to one genus. Firstly, the degree of concealment of the distal segments of the external maxillipede is a character which, in the allied genus *Geocarcinus*, is subject to a considerable amount of variation, and therefore by analogy is of no great value in the case of the species under discussion. Secondly, *Hylæocarcinus humii* is in one particular intermediate between *Limnocarcinus intermedius* and the species described above; a species which, on account of the freedom of the apical segments of the external maxillipede, is undoubtedly referable to the genus *Limnocarcinus* as defined by De Man. The above-mentioned particular is found in the relations *inter se* of the front and the two suborbital lobes. For in *L. intermedius* the distance between the front and the inner lobe is said to be equal to half the distance between the inner lobe and the outer lobe; in *H. humii* the two distances are about equal; in *H. natalis* the distance between the front and the inner lobe is about twice as great as the distance between the inner lobe and the outer lobe.

Now these facial features present in *Geocarcinus* an arrangement which is at least as constant as the degree of concealment of the apical segments of the external maxillipede. It is clear, therefore, that the one character is of not less value as a sign of affinity than the other.

It is certainly true that, so far as the external maxillipede is concerned, the relationship between *L. intermedius* and *H. natalis* is greater than the relationship between *L. intermedius* and *H. humii* or between *H. natalis* and *H. humii*. But the fact that in the other character mentioned *H. humii* is intermediate between *H. natalis* and *L. intermedius* appears to me to make it desirable either to consider the three forms to be referable to but one genus, or to keep the names *Hylæocarcinus* and *Limnocarcinus* for their respective species, *humii* and *intermedius*, and to constitute yet a third genus for *H. natalis*. But of the two courses it is assuredly more expedient to adopt the

former; and if this be done the genus must, in accordance with the laws of priority, be named *Hylæocarcinus*.

The three species of this genus may be separated as follows:—

a. Terminal segments of ext. maxillipedes partially visible; distance between front and inner suborbital lobe equal to the distance between the inner and outer lobes.
H. humii (Wood-Mason), Nicobar Islands.

b. Terminal segments of ext. maxillipedes almost wholly visible.

c'. Distance between front and inner suborbital lobe twice as great as distance between inner and outer lobes.
H. natalis, sp. n., Christmas Island.

b'. Distance between front and inner lobe half as great as distance between inner and outer lobes.
H. intermedius (De Man), Celebes.

December 18, 1888.

Prof. Flower, C.B., LL.D., F.R.S., President, in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of November 1888:—

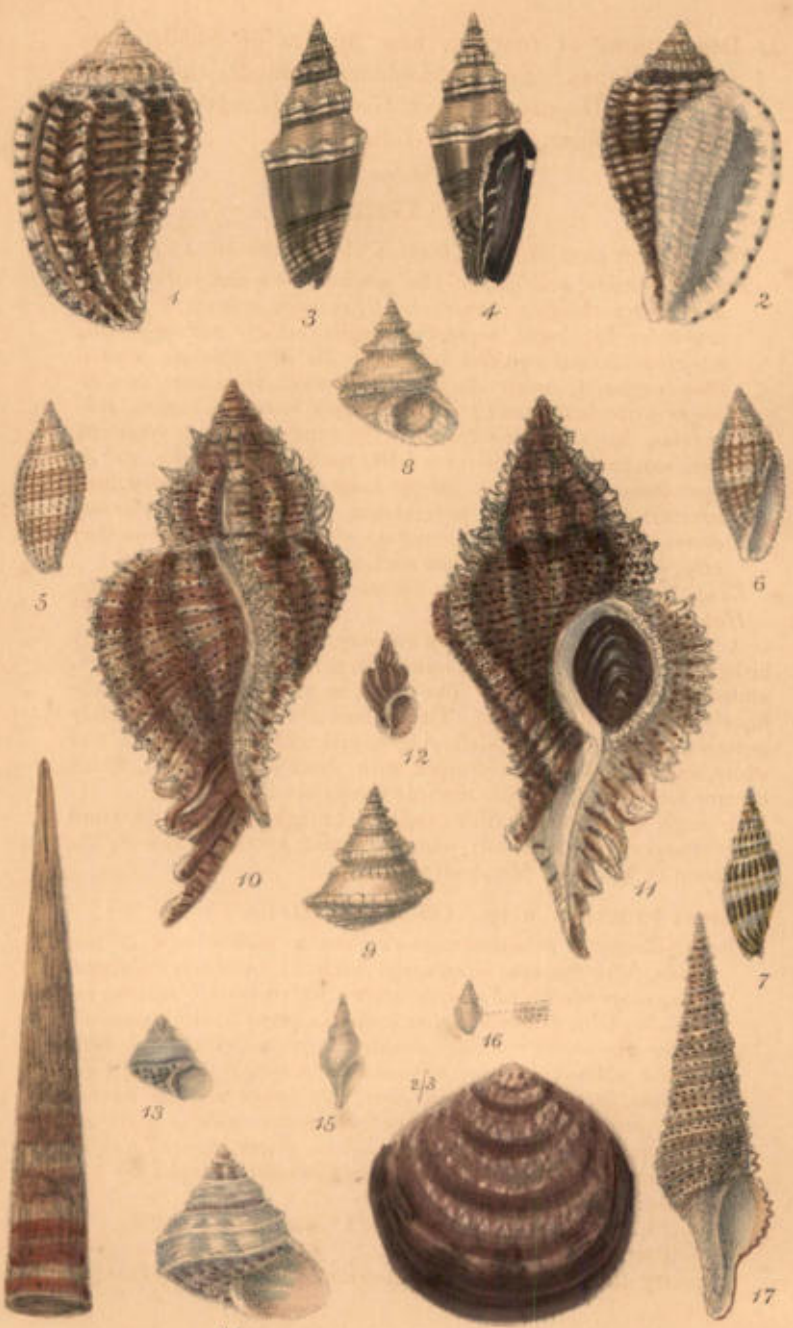
The registered additions to the Society's Menagerie during the month of November 1888 were 53 in number. Of these, 34 were acquired by presentation, 9 by purchase, and 10 on deposit. The total number of departures during the same period, by death and removals, was 95.

The most noticeable additions during the month were:—

1. A specimen of the Small-clawed Otter (*Lutra leptonyx*) of India, presented by W. L. Sclater, Esq., F.Z.S., Deputy Superintendent, Indian Museum, Calcutta, new to the Society's Collection.

2. A Monkey of the genus *Cercopithecus*, from South Africa, apparently referable to the Samango Monkey (*Cercopithecus samango*), new to the Society's Collection.

The following papers were read:—



G.B.Sowerby lith.

Hanhart imp.

NEW SHELLS.

1. Descriptions of fourteen new Species of Shells from China, Japan, and the Andaman Islands, chiefly collected by Deputy Surgeon-Gen. R. Hungerford. By G. B. Sowerby, F.Z.S., F.L.S.

[Received October 23, 1888.]

(Plate XXVIII.)

Murex superbus, n. sp. (Plate XXVIII. figs. 10, 11.)

Testa fusiformis, solidula, albida, profuse fusco variegata; spira mediocriter elongata; anfractus 9, *convexi, subrotundati, embryonales* 1½, *læves, sequentes longitudinaliter nodoso-plicati, varicibus* 3, *subangulatis squamosis hic illic spinosis muniti, liris transversis numerosis undulatis granulatis eximie fusco alboque articulatis cincti; ultimus spiram superans, superne subinflatus, basin versus attenuatus, in caudam oblique recurvam desinens, varicibus* 3, *subrotundatis, mediocriter elevatis, eximie squamosis, infra medium egregie laminato-frondosis instructus; apertura rotunde ovata, parviuscula, in canalem fere clausum desinens, intus cærulea; peristoma album, margine collumellari albo, lævi, externo ad limbum crenato. Operculum typicum.*

Long. 70, *maj. diam.* 32 *mill.; apertura* 18 *millim. longa,* 15 *lata.*

Hab. Hongkong.

A very beautiful shell, bearing no very close resemblance to any hitherto described species. In form it is, perhaps, most nearly represented by *M. senegalensis*. The canal, or rostrum, is directed obliquely and curved upwards. The surface of the shell is exquisitely ornamented with fine beaded ridges, articulated with brown and white, and the varices are fringed with short vaulted scales, which become longer and frondose towards the base.

A single specimen in perfect condition, brought by Dr. Hungerford from Hongkong, is the only one at present known. Now in the collection of Mr. J. J. MacAndrew.

Mitra exquisita, n. sp. (Plate XXVIII. fig. 7.)

Testa elongata, subcylindraceo-fusiformis, multicostata, carneo-albida, fulvo fuscoque interruptim fasciata; spira turrita, acuminata, subgradata, ad apicem acuta; anfractus 10, *superne rotunde angulati, deinde levissime convexi; costis* 13–16, *conspicuis leviter planulatis muniti, spiraliter inter costas sulcati; anfr. ultimus oblongus, spiram aliquanto superans, fasciis* 2–3, *fulvo fuscoque balteatus, et linea interrupta supra medium cinctus, basin versus attenuatus, leviter recurvatus, oblique sulcatus; apertura angusta, intus purpureo-fusco tincta, lirata; labrum subacutum, politum, haud crenulatum; columella inæqualiter* 4–5-*plicata.*

Long. 23, *maj. diam.* 7; *apert. long.* 11, *maj. lat.* 1¾ *millim.*

Hab. Port Blair, Andaman Island.

A pretty little species of the *Turricula* section. Of the four

specimens brought by Dr. Hungerford, one is less closely ribbed than the others, and is a trifle larger than the type, of which the dimensions are given above; while the two others are considerably smaller. The spiral sulci on the upper whorls, and on the upper part of the last whorl, are interrupted by the longitudinal ribs, while those towards the base cross them obliquely. The painting consists principally of three broad bands of yellowish buff and brown, and the two larger specimens exhibit a line of the lighter colour interrupted by the ribs, situated a little above the middle of the body-whorl.

MITRA BRIONÆ, n. sp. (Plate XXVIII. figs. 3, 4.)

Testa fusiformis, solidiuscula; spira acuminata, turrita, ad apicem acuta; anfractus 9, *convexiusculi, longitudinaliter costati, sulcis haud profundis superne sculpti, primi* 4–5 *nigro-fusco suffusi, sequentes fulvo-fusci, albo unifasciati, interdum fusco bilineati; costis* (*in anfr. ult., penult. et antepenult.*) *superne angulatis; anfr. ultimus mediocriter elongatus, zona lata viridescenti-fusca cinctus, angulatus, supra angulum levissime concavus, basin versus leviter attenuatus, vix recurvatus, oblique sulcatus; costis ad angulum latis conspicuis, deinde evanidis; apertura mediocriter lata, intus lirata; labrum leviter incrassatum, politum, nigro-fuscum; columella inæqualiter quadriplicata.*

Long. 37, *maj. diam.* 13; *apert. longa* 20, *maj. lat.* 4 *millim.*

Hab. Port Blair, Andaman Island.

A pretty species of the "*Turricula*" section, and allied to *M. vulpecula* and *M. corrugata*, but evidently distinct. The three specimens collected by Dr. Hungerford are all characterized by a brown belt with a greenish tinge, surmounted by a narrow white band.

MITRA MILLEPUNCTATA, n. sp. (Plate XXVIII. figs. 5, 6.)

Testa oblongo-ovata, utrinque acuminata; spira parviuscula, acuta; sutura impressa; anfractus 7–8, *convexi; liris numerosis subnodulosis, lira minore intercurrente spiraliter sculpti, longitudinaliter inconspicue sulcati, maculis minutis fuscis, multiseriatim dispositis ornati; anfractus ultimus subventricosus, fulvo bifasciatus, basin versus leviter contractus, haud recurvatus; apertura mediocriter lata, labrum crenulatum, columella inæqualiter sexplicata.*

Long. 24, *maj. diam.* 9; *apert. longa* 15, *maj. lat.* $3\frac{1}{2}$ *millim.*

Hab. Port Blair, Andaman Island.

An exquisite little species of the "*Scabricula*" section, with a shorter spire than others of the group; the spiral ridges are numerous and very slightly nodulous, with a very fine (in some cases duplicate) ridge running between. The painting consists of numerous minute brown spots and two rather faint buff bands.

PLEUROTOMA NOTATA, n. sp. (Plate XXVIII. fig. 17.)

Testa elongato-fusiformis, albida, fulvo fuscoque fasciata, strigata

et notata; spira elongata, acuminata; anfractus 14, *planato-convexi, superiores angulati, infra suturam excavati, liris numerosis parum elevatis, fusco minute notatis, lira minore intercurrente spiraliter sculpti; sutura anguste canaliculata; anfractus ultimus subrotundatus, ad basin valde contractus, et mediocriter productus; apertura ovata, fauce albida; columella rectiuscula, glabra, labro arcuato, sinu profundiusculo emarginato, canali breviusculo.*

Long. 55, *maj. diam.* 17 *millim.*

Hab. Hongkong.

A *Pleurotoma* belonging to the section "*Turris*," and allied to *P. cingulifera*; transversely finely ridged throughout, the ridges being articulated with minute brown dots.

PLEUROTOMA (BELA) LACEYI, n. sp. (Plate XXVIII. fig. 15.)

Testa fusiformis, utrinque acuminata, sordide alba; spira elongata, acuminata; anfractus rotunde convexi, longitudinaliter oblique multiplicati, spiraliter liris numerosis angustis confertis rotundatis sculpti; anfractus ultimus superne rotundatus, inferne attenuatus, paulo productus; apertura elongato-ovata, columella leviter contorta, labro leviter arcuato, sinu latiusculo haud profundo emarginato; canali brevi.

Long. 16, *maj. diam.* 5 *millim.*

Hab. Hongkong.

A species resembling in form *Bela pyramidalis* (Strøm), closely sculptured with spiral ridges and longitudinal ribs.

PLEUROTOMA (BELA) HONKONGENSIS, n. sp. (Plate XXVIII. fig. 16.)

Testa abbreviata, alba; spira abbreviato-turrita; anfractus 6, *primi* 2 *læves, rotundati, sequentes angulati, valde clathrati; sutura impressa; anfractus ultimus pyriformis, superne angulatus, supra angulum leviter concavus, infra angulum convexus, undique liris spiralibus elevatis* (*circ.* 10) *et laminis longitudinalibus magis numerosis clathratus; apertura oblonga, columella leviter sinuata, labro vix emarginato.*

Long. 6, *maj. diam.* 3 *millim.*

Hab. Hongkong.

A small white species of the typical form of the Arctic *Belæ*, very strongly and beautifully latticed throughout.

ONISCIA MACANDREWI, n. sp. (Plate XXVIII. figs. 1, 2.)

Testa subovata, solidiuscula, albida, fusco fasciata, et irregulariter fulvo fuscoque maculata; spira acuta, gradata; anfractus 7, *primi* 2–3 *læves, rotundati, sequentes* 2 *spiraliter sulcati, inconspicue longitudinaliter plicati, deinde angulati et cancellati; anfr. ultimus longitudinaliter dense lamellosus, costis circ.* 11 *rotundatis ubique nodulosis transversim instructus, superne angulatus, supra angulum concavus, infra angulum convexus, turgidulus, basin versus leviter contractus, ad canalem levissime re-*

curvus ; columella late expansa, irregulariter pustulata et plicata ; labrum incrassatum, reflexum, liris brevibus dentiformibus munitum.

Long. 45, *maj. diam.* 23; *apert. long.* 29, *maj. lat.* 5 *millim.*

Hab. Japan.

An interesting new species, intermediate in form between *O. cancellata* (Sowb.) and *O. ponderosa* (Hanley). The former is common at Hongkong, and the latter, quoted in the Paetel catalogue as inhabiting Japanese waters, is extremely rare. Compared with *O. cancellata*, the new species is much more gibbous and pyriform, and the transverse ridges are not raised into prickly scales on the ribs; the colouring is also different, consisting principally of angular blotches of light and dark brown. Compared with *O. ponderosa* it is much higher in the spire, and the nodules are much smaller and less prominent. Two specimens found by Dr. Hungerford, the most perfect of which is now in the collection of Mr. James J. MacAndrew.

CANCELLARIA FUSCA, n. sp. (Plate XXVIII. fig. 12.)

Testa elongata, utrinque acuminata, solidiuscula, fusca, spira turrita, gradata ; anfractus 7, *sutura excavata divisi, primi* 2 (*embryonales*) *læves, sequentes leviter convexi, spiraliter filo striati, longitudinaliter costati, costis rotundatis, subcrenulatis, superne angulato-productis ; anfractus ultimus superne angulatus, ad angulum fascia pallida obscure cincta, supra angulum excavatus, infra angulum mediocriter convexus, costis longitudinalibus circ.* 8 *munitus, basin versus attenuatus, anguste umbilicatus ; apertura elongato-subtrigona, fauce fusca, obscure lirata ; columella leviter depressa, polita, oblique triplicata ; labrum arcuatum, politum.*

Long. 14, *maj. diam.* 7; *apert. long.* 7, *maj. lat.* 3 *millim.*

Var. minor. *Testa brevior, magis inflata.*

Long. 8, *maj. diam.* 5 *millim.*

Hab. Hongkong.

This species is allied to *C. costifera* (Sowb.), of an almost uniform brown colour, with an elevated spire and an excavated suture. The longitudinal ribs are slightly nodulous or crenulated. Of the four specimens in the Hungerford collection three are of the variety *minor*.

CALLIOSTOMA HUNGERFORDI, n. sp. (Plate XXVIII. fig. 14.)

Testa conica, imperforata, grisea, cæruleo-tincta, fusco sparsim maculata, ad apicem nigro-fusca, ad basin fusco triseriatim punctata ; spira acutiuscula ; anfractus 7, *sutura impressa divisi, convexi, obtuse angulati, striati, spiraliter irregulariter lirati, liris supremis minutissime granulatis ; anfr. ultimus obscure biangulatus, ad basin convexus, dense spiraliter liratus, et decussatim striatus ; apertura oblique subquadrata ; columella leviter obliqua, margaritacea. Operculum tenue, corneum, multispirale, extus concavum.*

Alt. 24, *maj. diam.* 25 *millim.*

Var. β. *Testa fulva, albo fuscoque obscure strigata.*

Alt. 29, *diam.* 28 *millim.*

Hab. Japan.

Allied to *Trochilus unicus* (Dunker) and *Trochilus consors* (Lischke), but differing from both in form and sculpture. The species, like *T. unicus*, seems to vary considerably in colour. Only one specimen of each of the two varieties is at present known.

MINOLIA CHINENSIS, n. sp. (Plate XXVIII. fig. 13.)

Testa conica, mediocriter umbilicata, grisea, strigis albidis angustis, undulatis (ad basin magis conspicuis) undique ornata, nitida; spira acutiuscula, mediocriter elevata, gradata; anfractus 7, sutura impressa divisi, striis obliquis tenuissimis sculpti, superne bicarinati; anfractus ultimus infra obtuse angulatus, ad angulum carinatus, ad basin convexus, plus minusve spiraliter sulcatus; umbilicus rotundus, profundus, liratus; apertura oblique subquadrata. Operculum corneum, tenue, multispirale, extus concavum.

Alt. 10, *maj. diam.* 11 *millim.*

Hab. Hongkong.

In form like *Minolia biangulata* (Angas), but much larger, obliquely striated, and without the beaded ridge bordering the umbilicus. The interior of the umbilicus is spirally grooved.

TURCICA CHINENSIS, n. sp. (Plate XXVIII. figs. 8, 9.)

Testa trochiformis, alba; spira elata, acuta; anfractus 9, sutura canaliculata divisi, primi 2–3 læves, cæteri concavo-declives, oblique obscure striati, superne concavo-depressi, plicis numerosis rugosis coronati, inferne carina rotundata corrugata spiraliter marginati, infra carinam profunde canaliculati et foveolati; basi convexa, costis 6 confertiusculis, rugoso transversim plicatis, interstitiis foveolatis sculpta; apertura subrotunda, fauce margaritacea, lirata; columella rectiuscula, margaritacea, obscure unituberculata.

Alt. 20, *maj. diam.* 19 *millim.*

Hab. Hongkong.

Compared with *Turcica elisæ* (A. Adams), the body-whorl is larger in proportion to the spire, the keel more prominent, and the suture more deeply excavated. The whorls have two rounded nodulous keels, the space between which is smooth excepting for the fine oblique striæ. The base is strongly corded and deeply pitted. Of the only two specimens known, one is in the National Collection at South Kensington, and the other in that of Mr. MacAndrew.

DENTALIUM COMPRESSUM, n. sp. (Plate XXVIII. fig. 18.)

Testa latiuscula, fere recta, acuta, inæqualiter compressa, versus apicem leviter inclinata; fulva, fusco irregulariter fasciata; costellis inæqualibus numerosissimis plano-convexis sculpta, striisque vix conspicuis transversis cancellata; fissura longa, angusta; apertura subovalis.

Long. 72, *maj. diam.* 12 *millim.*

Hab. Hongkong.

A very distinct and remarkable species, more highly coloured than its congeners; but it is chiefly distinguished by its curiously compressed form. A second specimen, brought by Dr. Hungerford, is only 62 millimetres in length, and rather wider in proportion. It is rather lighter in colour, but presents all the same characters, confirming the specific importance of the chief characteristic, which might otherwise have been thought accidental.

PECTUNCULUS YESSOENSIS, n. sp. (Plate XXVIII. fig. 19.)

Testa suborbicularis, compressa, solida, sordide alba, zonis maculisque rufo-fuscis angulatis picta, striis minimis decussatim sculpta; umbones acutiusculi, approximati; area ligamenti parva et angusta; margo dorsalis anticus longiusculus declivis, posticus elongatus valde declivis, obtuse angulatus; margo ventralis anticus valde arcuatus, posticus obscure angulatus; epidermis fusca, holoserica; pagina interna alba; crenæ in margine ventris longiusculæ, crassæ.

Diam. antero-post. 48, *umbono-marg.* 45 *millim.*

Hab. Yesso, Japan.

In painting and sculpture this species is not very unlike some varieties of *P. glycimeris* of our seas, but may at once be recognized by its sloping dorsal margins and posterior angle.

EXPLANATION OF PLATE XXVIII.

Fig. 1, 2. *Oniscia macandrewi*, p. 567.
3, 4. *Mitra briona*, p. 566.
5, 6. —— *millepunctata*, p. 566.
7. —— *exquisita*, p. 565.
8, 9. *Turcica chinensis*, p. 569.
10, 11. *Murex superbus*, p. 565.
12. *Cancellaria fusca*, p. 568.
13. *Mitrolia chinensis*, p. 569.
14. *Calliostoma hungerfordi*, p. 568.
15. *Pleurotoma* (*Bela*) *laceyi*, p. 567.
16. —— (——) *hongkongensis*, p. 567.
17. —— *notata*, p. 566.
18. *Dentalium compressum*, p. 569.
19. *Pectunculus yessoensis*, p. 570.

2. List of the Lepidoptera Heterocera, with Descriptions of the new Species, collected by Mr. C. M. Woodford at Aola, Guadalcanar Island, Solomon Islands. By HERBERT DRUCE, F.L.S., F.R.G.S., F.Z.S., &c.

[Received November 13, 1888.]

(Plate XXIX.)

The collection of which this paper gives an account formed part of the second series of insects brought to this country by Mr. Woodford. It was made at Aola on Guadalcanar Island, and contains examples of a considerable number of species that were not in the

W. Purkiss lith. Hanhart imp.

NEW LEPIDOPTERA HETEROCERA.

first collection. All the specimens are in my possession. Of fifty-three species represented in the present collection, I have described eighteen as new to science, two being not good enough for determination.

Fam. Sphingidæ.

Subfam. Macroglossinæ.

1. Macroglossa fulvicaudata.

Macroglossa fulvicaudata, Butl. Ann. & Mag. Nat. Hist. ser. 5, x. p. 155.

The specimens are identical with those in my collection from the New Hebrides and New Britain.

Subfam. Sphinginæ.

2. Diludia nebulosa.

Diludia nebulosa, Butl. Trans. Zool. Soc. ix. p. 615.

The specimen agrees with the type in the National Collection from Cape York.

Fam. Agaristidæ.

3. Eusemia siriella, n. sp. (Plate XXIX. fig. 1.)

♂ and ♀ alike.

Primaries black, with four pure white spots, the first close to the base on the inner margin, the second small and square-shaped in the middle of the cell, the third below near the inner margin, the fourth larger, placed beyond the cell and nearer the apex; secondaries black, with a large central round white spot. The underside of all the wings the same as above. The head, antennæ, palpi, thorax, and legs black; the abdomen pale yellow. Expanse, ♂ 2 inches, ♀ 2½ inches.

Hab. Aola, Guadalcanar Island, Solomon Islands (*C. M. Woodford*).

This species is allied to *Eusemia woodfordii*, Butl., from Shortland Island, but it is at once distinguished from that species in having four white spots on the primaries instead of five.

4. Ophthalmis lincea.

Ophthalmis lincea, Cram. Pap. Exot. iii. p. 61, t. 228. f. B.

The specimens are identical with those in my collection from Amboyna.

The species of this genus seem to vary to a considerable extent in the size of the apical orange spot on the primaries. I have specimens of *O. lincea* from New Guinea in which the orange apical patch is almost gone, and others from the same place in which it is of quite the normal form.

Subfam. Euchromiinæ.

5. Euchromia ganymede.

Euchromia ganymede, Doubl. Lort's Disc. App. t. 3; Butl. Journ. Linn. Soc. xii. p. 365; Trans. Ent. Soc. 1888, p. 111.

Fam. Arctiidæ.

6. Pelochyta astræa.

Pelochyta astræa, Drury, Ill. Exot. Ins. ii. t. 28. f. 4; Walk. Cat. iii. p. 725.

One specimen in poor condition, agreeing well with specimens of this species in my collection from New Guinea, excepting it is considerably larger.

Fam. Hypsinæ.

7. Hypsa semifusca.

Hypsa semifusca, Butl. Ann. & Mag. Nat. Hist. ser. 5, vol. xix. p. 220.

The specimens from Aola are identical with those from Alu, Shortland Island.

8. Hypsa diana.

Hypsa diana, Butl. Ann. & Mag. Nat. Hist. ser. 5, vol. xix. p. 220.

The large crescent-shaped spot on the primaries varies considerably in size, in some specimens it is much larger than in others. The specimens before me from Aola are identical with those in the National Collection from Shortland Island.

9. Cleis biplagiata.

Cleis biplagiata, Butl. Ann. & Mag. Nat. Hist. ser. 5, vol. xix. p. 221.

The Aola specimen is identical with the type from Ulaua.

10. Cleis hypoleuca.

Cleis hypoleuca, Butl. Ann. & Mag. Nat. Hist. ser. 5, vol. xix. p. 222.

Two specimens identical with those from Shortland Island.

11. Cleis nenia, sp. n. (Plate XXIX. fig. 2.)

♂ ♀. Primaries and secondaries uniform purplish brown. Primaries crossed beyond the middle from the costal margin to near the anal angle with a wide reddish-orange band, which is almost lobe-shaped, being narrow on the costal margin. Underside: primaries reddish brown, the orange band as above, but brighter in colour; a silver-grey marginal line extending from the apex to the anal angle, the fringe black; secondaries uniform dark brown, with a silver-grey marginal line extending from the apex to the anal angle. Head, thorax, and abdomen dark brown. Antennæ, palpi, and legs reddish orange. Expanse, ♂ 1¼ inches, ♀ 1½ inches.

Hab. Aola, Guadalcanar Island, Solomon Islands.

This species is allied to *C. nigrescens*, Butl., from Shortland Island, from which it is at once distinguished by the band on the primaries being narrower and by the entire absence of colour on the underside of the secondaries.

Fam. NYCTEMERIDÆ.

12. NYCTEMERA ALUENSIS.

Nyctemera aluensis, Butl. Ann. & Mag. Nat. Hist. ser. 5, xix. p. 222.

The male and female specimens from Aola are identical with those in the National Collection from Alu Island.

13. NYCTEMERA HORITES, sp. n.

Primaries black. A large elongated white spot at the end of the cell, below which are four oval-shaped white spots, the third from the cell being considerably larger than the others. Secondaries pure white, broadly bordered with black; the fringe of both primaries and secondaries white. The underside the same as above. The head, thorax, and abdomen black, banded with white, the anus orange. Antennæ and legs black. Expanse 2¼ inches.

Hab. Aola.

This species is allied to *Nyctemera extendens*, Walk.

14. LEPTOSOMA AOLAENSIS, sp. n.

Primaries black, with a large triangular white spot close to the base, and a crescent-shaped white spot close to the costal margin, near the apex, below which nearest the anal angle is an almost round white spot. Secondaries pure white, broadly bordered from the apex to the anal angle with black. The underside as above. Head, thorax, abdomen, and antennæ black, the abdomen banded with orange-yellow, the legs black. Expanse 1¾ inch.

Hab. Aola.

This species is allied to *Leptosoma sexmaculatum*, Butl., from Alu, but quite distinct.

15. DEILEMERA ALBIPUNCTA, sp. n.

Primaries black, a minute dot at the base, a round spot on the inner margin beyond white; a large oval-shaped white spot crosses the wing from near the costal margin to the inner margin; two white spots close to the apex, the upper one considerably the largest; a round spot on the middle of the outer margin, and a small dot close to the anal angle, both white. Secondaries white, very broadly bordered with black; on the black border nearest the apex are two round white spots, the upper one being the largest. The underside of all the wings as above. The head and thorax black, the thorax spotted with white on the front and at the base. The abdomen black, banded with white on both sides, a white spot in the middle above the anus. Antennæ and legs black. Expanse 1¾ inch.

Hab. Aola, Guadalcanar Island (*C. M. Woodford*).

The white spots on the primaries vary considerably in size, some specimens being much more spotted than others.

Fam. DREPANULIDÆ.

16. CALLIDREPANA ARGENTIFERA, sp. n. (Plate XXIX. fig. 3.)

♂. Primaries and secondaries pale cream-colour, a silver streak from the base along the costal margin to the apex, then forming a submarginal band to the anal angle, a dark brownish spot at the end of the cell irrorated with metallic scales. Secondaries with a silvery streak crossing the wing below the middle, from near the apex to the inner margin. Underside of all the wings dark yellowish cream-colour, with a submarginal slate-coloured line to each wing. Head, thorax, and abdomen dark cream-colour. Antennæ and legs yellowish.

♀. Considerably larger than the male and altogether paler in colour, and without the dark submarginal lines on the underside of the wings.

Expanse, ♂ 1¾ inch, ♀ 1½ inch.

Hab. Aola, Guadalcanar Island (*C. M. Woodford*).

This pretty species is allied to *C. scintillata*, Walk.

Fam. NOTODONTIDÆ.

17. PHALERA PERUDA, sp. n. (Plate XXIX. fig. 4.)

♂. Primaries silvery grey, shading to pale brown along the costal margin; the apical buff spot very like that of *P. javana*, Moore, but much rounder on the inner side and in colour more like that of *P. bucephala*, Linn. Secondaries very pale silvery brown, slightly darker along the inner margin. The underside of all the wings almost white. The head and front of the thorax greyish. The thorax and abdomen dark blackish brown; the anus and each segment banded with grey. Antennæ and legs greyish brown. The underside of the abdomen silvery grey. Expanse 3 inches.

Hab. Aola, Guadalcanar Island (*C. M. Woodford*).

This species is allied to *P. javana*, Moore, from which it is at once distinguished by the paler and different-shaped apical spot on the primaries.

NOCTUITES.

Fam. LEUCANIDÆ.

18. LEUCANIA, sp.?

One specimen from Aola in very bad condition.

Fam. CARADRINIDÆ.

19. AMYNA STELLATA?

Amyna stellata, ? Butl. Ann. & Mag. Nat. Hist. ser. 5, i. p. 162; Illust. Lep. Het. pt. ii. p. 26, t. xxix. f. 6.

The specimens from Aola are almost identical with those in my collection from Japan excepting that the white spot on the primaries is considerably larger; they may prove to belong to a distinct species, but at present I have not sufficient specimens to determine this point.

Fam. TOXOCAMPIDÆ.

20. TOXOCAMPA LUNIFERA, sp. n.

Primaries pale mouse-colour, crossed beyond the middle by three indistinct pale lines, a spot at the end of the cell and a lunular-shaped mark on the costal margin close to the apex, both dark brown. Secondaries darker in colour than the primaries, but slightly paler at the base. The underside of all the wings uniform pale mouse-colour. Head, collar, and front of the thorax dark brown. The thorax, abdomen, and legs mouse-colour. Expanse 1½ inch.

Hab. Aola, Guadalcanar Island (*C. M. Woodford*).

This species is quite distinct from any known to me.

Fam. PHYLLODIDÆ.

21. PHYLLODES IMPERIALIS.

Phyllodes imperialis, Druce, Ann. & Mag. Nat. Hist. ser. 6, vol. ii. p. 241.

This grand insect is quite distinct from all the species of *Phyllodes* known to me.

Fam. OMMATOPHORIDÆ.

22. PATULA MACROPS.

Patula macrops, Linn. Syst. Nat. p. 225; Walk. Cat. xiv. p. 1300.

Two specimens; they are almost intermediate between the Indian and Australian form of this species.

23. ARGIVA PURPURATA, sp. n.

Primaries and secondaries uniform dark blackish brown, palest at the apex of the primaries. All the wings shot with dark glossy blue. The underside dark brown with a cream-coloured spot near the apex of the primaries. The head, thorax and abdomen, antennæ and legs dark brown. Expanse 3¾ inches.

Hab. Aola, Guadalcanar Island (*C. M. Woodford*).

A fine distinct species, not closely allied to any known to me.

24. NYCTIPAO VARIEGATA.

Nyctipao variegata, Butl. Ann. & Mag. Nat. Hist. ser. 5, xix. p. 432.

The specimens from Aola are identical with the type from Alu.

25. NYCTIPAO CALIGINEA.

Nyctipao caliginea, Butl. Ann. & Mag. Nat. Hist. ser. 5, xix. p. 433.

This species varies to some extent, the white bands are much wider in some specimens than others.

Fam. BENDIDÆ.

26. HULODES CARANEA.

Hulodes caranea, Cram. Pap. Exot. iii. p. 140, t. 269. f. E, F; Walk. Cat. xiv. p. 1335.

One specimen, identical with those in my collection from Perak and Java.

Fam. REMIGIDÆ.

27. REMIGIA FRUGALIS.

Remigia frugalis, Fabr. Ent. Syst. iii. 2, p. 138; Walk. Cat. xiv. p. 1507.

Fam. THERMESIIDÆ.

28. SONAGARA SUPERIOR.

Sonagara superior, Butl. Ann. & Mag. Nat. Hist. ser. 5, xix. p. 433.

Fam. HYPENIDÆ.

29. HYPENA SEMICLUSALIS.

Hypena semiclusalis, Walk. Cat. xxxiv. p. 1511.

The Aloa specimens are identical with the type in the National Collection from Java.

GEOMETRITES.

Fam. EUSCHEMIDÆ.

30. SATARA WOODFORDI, sp. n. (Plate XXIX. fig. 6.)

Primaries black, with two large yellow spots, the first almost oval and nearest the base, the second beyond, nearer the apex, extending from the costal margin almost to the inner margin near the anal angle. Secondaries bright yellow, crossed in the middle from the costal margin to the anal angle by a wide straight black band; the outer margin broadly bordered with black from the apex to the anal angle, where it joins the black band crossing the middle of the wing. The underside of all the wings the same as above, but not quite so bright in colour. The head, collar, and thorax black; the tegulæ bright yellow; the abdomen dusky yellow; antennæ and legs black. Expanse 2 inches.

Hab. Aola, Guadalcanar Island (*C. M. Woodford*).

I have much pleasure in naming this species after Mr. Woodford. It reminds one at first of *Phæochlæna solilucis*, a South-American insect.

31. BOCIRAZA VACUNA, sp. n. (Plate XXIX. fig. 7.)

Primaries and secondaries deep glossy black; the primaries crossed beyond the middle from the costal to the inner margin close to the anal angle with a wide orange-red band which is narrower near the inner margin. The underside of all the wings as above. The head, thorax, abdomen, legs, and antennæ all deep black. Expanse 3 inches.

Hab. Aola, Guadalcanar Island (*C. M. Woodford*).

This species is allied to *B. seprata* from New Guinea.

32. EUSCHEMA PILOSA.

Euschema pilosa, Butl. Ann. & Mag. Nat. Hist. ser. 5, xx. p. 240.

Hab. Aola, Guadalcanar Island.

The specimens from Aola are very much darker in colour and are

almost without the orange submarginal band on the secondaries, thus differing from the typical form from Shortland Island.

Fam. Uraniidæ.

33. Alcides latona. (Plate XXIX. fig. 5.)

Alcides latona, Druce, Ann. & Mag. Nat. Hist. ser. 6, vol. ii. p. 241.

This beautiful species is allied to *A. aurora*, Salvin.

34. Lyssidia mutata.

Lyssidia mutata, Butl. Ann. & Mag. Nat. Hist. ser. 5, xx. p. 241.

Very close to *L. patroclus*, but with a more purple shade on the wings.

Fam. Urapterydæ.

35. Lagyra myciterna, sp. n.

Primaries dark glossy brown, crossed by two wide slate-coloured bands edged with dark brown, extending from the costal to the inner margin. Secondaries glossy brownish slate-colour, crossed about the middle from the costal margin close to the apex to the inner margin by a wide dark brown band. The underside of all the wings as above. The head, thorax, abdomen, antennæ, and legs dark brown. Expanse 2¼ inches.

Hab. Aola (*C. M. Woodford*).

In form this species closely resembles *L. talaca*, but it is very different in colour.

Fam. Geometridæ.

36. Iodis minutata, sp. n.

Female. Primaries and secondaries pale pea-green, edged from the base along the costal margin to the apex, from the apex to the anal angle, and halfway up the inner margin, with reddish fawn-colour, on the inner side of which is a narrow silvery line dentated on the costal margin and at the anal angle. Secondaries with the same margin as the primaries, extending from the apex to the anal angle. The underside of all the wings silky white. The head, thorax, and abdomen pale fawn-colour. Antennæ greenish; legs fawn-colour. Expanse 1 inch.

Hab. Aola (*C. M. Woodford*).

A beautiful little species, resembling to some extent *I. checometa*, Meyr., but very distinct.

37. Thalassodes opalina.

Thalassodes opalina, Butl. Ann. & Mag. Nat. Hist. ser. 5, vi. p. 214; Druce, P. Z. S. 1888, p. 227.

38. Thalassodes patara, sp. n.

Male. Primaries and secondaries silvery green, both wings crossed by two dentated waved brownish bands; the fringes brownish. The underside of all the wings uniform yellowish green. Antennæ

brown. The thorax and abdomen greenish; the legs yellow. Expanse 1½ inch.

Hab. Aola (*C. M. Woodford*).

Two specimens of this distinct species are in the collection, but neither of them are in good condition, being much marked with damp, and doubtless fresh specimens would be of a much brighter green colour.

Fam. PALYADÆ.

39. EUMELIA ROSALIA.

Eumelia rosalia, Cram. Pap. Exot. iv. p. 152, t. 368. f. F.; Walk. Cat. xxii. p. 609.

A common species, found over a very extended range; it varies considerably both in colour and markings.

Fam. DESMOBATHRIDÆ.

40. DESMOBATHRA NIPHOPLACA.

Desmobathra niphoplaca, Meyr. Trans. Ent. Soc. 1886, p. 199.

The specimens are identical with those in Mr. Mathew's collection.

Fam. MACRONIIDÆ.

41. STROPHIDIA COSTALIS.

Strophidia costalis, Butl. Ann. & Mag. Nat. Hist. ser. 5, vol. xx. p. 246.

Several specimens identical with those from Shortland Island.

42. STROPHIDIA HYEMALIS.

Strophidia hyemalis, Butl. Ann. & Mag. Nat. Hist. ser. 5, vol. xx. p. 247.

One specimen identical with the type in the National Collection, from Shortland Island.

43. STROPHIDIA BIGTHANA, sp. n.

Male and female silky white, the underside of the male dusky. The primaries crossed from the costal to the inner margin by three wide, pale fawn-coloured bands; the secondaries crossed by two pale fawn-coloured bands, the first about the middle, the second beyond, nearer the outer margin. The outer margin of the secondaries narrowly edged with black. The head, thorax, abdomen, and legs dusky white. The antennæ black, whitish at the base. Expanse, ♂ 2 inches, ♀ 2½ inches.

Hab. Aola (*C. M. Woodford*).

A very distinct species from any known to me.

Fam. SPILOMELIDÆ.

44. ZEBRONIA JAGUARALIS.

Spilomela jaguaralis, Guén. Sp. Gén. Lép. viii. p. 283.

Zebronia jaguaralis, Walk. Cat. xvii. p. 486.

One specimen, agreeing with specimens before me from Darjeeling, but considerably larger.

Fam. MARGARODIDÆ.

45. GLYPHODES EXCELSALIS.

Glyphodes excelsalis, Walk. Cat. xxxiv. p. 1360.

One specimen, identical with the type in the National Collection from Swan River.

46. MARGARONIA ATLITALIS.

Margaronia atlitalis, Walk. Cat. xviii. p. 533.

The specimen is identical with those in my collection from Borneo, Java, and the Philippine Islands.

47. MARUCA AQUATILIS.

Hydrocampa aquatilis, Boisd., Guér. Icon. Règn. Anim., Ins. t. 90. f. 9.

Maruca aquatilis, Walk. Cat. xviii. p. 540.

The specimens are identical with those before me from New Guinea and Darjeeling.

Fam. BOTYDIDÆ.

48. PLEONECTUSA MODESTALIS.

Erilita modestalis, Ld. Wien. ent. Mon. vii. p. 426, t. 16. f. 3.
Pleonectusa chalinota, Meyr. Trans. Ent. Soc. Lond. 1886, p. 233.
Pleonectusa modestalis, Meyr. *l. c.* 1887, p. 216.

One specimen, identical with those before me from New Guinea.

49. SPILOBOTYS ARCTIOIDES.

Spilobotys arctioides, Butl. Ann. & Mag. Nat. Hist. ser. 5, xx. p. 123.

One specimen of this very distinct species.

50. ASTURA PUNCTIFERALIS.

Astura punctiferalis, Guén. Sp. Gén. Lép. viii. p. 320; Walk. Cat. xviii. p. 548.

The specimens agree well with those in the National Collection from North China.

51. BOTYS, sp.?

One specimen in very bad condition.

Fam. TINEIDÆ.

52. SIPPHARARA WOODFORDI, sp. n. (Plate XXIX. fig. 8.)

Primaries black; a coppery red curved band from the base extending for about two thirds the length of the wing along the costal margin, then crossing the wing to near the anal angle, but not reaching it, the red band being streaked from the base with silver. The apex and part of the outer margin narrowly bordered with coppery red. Secondaries glossy brownish black, broadly bordered

at the apex with orange-red. The head, thorax, abdomen, antennæ, and legs black. Expanse 1½ inch.

Hab. Aola.

A beautiful species, allied to *S. euchromiella*, Walk., but very distinct.

Fam. HYPONOMEUTIDÆ.

53. CORINEA MATHEWI.

Corinea mathewi, Butl. Ann. & Mag. Nat. Hist. ser. 5, xx. p. 414.

Two specimens, identical with those in the British Museum from Malaya.

EXPLANATION OF PLATE XXIX.

Fig. 1. *Eusemia siriella*, ♂, n. sp., p. 571.
2. *Cleis nenia*, ♀, n. sp., p. 572.
3. *Callidrepana argentifera*, ♂, n. sp., p. 574.
4. *Phalera peruda*, ♂, n. sp., p. 574.
5. *Alcides latona*, ♂, p. 577.
6. *Satara woodfordi*, ♂, n. sp., p. 576.
7. *Bociraza vacuna*, n. sp., p. 576.
8. *Sippharara woodfordi*, n. sp., p. 579.

3. On the Lepidoptera of Japan and Corea.—Part II. Heterocera, Sect. I.[1] By J. H. LEECH, B.A., F.R.G.S., F.L.S., F.Z.S., F.E.S., &c.

[Received November 26, 1888.]

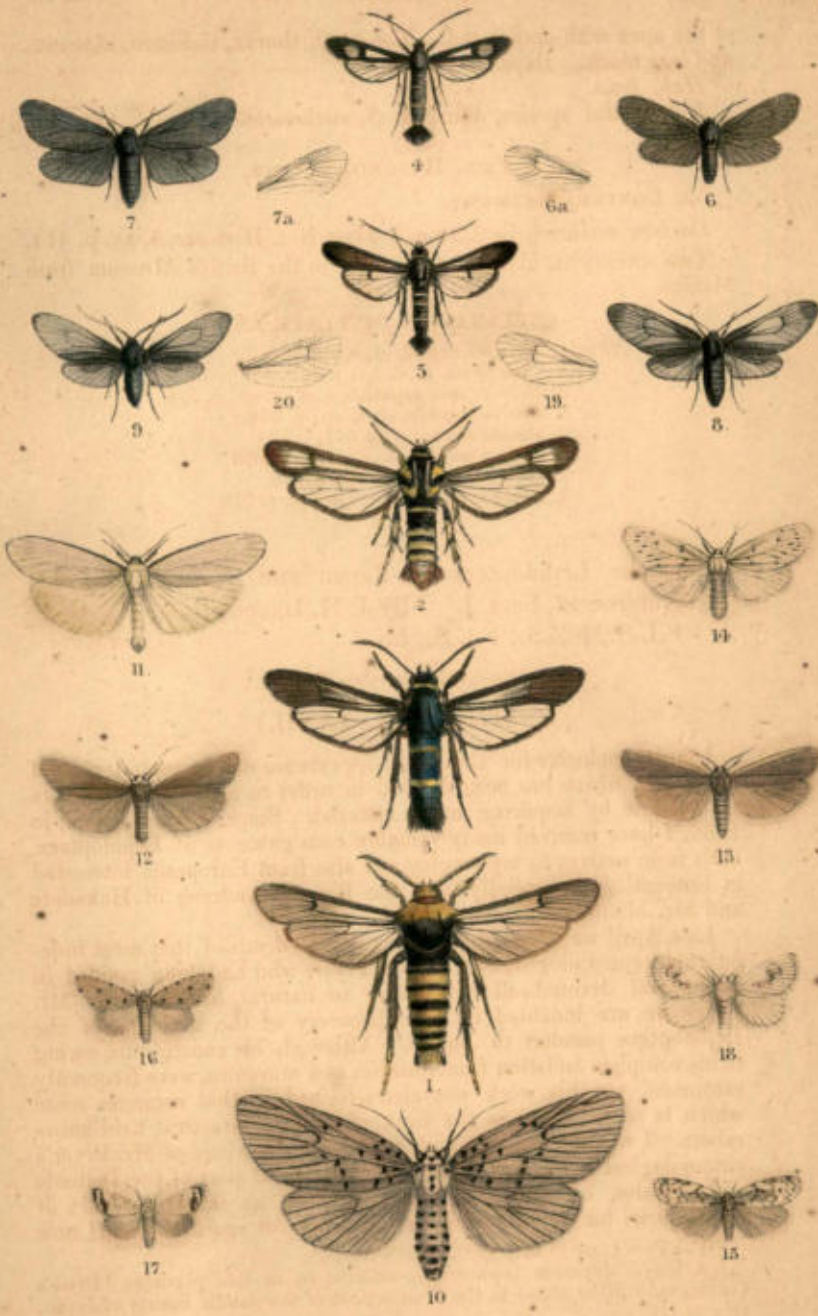
(Plates XXX.–XXXII.)

I must apologize for the tardy appearance of the second part of this paper, which has been delayed in order to make it as complete as possible by acquiring more material. Since leaving Japan, in 1886, I have received many valuable consignments of Lepidoptera, both from natives in my employ and also from Europeans interested in Entomology, especially from the Rev. F. Andrews of Hakodate and Mr. Manley of Yokohama.

Last April we received the news of the death of that most indefatigable entomologist, Mr. Henry Pryer, who had long resided in Japan and devoted all his leisure to natural history. To Mr. Pryer we are indebted for the discovery of the majority of the Lepidoptera peculiar to Japan[2]. Although his conclusions, owing to his complete isolation from libraries and museums, were frequently erroneous, yet his work was characterized by that common sense which is to be found in the work of so many practical field-naturalists. I was fortunate enough to procure the whole of Mr. Pryer's entomological collections, with the exception of part of the Deltoids and Pyrales, by purchase, and they form an important part of the material for the present paper. Out of 38 species which I now

[1] For Part I. see P. Z. S. 1887, p. 398.

[2] A list of Japanese Lepidoptera, referred to in this paper as 'Pryer's Catalogue,' will be found in the Transactions of the Asiatic Society of Japan, vols. xi. and xii.



F.W. Frohawk, del. et lith.

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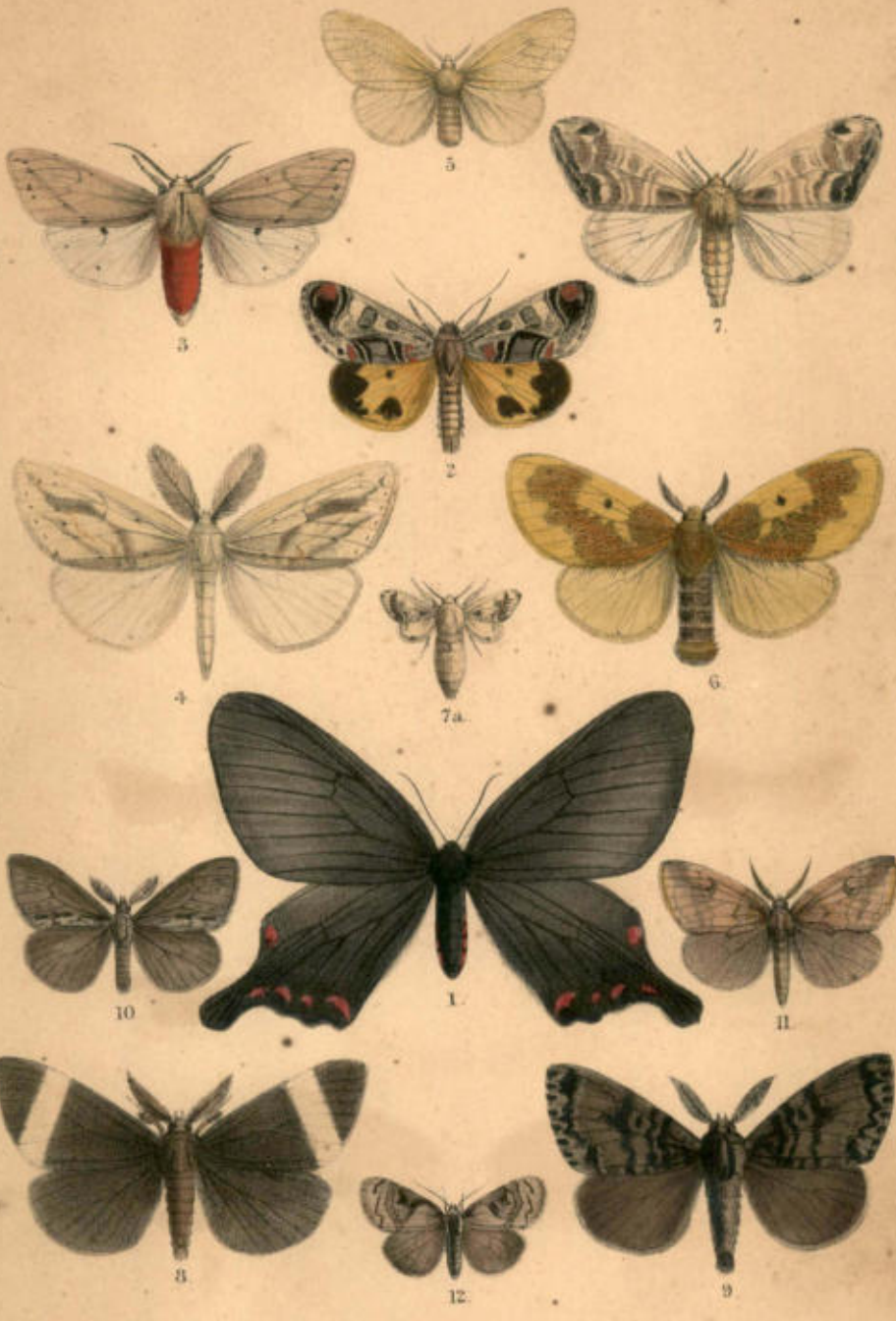
LEPIDOPTERA OF JAPAN & COREA.



T.W. Bobawijk, del. et lith. Mintern. Bros., imp.

LEPIDOPTERA OF JAPAN & COREA.

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F.W. Frohawk del. et lith.

Mintern Bros. imp.

LEPIDOPTERA OF JAPAN & COREA.

describe as new to science, 20 are from Mr. Pryer's collection and the remaining 18 were discovered by myself during the summer of 1886. Considering that in a single season I succeeded in taking 80 per cent. of the species of the groups referred to in this paper as occurring in Japan, but that, although collecting for the greater part of the time in localities never before visited by an entomologist, I only succeeded in capturing 18 new species, we may conclude that the Lepidopterous fauna of Japan is fairly well known. It is satisfactory to note that of the 352 species included in this paper over 200 were described in this country, principally by Mr. Butler, Mr. Moore, and Mr. Walker; many, however, as will be seen from the synonymy, have been subsequently redescribed on the continent from specimens received from N.E. Asia, by entomologists unacquainted with the types in our National Collection.

1. Cephonodes hylas.

Sphinx hylas, Linn. Mant. i. p. 539.
Sphinx picus, Cram. Pap. Exot. ii. p. 83, pl. 148. fig. B.
Sesia hylas, Fabr. Ent. Syst. iii. 1, p. 379. 3; Walk. Cat. Lep. Het. viii. p. 84.
Cephonodes hylas, Hübn. Verz. Schmett. p. 131. 1402.
Hemaris hylas, Saalm. Lep. Madag. i. p. 117, pl. 3. fig. 40.

Several specimens from Satsuma in May and Nagasaki in May and June, and there were six examples in Pryer's collection.

Satsuma and Nagasaki (*Leech*); Yokohama (*Pryer*); and generally distributed throughout the warmer portions of the Old World.

2. Hemaris radians.

Sesia radians, Walk. Cat. Lep. Het. viii. p. 84 (1856).
Hemaris radians, Butl. Ill. Typ. Lep. Het. pt. ii. p. 1, pl. xxi. fig. 2 (1878).
Hemaris mandarina, Butl. Proc. Zool. Soc. 1875, p. 239.

The fuscous band on the outer margin of the primaries is variable as regards width, and the radiations emanating therefrom towards centre of wing are often conspicuous, but in some examples these are entirely absent. These latter agree exactly with description and figure of *H. mandarina*, Butl., from Shanghai. Appears to be the Oriental representative of *H. bombyliformis* as *H. alternata* is of *H. fuciformis*.

Yokohama (*Jonas* and *Pryer*); Oiwake (*Pryer*); Nagasaki, Fushiki, Gensan (*Leech*); Shanghai (*Fortune*); Kiukiang (*Pratt*); Corea (*Herz*).

3. Hemaris alternata.

Sesia alternata, Butl. Ann. & Mag. Nat. Hist. (4) xiv. p. 366 (1874).
Hemaris alternata, Butl. Ill. Typ. Lep. Het. pt. ii. p. 1, pl. xxi. fig. 2 (1878).

The inward radiation is sometimes so pronounced as to give an appearance of opacity to the disk of the wing.

Examples of this species in Pryer's collection bear the same number (30) as specimens of *H. radians*; it is therefore not possible to say which insect he refers to in his catalogue, where he remarks "Common at Yokohama. I have bred it from larva found feeding on the Weglia."

Yokohama (*Pryer* and *Jonas*); Hakodate (*Whitely*); Oiwake (*Pryer*); Gensan (*Leech*).

4. HEMARIS AFFINIS.

Macroglossa affinis, Brem. Bull. de l'Acad. tom. iii. 1863; Lep. Ost-Sib. p. 35, tab. iii. fig. 13.

? *Hemaris alternata*, Butl. *teste* Fixsen, Rom. Mém. sur Lép. iii. p. 323.

Recorded from Corea (*Herz*).

5. HEMARIS SIEBOLDI.

Macroglossa sieboldi, Boisd., de l'Orza, Lép. Jap. p. 35 (1869).

Sesia whitelyi, Butl. Ann. & Mag. Nat. Hist. (4) xiv. p. 367 (1874).

Two examples, Hakodate, and there were four specimens in coll. Pryer. Said by Pryer to be common at Yokohama.

Gifu (*Pryer*); Hakodate (*Leech*).

6. MACROGLOSSA BOMBYLANS.

Macroglossa bombylans, Boisd. Sp. Gén. Lép. p. 334 (1875).

Several specimens in Satsuma in May and at Nikko in September and Oiwake in October. Exhibits considerable variation in the character of yellow marking of secondaries.

Yokohama (*Pryer*); Satsuma, Nikko, Oiwake (*Leech*); Kiukiang (*Pratt*).

7. MACROGLOSSA PYRRHOSTICTA.

Macroglossa pyrrhosticta, Butl. Proc. Zool. Soc. 1875, p. 242, pl. xxxvi. fig. 8.

Macroglossa saga, Butl. Ent. Mo. Mag. xiv. p. 206 (1878); Ill. Typ. Lep. Het. pt. ii. p. 1, pl. xxi. fig. 1 (1878).

One example at Nagahama and one at Gensan in July. Several specimens coll. Pryer.

Yokohama (*Jonas* and *Pryer*); Nagahama and Gensan (*Leech*); Kiukiang (*Pratt*); Shanghai.

8. MACROGLOSSA STELLATARUM.

Sphinx stellatarum, Linn. Syst. Nat. x. p. 493; Hübn. Sphing. p. 94, pl. ix. fig. 57.

Macroglossa stellatarum, Steph. Ill. Brit. Ent. Haust. i. p. 133. 1.

I met with this species at several places in Japan, and Pryer notes it common at Yokohama. The specimens are very typical.

Yokohama (*Pryer*); Oiwake (*Pryer* and *Leech*); Nagahama, Nikko, Hakodate, Nemoro, Foochau (*Leech*); North China. Teneriffe; Europe.

9. LOPHURA SANGAICA.

Lophura sangaica, Butl. Proc. Zool. Soc. 1875, p. 621.

Occurred in Satsuma in May, at Nagasaki in June, Fushiki and Shimonoseki in July, and Gensan in August. Pryer in his catalogue notes it as common at Yokohama; but there were only five examples in his collection.

Satsuma, Nagasaki, Shimonoseki, Fushiki (*Leech*); Gensan (Nat. Coll.).

10. AMPHELOPHAGA RUBIGINOSA.

Amphelophaga rubiginosa, Brem. & Grey, Beitr. zur Schmett.-Faun. Nörd. China's, p. 52.

Deilephila rubiginosa, Walk. Cat. Lep. Het. viii. p. 173.

Deilephila romanovi, Staud., Rom. Mém. sur Lép. iii. pl. ix. fig. 1.

Three specimens from Yokohama. Except that the olivaceous markings on primaries and abdomen are of a rather browner tint, these Japanese representatives of the species agree exactly with Kiukiang examples.

There was one example of this species in Pryer's collection labelled Oiwake. It is no. 20 of his catalogue, where he remarks "Also about Yokohama, but not so common as the preceding species" (No. 19. *Clamis bilineata*).

Yokohama (*Manley* and *Pryer*); Oiwake (*Pryer*); N. China (*Bremer*); Kiukiang (*Pratt*); Corea (*Herz*).

11. PERGESA MONGOLIANA.

Pergesa mongoliana, Butl. Proc. Zool. Soc. 1875, p. 622.

A common species at Yokohama.

Some of the specimens in Pryer's collection and one I received from Manley have a luteous submarginal band on primaries; this has its external edge much indented, but its internal edge is ill-defined. In the same specimens there is a distinct luteous oblique streak at anal angle of secondaries.

I am disposed to consider *P. mongoliana*, Butl., a local form of *P. velata*, Walk.

Yokohama (*Pryer* and *Manley*); Kiukiang (*Pratt*).

12. DEILEPHILA GALII.

Sphinx galii, Fabr. Sp. Ins. ii. p. 147. 33; Hübn. Sphing. p. 96, pl. xii. fig. 64.

Deilephila galii, Steph. Ill. Brit. Ent. Haust. i. p. 125, pl. xii. fig. 2.

Two examples in Pryer's collection, neither are localized; but in his catalogue Pryer says, "I took one specimen at Fujisan in June. The yellow bed-straw (*Galium verum*) is a common plant there." One specimen came under my notice at Tsuruga in July. It was hovering over flowers on the side of a mountain in the neighbourhood of that town.

Fujisan (*Pryer*). North America; Europe.

13. CHÆROCAMPA CLOTHO.

Sphinx clotho, Drury, Exot. Ins. ii. p. 48, pl. 28. fig. 1.
Chærocampa clotho, Walk. Cat. Lep. Het. viii. p. 141 (1856).

I took a specimen in Satsuma in May.

Satsuma (*Leech*). Silhet, North India, Ceylon, Java.

14. CHÆROCAMPA JAPONICA.

Chærocampa japonica, Boisd. Ins. Lép. Hét. i. p. 241.

In his catalogue Pryer observes of this species that it is common about Yokohama. I took it in Satsuma in May, and at Nagasaki in June, and Hakodate in August.

Yokohama (*Pryer*); Satsuma, Nagasaki, Hakodate (*Leech*); Corea (*Herz*).

15. CHÆROCAMPA OLDENLANDIÆ.

Sphinx oldenlandiæ, Fabr. Sp. Ins. ii. p. 148. 37.
Xylophanes gortys, Hübn. Zeit. Samml. exot. Schmett. p. 28. 513, 514; Walk. Cat. Lep. Het. viii. p. 142.

A long series of this species, including several specimens bred at this Society's Gardens, from larvæ which I brought from Yokohama, where the larvæ are common, feeding on taro and balsam.

Yokohama (*Pryer* and *Leech*). North India, Java, Australia, Sydney.

16. CHÆROCAMPA NESSUS.

Sphinx nessus, Drury, Ill. Exot. Ins. ii. p. 46, pl. xxvii. fig. 1 (1773).
Theretra equestris, Hübn. Verz. bek. Schmett. p. 135 (1816).
Chærocampa nessus, Walk. Cat. Lep. Het. viii. p. 140 (1856).

This appears to be a common species at Yokohama. Nine specimens in Pryer's collection are fairly constant in coloration.

Yokohama (*Pryer*). North India, Silhet, Ceylon, Hong Kong, Java, Kanara.

17. CHÆROCAMPA ELPENOR.

Sphinx elpenor, Linn. Syst. Nat. x. p. 492; Hübn. Sphing. p. 96, pl. x. fig. 61.
Chærocampa elpenor, Westw. & Humph. Brit. Moths, i. p. 22, pl. 51. figs. 7–8.
♂. *Chærocampa macromera*, Butl. Proc. Zool. Soc. 1875, p. 7; Ill. Typ. Lep. Het. v. pl. lxxix. fig. 3.
♀. *Chærocampa fraterna*, Butl. Proc. Zool. Soc. 1875, p. 247; Ill. Typ. Lep. Het. v. pl. lxxix. fig. 4; *teste* Fixsen, Rom. Mém. sur Lép. iii. p. 321.
Chærocampa lewisii, Butl. Proc. Zool. Soc. 1875, p. 247.

Except that some examples are more rosy than the type, the specimens from Oiwake, in Pryer's collection, and others I took at Shimonoseki and Gensan in July, are not separable from *C. elpenor*.

Oiwake (*Pryer*); Shimonoseki, Gensan (*Leech*); Kiukiang (*Pratt*); Hakodate.

18. Cinogon askoldensis.

Smerinthus askoldensis, Oberth. Etud. d'Entom. v. p. 251, pl. i. fig. 3 (1880).

Cinogon cingulatum, Butl. Trans. Ent. Soc. 1881, p. 2.

Two specimens in Pryer's collection, one of which is labelled Oiwake. These agree well with Oberthür's figure of *S. askoldensis* and also with Butler's description of *C. cingulatum*.

Oiwake, Japan (*Pryer*); Askold, Hakodate (*Andrews*).

19. Acosmeryx anceus.

Sphinx anceus, Cram. Pap. Exot. iv. p. 124, pl. 355. f. A.

Enyo anceus, Hübn. Verz. Schmett. p. 132. 1423; Walk. Cat. Lep. Het. viii. p. 119.

Acosmeryx anceus, Butl. Trans. Zool. Soc. 1876, p. 544, pl. 90. figs. 11 & 12 (larva and pupa).

Acosmeryx metanaga, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 350 (1879).

Pryer says that this species is common at Yokohama, in which locality the eight examples in his collection were probably obtained. In some specimens there is no trace of yellow in the discal spot; but as this spot is really a small tuft of raised yellow scales surrounded with a more or less distinct fuscous ring, absence of the yellow may be due to condition of the specimens.

Yokohama (*Pryer*); Kiukiang (*Pratt*); Amboina.

20. Ambulyx schauffelbergeri.

Ambulyx schauffelbergeri, Brem. & Grey, Beitr. zur Schmett. Nörd. China's, p. 53.

I got a specimen at Nagasaki in June; three coll. Pryer and two from Mr. Manley. This is probably a local form of *A. substrigilis*, Westw., as possibly are also *A. maculifera* and *A. consanguis*, Butl. The Japanese insects agree very well with the last-named, but the transverse lines are not clearly defined.

Nagasaki (*Leech*); Yokohama (*Pryer* and *Manley*); North China.

21. Triptogon sperchius.

Smerinthus sperchius, Mén. Enum. Lep. Mus. Petrop. p. 137, pl. 13. fig. 5 (1857).

Triptogon piceipennis, Butl. Ann. & Mag. Nat. Hist. (4) xx. p. 393 (1877); Ill. Typ. Lep. Het. pt. ii. p. 2, pl. xxi. fig. 4 (1878).

Triptogon gigas, Butl. Proc. Zool. Soc. 1875, p. 253; Ill. Typ. Lep. Het. pt. v. p. 12, pl. lxxx. fig. 5 (1881).

(Pryer records the larvæ as feeding on chestnut in the neighbourhood of Yokohama.)

In tone of colour, curvature, angulation, and distance apart of the transverse linear markings this species exhibits much aberration. With the exception of an example I took at Tsuruga in July, and one sent me by Manley from Yokohama, all my specimens are from

Pryer's collection. These are without locality labels, but bear his catalogue number (8), and are most probably from Yokohama. In the entire series there are examples agreeing with *S. sperchius*, Mén., others with *T. piceipennis*, Butl., and others again with *T. gigas*, Butl., whilst in a few the tint of colour, shape, and direction of lines, &c. are not quite identical with either. As I do not feel justified in describing these as distinct, I am obliged to consider them and also the three aberrations named and described as forms of one species.

22. TRIPTOGON COMPLACENS.

♂. *Smerinthus complacens*, Walk. Cat. Lep. Het. Suppl. i. p. 40 (1864).

♀. *Smerinthus dyras*, var. *β*, Walk. Cat. Lep. Het. viii. p. 251 (1856); Bull. Ill. Typ. Lep. Het. pt. iii. p. 2, pl. xli. fig. 4.

Triptogon roseipennis, Butl. Proc. Zool. Soc. 1875, p. 257; Trans. Zool. Soc. ix. p. 588, pl. xci. fig. 6, transformations (1876); Ill. Typ. Lep. Het. pt. iii. p. 2, pl. xli. fig. 3 (1879).

? *Smerinthus gaschkewitschii*, Brem. Beitr. Schm. N. China, p. 13.

A fine series showing considerable variation in colour.

Yokohama (*Pryer* and *Manley*); Nagasaki (*Leech*); Hakodate.

23. SMERINTHUS DISSIMILIS.

Triptogon dissimilis, Brem. Bull. de l'Acad. Sci. St. Pétersb. 1864, tom. iii.

Smerinthus dissimilis, Brem. Lep. Ost-Sib. p. 35, pl. iii. fig. 12 (1864).

This is no. 5 of Pryer's catalogue, and there were three examples in his collection, two of which were from Tokio and one with aborted hind wings, probably a bred specimen, from Oiwake. In colour all three differ from a specimen I have from Kiukiang, but the markings are exactly alike in all four. Japanese examples agree better with Amur specimens in colour.

Tokio, Oiwake (*Pryer*); Kiukiang (*Pratt*); Ussuri (*Bremer*).

24. SMERINTHUS CHRISTOPHI.

Smerinthus christophi, Staud., Rom. Mém. sur Lép. iii. p. 162, pl. ix. fig. 3 *a*, *b*, & pl. xi. fig. 1 (1887).

This species appears to be closely allied to *S. tiliæ*, Linn.

Fujisan, Yesso (*Pryer*); Amur.

25. SMERINTHUS TATARINOVII.

Smerinthus tatarinovii, Bremer, Motsch. Etud. Ent. 1852, p. 62.

Smerinthus eversmanni, Popoff, Bull. Soc. Imp. Nat. Mosc. 1854, ii. p. 182, pl. 1. fig. 5.

Pryer says this species is not uncommon about Yokohama, but there were only four examples in his collection; of these one has the primaries suffused with pink and the central band and apical patch are russet-brown. Six other specimens in his series are from Yesso, and are much smaller and paler in colour.

Yokohama (*Pryer* and *Manley*); Yesso (*Pryer*).

26. SMERINTHUS OCELLATUS.

Sphinx ocellata, Linn. Syst. Nat. x. p. 489.
Sphinx salicis, Hübn. Sphing. p. 73.
Smerinthus ocellatus, God. Hist. Nat. Lép. Fr. iii. p. 20, 2.
Smerinthus planus, Walk. Cat. Lep. Het. viii. p. 254 (1856).
Smerinthus argus, Mén. Enum. Lep. Mus. Petrop. no. 1561, p. 136, tab. xiii. fig. 3 (1857).

There is nothing whatever in the Asiatic form (i. e. *planus*, Walk.) of *S. ocellatus* to separate it from that species. As we find variation in colour and markings in any good series of European *S. ocellatus*, so also do we find this to be the case where a number of Japanese specimens of the species are brought together. These last are exactly like Kiukiang and Gensan examples, and there is not a specimen in my Asiatic series for which I cannot find an exact counterpart among my European series. Pryer says of *S. planus*, "The larva is green with a green horn instead of sky-blue as in *S. ocellatus*." As no other point of difference is referred to, it is to be assumed that none existed, and I cannot think that any value can possibly attach to such an unimportant character.

Yokohama (*Pryer*); Gensan (*Leech*); Kiukiang (*Pratt*). Europe.

27. DAPHNUSA COLLIGATA.

Daphnusa colligata, Walk. Cat. Lep. Het. viii. p. 238 (1856).
Metagastes bieti, Oberth. Etud. d'Entom. xi. p. 29, pl. i. fig. 2 (1886).

One example, without locality, in coll. Pryer.

Japan (*Pryer*); Kiukiang (*Pratt*); North and Western China.

28. CLANIS BILINEATA.

Basiana bilineata, Walk. Cat. Lep. Het. Suppl. v. p. 1857 (1866); Butl. Ill. Typ. Lep. Het. pt. v. p. 14, pl. lxxxi. fig. 4 (1881).
Clanis deucalion, Butl. *l. c.* fig. 5.

This is Pryer's no. 19, of which he observes in his catalogue "common about Yokohama," but of which it appears he did not keep a long series, as there were only three examples in his collection. One of these specimens (♂) agrees well with examples of *C. bilineata* from Kiukiang, whilst the other two (♀ ♀) are the *deucalion* of Butler. I cannot find any trustworthy character by which the last-named form can be specifically separated from *C. bilineata*.

Yokohama (*Pryer*); Kiukiang (*Pratt*); Darjeeling (*Russell* and *Liddesdale*); North India (*Mauger*); Corea (*Herz*).

29. ACHERONTIA ATROPOS.

Sphinx atropos, Linn. Syst. Nat. x. p. 490; Hübn. Sphing. p. 68.
Acherontia atropos, Ochs. Hübn. Verz. Schmett. p. 139. 1494.
Acherontia styx, Westw. Cab. Orient. Ent. p. 88, pl. 42. fig. 3.
Var. *Acherontia medusa*, Butl. Trans. Zool. Soc. ix. p. 597 (1876); Ill. Typ. Lep. Het. pt. iii. p. 3, pl. xli. fig. 5.

Neither Chinese nor Japanese representatives are to be separated

with certainty from *A. atropos*. However, the more slender abdominal belts and transverse stripe, together with the darker "skull-mark" on thorax, of most of the specimens from China and Japan afford fairly good varietal characters; and as these seem to be pretty constant, it will perhaps be well that this form be known as var. *medusa*. I should note that among my European specimens of *A. atropos* are individuals with the "skull-mark" quite as dark as in any Japanese or Chinese example.

Yokohama (*Jonas* and *Pryer*); Oiwake, Nikko, Hakone, and Gensan (*Leech*); Nagasaki (*Lewis*); Hong Kong (*Bowring*). North India, Philippine Isles, Sierra Leone, Turkey in Asia, Africa, Europe.

30. PROTOPARCE CONVOLVULI.

Sphinx convolvuli, Linn. Syst. Nat. x. p. 490; Hübn. Sphing. p. 70; Moore, Cat. Lep. Mus. E. I. Comp. i. p. 267, pl. ix. figs. 3, 3*a*, larva and pupa (1857).

Protoparce orientalis, Butl. Trans. Zool. Soc. ix. p. 609, pl. 91. figs. 16, 17, larva and pupa (1876).

A very typical series, including four specimens from Pryer's collection. Having regard to the great variability and extensive geographical range of this species, I am at a loss to understand how any one can attempt to claim specific rank for representatives of *P. convolvuli* coming from any part of the Old World.

Yokohama (*Pryer*); Fushiki, Hakodate (*Leech*). North India, Scinde?, Ceylon, Java, New Zealand, New South Wales, Port Natal, Africa, Europe, East Indies, Hong Kong.

31. PSEUDOSPHINX INEXACTA.

Macrosila inexacta, Walk. Cat. Lep. Het. viii. p. 208 (1856).

Pseudosphinx inexacta, Butl. Ill. Typ. Lep. Het. pt. v. p. 16, pl. lxxxi. fig. 8 (1881).

Japanese examples agree well with Butler's figure, only the markings at anal angle of secondaries are not so distinct. This is Pryer's no. 15, and appears to occur among yew trees. I took some fine specimens at Hakodate in August. Amurland specimens are grey, without the olivaceous tint found in the type and Japanese examples.

Yokohama, Yesso (*Pryer*); Hakodate (*Leech*). North India (*Hume*); Amur; Corea (*Herz*).

32. ANCERYX PINASTRI.

Sphinx pinastri, Linn. Syst. Nat. x. p. 492; Hübn. Sphing. p. 67.

Hyloicus pinastri, Hübn. Verz. Schmett. p. 139. 1483.

Anceryx pinastri, Walk. Cat. Lep. Het. viii. p. 223 (1856).

Hyloicus caligineus, Butl. Ann. & Mag. Nat. Hist. (4) xx. p. 393 (1877); Ill. Typ. Lep. Het. pt. ii. p. 2, pl. xxi. fig. 6 (1878).

Common in Japan, especially at Yokohama.

In his differentiation of the dark Japanese form of *A. pinastri*, Butler refers to the absence of "white markings on the body" and

"lateral black spots on the abdomen." In my series of *A. pinastri* from Japan, I find that almost every specimen has the body paler where the white markings should be, and dark patches along the sides are distinctly visible. The dark form is most frequent in Japan; but in Pryer's collection there is one example of *A. pinastri* which has a pale grey ground-colour clouded with darker, and with strong and sharply defined markings. This is one of three examples labelled no. 16, and noted as occurring newly emerged on stems of yew trees; the other two are referable to *A. davidis*, Oberth.

Yokohama (*Jonas* and *Pryer*); Nagahama, Tsuruga, Fushiki, Ningpo (*Leech*). North India; Europe.

33. ANCERYX INCRETA.

Anceryx increta, Walk. Cat. Lep. Het. Suppl. i. p. 36 (1864).

Diludia increta, Butl. Ill. Typ. Lep. Het. pt. iii. p. 4, pl. xli. fig. 7 (1879).

An extensive series showing considerable variation in tone of colour and intensity of marking.

Yokohama (*Jonas* and *Pryer*); Nagahama, Sendai, Shimonoseki, Fushiki (*Leech*); Kiukiang (*Pratt*); Shanghai; North China (*Fortune*).

34. ANCERYX DAVIDIS.

Sphinx davidis, Oberth. Etud. d'Entom. v. p. 27, pl. vii. fig. 9 (Oct. 1880).

Sphinx streckeri, Staud. Ent. Nachr. vi. p. 252 (1880).

Hyloicus davidis, Butl. Trans. Ent. Soc. 1881, p. 2.

Two fine examples in Pryer's collection. These, as previously adverted to, are two of the three insects (no. 16) found on stems of yew at Yokohama. In one the central area of primaries between the transverse lines is pale grey like the rest of the wing, but in the other it is clouded with fuscous, and as a consequence the wing appears to have a broad fuscous transverse fascia. Neither of these specimens agree exactly with Oberthür's figure of *A. davidis*, but there can be no doubt they are forms of that insect, as also is *Sphinx streckeri*, Staud., from Vladivostok. Amurland specimens of *A. davidis* in my collection are rather darker than my Japanese examples, and seem to fit in between these last and specimens of *S. streckeri* from the Amur.

Yokohama (*Pryer*); Tokio (*Fenton*); Nikko (*Maries*); Vladivostok; Amur.

35. SPHINX LIGUSTRI.

Sphinx ligustri, Linn. Faun. Suec. p. 287. 1087; Hübn. Sphing. pl. xiv. fig. 69.

Sphinx constricta, Butl. Cistula Ent. vol. iii. p. 113 (1885).

One example, taken at Hakodate by my native collector in June, does not differ sufficiently from European examples to deserve specific rank.

Hakodate; Kashiwage (*Lewis*).

36. THYRIS FENESTRELLA.

Thyris fenestrella, Scop. Ent. Carn. p. 217 (1763).

Three specimens at Gensan in June and July.

Gensan (July).

37. THYRIS USITATA.

Thyris usitata, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 367 (1879).

I took four specimens in Satsuma in May. A very fine series coll. Pryer.

Yokohama (*Jonas* and *Pryer*); Oiwake (*Pryer*); Satsuma (*Leech*).

38. MELITTIA BOMBYLIFORMIS.

Sphinx bombiliformis, Cram. Pap. Ex. iv. p. 241, pl. 400. fig. C. (1782).

Melittia anthredoniformis, Hübn. Verz. Schmett. p. 128 (1816).

Trochilium phorcus, West. Cab. Orient. Ent. p. 62, pl. 30. fig. 7.

A specimen from Japan in the National Collection.

India, N. and E.

39. MELITTIA EURYTION.

Trochilium eurytion, Westw. Cab. Or. Ent. p. 62, pl. 30. fig. 5 (1848).

Melittia eurytion, Walk. Cat. Lep. Het. viii. p. 70 (1856).

Two specimens at Tsuruga in June. Five examples coll. Pryer (no. 42).

Yesso, Nikko, Yokohama (*Pryer*); Tsuruga (*Leech*); North India, Silhet.

40. MELITTIA CHALCIFORMIS.

Sphinx chalciformis, Fabr. Ent. Syst. tom. iii. pt. 1, p. 382.

Melittia indica, Butl. Ann. & Mag. Nat. Hist. (4) xiv. p. 411 (1874).

One example in Satsuma in May.

Satsuma (*Leech*).

41. SPHECIA RHYNCHIOIDES.

Sphecia rhynchioides, Butl. Trans. Ent. Soc. 1881, p. 589.

Six specimens in coll. Pryer, Yokohama.

Pryer says that the larva "feeds on oak."

42. SPHECIA CONTAMINATA.

Sphecia contaminata, Butl. Ill. Typ. Lep. Het. pt. ii. p. 59, pl. xl. fig. 2.

Four specimens, coll. Pryer.

Yokohama (*Jonas*); Yesso (*Pryer*).

43. SPHECIA ROMANOVI, sp. n. (Plate XXX. fig. 1.)

♂. Primaries hyaline, brownish, thickly clothed with dark brown scales along the costa, inner margin, and median nerve; secondaries hyaline, outer half brownish, sprinkled with a few darkish scales; fringes yellowish brown. Body brownish orange, with 7 black belts. Thorax black, front portion brilliant orange; collar reddish; head and palpi bright orange marked with reddish; antennæ pectinated, lower half reddish, remainder black. Prolegs orange, marked with reddish; remaining legs dark brown, marked with orange and reddish.

♀. Like the male, but primaries more densely clothed with scales; antennæ simple.

Expanse 46 millim.

Four specimens of this fine insect in coll. Pryer, Yokohama.

44. SPHECIA? FIXSENI, sp. n. (Plate XXX. fig. 2.)

Primaries partly hyaline, thickly clothed along the nerves as far as the end of cell with reddish-brown scales; apex of wing and broad outer margin deep buff; secondaries hyaline, with deep dark brown fringes. Head black; palpi yellow; a narrow yellow collar. Thorax marked on each side with yellow. Body blackish, with four orange-yellow bands and reddish-orange anal tuft. Antennæ blackish above, reddish below; all the legs yellow marked with reddish orange. Underside of primaries yellow along the nerves and towards apex; secondaries sprinkled with yellow along the outer margin.

Expanse 42 millim.

Sexes do not differ.

Five specimens in coll. Pryer from Nikko and Oiwake (June and July, 1887).

45. SCIAPTERON CRABRONIFORME.

Sciapteron crabroniforme, Hübn., Rom. Mém. sur les Lép. vol. iii. p. 323.

Corea (*Herz*).

46. SCIAPTERON FERALE, sp. n. (Plate XXX. fig. 3.)

Primaries brown, sprinkled with orange scales, with a purplish reflection, hyaline from base to a little beyond centre; secondaries hyaline with an opalescent reflection. Head black; palpi yellow in front; collar yellow. Thorax and body black, the latter broadly belted just beyond the middle with sulphur; legs blackish; hind tarsi yellow. Under surface of all wings iridescent.

This species is much larger and differently belted to the other two Japanese species in the genus.

Expanse 43 millim.

One male, coll. Pryer, taken in Yesso in 1882.

47. SCIAPTERON REGALE.

Sciapteron regale, Butl. Ill. Typ. Lep. Het. pt. ii. p. 60, pl. xl. fig. 3 (1878).

Satsuma in May; Nagasaki in May and June; and Shimonoseki in July. Six examples, coll. Pryer.

There is no difference between Japanese and Kiukiang specimens of this species.

Yokohama (*Jonas* and *Pryer*); Shimonoseki, Nagasaki, Satsuma (*Leech*); Kiukiang (*Pratt*).

48. SCIAPTERON BICINCTA.

Ægeria bicincta, Walk. Cat. Lep. Het. Suppl. i. p. 12 (1864).

Several specimens at Nagasaki in June, and Tsuruga and Shimonoseki in July. Two examples, coll. Pryer.

Nagasaki, Tsuruga, Shimonoseki (*Leech*); Yokohama, Oiwaki (*Pryer*); N. China (*Fortune*).

49. ÆGERIA HECTOR.

Ægeria hector, Butl. Ill. Typ. Lep. Het. pt. ii. p. 60, pl. xl. fig. 4 (1878).

A number of specimens, coll. Pryer.

Yokohama (*Jonas* and *Pryer*); Oiwake (*Pryer*).

50. ÆGERIA MONTIS, sp. n. (Plate XXX. fig. 4.)

Primaries deeply bordered with black; the central hyaline area divided by a broad black bar just beyond the middle of the wing; secondaries hyaline, bordered with black, broadly on their outer and narrowly on their inner margins. Body black, belted with yellow near the anal extremity, and again towards the middle. Head, thorax, legs, antennæ, and under surface black; under surface of primaries dashed with yellow along the costa and inner margin.

Allied to *Æ. stelidiformis* (Freyer), but differing in the belts.

Expanse 25 millim.

A single male in coll. Pryer, taken at Oiwake, June 1887.

50 *a*. ÆGERIA TENUIS.

Ægeria tenuis, Butl. Ill. Typ. Lep. Het. pt. ii. p. 60, pl. xl. fig. 8 (1878).

Three specimens, coll. Pryer.

Oiwake (*Pryer*).

51. SESIA VELOX.

Sesia velox, Fixsen, Rom. Mém. sur Lép. vol. iii. p. 323.

Corea (*Herz*).

52. BEMBECIA ODYNERIPENNIS.

Ægeria odyneripennis, Walk. Cet. Lep. Het. viii. p. 42 (1856).

I took one specimen of this insect near Hakodate in August.

Nova Scotia.

53. BEMBECIA PERNIX, sp. n. (Plate XXX. fig. 5.)

Primaries reddish fuscous, paler and somewhat subhyaline about the disk and base of wings; secondaries hyaline, with dark outer border and fringes. Head black; palpi and collar pale yellow. Thorax and abdomen black, the latter with two narrow pale yellow rings near the anal tuft and two wider rings, one about the centre

and one towards the base of the body; anal tuft tipped with white. Antennæ black, tipped with reddish. Underside of primaries paler than upper surface. Legs black, with faint pale markings.

I took one specimen of this species at Shimonoseki in July 1886, and there is one in coll. Pryer, Oiwake, June 1887.

54. TINTHIA CONSTRICTA.

Tinthia constricta, Butl. Ill. Typ. Lep. Het. pt. ii. p. 61, pl. xl. fig. 10 (1878).

I got one specimen at Nagasaki in June.
Yokohama (*Jonas*); Nagasaki (*Leech*).

55. TINTHIA EDITHA.

Tinthia editha, Butl. Ill. Typ. Lep. Het. pt. ii. p. 61, pl. xl. fig. 9.
Yokohama (*Jonas*).

56. SYNTOMIS EREBINA.

Syntomis erebina, Butl. Trans. Ent. Soc. 1881, p. 5.
"Allied to *S. phegea* of Europe."—*Butler*.
Tokio (*Fenton*).

57. SYNTOMIS THELEBUS.

Zygæna thelebus, Fabr. Ent. Syst. iii. 1, p. 391.
Syntomis mandarinia, Butl. Journ. Linn. Soc. Zool. xii. p. 349.
? = *germana*, Feld. Wien. ent. Mon. vi. p. 37.

I got a nice series of this species in Japan and Corea, showing considerable variation in size and number of hyaline spots; but in Pryer's collection there was a series which had evidently been made up of specimens selected to show something of the entire range of ma clar aberration in Japanese *S. thelebus*. At one end of this series is a pecimen minus the apical spot, and the other spots on primaries are very small, whilst at the other end is an example which has exceedingly large spots, and in consequence might be said to have hyaline primaries with black transverse and longitudinal band-like markings; between these two are all the intermediate gradations, some of which have the basal spots of all the wings thinly clothed with yellowish scales. In the series I obtained are specimens with an extra hyaline spot above or below the usual apical one, and others which have both these additional spots.

Expanse 30–40 millim.

Oiwake, Ohoyama, Fujisan, Kanosan (*Pryer*); Nagahama, Nagasaki, Tsuruga, Gensan (*Leech*); Ningpo, Corea (*Herz*); Kiukiang (*Pratt*); Amur.

58. SYNTOMIS FORTUNEI.

S. fortunei, De l'Orza, Lep. Jap. p. 38.
S. zelleri, Ersch.
Syntomis annetta, Butl. Journ. Linn. Soc., Zool. xii. p. 347 (1876); Ill. Typ. Lep. Het. pt. iii. pl. xlii. fig. 5.

I took a number of specimens in Japan and the Corea during July

1886, and my native collector obtained it at Hakodate in June and July 1887.

In expanse this species ranges from 28 to 40 millim.

Oiwake, Yokohama (*Pryer*); Tsuruga, Nagahama, Shimonoseki, Hakone, Gensan (*Leech*); Corea; Hakodate.

59. PRYERIA SINICA.

Pryeria sinica, Moore, Ann. & Mag. Nat. Hist. (4) xx. p. 86 (1877).

A fine series, including two females, in Pryer's collection. I did not meet with this species in Japan or Corea.

Mr. Moore's description appears to apply to the male only, as the female has rather broader wings and the last abdominal segments have lateral tufts of short black and long golden-brown hairs; these last meet over the back and project beyond the anal segment. The antennæ of the female are filiform to beyond the middle, then thickened towards the pointed apex.

Pryer says that it feeds on the Masaki.

Yokohama (*Pryer*); Shanghai (type).

60. BALATÆA OCTOMACULATA.

Euchromia octomaculata, Brem. Bull. de l'Acad. Pétersb. 1861, tom. iii.; Lep. Ost-Sib. p. 36, pl. iv. fig. 1 (1864).

Balatæa ægerioides, Walk. Cat. Lep. Het. Suppl. i. p. 110 (1864); Butl. Ill. Typ. Lep. Het. pt. iii. p. 4, pl. xlii. fig. 2 (1879).

I only met with this species at Gensan, where I took four males in June 1886. One example (♀) in coll. Pryer, and Fixsen also records it from Corea.

Ohoyama (*Pryer*); Gensan (*Leech*); North China.

61. BINTHA GRACILIS.

Bintha gracilis, Walk. Cat. Lep. Het. Suppl. i. p. 127 (1864); Butl. Ill. Typ. Lep. Het. pt. iii. p. 5, pl. xlii. fig. 3 (1879).

I took two ♀ specimens at Nagahama and one at Gensan in July 1886, and there were six examples in Pryer's collection (2 ♂, 4 ♀).

Yokohama (*Jonas* and *Pryer*); Nagahama, Gensan (*Leech*).

62. PROCRIS BUDENSIS.

Procris budensis, Spey. Geogr. Verbr. i. p. 466 (1862).

Jinchuen, W. Corea, Amur, Hungary, Sarepta, Armenia.

Motschulsky records this species from Japan.

63. PROCRIS TRISTIS.

Procris tristis, Brem. Lep. Ost-Sib. p. 97, tab. viii. fig. 4 (1864).

Procris esmeralda, Butl. Ann. & Mag. Nat. Hist. (4) xx. p. 394 (1877); Ill. Typ. Lep. Het. pt. ii. p. 4, pl. xxi. fig. 8 (1878).

I have about forty examples of this *Procris* from Japan and the Corea. The only difference I can see between *P. tristis*, Brem., and

P. esmeralda, Butl., is one of colour, the former being blackish grey, and the last named green of various shades. Separating the specimens in the series by their colour, eight are referable to *P. esmeralda*, and seventeen to *P. tristis*; but the remainder do not agree exactly with either in the matter of colour. Pryer in his Catalogue has "68. *Illibris*? sp. Fujisan" and "69. *Illibris trista*, Brem., or *sinensis*, Walker." The first he says is blue, and the second green. In his collection, however, his series no. 68 comprises 7 "blue," 1 blackish-grey ♀s, and 3 blackish-grey ♂s, one of which has "blue" borders. Series no. 69 consists of 10 specimens, all males and mostly blackish grey in colour, but some have the primaries sprinkled with green or bluish-green scales. The Gensan specimens are blackish grey, sometimes with blue or green scales over disk of wing.

Yokohama (*Jonas* and *Pryer*); Ohoyama, Kanosan, Oiwake (*Pryer*); Gensan (*Leech*); Corea (*Herz*).

64. Procris fusca, sp. n. (Plate XXX. fig. 6.)

All the wings bronzy brown. Antennæ brown above, paler beneath, moderately long and slightly pectinated.

Expanse 15–23 millim.

One small ♂, Gensan, July; and five examples, coll. Pryer.

65. Procris nigra, sp. n. (Plate XXX. fig. 7.)

♀. All the wings fuliginous semitransparent. Antennæ simple. Head, thorax, and abdomen black; legs bluish black. Expanse 29 millim.

One example, coll. Pryer.

Ohoyama (*Pryer*).

66. Procris chinensis.

Ino chinensis, Feld. Wien. ent. Mon. vi. p. 31.

Procris chinensis, Walk. Cap. Lep. Het. Suppl. v. p. 1862.

Several examples at Nagasaki in June, and there were two specimens in Pryer's collection. It is said to have been common at Yokohama, the larva feeding on Masaki.

Nagasaki (*Leech*); Yokohama (*Pryer*), Corea; China.

67. Procris funeralis.

Procris funeralis, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 351 (1879).

Four examples in coll. Pryer.

Yokohama (*Pryer*).

68. Northia sinensis.

Illiberis sinensis, Walk. Cat. Lep. Het. i. p. 281 (1854).

(Neuration of primaries, Plate XXX. fig. 20.)

One specimen at Hakodate (August) and several at Gensan (June

and July). This is Pryer's no. 77; there were only two examples in his collection, and were taken, I believe, at Yokohama.

? Yokohama (*Pryer*); Hakodate, Gensan (*Leech*); Kiukiang (*Pratt*); Foochau (April, *Leech*); Isle of Askold; N. China.

69. NORTHIA PSYCHINA.

Procris psychina, Oberth. Etud. d'Entom. pt. v. p. 28, pl. vii. fig. 6.

Allied to *N. sinensis*, but the wings, which are shorter and rounder, are thickly clothed with brownish scales. There were two examples in Pryer's collection, and I took an example at Hakodate in August.

Yokohama (*Pryer*); Hakodate (*Leech*).

70. NORTHIA TENUIS.

Northia tenuis, Butl. Ann. & Mag. Nat. Hist. (4) xx. p. 394 (1877); Ill. Typ. Lep. Het. pt. ii. p. 4, pl. xxi. fig. 7 (1878).

(Neuration of primaries, Plate XXX. fig. 19.)

I met with several specimens in Satsuma and at Nagasaki in May 1886 and one at Hakodate in August of the same year. My native collector obtained it in the last-named place, in June and July. Eleven examples in Pryer's collection, two of which are somewhat faded and are the no. 75 of his catalogue. The larva is said to feed on spindle.

In his paper on Lepidoptera from the Corea, Dr. Fixsen notes the occurrence of this insect, but not of *N. sinensis*. On my visit to the Corea I obtained the last named, but not *N. tenuis*.

Yokohama (*Jonas* and *Pryer*); Oiwake (*Pryer*); Nagasaki, Satsuma, Hakodate (*Leech*); Hong-Kong.

71. NORTHIA DIRCE, sp. n. (Plate XXX. fig. 8.)

♀. Hyaline, primaries clouded with black at base, third of costa, and broadly along inner margin; apex broadly, and outer margin narrowly bordered with black. Secondaries black along the costa. Antennæ, head, thorax, abdomen, and legs black.

Expanse 30 millim.

Allied to *M. tenuis*, Butl., but can at once be separated therefrom by the black apex of primaries and also by its longer and narrower wings, and different shape of discal cell.

One example taken by myself at Gensan in July. There are four specimens from N. China in the National Collection at South Kensington.

72. NORTHIA CYBELE, sp. n. (Plate XXX. fig. 9.)

♀. Hyaline, clouded with blackish at the base, along the costa nearly to the middle, and on inner margin of primaries; there are also a few black scales along outer margin. Secondaries thickly dotted with black along the costal area. Fringes black. Antennæ slightly pectinated, brilliant metallic green; body black with metallic green reflections.

Expanse 30 millim.

Closely allied to *N. sinensis*, Walk., from which, however, it may

be separated by the colour of antennæ, greater width of thorax, narrowness of wing, and density of black scales. The neuration at end of cell is also of a different character.

One example taken by myself at Gensan in July.

73. Zygæna niphona.

Zygæna niphona, Butl. Ann. & Mag. Nat. Hist. (4) xx. p. 393 (1877); Ill. Typ. Lep. Het. pt. ii. p. 4, pl. xxi. fig. 9 (1878).

Zygæna christophi, Staud., Rom. Mém. sur Lép. p. 173 (1887).

A fine series in Pryer's collection. I took two specimens at Hakodate in August 1886.

This species may have either five or six spots on the upper surface of primaries, but below the sixth spot is always to be seen though sometimes only faintly. Confluency of the spots appears to be rather the exception than the rule. There are one or two examples in my series which agree very well with Butler's figure; but in the majority the five or six spots, although contiguous, are quite independent of each other, except perhaps as regards the upper spots of the central and outer pairs, which are often united by a thin line of their own colour.

Yokohama (*Jonas*); Oiwake (*Pryer*); Hakodate (*Leech*).

74. Amuria cyclops.

Amuria cyclops, Staud., Rom. Mém. sur Lép. p. 172, pl. 8. fig. 6 (1887).

I have no example of this species, but it seems from the description and figure to come between *Procris funeralis* and *P. fusca*.

Vladivostok, Askold, Sidemi, Corea.

75. Psyche viciella.

Psyche viciella, Schiff. S. V. p. 133.

Var. *stetinensis*, Hering, Stett. ent. Zeit. 1846, p. 227.

One specimen of var. *stetinensis* in coll. Pryer without locality.

76. Psyche unicolor.

Psyche unicolor, Hufn. Berl. Mag. ii. p. 418 (1766).

Psyche graminella, Schiff. S. V. p. 133. 291 (1776).

Several specimens in coll. Pryer, which I believe are referable to this species.

Yokohama, Yesso (*Pryer*).

77. Plateumeta aurea.

Plateumeta aurea, Butl. Trans. Ent. Soc. 1881, p. 22.

Yokohama (*Pryer*).

78. Govirana bipars.

Perina bipars, Walk. Cat. Lep. Het. Suppl. ii. p. 406.

One specimen in coll. Pryer.

Japan, N. India.

79. EUMETA MINUSCULA.

Eumeta minuscula, Butl. Trans. Ent. Soc. 1881, p. 22.

I bred an example of this species at Nagasaki in May.

Yokohama (*Pryer*); Nagasaki (*Leech*).

80. EUMETA PRYERI, Moore, MS.

Nearly allied to *E. wardii* from South India, but has a broader fore wing and less produced apex to the hind wing; it is also of a more uniformly darker cupreous brown colour than any of the other species.

Expanse $1\frac{1}{8}$ inch.

Shanghai (*Pryer*). In coll. W. B. Pryer and F. Moore.

The description has been kindly communicated by Mr. Moore. There were two examples in H. Pryer's collection.

81. SYSTROPHA NIVOSA.

Systropha nivosa, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 353 (1879).

Five specimens in coll. Pryer, and one example taken by myself at Gensan in July.

Yokohama (*Pryer*); Gensan (*Leech*).

82. AGRISIUS JAPONICUS, sp. n. (Plate XXX. fig. 10.)

Allied to *A. guttivitta*, Walk., from India, but of an obscure greyish colour, and without the central series of spots of that species. Near the base there are twelve black spots arranged in four oblique rows, the last two extending only from the costa to the median nerve; then comes a clear space bounded by a curved series of black dots, which divide the wing into two equal portions, the outer portion has black nervules. Abdomen grey, with a dorsal and lateral series of round black spots.

Expanse 52 millim.

83. ŒONISTIS NIGRICOSTA, sp. n. (Plate XXX. fig. 11.)

♂. Primaries grey; basal, inner and outer marginal areas yellowish; costa with a bluish-black streak from base tapering to apex: secondaries pale buff, slightly darker towards margins, and with a short, longitudinal, black bar just above the centre of wing. Under surface yellowish; primaries clouded with fuscous towards costa and outer angle, and rather darker in discal cell; secondaries with some fuscous scales along anterior margin. Head black. Thorax orange. Abdomen dull orange.

Expanse 36 millim.

Allied to *Œ. quadra*, but the black costal streak on primaries and black bar on secondaries separate it at once from that species.

One example, coll. Pryer.

84. ŒONISTIS QUADRA.

Phal.-Noctua quadra, Linn. Syst. Nat. ed. xii. p. 840; Walk. Cat. Lep. Het. ii. p. 496.

Œonistis dives, Butl. Ann. & Mag. Nat. Hist. (4) xx. p. 398 (1877); Ill. Typ. Lep. Het. pt. ii. pl. xxii. fig. 11 (1878).

Japanese specimens are not separable from European examples of *Œ. quadra* by any character whatever.

Yokohama (*Pryer*); Gensan (*Leech*).

85. Lithosia cribrata.

Lithosia cribrata, Staud., Rom. Mém. sur Lép. p. 189, pl. x. fig. 11 (1887).

One example, coll. Pryer (no. 114).

Nikko (*Pryer*); Askold.

86. Lithosia muscerda.

Phalæna muscerda, Hufn.; Walk. Cat. Lep. Het. ii. p. 504.

Lithosia muscerda, Ochs. Schmett. iii. p. 143. 11.

Several specimens, coll. Pryer. I took an example at Ningpo in April.

Nikko, Yesso, Oiwake (*Pryer*); Corea (*Herz*); Ningpo (*Leech*).

87. Lithosia griseola.

Bombyx griseola, Hübn. Bomb. p. 126, pl. 23. fig. 97; Walk. Cat. ii. p. 497.

Lithosia adaucta, Butl. Ann. & Mag. Nat. Hist. (4) xx. p. 398 (1877); Ill. Typ. Lep. Het. pt. ii. p. 6, pl. xxiii. fig. 6 (1878).

Lithosia ægrota, Butl. Ann. & Mag. Nat. Hist. (4) xx. p. 397.

Collita ægrota, Butl. Ill. Typ. Lep. Het. pt. iii. pl. xlii. fig. 13.

Among English representatives of *L. griseola* there are several specimens in my collection with secondaries of a "creamy straminеous" colour, whilst among the Japanese examples of *adaucta*, Butl., are one or two individuals with dark grey secondaries. As regards size, some of my English *L. griseola* measure 1 inch 7 lines, whereas there are four specimens of *L. adaucta* which do not exceed 1 inch 3 lines. I cannot separate *L. adaucta* or *L. ægrota*, Butl., from *L. griseola*, Hübn.

Nikko, Yesso, Oiwake (*Pryer*); Hakodate, Tsuruga, Gensan (*Leech*); Corea (*Herz*).

88. Lithosia unita.

Bombyx unita, Hübn.

Var. *arideola*, Herr.-Sch., Rom. Mém. sur Lép. p. 331.

Recorded by Dr. Fixsen as occurring in Corea.

89. Lithosia aprica.

Katha aprica, Butl. Cist. Ent. iii. p. 115.

Superficially allied to *L. sororcula*, Hufn.

Ohoyama, Yesso (*Pryer*).

90. Lithosia debilis.

Lithosia debilis, Staud., Rom. Mém. sur Lép. p. 190, pl. x. fig. 12.

Fixsen gives Corea as a locality for this insect (*op. cit.* p. 331).

91. LITHOSIA JAPONICA, sp. n. (Plate XXX. fig. 12.)

Smoky grey, secondaries slightly paler; primaries with a pale yellowish streak from base to middle of costa. Under surface of all wings smoky; costal streak on primaries extending to apex. Head yellowish. Thorax and abdomen fuscous.

Expanse, ♂ 26 millim., ♀ 30 millim.

Two examples, coll. Pryer.

92. LITHOSIA IMMACULATA.

Lithosia immaculata, Butl. Proc. Zool. Soc. 1880, p. 671.

I obtained two examples at Nagasaki in June, and there were two specimens in Pryer's collection.

Nagasaki (*Leech*).

93. LITHOSIA AFFINEOLA.

Lithosia affineola, Brem. Lep. Ost-Sib. p. 97, pl. viii. fig. 5 (1864).

One example, Gensan, July, and one, Hakodate, August.

Gensan, Hakodate (*Leech*).

94. LITHOSIA COREANA, sp. n. (Plate XXX. fig. 13.)

♂. Primaries yellowish grey, costal streak pale yellow, running through to the fringe; secondaries also yellowish grey, shading into yellow towards the inner margin. Under surface—primaries same as above, but slightly darker; secondaries yellow; costal area darker fuscous, edged with pale yellowish. Head yellow; thorax grey; abdomen and legs brownish.

Expanse 27 millim.

Allied to *L. affineola*, Brem.

I took one example at Gensan in June.

95. LITHOSIA VETUSTA.

Lithosia vetusta, Walk. Cat. Lep. Het. iii. p. 508 (1854).

One example taken by myself at Gensan in July, and another by Mr. Smith at Hakone, August.

Hakone (*Smith*); Gensan (*Leech*).

96. LITHOSIA DEPLANA.

Noctua deplana, Esp. Schmetterl. iv. p. 97, t. 93. figs. 1 ♂, 2 ♀.
Noctua depressa, Esp. iv. t. 93. fig. 3 ♀.
Lithosia helveola, Ochs. Schmett. Eur. iii. p. 133.
Bombyx ochreola, Hübn. Bomb. pl. xxiii. fig. 96.
Lithosia pavescens, Butl. Ann. & Mag. Nat. Hist. (4) xx. p. 398 (1877); Ill. Typ. Lep. Het. pt. ii. p. 7, pl. xxiii. fig. 5 (1878).
Lithosia lævis, Butl. Ann. & Mag. Nat. Hist. (4) xx. p. 393; Ill. Typ. Lep. Het. pl. xxii. fig. 12.

I obtained this species at Hakodate in August. Several examples, coll. Pryer.

Hakodate (*Leech*); Oiwake, Nikko (*Pryer*).

97. GHORIA COLLITOIDES.

Ghoria collitoides, Butl. Cist. Ent. vol. iii. p. 115.

A series in coll. Pryer.

This insect is near to *Lithosia gigantea*, Oberth., from Isle of Askold, but it has a black head, and the costal streak is not continued to apex of primaries.

Nikko, Oiwake (*Pryer*).

98. STIGMATOPHORA FLAVA.

Setina flava, Brem. & Grey, Schmett. Nörd. China's, p. 14 (1853); Lep. Ost-Sib. pl. viii. fig. 6.

Setina ochracea, Lederer, Verh. zool.-bot. Ver. Wien, 1855, p. 105, t. i. fig. 4 (Sibir.).

Setina sinensis, Walk. Cat. Lep. Het. ii. p. 520.

I took this species in two localities in Japan, and there wer several specimens in Pryer's collection.

Hakodate, Sakata, Gensan (*Leech*); Ningpo, N. China, Amur.

99. STIGMATOPHORA MICANS.

Setina micans, Brem. & Grey, Schmett. N. China's, p. 9 (1853).

I took a good series at Gensan in July, and one at Fusan in June.

Corea (*Herz*); Fusan, Gensan (*Leech*); N. China.

100. MELANÆMA VENATA.

Melanæma venata, Butl. A. M. N. H. (4) xx. p. 397 (1877); Ill. Typ. Lep. Het. pt. ii. p. 6, pl. xxii. fig. 5 (1878).

Appears to be fairly constant in colour and markings.

Yokohama (*Jones*, *Pryer*, and *Manley*); Oiwake (*Pryer*).

101. MILTOCHRISTA PULCHRA.

♀. *Miltochrista pulchra*, Butl. A. M. N. H. (4) xx. p. 396 (1877); Ill. Typ. Lep. Het. pt. ii. p. 5, pl. xxii. fig. 6.

♂. *Miltochrista mactans*, Butl. Trans. Ent. Soc. 1877, p. 340; Ill. Typ. Lep. Het. pt. v. p. 39, pl. lxxxv. fig. 13 (1881).

Butler's *M. pulchra* and his *M. mactans* are not two species, but sexes of the same species.

In the description of *M. pulchra* reference is made to four series of black dots; the first and third series are said to be well defined and arched, and the fourth composed of small linear dashes. No direct mention, however, is made of the second series; neither is there any indication of four series of black dots in the figure of this insect. On the other hand, three distinct lines of black spots are found across the discal area of the figure representing *M. mactans*, and in the description of that insect reference is made to a series of longitudinal streaks exterior to the third line. These streaks of *M. mactans* and the small linear dashes occupying a similar position in *M. pulchra*, forming the fourth series of dots in that insect, are simply modifications of a marking which in its entirety is a character sometimes found in one sex, and when interrupted or broken up an occasional feature of the

other sex of a species which, as it is the prior name, should be known as *M. pulchra*. In my series of this *Miltochrista* from Japan and the Corea are specimens showing every gradation in the length of the longitudinal streaks. The second line or series of black dots is clearly defined in all the examples of both sexes, and, with but few exceptions, this runs in a straight line from costa to inner margin.

Yesso, Yokohama (*Pryer*); Gensan (*Leech*); Ningpo, Hakodate; Corea (*Herz*).

102. MILTOCHRISTA STRIATA.

Lithosia striata, Brem. & Grey, Beitr. zur Schmett. Nörd. China's, p. 14.

An extensive series from Japan and Corea showing considerable variation, especially in the character of the transverse marking nearest outer margin of male primaries; often this is simply a series of grey linear spots, but in some examples the spots are elongated into dashes or streaks, and in other specimens again these are confluent, and form a broad transverse grey band slightly interrupted here and there by rose-coloured streaks. In some female examples there are but the faintest traces of rose-coloured streaks, and the grey spots and streaks are very indistinct.

Yokohama, Oiwake (*Pryer*); Gensan (*Leech*); Hakodate; Ningpo, North China.

103. MILTOCHRISTA MINIATA.

Geometra miniata, Forst. Nov. Spec. Ins. p. 75 (1771).

Bombyx rosea, Fabr. S. E. p. 587 (1775); Esp. 77, 1–3.

Noctua rubicunda, Schiff. S. V. p. 68 (1776); Hübn. Bombyces, pl. xxvi. fig. 111.

Miltochrista rosaria, Butl. Ann. & Mag. Nat. Hist. (4) xx. p. 397 (1877); Ill. Typ. Lep. Het. ii. p. 6, pl. xxii. fig. 8 (1878).

A specimen in Satsuma in May, one at Nagasaki in June, another at Nagahama in July, and two at Gensan in the same month. There was a long series in coll. Pryer.

Comparing these specimens with others from Europe, I cannot find any trustworthy point of difference between them.

Yokohama (*Jonas* and *Pryer*); Yesso, Oiwake (*Pryer*); Satsuma, Nagasaki, Nagahama, Gensan (*Leech*); Hakone (*Smith*).

104. MILTOCHRISTA INSCRIPTA.

♀. *Sesapa inscripta*, Walk. Cat. Lep. Het. ii. p. 547 (1854).

Miltochrista inscripta, Butl. Ill. Typ. Lep. Het. pt. iii. p. 7, pl. xlii. fig. 11 (1879).

One example from Gensan. It is also recorded from Corea by Dr. Fixsen in the paper previously referred to.

Gensan (*Native Coll.*); Foochau (*Leech*).

105. MILTOCHRISTA RHODOPHILA.

Barsine rhodophila, Walk. Cat. Lep. Het. Suppl. i. p. 254 (1864).

Miltochrista rhodophila, Butl. Ill. Typ. Lep. Het. pt. iii. p. 8, pl. xlii. fig. 12 (1879).

Miltochrista torrens, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 353.

I took specimens at Gensan (July), Fusan (June), and Shimonoseki (July).

Yokohama, Yesso (*Pryer*); Fusan, Gensan, Shimonoseki (*Leech*); Shanghai, Mongolia.

106. MILTOCHRISTA ABERRANS.

Miltochrista aberrans, Butl. Ann. & Mag. Nat. Hist. (4) xx. p. 397 (1877); Ill. Typ. Lep. Het. pt. ii. p. 5, pl. xxii. fig. 7.

Miltochrista bivittata, Butl. Cist. Ent. vol. iii. p. 116.

Though superficially resembling *M. miniata*, this species is at once separated therefrom by the very different angulation of the blackish discal line.

Yokohama (*Jonas* and *Pryer*).

107. MILTOCHRISTA CALAMINA.

Miltochrista calamina, Butl. Ann. & Mag. Nat. Hist. (4) xx. p. 396 (1877); Ill. Typ. Lep. Het. pt. ii. p. 6, pl. xxii. fig. 10 (1878).

Taken at Nagasaki in June, Nagahama and Fushiki in July, and Hakodate in August. Several specimens, coll. Pryer.

In colour this species is very similar to the yellow form of *M. miniata*, which I believe is not uncommon in Germany and some other parts of Europe, but the angulation of the discal line is different. With the exception of the discal spot, the female is almost without marking.

Yokohama (*Jonas* and *Pryer*); Oiwake (*Pryer*); Nagahama, Fushiki, Hakodate, Nagasaki (*Leech*).

108. MILTOCHRISTA BUTLERI, sp. n. (Plate XXX. fig. 14.)

♂. Primaries buff-yellow, with a black discal spot and two series of black dots arranged in irregular lines, one towards the base and the other before outer margin. Secondaries pale yellowish grey. Head and thorax buff-yellow, abdomen pale brown. Under surface: central area of primaries pale fuscous bordered with darker; apices and outer margin buff-yellow; secondaries pale yellow. ♀ similar to the ♂, but the markings of underside less distinct.

Expanse, ♂ 24 millim., ♀ 26 millim.

I took a specimen of each sex at Nagasaki in June, and there was a male example in Pryer's collection, but this was not localized.

Nagasaki (*Leech*); Japan (*Pryer*).

109. MILTOCHRISTA PALLIDA.

Calligenia pallida, Brem. Lep. Ost-Sib. p. 97, pl. viii. fig. 7.

I took examples at Fusan and Gensan in July, also at Ningpo and Foochau in April.

Fusan and Gensan (*Leech*); Corea (*Herz*); Ningpo, Foochau (*Leech*).

110. Miltochrista artaxidia.

Miltochrista artaxidia, Butl. Trans. Ent. Soc. 1881, p. 8.

Nudaria nubilosa, Staud., Rom. Mém. sur Lép. p. 186, pl. x. fig. 10 (1887).

I took two specimens at Gensan in July. *N. nubilosa*, Staud., from Vladivostok, is exactly identical with *M. artaxidia*, Butl., with which Dr. Staudinger was evidently unacquainted, or he would have at least referred to it.

Tokio (*Fenton*); Ohoyama (*Pryer*); Gensan (*Leech*); Vladivostok.

111. Bizone hamata.

Bizone hamata, Walk. Cat. Lep. Het. ii. p. 549 (1854).

Bizone puella, Drury, *teste* Fixsen in Rom. Mém. sur Lép. p. 332.

Several specimens in coll. Pryer. There appears to be considerable variation, one of the examples has orange transverse lines and two others have the secondaries white instead of pink.

B. puella, Drury, is recorded from Nepaul and Java.

Yokohama, Oiwake (*Pryer*); Satsuma (*Leech*); Kiukiang (*Pratt*); North China.

112. Cyane decipiens.

Cyane decipiens, Butl. Ann. & Mag. Nat. Hist. ser 5, vol. iv. p. 352 (1879).

Japan (*Pryer*).

113. Paida obtrita.

Paida obtrita, Staud., Rom. Mém. sur Lép. iii. p. 183, pl. x. fig. 8.

Nine specimens, coll. Pryer (no. 99).

Japanese examples are darker than the Amur specimens figured by Staudinger, and both appear to be referable to *P. obtusa*, H.-S.

Yokohama (*Pryer*); Amur (*Herz*).

114. Eugoa? obscura, sp. n. (Plate XXX. fig. 15.)

Primaries greyish white, with four transverse waved brownish lines, a brownish cloud in central area and a smaller one at base of inner margin; the basal line has its lower half bordered with blackish, and this is crossed with a longitudinal blackish streak, thus giving a T-shaped mark; a black dot precedes the submarginal line. Secondaries fuscous. Head, thorax, and abdomen greyish. Under surface: primaries fuscous, secondaries paler.

Expanse 20 millim.

One example, coll. Pryer.

115. Eugoa grisea.

Eugoa grisea, Butl. Ann. & Mag. Nat. Hist. (4) xx. p. 399 (1877); Ill. Typ. Lep. Het. pt. ii. p. 8, pl. xxiii. fig. 1 (1878).

I took a specimen at Gensan in July.

Yokohama (*Jonas, Manley*); Gensan (*Leech*).

116. Æmene minuta.

Æmene minuta, Butl. Trans. Ent. Soc. 1881, p. 595.

Pryer says "found on fig-tree leaves": there were four examples in his collection, but these were without locality labels.

Yokohama (*Pryer*).

117. Æmene fasciata.

Æmene fasciata, Butl. Ann. & Mag. Nat. Hist. (4) xx. p. 399 (1877); Ill. Typ. Lep. Het. pt. ii. p. 7, pl. xxii. fig. 9 (1878).

I took an example in August at Hakodate.

Yokohama (*Jonas*); Nikko, Oiwake (*Pryer*); Hakodate (*Leech*).

118. Æmene tæniata.

Æmene tæniata, Fixsen, Rom. Mém. sur Lép. iii. p. 307, pl. xv. fig. 6.

Corea (*Herz*).

119. Siccia maculata, sp. n. (Plate XXX. fig. 16.)

Primaries pale olive-brown, with nine black spots, three of which are placed at regular intervals on the costa, three on the outer border, two towards inner margin, and one in the central area; secondaries greyish brown, semitransparent towards base. Head, thorax, abdomen, and legs olivaceous. Under surface—primaries fuscous grey, with the spots of upper surface faintly reproduced; secondaries pale grey, with a fuscous spot on central area.

Expanse 20 millim.

Allied to but easily distinguished from *S. caffra*, Wallengren.

One example taken by myself in Satsuma in May.

Satsuma, Japan (*Leech*).

120. Nudaria senex.

Bombyx senex, Hübn. Bomb. pl. 55. figs. 236–7.

?=*Nudaria muscula*, Staud., Rom. Mém. s. Lép. iii. p. 185, pl. x. fig. 9 (1887).

Four ♂ and three ♀ specimens in coll. Pryer. I cannot see any differences between Japanese and British examples of *N. senex*.

Oiwake (*Pryer*).

121. Nudaria mundana.

Tortrix mundana, Linn. F. S. p. 349.

Bombyx nuda, Hübn. Bomb. pl. 17. figs. 63, 64; *hemerobia*, Hübn. *l. c.* fig. 65.

Two examples, coll. Pryer.

Gifu, Yesso (*Pryer*).

122. Earias chromataria.

Earias? chromataria, Walk. Cat. Lep. Het. xxvii. p. 204 (1863).

Earias limbana, Snellen, Tijdschr. Ent. xxii. p. 97, pl. viii. fig. 2.

A specimen I took at Gensan has the reddish discal markings very

inconspicuous, but agrees in all other respects with examples from Yokohama in Pryer's collection. This is Snellen's *limbaria*.

Yokohama (*Pryer*); Gensan (*Leech*); N. Ceylon, India; Shanghai.

123. EARIAS ROSEIFERA.

Earias roseifera, Butl. Trans. Ent. Soc. 1881, p. 18.

Several specimens, coll. Pryer (nos. 62 and 63).

Varies in the intensity of pinkish suffusion on disk of primaries; this, in one example, occupies the whole central area, in other specimens it is represented by a mere spot, whilst in others again it is quite absent.

Tokio (*Fenton*); Yokohama, Gifu (*Pryer*).

124. EARIAS PUDICANA.

Earias pudicana, Staud., Rom. Mém. Lép. iii. p. 174, pl. viii. fig. 10 (1887).

One example at Tsuruga in July. Two specimens, coll. Pryer.

The fringes of primaries are reddish brown, and the basal half of costal border is sometimes pinkish, but in other respects this species is very suggestive of *E. chlorana*, Linn.

Yokohama (*Pryer*); Tsuruga, Ningpo (*Leech*); Amur.

125. CHIONOMERA ARGENTEA.

Chionomera argentea, Butl. Trans. Ent. Soc. 1881, p. 18.

"Nearly allied to *C. superba*."

One specimen from the isle of Kiushiu (*Nat. Coll.*).

Yokohama (*Pryer*); Tokio (*Fenton*); Fusiyama (*Maries*).

126. GELASTOCERA EXUSTA.

Gelastocera exusta, Butl. Ill. Typ. Lep. Het. pt. ii. p. 13, pl. xxiv. fig. 2 (1878).

Earias ochroleucana, Staud., Rom. Mém. Lép. iii. p. 176, pl. viii. fig. 11 (1887).

Three examples at Gensan, June and July. There were five specimens in Pryer's collection, two of which were labelled no. 746 (*Miana*? sp.); these would be from Yokohama, and there is one from Oiwake, but the others are not localized.

The Gensan specimens are much paler than those from Japan, but have more pink in the colour of primaries than the Amur example figured by Staudinger; the characters of marking are identical in all the specimens, and the difference is one of tint only.

Oiwake, Yokohama (*Pryer*); Hakodate (*Whitely*); Gensan (*Leech*); Amur.

127. HYLOPHILA PRASINANA.

Tortrix prasinana, Linn. Faun. Sv. p. 342 (1761).

Hylophila sylpha, Butl. Ill. Typ. Lep. Het. pt. iii. p. 10, pl. xliii. fig. 10 (1879).

In European, even British, examples of *H. prasinana* it is no un-

common thing for the costa and inner margin to be sulphur-yellow, and specimens with red-spotted white fringes are of not unfrequent occurrence to the collector of British Lepidoptera; whilst among my series of Japanese *prasinana* are specimens with the costa, inner margin, and fringes as rosy as in any European example I have yet seen. *H. sylpha*, Butl., cannot stand except perhaps as a varietal name.

Yokohama (*Jonas* and *Pryer*); Oiwake (*Pryer*).

128. SARROTHRIPA UNDULANA.

Tortrix undulana, Hübn. Tortr. fig. 7 (1796).
Penthina revayana, Tr. Schmetterl. viii. p. 22.
Var. *russiana*, Dup. Cat. p. 284.

Four specimens in Pryer's collection, all of the ashy-grey form known as *russiana*, Dup.

Yokohama, Oiwake (*Pryer*).

129. NOLA MICROPHASMA.

Nola microphasma, Butl. Cist. Ent. vol. iii. p. 117.

Two specimens, coll. Pryer (no. 86).
Yokohama (*Pryer*).

130. NOLA MINUTALIS, sp. n. (Plate XXX. fig. 17.)

Primaries white, with curved basal, angulated central and submarginal brownish-grey lines; the outer margin is pale chocolate-brown, and is traversed throughout its length by a white wavy line. Secondaries pale greyish brown with a faint discal spot. Head, thorax, and abdomen white, the latter tinged with brownish. Under surface of primaries fuscous; secondaries whitish, with distinct black discal spot.

Expanse 15 millim.

Closely allied to *P. chlamitulalis*, Hübn., but in that species there is no white wavy line in hind marginal border.

An example of each sex in Pryer's collection; the female is not quite equal in condition to the male; but there does not appear to be any difference in the markings.

131. NOLA CANDIDA.

Nola candida, Butl. Ill. Typ. Lep. Het. pt. iii. p. 9, pl. xliii. fig. 3 (1879).

A good series, coll. Pryer.
Yokohama (*Jonas*); Fujisan (*Pryer*); Ningpo in April (*Leech*).

132. NOLA CENTONALIS.

Pyralis centonalis, Hübn. Pyral. pl. 3. fig. 15.
Glaphyra atomosa, Brem. Bull. de l'Acad. Pétersb. 1861, tom. iii.; Lep. Ost-Sib. p. 55, tab. v. fig. 16.

A number of specimens, several of which were taken by myself in the Corea in June, and one at Hakodate in August; others are from coll. Pryer. With the exception of the Hakodate example,

which has the central area of primaries dark, all are of the pale form with ochreous-brown lines, not infrequent among English specimens of this species.

Fujisan, Oiwake (*Pryer*); Hakodate, Fusan, Gensan (*Leech*).

133. NOLA ALBULALIS.

Pyralis albulalis, Hübn. Pyral. pl. 3. fig. 14.

One example in Satsuma in May and one at Gensan in June. There was but one specimen in Pryer's collection; this is from Oiwake, and has more brown on the primaries than either of the other two specimens.

A form of this species occurring in Corea has been named *mandschurica*, Oberth. (Rom. Mém. sur Lép. iii. p. 327).

Oiwake (*Pryer*); Satsuma, Gensan (*Leech*).

134. NOLA CONFUSALIS.

Roeselia confusalis, Herr.-Schäff. ii. p. 164.

Roeselia cristulalis, Dup. Hist. Nat. Lep. viii. p.227. 6, 7.

This is no. 94 of Pryer's catalogue, and there were two examples in his collection. These are typical *N. confusalis*.

Yokohama, Oiwake (*Pryer*).

135. NOLA COSTIMACULA.

Nola costimacula, Staud., Rom. Mém. Lép. iii. p. 182, pl. x. fig. 6 (1887).

One example in Pryer's collection without locality.

Japan, Amur.

136. NOLA FUMOSA.

Nola fumosa, Butl. Ill. Typ. Lep. Het. pt. iii. p. 9, pl. xliii. fig. 2 (1879).

Nola strigulosa, Staud., Rom. Mém. Lép. iii. p. 180, pl. x. fig. 4 (1887).

After seeing Pryer's series of *N. fumosa*, I have no doubt that *strigulosa*, Staud., is referable to this species, as in the series referred to there are examples which agree exactly with the figure of *strigulosa*, others with the type of *fumosa*, Butl., in the National Collection, whilst other examples link the two together.

Yokohama (*Jonas* and *Pryer*); Fushiki (*Leech*); Corea, Amur.

137. NOLA GIGAS.

Nola gigas, Butl. Ann. & Mag. Nat. Hist. (5) xiii. p. 274.

Four examples, coll. Pryer.

Yesso (*Pryer*).

138. NOLA TRIANGULALIS, sp. n. (Plate XXXI. fig. 12.)

♂. Primaries ashy grey, brownish along the costa; the centre of the wing is occupied by a triangular brownish patch, the outer portion of which is traversed by a serrated blackish line and bounded by

another blackish line elbowed in the middle; submarginal line blackish and much indented. Secondaries fuscous-grey. Head chocolate; thorax and abdomen dark brown; tegulæ brown, tipped with white. Under surface—primaries chocolate; secondaries whitish with a black discal spot and thickly sprinkled with blackish scales.

Expanse 28 millim.

Allied to *N. gigas*, Butl., but may at once be distinguished therefrom by the different character of marking.

One specimen, which I took in Satsuma in May.

139. NOLA LEODURA.

Nola leodura, Staud., Rom. Mém. Lép. iii. p. 178, pl. x. fig. 2 (1887).

Five specimens in Pryer's collection agreeing exactly with Staudinger's figure of this species.

Oiwake (*Pryer*); Amur.

140. NOLA MANDSCHURIANA.

Erastria mandschuriana, Oberth. Etud. d'Entom. v. p. 83, pl. ii. fig. 9 (1880).

Two specimens, coll. Pryer. These are identical with an example in the National Collection at South Kensington, labelled *Mimærastria mandschuriana*.

Japan (*Pryer*); isle of Askold.

141. HETEROGENEA UNCULA.

Heterogenea uncula, Staud., Rom. Mém. Lép. iii. p. 197, pl. xi. fig. 9 (1887).

Five examples, coll. Pryer (nos. 66, 67).

Yokohama, Oiwake, Yesso (*Pryer*); Amur.

142. HETEROGENEA FULGENS, sp. n. (Plate XXX. fig. 18.)

♂. Densely scaled, giving the insect a very silky appearance. Pale straw-colour, whitish towards costa, with some irregular pale sienna-coloured markings on disk, and a row of minute black dots on outer margin of primaries; fringes of all the wings shining. Under surface—primaries pale orange, narrowly bordered with silvery white; central area of secondaries whitish, with a greenish reflection; margins and fringes silvery white.

Expanse, ♂ 20 millim., ♀ 22 millim.

Two specimens (♀) taken by myself at Gensan in July, and a ♂ taken by my native collector at Ningpo also in July.

Gensan (*Leech*); Ningpo.

143. PHRIXOLEPIA SERICEA.

Phrixolepia sericea, Butl. Ann. & Mag. Nat. Hist. (4) xx. p. 476 (1877); Ill. Typ. Lep. Het. pt. iii. p. 11, pl. xliii. fig. 6 (1879).

Limacodes castaneus, Oberth. Etud. d'Entom. v. p. 41, pl. i. fig. 11 (1880).

One example at Nagasaki in June. Several specimens, coll. Pryer.

The species seems to be fairly constant in colour and marking; but ranges from 22 millim. to 30 millim. in expanse.

Yokohama (*Jonas* and *Pryer*); Oiwake, Yesso (*Pryer*); Nagasaki (*Leech*).

144. MICROLEON LONGIPALPIS.

Microleon longipalpis, Butl. Cist. Ent. vol. iii. p. 121 (1885).

Three specimens, Satsuma, May, and several coll. Pryer. This is Pryer's no. 60, and was considered by him to differ only from *Phrixolepia sericea*, Butl., in being smaller; it is, however, not closely allied to that species, and the only point of resemblance between the two insects is a somewhat similar coloration.

Yokohama (*Pryer*); Satsuma, Fusan (*Leech*).

145. APHENDALA SERICEA.

Aphendala sericea, Butl. Trans. Ent. Soc. 1881, p. 595.

Hakodate (*Andrews*); Tokio (*Fenton*).

146. PARASA HILARIS.

Limacodes hilaris, Westw. Cab. Orient. Ent. p. 50, pl. xxiv. fig. 3 (1848).

Parasa sinica, Moore, Ann. & Mag. Nat. Hist. (4) xx. p. 93 (1877).

Heterogenea hilarula, Staud., Rom. Mém. Lép. iii. p. 197 (1887).

Heterogenea hilarata, Staud. *l. c.* p. 198.

One female example, Hakodate, August, and two males and one female, Gensan, July. Several specimens, coll. Pryer.

Yokohama (*Pryer*); Hakodate, Gensan (*Leech*); Corea.

147. PARASA CONSOCIA.

Parasa consocia, Walk. Cat. Lep. Het. Suppl. ii. p. 484 (1865).

Heterogenea princeps, Staud., Rom. Mém. Lép. iii. p. 199 (1887).

Neaera princeps, Staud. *l. c.* pl. xv. fig. 7.

Two specimens at Gensan in July. These agree with figure of *N. princeps*, Staud., from Amur.

Gensan (*Leech*); Corea, Ussuri.

148. MONEMA FLAVESCENS.

Monema flavescens, Walk. Cat. Lep. Het. v. p. 1112 (1855); Butl. Ill. Typ. Lep. Het. pt. ii. p. 14, pl. xxv. fig. 5 (1878).

My native collector took a fine series of this species at Hakodate in June and July, and I took three specimens at Gensan in July. Four specimens, coll. Pryer.

Pryer, in his catalogue, says of this species:—"Feeds on the Celtis and elm; forms an oval, very hard and smooth cocoon, mottled with white and brown, very much resembling a bird's egg; the larva spins up in the autumn, but does not change to pupa until the spring" (p. 41).

Yokohama (*Jonas* and *Pryer*); Gensan (*Leech*); Hakodate, N. China, Corea, Amur.

149. MIRESA INORNATA.

♀. *Miresa inornata*, Walk. Cat. Lep. Het. v. p. 1125 (1855); ♂, Cist. Ent. vol. iii. p. 120.

Heterogenea flavidorsalis, Staud., Rom. Mém. Lép. iii. p. 195, pl. xi. fig. 7 (1887).

Heterogenea flavidorsalis, var. *fuscicostalis*, Fixsen, *op. cit.* p. 337, pl. xv. fig. 10.

Two examples, coll. Pryer, and one taken by native collector at Hakodate in June or July. The two in Pryer's collection are labelled "56. *Limacodes*? sp.," as also was another specimen with them, but this last is not of the same species. Pryer says that the larva feeds on pear.

Fixsen records variety *fuscicostalis* from Corea.

Yokohama, Yamato (*Pryer*); Corea, Bengal.

150. MIRESA CONJUNCTA.

Limacodes? *conjuncta*, Walk. Cat. Lep. Het. v. p. 1150 (1885).

Heterogenea conjuncta, Walk., Rom. Mém. Lép. iii. p. 338, pl. xv. fig. 9 (1887).

Two specimens, Gensan, July.

This insect is very closely allied to *M. dentatus*, Oberth.

North China; Gensan (*Leech*).

151. ANZABE SINENSIS.

Anzabe sinensis, Walk. Cat. Lep. Het. v. p. 1093 (1855).

One specimen at Gensan in July.

Gensan; Hongkong.

152. SCOPELODES URSINA.

Scopelodes ursina, Butl. Ill. Typ. Lep. Het. vi. p. 3, pl. ci. figs. 7 & 8 (1886).

I took a male example of this species at Tsuruga in July.

Darjeeling, Silhet; Tsuruga.

153. SETORA SINENSIS.

Tadema sinensis, Walk. Cat. Lep. Het. vii. p. 1759 (1856).

Pryer says that the larva feeds on pear.

Yokohama, Yamato (*Pryer*).

154. EPICOPEIA SIMULANS, sp. n. (Plate XXXI. fig. 1.)

Both sexes: all the wings smoky black; secondaries with a broad short tail, about the centre of the outer margin is a crimson spot; there are also four crimson spots between the tail and anal angle; head, thorax, and abdomen black, the latter with a crimson streak along each side; legs black, with the exception of femora of anterior pair, which are crimson; under surface as above, but primaries paler towards the outer margins.

Expanse, ♂ ♀ 78 millim.

Hakodate (*Nat. Coll.*, June & July 1887); Hakone (*Pryer*).

Allied to *Epicopeia mencia*, Moore, P. Z. S. 1874, p. 578, pl. lxvii. fig. 8, from which it differs in having only one row of crimson spots on secondaries, no crimson marks on thorax, and less crimson on the abdomen; it has also differently shaped secondaries, shorter tails, and is a much smaller insect.

155. ELCYSMA TRANSLUCIDA.

Elcysma translucida, Butl. Trans. Ent. Soc. 1881, p. 4.

Three examples coll. Pryer, and one taken by a native collector at Gensan in August.

Chalcosia caudata, Brem., is very closelly allied, but appears to have shorter tails and the neuration is somewhat different.

Yokohama, Yoshino (*Pryer*); Gensan (*Nat. Coll.*), Aug.

156. PSYCHOSTROPHIA MELANARGIA.

Psychostrophia melanargia, Butl. Ann. & Mag. Nat. Hist. (4) xx. p. 401 (1877); Ill. Typ. Lep. Het. pt. ii. p. 9, pl. xxiii. fig. 7 (1878).

I took examples in July at Tsuruga. Pryer says that the species is an active day-flier.

Yokohama (*Jonas*); Nikko, Fujisan (*Pryer*); Tsuruga (*Leech*).

157. PTERODECTA GLORIOSA.

Pterodecta gloriosa, Butl. Ann. & Mag. Nat. Hist. (4) xx. p. 399 (1877); Ill. Typ. Lep. Het. pt. ii. p. 8, pl. xxiii. fig. 4 (1878).

Of frequent occurrence in mountainous districts in July.

Bremer's figure of *Callidula felderi* (Lep. Ost-Sib. tab. iv. fig. 3) agrees well with my Japanese specimens of *P. gloriosa*, but in the description of his insect Bremer says that it has an ochreous yellow fascia, whereas in *P. gloriosa* the fascia is, according to Butler, "brilliant scarlet." It may be that Bremer's type was a faded specimen.

Yokohama (*Jonas*); Fujisan, Yamato (*Pryer*); Nagahama, Tsuruga (*Leech*).

158. SCHISTOMITRA FUNERALIS.

Schistomitra funeralis, Butl. Trans. Ent. Soc. 1881, p. 4.

A nice series in Pryer's collection. The broad cream-coloured band on disk of primaries is sometimes completely divided by the black ground-colour into two spots, the smaller one nearest the costa being nearly round, and the larger one cuneiform. The initial spot of submarginal series is sometimes absent altogether.

Fusiyama, Nikko (*Maries*); Fujisan (*Pryer*).

159. LAURION REMOTA.

Eterusia remota, Walk. Cat. Lep. Het. ii. p. 431 (1854).

Laurion remota, Butl. Ill. Typ. Lep. Het. pt. ii. p. 9, pl. xxiii. fig. 10 (1878).

A long series, most of the specimens taken by myself at Gensan, July 1884. Mr. Butler gives the measurement of this species as

2 in. 2 lines, this is about equal to 55 mm. I find the males range from 48 mm. to 59 mm. in expanse; females from 56 mm. to 65 mm.: average 57 mm.

Yokohama (*Jonas* and *Pryer*); Tokio, Nikko (*Pryer* Fushiki, Tsuruga, Gensan (*Leech*); Corea (*Herz*).

160. PIDORUS GLAUCOPIS.

Callimorpha? glaucopis, Drury, Illustr. Exot. Entom. ii. p. 14, pl. 6. fig. 4 (1837).

Pidorus atratus, Butl. Ann. & Mag. Nat. Hist. (4) xx. p. 401 (1877); Ill. Typ. Lep. Het. pt. ii. p. 9, pl. xxiii. fig. 9 (1878).

Several specimens, coll. Pryer. Larva said to feed on "the Uria."

This species is extremely variable in size, and the width and outline of white fascia is also subject to much variation.

Hakodate, Yokohama (*Whitely* and *Jonas*); Tsuruga, Shimonoseki (*Leech*); Hakone, Gensan.

161. MIMEUSEMIA PERSIMILIS.

Mimeusemia persimilis, Butl. Ann. & Mag. Nat. Hist. (4) xv. p. 397 (1875); Ill. Typ. Lep. Het. pt. ii. p. 3, pl. xxii. fig. 2.

Several examples, coll. Pryer.

Hakodate (*Whitely*); Yesso, Oiwake (*Pryer*); Gensan (*Leech*); Corea (*Herz*).

162. ETERUSIA EUCHROMOIDES.

Eterusia euchromoides, Walk. Cat. Lep. Het. Supp. i. p. 120 (1864).

Three specimens of this beautiful insect taken at Gensan by my native collector in July 1887.

N. China (*Fortune*); Gensan (*Nat. Coll.*).

163. EUSEMIA JAPANA.

Chelonomorpha japana, Motsch. Et. Ent. p. 30 (1860).

Eusemia villicoides, Butl. Ann. & Mag. Nat. Hist. (4) xx. p. 141, pl. xiii. fig. 2 (1875).

This insect was common at Hakodate in June and July. It seems to be pretty constant in markings.

Nikko, Yesso, Nambu (*Pryer*); Hakodate (*Andrews*).

164. SEUDYRA NOCTUINA.

Seudyra noctuina, Butl. Ent. Mo. Mag. xiv. p. 206 (1878); Ill. Typ. Lep. Het. pt. ii. p. 3, pl. xxii. fig. 1.

Mr. Pryer in his catalogue says that this species "has a habit of buzzing about sugar." He seems to have considered it a Noctuid, and placed it among the Calpidæ.

Nikko, Oiwake, Yesso (*Pryer*); Hakodate (*Whitely* and *Leech*).

165. SEUDYRA SUBFLAVA.

Seudyra subflava, Moore, Ann. & Mag. Nat. Hist. (4) xx. p. 85.

I have a good series from Japan and one specimen from Corea. This last is somewhat darker in coloration.

Yokohama (*Pryer* and *Manley*); Gensan (*Leech*); Kiukiang (*Pratt*); Chekiang.

166. SEUDYRA VENUSTA, sp. n. (Plate XXXI. fig. 2.)

♂. Primaries whitish, much sprinkled with dark grey scales; reniform and orbicular spots dark grey; a broad parti-coloured patch along the inner margin, commencing near the base, this patch is deep chestnut-brown followed by a transverse band of grey bordered internally with white, and one of dark brown divided by a white line preceding a band of leaden grey edged with chestnut-brown. A large dark chestnut patch occupies the apical third, this has a round dark grey spot bordered externally with bluish grey nearly in its centre, and is bounded internally by a greyish dark-edged band, which starting from the costa curves gently towards the outer margin, then turning inwards until it reaches the internal patch through which it passes to the inner margin in a slightly oblique direction. Fringes grey, chequered with chocolate-brown towards apex. Secondaries yellow, with a well-defined black discal spot and a broad black marginal band indented on its internal edge and interrupted before the anal angle, where the isolated portion forms a large round spot. Fringes pale grey. Thorax grey. Abdomen slightly darker than secondaries, with some dark grey dorsal marks. Under surface of primaries whitish, broadly dashed with black along the inner margin, the white interrupting at anal angle; submarginal band black, its internal edge undulating and well defined, the discal spots of upper surface reproduced in black; secondaries yellow, fuscous along outer margin; blackish discal and anal spots. Fringes of all the wings pale grey.

Expanse 42 millim.

Allied to *S. longipennis*, Walk., from N. India, from which species it may be distinguished by its smaller size, whitish ground-colour of primaries, and different ornamentation of secondaries.

167. VITHORA STRATONICE.

Phalæna stratonice, Cram. Pap. Exot. iv. p. 234, pl. 398. fig. K.
Cystidia stratonice, Hübn. Verz. Schmett. p. 174 (1800).
Vithora agrionides, Butl. Ann. & Mag. Nat. Hist. (4) xv. p. 137 (1875); Ill. Typ. Lep. Het. pt. ii. p. 3, pl. xxii. fig. 3 (1878).

I met with this species at several places in Japan during the months of May, June, and July, also at Gensan in June.

There is some variation in the character of the black markings.

Hakodate (*Whitely*); Yokohama (*Jonas* and *Pryer*); Nagahama, Nagasaki, Satsuma, Gensan (*Leech*).

168. GAMPOLA NOCTIS.

Gampola noctis, Butl. Trans. Ent. Soc. 1881, p. 8.
Tokio (*Fenton*).

169. Deiopeia pulchella, Linn.

Four specimens in coll. Pryer. I did not meet with this species in Japan or the Corea.

Yokohama (*Pryer*).

170. Sinna extrema.

Sinna extrema, Walk. Cat. Lep. Het. ii. p. 573.
Teinopyga reticularis, Feld. Reise Nov. Lep. iv. pl. cvi. fig. 18.
Sinna fentoni, Butl. Trans. Ent. Soc. 1881, p. 8.
Sinna clara, Butl. *l. c.*

Five specimens at Hakodate in August, and several examples in Pryer's collection.

The entire series, comprising some fourteen specimens, exhibit a considerable degree of variation. There are forms identical with *clara* and *fentoni*, Butl., and others differing from those named forms and also from the type. There cannot be the least doubt but that all these forms are referable to one variable species.

Shanghai, N. China; Hakodate (*Leech*).

171. Camptoloma interiorata.

Numenes interiorata, Walk. Cat. Lep. Het. Suppl. i. p. 290 (1864).

Pryer says the larva is gregarious, "living under a tough silk web made on the bark of chestnut-trees, on the leaves of which it feeds" (Cat. Jap. Lep. p. 47).

Yokohama (*Pryer*); Shanghai.

172. Nemeophila plantaginis.

Phalæna-Bombyx plantaginis, Linn. Syst. Nat. xii. 2, p. 820, n. 42.
Nemeophila macromera, Butl. Trans. Ent. Soc. 1881, p. 5.
Var. *leucomera*, Butl. *l. c.* = *hospita*, Schiff.

A series of nine specimens (7 ♂, 2 ♀). Four of the males are the form *hospita*, Schiff., and type and variety agree with Amur specimens. Var. *melanomera*, Butl., corresponds with var. *matronalis*, Freyer, but I did not take this form in Japan or Corea.

Tokio (*Fenton*); Oiwake (*Pryer*); Altai; Amur; Europe.

173. Diacrisia irene.

Diacrisia irene, Butl. Trans. Ent. Soc. 1881, p. 6.

There is one example from Tokio in the National Collection at South Kensington, which appears to differ from *D. russula* only in the absence of markings on the wings. Perhaps this is only an uncommon form of *D. russula*?

Tokio (*Fenton*).

174. Diacrisia russula.

♀. *Phalæna-Bombyx russula*, Linn. Syst. Nat. x. p. 510.

♂. *Phalæna-Bombyx sannio*, Linn. Syst. Nat. x. p. 506.
Bombyx russula, Hübn. Bomb. pl. 29. figs. 124–5.

Examples of both sexes in Pryer's collection, and I took one at Gensan in July.

Nikko, Fujisan, Oiwake (*Pryer*) ; Gensan (*Leech*) ; Corea (*Herz*).

175. NEMEOPHILA METALKANA.

Nemeophila metalkana, Led. Wien. Monats. 1861, p. 152, t. 3. 12.
Chelonia flavida, Brem. Bull. de l'Acad. tom. iii. p. 861 ; Lep. Ost-Sib. p. 39, t. iv. fig. 4.

Several examples, coll. Pryer. I took a specimen at Gensan in June.

Three of the specimens in Pryer's series of this species were labelled *subvaria*, but this was most certainly an error. *D. subvaria* does not appear to occur in Japan.

Yesso (*Pryer*); Gensan (*Leech*) ; Corea (*Herz*).

176. RHYPARIOIDES SUBVARIA.

Diacrisia subvaria, Walk. Cat. Lep. Het. iii. p. 637 (1855); Butl. Ill. Typ. Lep. Het. pt. ii. p. 5, pl. xxiii. fig. 3 (1878).

Walker's type of this species was from N. China. There were no specimens of this species in Pryer's collection, neither did I meet with it in any part of Japan. Specimens labelled *subvaria* were in Pryer's collection, but these are *metalkana*, Led. I received a fine series of *R. subvaria* from a native collector at Ningpo, which agree perfectly with Mr. Butler's figure and description of that species.

There are no examples of this species from Japan in the National Collection, South Kensington.

? Hakodate (*Whitely*); ? Yokohama (*Jonas*); Ningpo, N. China, Hongkong.

177. RHYPARIOIDES RUBESCENS.

Spilosoma rubescens, Walk. Cat. Lep. Het. iii. p. 677 (1855).
Chelonia rubescens, var. *amurensis*, Brem. Lep. Ost-Sib. p. 39, tab. iii. fig. 16 (1864).
Rhyparioides nebulosa, Butl. Ann. & Mag. Nat. Hist. (4) xx. p. 396 (1877); Ill. Typ. Lep. Het. pt. ii. p. 5, pl. xxiii. fig. 2 (1878).

An exceedingly variable species occurring throughout Japan. I am not satisfied that *R. simplicior*, Butl. (Trans. Ent. Soc. 1881, p. 6), is anything more than a var. of this species.

Hakodate (*Whitely*); Yokohama (*Jonas, Pryer*); Hakone, Hakodate, Gensan (*Leech*); Tokio.

178. RHYPARIA PURPUREA.

Phalæna-Bombyx purpurea, Linn. Syst. Nat. xii. p. 828.
Bombyx purpurea, Hübn. Bomb. pl. 33. fig. 142.

Only two examples of this species, one of which I bred from a

larva obtained at Gensan, and the other was in a series of *R. amurensis* in Pryer's collection.

Oiwake (*Pryer*); Gensan (*Leech*); Amur; Europe.

179. EUPREPIA CAIA.

Phalæna-Bombyx caja, Linn. Syst. Nat. x. p. 500.

Euprepia phæosoma, Butl. Ann. & Mag. Nat. Hist. (4) xx. p. 395. n. 8 (1877); Ill. Typ. Lep. Het. pt. iii. p. 7, pl. xlii. fig. 10 (1879).

Euprepia phæosoma, var. *auripennis*, Butl. Trans. Ent. Soc. 1881, p. 7.

Six examples in Pryer's collection under the name of *A. caia*. I took a specimen in September 1886, at Sendai.

There appears to be no constant difference between these Japanese insects and more or less typical examples of *A. caia* from any part of Europe; but, curiously enough, not one of them agrees exactly with Butler's description of *E. phæosoma*, although I have specimens among my European series of *A. caia*, to which that description applies in every particular.

The number and also the size and shape of spots on secondaries are most unstable characters, and no more value attaches to them than to the excentricities of the mazy cream-coloured pattern on primaries.

Oiwake, Yesso (*Pryer*); Yokohama (*Jonas*); Nikko, Tokio (*B. M.*); Sendai (*Leech*); Corea (*Herz*).

180. HYPERCOMPA HISTRIO.

Hypercompa histrio, Walk. Cat. Lep. Het. iii. p. 654 (1855); Rom. Mém. Lép. t. iii. p. 333, pl. xv. fig. 2.

Two specimens I took at Gensan in July 1886 agree with an example I obtained at Ningpo in April of the same year.

Ningpo, Gensan (*Leech*); Shanghai.

181. ALPENUS FLAMMEOLUS.

Alpenus flammeolus, Moore, Ann. & Mag. Nat. Hist. (4) xx. p. 88.

Of this species, which has not been previously recorded from Japan, I took three specimens at Nagasaki in June, and one at Shimonoseki in July. There was also one example in Pryer's collection. All these are males; the only females I have are from China.

Nagasaki, Shimonoseki (*Leech*); Ningpo, Kiukiang.

182. THANATARCTIA INFERNALIS.

Thanatarctia infernalis, Butl. Ann. & Mag. Nat. Hist. (4) xx. p. 395 (1877); Ill. Typ. Lep. Het. pt. iii. p. 7, pl. xlii. fig. 9 (1879).

Four males: two coll. Pryer, one I took myself at Hakodate in August, and one I received from a native collector.

Nikko and Oiwake (*Pryer*); Hakodate.

183. Spilosoma fuliginosa.

Phalæna-Bombyx fuliginosa, Linn. Syst. Nat. xii. 2, p. 836.

Two examples, coll. Pryer.

Japan (*Pryer*).

184. Spilosoma luctifera.

Bombyx luctifera, Esp. Schmett. iii. pl. 43. figs. 1–5.

Atolmis japonica, Walk. Cat. Lep. Het. Suppl. i. p. 223 (1864).

Estigmene mœrens, Butl. Cist. Ent. vol. iii. p. 114 (1885).

I took an example at Nagasaki in June, and there were three specimens in Pryer's collection.

Yokohama, Nikko, Oiwake (*Pryer*); Nagasaki (*Leech*).

185. Spilosoma menthastri.

Bombyx menthastri, Fabr. Ent. Syst. iii. p. 452. 140.

Estigmene menthastri, Hübn. Verz. Schmett. p. 184.

Spilosoma punctarum, Cram. Pap. Exot. iv. p. 233, pl. 398. fig. D.

Spilosoma sangaica, Walk. Cat. Lep. Het. Suppl. i. p. 294.

An abundant species in Japan and Corea, varying greatly in the number and size of spots on the wings, also in colour of body, which ranges from pale yellow to vermilion. Further the ground-colour of primaries and thorax is buff instead of the normal white, agreeing in this respect with examples from the north of England.

Nagasaki, Tsuruga, Hakodate, Hakone (*Leech*); Yokohama (*Pryer*); Gensan, Ningpo, Shanghai; Amur; Europe.

186. Spilosoma seriatopunctata.

Arctia seriatopunctata, Motsch. Et. Ent. 1860, p. 31.

? *Arctia punctigera*, Motsch. *l. c.*

Spilarctia ione, Butl. Cist. Ent. ii. p. 41 (1875); Ill. Typ. Lep. Het. pt. iii. pl. xlii. fig. 6.

Arctia rosacea, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 352 (1879).

Spilarctia basilimbata, Butl. Trans. Ent. Soc. 1881, p. 6.

A very long series from various localities in Japan, the majority of the specimens from Hakodate. These were taken in June, July, and August. This appears to be a most variable species; some examples are hardly, if at all, different from *S. lubricepeda* of Europe, others agree with *rosacea*, Butl., others, again, are identical with *basilimbata*, Butl., and intermediates connect these forms one with the other.

Tokio (*Fenton*); Hakodate, Gensan (*Leech*); Yokohama (*Pryer* and *Manley*); Oiwake (*Pryer*).

187. Spilosoma bisecta, sp. n. (Plate XXXI. fig. 3.)

♀. Primaries buff-coloured, traversed by an interrupted line of spots from centre of inner margin to apex of wing; secondaries pale

buff, with a black discal spot and one or two smaller black spots near the outer margin and towards the anal angle. Thorax buff, bisected by a black line; body brilliant scarlet, except anal and basal extremities, which are buff; a row of black dorsal spots, and another along the sides. Under surface of wings as above, but markings on primaries more distinct, and a rosy flush about the disco-costal area. Antennæ slightly pectinated; pectus brown; femora of fore legs rosy.

Expanse 47 millim.

I took two male specimens of this insect, which may be compared with *seriato-punctata*, Motsch., but from which it may be readily separated by the black thoracic streak.

Hongkong (March); Nagasaki (May).

There is an unnamed specimen of this species in Dr. Staudinger's collection.

188. SPILOSOMA SUBCARNEA.

♀. *Spilosoma subcarnea*, Walk. Cat. Lep. Het iii. p. 675 (1855).

♀. *Aloa bifrons*, Walk. Cat. Lep. Het. iii. p. 705 (1855).

Aloa leucothorax, Feld. Wien. ent. Mon. vi. p. 36.

Spilarctia subcarnea, Butl. Ill. Typ. Lep. Het. pt. iii. pl. xlii. fig. 8 (1879).

Hongkong, North China, Ningpo, Yokohama (*Manley* and *Pryer*).

189. SPILOSOMA LUBRICEPEDA.

Bombyx lubricepeda, Esp. Schmett. iii. pl. 66. figs. 1–5.

I took two specimens at Gensan in July.

Gensan (*Leech*); Amur; Europe.

190. SPILOSOMA MOLLICULA.

♀. *Spilarctia mollicula*, Butl. Ann. & Mag. Nat. Hist. (4) xx. p. 395 (1877); Ill. Typ. Lep. Het. pt. iii. p. 6, pl. xlii. fig. 7 (1879).

I did not meet with this species in Japan, and there were no specimens of it in Pryer's collection.

Hakodate (*Whitely*).

191. SPILOSOMA INÆQUALIS.

Spilarctia inæqualis, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 351 (1879).

A fine series in Pryer's collection, varying greatly not only in colour, which ranges in tint from almost pure white to a rich buff-yellow, but also in the intensity of the black markings.

Ohoyama, Fujisan (*Pryer*); Hakone (*Leech*).

192. SPILARCTIA BIFASCIATA.

Spilarctia bifasciata, Butl. Trans. Ent. Soc. 1881, p. 7.

Four examples, in one of which the inner row of black dots forming the basal fascia is represented by a small spot on the costa and one just above inner margin.

Tokio (*Fenton*); Nikko (*Pryer*); Yokohama (*Manley*).

193. Spilarctia imparilis.

Spilarctia imparilis, Butl. ♂, Ann. & Mag. Nat. Hist. (4) xx. p. 394 (1877); Ill. Typ. Lep. Het. ii. p. 4, pl. xxii. fig. 4 (1878); ♀, Ann. & Mag. Nat. Hist. (5) iv. p. 351 (1879).

Several examples, coll. Pryer.

The markings of the male are fairly constant, but the maculation of the female is subject to considerable modification, and in some examples of this sex almost entirely absent.

Yokohama (*Jonas*); Yesso (*Pryer*); Hakone (*Smith*).

194. Seriarctia lewisii.

Seriarctia lewisii, Butl. Cist. Ent. vol. iii. p. 115 (1885)

Eight specimens, coll. Pryer.

The marking of primaries is very constant, but on the secondaries the maculation is subject to variation.

Nikko, Oiwake (*Pryer*).

195. Aloa lactinea.

Phalæna lactinea, Cram. Pap. Exot. ii. p. 58, pl. 133. fig. D.
Bombyx sanguinolenta, Fabr. Ent. Syst. iii. 1, p. 473. 206.
Estigmene lactinea, Hübn. Verz. Schmett. p. 184. 1894.
Aloa lactinea, Walk. Cat. Lep. Het. iii. p. 702.

Nine specimens, coll. Pryer.

Varies considerably, the number of black spots ranging from but a slight trace of a single spot to five distinct large spots.

Yokohama (*Pryer*, *Manley*); North China, North India, Nepaul, Ceylon, East Indies, Australia.

196. Dionychopius niveus.

Dionychopius niveus, Mén. Bull. Phys. Pétersb. iii. p. 108; Bull. de l'Acad. t. xvii. p. 218; Schr. Amur Reisen, p. 52, tab. iv. fig. 6.

Varies in the intensity of red lateral spots on abdomen. Normally the female has six of these spots and the male five, but a male from Gensan has only two distinct, and three faint red spots on side of body. The usual dorsal series of black spots may also be absent. There is further some modification in the character of the discal spot on secondaries; in some specimens this is conspicuous, whilst in others it is scarcely discernible.

Oiwake, Yokohama (*Pryer*); Hakodate, Sendai, Hakone, and Gensan (*Leech*); Amur.

197. Bireta plumosa, sp. n. (Plate XXXI. fig. 4.)

♂. Primaries yellowish buff, darker along the inner margin, clouded about the disk and towards the apex with purplish brown. Secondaries silky white with a faint yellowish tinge. Thorax and abdomen buff; antennæ plumose. Underside uniform yellowish white, silky.

♀. Resembles male, but primaries clouded with ochreous; antennæ simple.

Closely allied to *B. straminea*, but secondaries of both sexes paler, and antennæ of male plumose and not simply pectinated.

Two specimens, coll. Pryer, ♂ ♀. Ohoyama.

Expanse, ♂ 53 millim., ♀ 51 millim. No. 48 Pryer's Cat. As. Soc. Jap., May 1883.

198. BIRETA STRAMINEA.

Ceira straminea, Moore, Ann. & Mag. Nat. Hist. (4) xx. p. 91 (1877).

I took this species at Gensan in July, and there were several examples in coll. Pryer.

Yokohama (*Pryer* and *Manley*); Gensan (*Leech*).

199. BIRETA PALLIDA.

Bireta pallida, Butl. Ann. & Mag. Nat. Hist. (4) xx. p. 473 (1877); Ill. Typ. Lep. Het. pt. ii. p. 12, pl. xxv. figs 10, 11 (1878).

A few examples in a long series of *Bireta*, composed principally of specimens of *B. straminea*, in Pryer's collection.

Yokohama (*Jonas*, *Pryer*, and *Manley*).

200. LÆLIA GIGANTEA.

Lælia gigantea, Butl. Cist. Ent. vol. iii. p. 117.

One male and six females in coll. Pryer.

Oiwake (*Pryer*).

201. LÆLIA CŒNOSA.

Bombyx cœnosa, Hübn. Bomb. pl. 51. fig. 218.

Bombyx sangaica, Moore, Ann. & Mag. Nat. Hist. (4) xx. p. 92 (1877).

Leucoma brevicornis, Walk. *l. c.* vii. p. 1729 (1856).

?=*Lælia sinensis*, Walk. Cat. Lep. Het. iv. p. 829 (1855); Butl. Ill. Typ. Lep. Het. pt. iii. p. 9, pl. xliii. fig. 8 (1879).

Eleven ♂ and 2 ♀, coll. Pryer. A little darker as a rule, but otherwise Japanese examples do not differ from European specimens of *L. cœnosa*. Some of the specimens, however, agree with *L. sinensis*, Walk., the type of which came from Hong-Kong; Dr. Fixsen records a specimen of the last-named from Corea.

Yokohama (*Pryer*); Hakodate, Gensan, and Ningpo (*Leech*).

202. LEUCOMA SUBVITREA.

Leucoma subvitrea, Walk. Cat. Lep. Het. Suppl. ii. p. 344.

?=*Aroa alba*, Brem. Lep. Ost-Sib. p. 41, tab. iii. fig. 18 (1864).

I obtained this species at Gensan in July 1886, and an example of each sex at Fusan in June 1886. Five specimens in Pryer's collection are not localized, but in his Catalogue he gives Nikko.

Nikko (*Pryer*); Fusan, Gensan (*Leech*); Hindustan. ? Amur.

203. LEUCOMA AURIPES.

Leucoma auripes, Butl. Ann. & Mag. Nat. Hist. (4) xx. p. 402 (1877); Ill. Typ. Lep. Het. ii. p. 9, pl. xxiv. fig. 1 (1878).

I did not meet with this species in Japan, but there were four males and three females in Pryer's collection. Three of the former and one of the latter are labelled Yesso, 1882. In the same collection three small specimens of *L. auripes*, also from Yesso, were set apart and are the no. 161 of Pryer's Catalogue. These small specimens agree with a series I obtained at Gensan in 1886. The smallest ♂ in this series measures only 40 millim., and the largest ♂ 49 millim.; the smallest ♀ 44 millim., and the largest ♀ 58 millim.; whereas the measurements of typical examples are, 58 millim. for ♂, and 68 millim. for ♀.

Common at Gensan, flying among fir-trees in the daytime.

The primaries of ♀ have no black costal edging as in the ♂.

Yokohama (*Jonas*); Yesso (*Pryer*); Gensan (*Leech*).

204. LARIA L-NIGRUM.

Phalæna-Bombyx l-nigrum, Mueller, Faun. Fr. p. 40 (1764).
Bombyx v-nigrum, Fabr. Syst. Ent. p. 577 (1775).

Four males and one female, coll. Pryer. The male from Japan, like the same sex of this species from Ningpo and Kiukiang, has a round black spot at end of discal cell instead of the usual L or V. The female, on the other hand, has a well-developed V-like mark.

Ohoyama, Nikko (*Pryer*); Ningpo (*Leech*); Corea (*Herz*). Europe.

205. STILPNOTIA SALICIS.

Phalæna-Bombyx salicis, Linn. Syst. Nat. x. p. 502.

Several examples in coll. Pryer. Perhaps a little more densely scaled, but otherwise Japanese specimens agree very well with the European type.

Tokio, Yesso (*Pryer*); Corea (*Herz*).

206. PORTHESIA CHRYSORRHŒA.

Phalæna-Bombyx chrysorrhœa, Linn. Syst. Nat. x. p. 502.
Bombyx chrysorrhœa, Hübn. pl. 18. fig. 67, pl. 58. figs. 248–9.

A ♀ example at Nagahama, July.

207. PORTHESIA AURIFLUA.

Bombyx auriflua, Fabr. Mant. p. 125 (1717).
Bombyx auriflua, Hübn. Bomb. pl. 18. figs. 68, 69.
Bombyx chrysorrhœa, Esp. Schmett. iii. pl. 39. figs. 1, 2, 7.

Among Japanese and Corean examples of this species there is much variation in the markings of primaries. In typical ♂ specimens of *P. auriflua* there is a brownish-black spot on the inner margin near anal angle, and such specimens there are in my series from Japan and Gensan; but others have an additional spot towards the base of the inner margin, and other examples again have a third

spot placed near the costa and directly above that last referred to; one has a fourth spot towards apex. On the other hand, there are specimens with but the slightest trace of a spot at anal angle. As a rule the female is without markings, but sometimes a brownish spot appears at anal angle, and one example of this sex in Pryer's collection has the basal spot also well developed.

There is considerable difference in size, as will be seen by the following measurements:—

Smallest ♂	24 millim.	Largest ♂	36 millim.
„ ♀	33 millim.	„ ♀	46 millim.

Thus it will be seen that the largest ♀ is almost twice the size of the smallest ♂ in wing expanse, whilst this last is one third less in expanse than the largest ♂.

Yokohama, Oiwake, Yesso (*Pryer*); Fushiki, Gensan (*Leech*); Ningpo; Armenia, Altai, Amur, Europe.

208. PORTHESIA RADDEI.

Porthesia raddei, Staud., Rom. Mém. sur Lép. vol. iii. pp. 207, 343, pl. xvii. f. 3.

Corea (*Herz*).

209. ARTAXA SUBFLAVA.

Aroa subflava, Brem. Lep. Ost-Sib. p. 41, tab. iii. fig. 19 (1864).

Leucoma subflava, var. *piperita*, Oberth. Etud. d'Entom. v. p. 35.

Of the type of this species, which Bremer says is very like *helladia*, Cram., I have no specimen, but there were two examples of var. *piperita* in Pryer's collection taken at Oiwake. These very closely resemble *Porthesia snelleni*, Staud., Rom. Mém. sur Lép. iii. p. 207, pl. xii. fig. 3.

Oiwake (*Pryer*).

210. ARTAXA INTENSA.

Artaxa intensa, Butl. Ann. & Mag. Nat. Hist. (4) xx. p. 402 (1877); Ill. Typ. Lep. Het. pt. ii. p. 10, pl. xxiii. fig. 12 (1878).

A long series from various parts of Japan and Corea. Some of the specimens have two distinct black spots near apex of primaries, others have only one, whilst some other examples again have not a trace of any such marking. Further, there are two specimens which appear to me to be varieties of this species; one of these is identical with *flavinata*, Walk., and the other with *conspersa*, Butl. Without a longer series it is not possible to form an opinion as to the legitimate rank of these two last.

Yokohama (*Jonas* and *Pryer*); Oiwake (*Pryer*); Tsuruga, Fusan, Gensan, Ningpo (*Leech*).

211. ARTAXA PULVEREA, sp. n. (Plate XXXI. fig. 5.)

Allied to *A. subflava* var. *piperita* but smaller, the primaries are of a deeper yellow sparingly sprinkled from the base nearly to the

outer margin with brown scales; these form a sort of cloak, the external edge of which is bordered with some silvery spots. Secondaries and under surface of all the wings buff without spot or marking.

Expanse, ♂ 24–32 millim., ♀ 37 millim.

I took this species in Satsuma in May, Nagasaki in June, and Gensan in July. The ♂ coll. Pryer.

Japan (*Pryer*); Satsuma, Nagasaki, Gensan (*Leech*).

212. Artaxa scintillans.

Somena scintillans, Walk. Cat. Lep. Het. vii. p. 1734 (1856).

Artaxa scintillans, Butl. Ill. Typ. Lep. Het. pt. v. p. 52, pl. xc. fig. 1 (1881).

Artaxa limbata, Butl. *l. c.* p. 53, pl. xc. fig. 3.

Two examples.

Gensan, Ningpo, Darjeeling, North India.

213. Artaxa conspersa.

Artaxa conspersa, Butl. Cist. Ent. vol. iii. p. 117 (1885).

A long series in Pryer's collection.

The males are mostly of a dark chocolate colour, but the females are pale yellow; some of the males, however, are quite of the female coloration and others are intermediate.

Yokohama (*Pryer*).

214. Chœrotriche staudingeri, sp. n. (Plate XXXI. fig. 6.)

Deep buff-yellow; primaries with a purple-brown basal patch and a curved central fascia, the latter is contracted just below the costa: discal spot black, round and well defined; secondaries without spot. Antennæ broadly pectinated. Head and thorax orange. Abdomen velvety black, base and anal tuft orange. Under surface buff-yellow; central area of primaries slightly darker.

Expanse, ♂ 36–44 millim., ♀ 48–60 millim.

An example of this species is represented in the National Collection at South Kensington by two wings.

Yokohama (*Pryer* and *Leech*).

215. Chœrotriche niphonis.

♂. *Chærotriche niphonis*, Butl. Trans. Ent. Soc. 1881, p. 9.

♀. *Chærotriche squamosa*, Butl. *l. c.*

Porthesia raddei, Staud., Rom. Mém. sur Lép. iii. p. 207, pl. xvii. ♂, fig. 3 (1887).

There can be little doubt that Butler's *C. squamosa* is the female of his *C. niphonis*. I took an example of each sex at Gensan and in Pryer's collection there were seven males in splendid condition, and two females not quite so fine. Six of the former are labelled Oiwake and one of the last Yesso. In the male specimens there is considerable variation in the coloration of primaries. Three examples have the buff costal border represented by a buff edging to the costa itself and a streak of the same colour along the costal nerve as

far as black spot at end of discal cell. In the female all the wings are buff with the dark colour of the male showing only as a broad patch along the inner half of the wing, but not touching either the base or the outer margin; there are, however, distinct traces of a narrow stripe of the dark colour extending from the top posterior edge of the patch right through to the costa near the apex. Only that the male has dark secondaries, the Gensan specimens are almost alike in markings.

On the under surface the males are just as variable as above. In one example all the wings are dark smoky brown with buff fringes and a very slender buff costal edging, and in another specimen the smoky-brown primaries are broadly bordered on the costa and outer margin with buff, whilst the secondaries are buff tinged with smoky brown between the discal cell and outer margin. This example has a distinct black spot at the end of the cell on each wing, but similar spots are to be traced, more or less clearly, in all the specimens. In his descriptions of *niphonis* and *squamosa*, Mr. Butler makes no reference to these spots in the first-named, but he gives them as a character of *squamosa*.

Tokio (*Fenton*); Yokohama, Oiwake, Yesso (*Pryer*); Gensan (*Leech*).

216. Pœcilocampa subpurpurea.

Pœcilocampa subpurpurea, Butl. Trans. Ent. Soc. 1881, p. 18.

Tokio (*Fenton*).

217. Andraca gracilis.

Andraca gracilis, Butl. Cist. Ent. vol. iii. p. 125 (1885).

Two examples, coll. Pryer.

Nikko (*Pryer*).

218. Orgyia thyellina.

♂. *Orgyia thyellina*, Butl. Trans. Ent. Soc. 1881, p. 10.

A fine series, coll. Pryer, including four female specimens with well-developed wings, and three examples of the same sex, in which the wings are dwarfed, but with the markings reproduced in miniature. As the female has not been previously noticed a description is appended.

♀. Primaries whitish, with an ill-defined dark discal spot and ferruginous markings, the most conspicuous of which are a large roundish patch at base between median nervure and inner margin, a cloud on outer third towards apex, from the lower edge of which a curved stripe, bordered externally with the whitish ground-colour, runs to inner margin, and two angulated transverse lines on disk, between which is an indistinct ferruginous shade; near the costa and towards apex is an elongated blackish spot and at external angle tapering towards middle of outer margin is a purplish-grey patch enclosing three blackish lunules bordered internally with whitish. Secondaries pale whity brown, with a small brown patch near anal angle, and an indistinct brownish submarginal band. Under surface

pale whity brown; primaries with discal and apical spots as above; there are also two small brownish spots at outer angle; on secondaries are a discal spot and a linear dash near anal angle brownish.

Expanse 44–48 millim. (Plate XXXI. figs. 7, 7*a*.)

Although very different in coloration, the markings of the female are exactly of the same character as those of the male. In reference to the females with ill-developed wings it should be said that these organs are very similar in appearance to the wings of a moth on its first emerging from the pupa and gives one the idea of arrested development. Instances of this nature are not unknown to the breeder of Lepidoptera, although the cause is not understood. There is nothing to show whether Pryer's specimens of this species were captured or bred; but as the semiapterous form is nearer to typical female *Orgyia* we may reasonably suppose that such forms as that figured are usual with *O. thyellina*.

Tokio (*Fenton*); Yokohama, Oiwake (*Pryer*).

219. Orgyia gonostigma.

Bombyx gonostigma, Fabr. Syst. Ent. p. 585 (1775); Hübn. Bomb. pl. xx. fig. 78.

Orgyia approximans, Butl. Trans. Ent. Soc. 1881, p. 10.

One example in Pryer's collection from Oiwake.

The tone of colour and number of white apical spots are such variable characters in *O. gonostigma* that it is certainly an unnecessary addition to synonymy to endeavour to establish a species on such slight differences as those upon which Mr. Butler has relied in his differentiation of *O. approximans*.

Oiwake (*Pryer*).

220. Prismosticta hyalinata.

Prismosticta hyalinata, Butl. Cist. Ent. vol. iii. p. 125.

This is no. 163 of Pryer's Catalogue, and there were several specimens in his collection chiefly from Oiwake.

Oiwake, Nikko (*Pryer*).

221. Bombyx mori.

Phalæna mori, Linn. Syst. Nat. ii. p. 817. 33 (1767).

Several specimens, coll. Pryer.

Yokohama (*Pryer*).

222. Bombyx mandarinus.

Theophila mandarina, Moore, Proc. Zool. Soc. 1872, p. 576, pl. xxxiii. fig. 5.

A fine series in coll. Pryer. I took two males at Gensan in July.

This species is probably the wild form of the silkworm of commerce, *B. mori*. It is much darker in colour and has very distinct markings; the female is much larger than the same sex of *B. mori*. Compared with that of the cultivated silkworm the cocoon of *B. mandarinus* is very flimsy.

Yokohama (*Pryer*); Hakodate (*Andrews*); Gensan (*Leech*).

223. Bombyx neustria.

Phalæna neustria, Linn. Syst. Nat. x. p. 500.

? *Clisiocampa testacea*, Motsch. Et. Ent. 1860, p. 32.

I took specimens at Nagasaki in June and Gensan in July; these with a number from Pryer's collection make up a good series, exhibiting much variation, but nothing calling for special notice.

Nagahama, Nagasaki, Gensan (*Leech*); Yokohama, Oiwake (*Pryer*); Kiukiang (*Pratt*); Corea.

224. Apha tychoona.

Apha tychoona, Butl. Ent. Mo. Mag. xiv. p. 207 (1878); Ill. Typ. Lep. Het. pt. ii. p. 18, pl. xxvii. fig. 5.

A nice series from Japan, showing some variation in colour.

Yokohama (*Pryer*); Hakodate (*Leech*).

225. Lasiocampa fasciatella.

Bombyx fasciatella, Mén. Bull. de l'Acad. t. xvii. p. 218. no. 25; Schrenck's Amur Reisen, p. 55, tab. iv. fig. 8; Rom. Mém. sur Lép. vol. iii. p. 344.

Corea (*Herz*).

226. Lasiocampa pruni.

Phalæna-Bombyx pruni, Linn. Syst. Nat. x. p. 498, xii. p. 813.

Bombyx pruni, Hübn. Bomb. pl. 42. fig. 186.

Three males in Pryer's collection.

Hakodate (*Leech*); Yokohama, Nikko (*Pryer*); Europe.

227. Chrostogastria brevivenis.

Chrostogastria brevivenis, Butl. Cist. Ent. vol. iii. p. 119 (1885).

Three male examples. No. 185 of Pryer's Catalogue is referable to this species.

Nikko (*Pryer*); Hakodate (*Leech*).

228. Eutricha excellens.

Odonestis excellens, Butl. Ann. & Mag. Nat. Hist. (4) xx. p. 481 (1877); Ill. Typ. Lep. Het. pt. ii. p. 19, pl. xxvi. figs. 4, 5 (1878).

Var. *unicolor*, Oberth. Etud. d'Entom. v. p. 38 (1880).

A fine series, varying in size and markings.

Yokohama (*Pryer* and *Manley*).

229. Eutricha pini.

Phalæna-Bombyx pini, Linn. Syst. Nat. x. p. 498.

Odonestis superans, Butl. Ill. Typ. Lep. Het. ii. p. 19. pl. xxvii. fig. 4.

Eutricha fentoni, Butl. Trans. Ent. Soc. 1881, p. 17.

Eutricha zonata, Butl. *l. c.*

♂. *Eutricha dolosa*, Butl. *l. c.* p. 16.

This is a very variable species, both in Japan and Europe.

Yokohama, Oiwake (*Pryer*); Hakodate (*Leech*); Tokio; Corea, Europe (*Herz*).

230. EUTRICHA REMOTA.

Lasiocampa remota, Walk. Cat. Lep. Het. vi. p. 1439.
? *Lebeda hebes*, Walk. *op. cit.* p. 1462.
Œona segregata, Butl. Ill. Typ. Lep. Het. pt. ii. p. 20, pl. xxvi. figs. 6 & 7.
Œona spectabilis, Butl. *op. cit.* p. 19, pl. xxvii. fig. 3.

I took this species in all kinds of forms at Nagasaki and Shimonoseki. ♀ *Œona dolosa*, Butl., in national collection at South Kensington, is referable to this species.

Yokohama, Oiwake (*Pryer*); Tokio, Shanghai, North China.

231. ODONESTIS LÆTA.

Amydona læta, Walk. Cat. Lep. Het. vi. p. 1416 (1855).

One specimen at Tsuruga, July 1886, which I believe to be the only one from Japan.

Tsuruga (*Leech*); Corea (*Herz*).

232. ODONESTIS POTATORIA.

Phalæna-Bombyx potatoria, Linn. Syst. Nat. xii. p. 813.
Odonestis albomaculata, Brem. Bull. de l'Acad. Pét. 1861, tom. iii.; Lep. Ost-Sib. p. 42, tab. iv. 6 ♂, t. iii. 20 ♀.
Var. *askoldensis*, Oberth. Et. Ent. v. p. 38.

In the series of this species from Japan there are specimens which agree exactly with typical *potatoria*, Linn., and others which are most certainly identical with *O. albomaculata*, Brem., whilst between these two forms are aberrations, including a dark one near the variety *askoldensis* of Oberthür, which cannot be satisfactorily referred to either form; these serve as connecting-links and I think prove the identity of *O. potatoria* and *O. albomaculata*.

Yokohama (*Pryer*); Hakone, Gensan (*Leech*); Corea (*Herz*).

233. TRABALA CRISTATA.

Trabala cristata, Butl. Ann. & Mag. Nat. Hist. (4) xx. p. 480 (1877); Ill. Typ. Lep. Het. pt. ii. p. 18, pl. xxvii. fig. 1 (1878).

Seven specimens, including five from coll. Pryer.

Yokohama (*Jonas* and *Pryer*); Nagahama (*Leech*).

234. GASTROPACHA ILICIFOLIA.

Phalæna-Bombyx ilicifolia, Linn. Faun. Suec. p. 293; Syst. Nat. xii. p. 813.

Var. JAPONICA.

One male and two females, coll. Pryer.

The Japanese form of *G. ilicifolia* differs from the European type in size and colour. It expands 56 millim. and is pale reddish brown, with all the violet-tinged white markings well defined; there is, however, no character by which it may be specifically separated from *G. ilicifolia*, therefore I propose for it the varietal name *japonica*.

Yesso (*Pryer*).

235. GASTROPACHA QUERCIFOLIA.

Phalæna-Bombyx quercifolia, Linn. Syst. Nat. x. p. 497; (*Bombyx*) Hübn. Bomb. pl. xliii. figs. 187, 188.

Gastropacha quercifolia, Ochs. Schmett. Eur. iii. p. 247.

Japanese specimens are rich in colour and most nearly approach the form *alnifolia*, Ochs. Pryer says in his Catalogue that larvæ of this species are abundant at Fujisan.

A specimen which I bred from a larva found at Gensan is much paler than either Japanese or European examples in my collection.

Yokohama (*Pryer*); Corea (*Leech*). Europe.

236. GASTROPACHA POPULIFOLIA.

Bombyx populifolia, Esp. Schmett. iii. pl. 6. figs. 3, 4.

Gastropacha populifolia, Ochs. Schmett. Eur. iii. p. 45. 3.

Two males, one from Pryer's coll. and the other I took at Hakodate in August.

Yokohama (*Pryer*); Hakodate (*Leech*); Corea (*Herz*). Europe.

237. NUMENES DISPARILIS.

Numenes disparilis, Staud., Rom. Mém. sur Lép. iii. p. 200, pl. xi. figs. 2*a*, 2*b*.

Two female specimens in Pryer's collection; these are referable to no. 136 of his Catalogue, and the locality there given is Asamayama; but whether this applies to both examples it is not possible to say, as there are no locality tickets attached to the insects. They agree exactly with specimens from Kiukiang.

Asamayama (*Pryer*); Vladivostok, Askold.

238. LYMANTRIA ALBOFASCIA, sp. n. (Plate XXXI. fig. 8.)

♂. Brownish black; primaries with an oblique broad white fascia from costa towards apex to outer angle. Head, thorax, and legs chestnut-brown. Abdomen yellowish brown beneath. Under surface of primaries as above, but apical third yellowish white, with some orange scales along costa and outer margin.

Expanse 56 millim.

One example of this remarkable species in Pryer's collection.

Ohoyama (*Pryer*).

239. LYMANTRIA AURORA.

♀. *Lymantria aurora*, Butl. Ann. & Mag. Nat. Hist. (4) xx. p. 403 (1878); Ill. Typ. Lep. Het. ii. p. 11, pl. xxiv. fig. 5 (1878).

Var. FUSCA.

This species varies greatly in the matter of size. The male also exhibits considerable differences in the depth of colour. The example figured Plate XXXI. fig. 9 is one of four specimens of the darkest form; these were taken at Nagahama in July. I propose that this form should be known as var. *fusca*.

Yokohama (*Jonas* and *Pryer*); Kurile Islands, Yesso, Oiwake (*Pryer*); Nagahama, Tsuruga, Sendai, Gensan (*Leech*).

240. LYMANTRIA DISPAR.

Phalæna dispar, Linn. Syst. Nat. x. p. 501.
Var. *japonica*, Motsch. Étud. Ent. 1860, p. 31.
Porthetria umbrosa, Butl. Trans. Ent. Soc. 1881, p. 10.
Porthetria hadina, Butl. Trans. Ent. Soc. 1881, p. 11.

Except that they are somewhat larger male examples of *L. japonica*, Motsch., and *hadina*, Butl., are not separable from European males of *L. dispar* in my possession; whilst between *L. umbrosa*, Butl., and other males of *L. dispar* from Europe, also in my collection, there is not even a difference of size, consequently I cannot regard these insects as anything but forms of *L. dispar*.

If such forms as those referred to were admitted to specific rank there are some other forms of *L. dispar* occurring in Japan which are, apparently, as distinct from those already named as they are from typical *dispar*; these therefore would have to be raised to the dignity of species. Such a course is, however, opposed to the exact demands of science, which requires that we should acquaint ourselves with the geographical range of a species and ascertain all we can touching the variability of such species throughout such range rather than to allow locality to be the determinating factor when considering the claim of an insect to specific rank.

In colour (♂) *L. dispar* varies from whitish or pale whity brown through greyish brown up to a dark smoky brown, and in all forms the transverse lines and shades as also the discal spots of primaries may be either well-defined or more or less obliterated. The colour of females ranges from white to a pale fuscous and the markings are of different degrees of intensity.

This colour aberration in *L. dispar* is only equalled by its variability in size. The smallest male in my series from Japan and Corea expands only 37 millim., whilst the largest female in same series measures 114 millim. The following comparative table of measurements of specimens in my possession may not be without interest.

	Japan and Corea.	Europe.
Largest ♂	71	54
,, ♀	114	93
Smallest ♂	37	32
,, ♀	48	42

It will be seen that the difference in measurement between the smallest and largest males is 39 millim., and between the smallest and largest females 72 millim., whilst the smallest male is 82 millim. less in expanse than the largest female.

Yokohama, Yesso (*Pryer*); Fushiki, Nagahama, Gensan (*Leech*); Corea (*Herz*); Tokio (*Fenton*); Hakodate (*Whitely*).

241. LYMANTRIA FUMIDA.

♀. *Lymantria fumida*, Butl. Ann. & Mag. Nat. Hist. (4) xx. p. 402 (1877); Ill. Typ. Lep. Het. ii. p. 10, pl. xxix. fig. 4 (1878).

Yokohama (*Jonas* and *Pryer*).

242. LYMANTRIA MONACHA.

Phalæna-Bombyx monacha, Linn. Syst. Nat. x. p. 501.

A series of typical specimens, coll. Pryer.

Oiwake, Yesso (*Pryer*).

243. OCNERIA FURVA, sp. n. (Plate XXXI. fig. 10.)

♂. Brownish black, from the base nearly to outer angle, just above and parallel with the inner margin, is a series of black dots and streaks, around which are numerous pale scales, giving to this part of the wing a whitish appearance. There are also a few subapical black dashes.

♀. Paler, and markings more distinct; a distinct basal band, beyond which is a darkish cloud from the costa to the centre of wing.

Expanse, ♂ 26–35, ♀ 30–40 millim.

Allied to *O. terebynthi*, Freyer, from which, however, it is easily separated. There was a long series in Pryer's collection; it is no. 178 of his Catalogne.

Oiwake (*Pryer*).

244. DASYCHIRA LUNULATA.

♂. *Dasychira lunulata*, Butl. Ann. & Mag. Nat. Hist. (4) xx. p. 403 (1877); Ill. Typ. Lep. Het. pt. ii. p. 11, pl. xxiv. fig. 8 (1878).

Dasychira acronycta, Oberth. Etud. d'Entom. v. p. 35, pl. v. ♂, fig. 7 (1880).

♀. *Dasychira solitaria*, Staud. Rom. Mém. s. Lép. iii. pl. xii. fig. 1 (1887).

Three ♂ and three ♀, coll. Pryer. One ♀ from Manley, Yokohama.

Yokohama (*Jonas*, *Pryer*, and *Manley*); Oiwake (*Pryer*); Askold; Amur.

245. CALLITEARA PUDIBUNDA.

Phalæna pudibunda, Linn. Syst. Nat. x. p. 303.

Var. *Dasychira pryeri*, Butl. Cist. Ent. vol. iii. p. 119 (1885).

Var. *Dasychira pudica*, Staud., Rom. Mém. sur Lép. iii. p. 204 (1887).

Var. ? *Orgyia punctatella*, Motsch. Et. Ent. 1860, p. 32.

A nice series, coll. Pryer. Staudinger does not figure his *D. pudica* in the work referred to, but his description of that insect applies exactly to *D. pryeri*, Butl., and this last I consider to be a local form of *C. pudibunda*. I should mention that I took a specimen of *C. pudibunda* var. *concolor*, Staud., at Ningpo in April 1886, and this fact goes far, I think, to confirm my opinion.

Yokohama (*Pryer*); Hakodate, Hakone, and Gensan (*Leech*).

246. CALLITEARA ABIETIS.

Bombyx abietis, Schiff. S. V. p. 56; Esp. Schmett. p. 82. 1; Hübn. Bomb. pl. xxi. figs. 82, 83.

Dasychira abietis, Walk. Cat. Lep. Het. iv. p. 864.

Dasychira argentata, Butl. Trans. Ent. Soc. 1881, p. 12.
Calliteara pseudabietis, Butl. Cist. Ent. iii. p. 118.

Though certainly somewhat darker in colour, *argentata* is in no other respect separable from *C. abietis*, Schiff. I am therefore disposed to consider it as well as *pseudabietis* forms of that species.

Nikko (*Pryer*); Yokohama.

247. CIFUNA LOCUPLES.

Cifuna locuples, Walk. Cat. Lep. Het. v. p. 1173 (1855); Butl. Ill. Typ. Lep. Het. pt. ii. p. 18, pl. xxvii. fig. 6 (1878).
Artaxia confusa, Brem. Lep. Ost-Sib. p. 42, t. iv. fig. 5 (1864).

A fine series from Japan varying much in colour and intensity of markings; some of the examples agree exactly with Amur specimens.

Oiwake, Yokohama (*Pryer*); Hakodate, Gensan (*Leech* and *Andrews*); Corea (*Herz*); Amur.

248. PORTHETRIA LUCESCENS.

Porthetria lucescens, Butl. Trans. Ent. Soc. 1881, p. 11.

Two specimens in Pryer's collection labelled no. 177, Oiwake, July and August 1877; but in his Catalogue the locality given for the species is Ohoyama.

Tokio (*Fenton*).

249. PORTHETRIA EURYDICE.

♂. *Porthetria eurydice*, Butl. Cist. Ent. vol. iii. p. 118 (1885).
♀. *Dasychira amata*, Stgr., Rom. Mém. Lép. vol. iii. p. 206, pl. xii. fig 2 (1887).

One example of each sex in coll. Pryer.

Ohoyama (*Pryer*).

250. AGLIA TAU.

Phalæna tau, Linn. Syst. Nat. x. p. 497.
Bombyx tau, Hübn. Bomb. pl. 13. figs. 51, 52.

Var. JAPONICA.

Two specimens, coll. Pryer, Hakodate. In Japanese examples of *A. tau* the submarginal line of all the wings is further from the margin, and less strongly defined on the primaries than in European specimens; the black spot of primaries is also rather smaller, and in the male there is a whitish patch at apices as in female; also the ocellus on secondaries is larger than in European specimens, whilst that on primaries is much smaller. The female is darker than typical specimens of same sex, with the costa, outer third of primaries and costa, and abdominal fold of secondaries thickly sprinkled with black dots and powdered with black scales.

Expanse, ♂ 80, ♀ 108 millim.

These differences are, however, too insignificant to be considered of specific value, so I venture to propose that it be known as *Aglia tau*, var. *japonica*.

Yesso (*Pryer*); Hakodate; Amur; Europe.

251. RHODIA FUGAX.

Rhodia fugax, Butl. Ann. & Mag. Nat. Hist. (4) xx. p. 480 (1877); Ill. Typ. Lep. Het. pt. ii. p. 17, pl. xxvi. fig. 1 (1878).

Seven males and three females in coll. Pryer. The males range from 82 to 103 millim., but the females are more uniform, the smallest being 122 millim. and the largest 126 millim in expanse. According to Pryer, the larva, which he says is "bright green and resembles a butterfly larva," feeds on cherry and other trees, and the imago appears in November and December; the cocoon, which is bright green and resembles a pendent leaf, has "a slit on the top, opening by pressure."

Yokohama (*Pryer*).

252. CALIGULA JONASI.

Caligula jonasii, Butl. Ann. & Mag. Nat. Hist. (4) xx. p. 479 (1877); Ill. Typ. Lep. Het. pt. ii. p. 16, pl. xxv. fig. 2 (1878).

Seven examples, coll. Pryer (3 males, 4 females). I took two males at Nikko in September, and a female at Oiwake also in September.

According to Pryer, the larva is hairy and resembles a small larva of *Caligula japonica*.

Yokohama.

253. CALIGULA JAPONICA.

Caligula japonica, (pupa-case) Moore, Trans. Ent. Soc. (3) i. p. 322 (1862); (imago) Butl. Ann. & Mag. Nat. Hist. (4) xx. p. 479 (1877); Ill. Typ. Lep. Het. pt. ii. p. 16, pl. xxvi. fig. 2 (1878).

Several specimens from various parts of Japan, exhibiting much variation.

Pryer remarks in his Catalogue p. 52:—"Commonly called the wire-cartridge moth, from the resemblance of the cocoon to the wire-net in a cartridge; last year it was found feeding on poplars newly introduced into this country. The natives make a strong coarse silk from the cocoon, and a fine gut from the intestines of the larva. The imago appears in October. The larva hairy."

Yokohama (*Jonas, Pryer*); Nikko (*Leech*); Hakodate.

254. ANTHERÆA PERNYI.

Saturnia pernyi, Guérin, Rev. et Mag. de Zool. 1855, p. 6. 297, pl. 6. fig. 1.

Antheræa hazina, Butl. Trans. Ent. Soc. 1881, p. 13.

Antheræa fentoni, Butl. *l. c.*

Antheræa calida, Butl. *op. cit.* p. 14.

Antheræa morosa, Butl. *l. c.*

My Japanese examples of this *Antheræa* vary in colour from a pale brown, through pale reddish brown to "rusty orange" on the one hand, and to olivaceous and fuliginous brown on the other. The markings are subject to modifications within certain limits, but

in no case is the aberration sufficient to justify separation of the specimen or specimens exhibiting it from *A. pernyi*. There are examples showing the particular characters claimed for the several named forms well defined [1] and also others which do not agree exactly with these named forms or with the type, although they serve admirably to link together the various forms, and to connect one or other of such forms with the type. These prove most clearly the specific identity of all.

Yokohama (*Jonas*, *Pryer*, and *Manley*); Tokio (*Fenton*); Kiukiang (*Pratt*); Amur.

255. Attacus cynthia.

Phalæna (*Attacus*) *cynthia*, Drury, ii. p. 91; Cram. Pap. Exot. i. p. 62, pl. 39. fig. A.

Attacus pryeri, Butl. Proc. Zool. Soc. 1878, p. 397; Ill. Typ. Lep. Het. pt. iii. p. 11, pl. xliii. fig. 4 (1879).

Attacus vesta, Walk. Cat. Lep. Het. Suppl. ii. p. 525 (nom. cat.).

Attacus walkeri, Feld. Wien. ent. Mon. vi. p. 34.

A beautiful series, coll. Pryer.

The only difference between the representatives of this species from Japan (*A. pryeri*) and those from Kiukiang (*A. walkeri*) lies in the tint of ground-colour; this in the former is brownish olive, but in the latter greenish olive, or, in other words, there is more brown in the composition of the colour of *A. pryeri* than in that of *A. cynthia* or *A. walkeri*. There is, however, one specimen among Pryer's series which is not so brown as the other examples from Japan, and less green than Kiukiang specimens.

Yokohama (*Jonas* and *Pryer*); Kiukiang (*Pratt*); N. China, Ningpo.

256. Actias selene.

Tropæa selene, Hübn. Verz. Schmett. p. 152. 1588.

Actias selene, Macleay; Leech, Zool. Misc. ii. pl. 70.

Actias ningpoana, Feld.

Saturnia artemis, Brem. Etud. Entom. Motsch. 1852, p. 64; Bull. Acad. Pétersb. 1861, tom. iii.; Lep. Ost-Sib. tab. ii. figs. 6 ♂, 7 ♀.

Tropæa gnoma, Butl. Ann. & Mag. Nat. Hist. (4) xx. p. 480 (1877); Ill. Typ. Lep. Het. pt. ii. p. 17, pl. xxv. fig. 1 (1878).

Tropæa aliena, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 355 (1879).

Tropæa dulcina, Butl. Trans. Ent. Soc. 1881, p. 14.

In size and in tint of coloration this is a most variable species. Among the Japanese specimens in my collection (19 in number) there are green, whitish-green, yellowish-green, and bluish-green examples, ranging from 108 to 150 millim. in expanse. The costal

[1] As in other instances where slight aberrant forms have been elevated to specific rank.

stripe of primaries varies in width as it also does in tint, being sometimes rosy and sometimes dark purple, always bounded internally with black, and often though not invariably edged externally with white. The ocellus of primaries is as inconstant in shape as in size, and in some examples small and round, in others linear, and in others again large and oval, whilst the black outline, which is usually only distinct on the inner edge of these ocelli, is in some few examples entire and conspicuous. The submarginal and basal lines are in the different specimens either sharply defined, faint, or quite absent.

Yokohama (*Jonas*, *Pryer*, and *Manley*); Akita, Gensan (*Leech*); Kiukiang (*Pratt*).

257. Brahmæa japonica.

Brahmæa japonica, Butl. Ent. Month. Mag. x. p. 56 (1873); Ill. Typ. Lep. Het. pt. ii. p. 17, pl. xxvi. fig. 3.

?=*Brahmæa mniszechi*, Feld. Reise Nov. Lep. iv. pl. xciii. figs. 4, 5 (1864–5).

A fine series, coll. Pryer.

This is a variable species both as regards ground-colour and markings. Thus the former may be white or grey, and sometimes tinged with green; then the number of ocelli in central band and "rounded internal spot" is not the same in any two individuals comprised in my series of 15 specimens. The spot referred to sometimes has three ocelli across its centre on one wing, but its companion on the other wing has four. In all cases the number of ocelli, both in the spot and central band, is greater on one side than the other. Again, the shape of the central band is subject to modification, and stages in the formation of the rounded internal spot from the lower portion of this band are exhibited in the specimens in my Japanese series; thus between an example in which the band is entire from costa to inner margin, and but slightly contracted below the middle, and a specimen with the rounded spot completely formed and quite independent, there are all the intermediate stages.

Yokohama (*Pryer*).

258. Brahmæa certhia.

Bombyx certhia, Fabr. Ent. Syst. iii. 1, p. 412. 16.

Bombyx wallichii, Gray, Zool. Misc. p. 39.

Brahmæa carpenteri, Butl. Ann. & Mag. Nat. Hist. (5) p. 114 (1883).

Saturnia lunulata, Motsch. Etud. Entom. 1852, p. 64; Mén. Lep. Ost-Sib. p. 55 (1859); Rom. Mém. sur Lép. iii. p. 345.

Saturnia undulata, Brem. & Grey, Schmett. Nörd. China's, p. 16, tab. v. fig. 3 (1853); (*Brahmæa*) Rom. Mém. sur Lép. iii. p. 345.

Brahmæa carpenteri, Butl., is the only form of *B. certhia* recorded from the region under consideration. But this at best can only rank as a variety of *certhia*.

259. RHAMNOSA? ANGULATA.

Rhamnosa? angulata, Fixsen, Rom. Mém. sur Lép. vol. iii. p. 339, pl. 15. fig. 1.

Corea (*Herz*).

260. CLOSTERA ANASTOMOSIS.

Bombyx anastomosis, Linn. Syst. Nat. x. p. 506.

Clostera anastomosis, var. *orientalis*, Fixsen, Rom. Mém. sur Lép. iii. p. 350.

Five examples, coll. Pryer. Japanese specimens agree well with European.

Yesso (*Pryer*); Corea; Europe.

261. CLOSTERA ANACHORETA.

Bombyx anachoreta, Fabr. Mant. Ins. ii. p. 120; Hübn. Bomb. pl. 22. fig. 88.

Bombyx curtula, Esp. Schmett. iii. pl. 51. figs. 1–4.

Clostera anachoreta, Steph. Ill. Brit. Ent. Haust. ii. p. 13.

I took one example at Hakodate in August, and there was a nice series in Pryer's collection. The specimens are very typical.

Yokohama (*Pryer*); Hakodate (*Leech*); Europe.

262. GONOCLOSTERA TIMONIDES.

Pygæra timonides, Brem. Lep. Ost-Sib. p. 45 (1864).

Pygæra timoniorum, Brem. *op. cit.* pl. v. fig. 3.

Gonoclostera latipennis, Butl. Ann. & Mag. Nat. Hist. (4) xx. p. 476 (1877); Ill. Typ. Lep. Het. pt. ii. p. 13, pl. xxvii. fig. 2 (1878).

Eight examples, coll. Pryer, and one taken by myself at Hakodate in August.

Yokohama, Nikko (*Pryer*); Hakodate (*Leech*); Amur.

263. DATANOIDES FASCIATA.

Datanoides fasciata, Butl. Ent. Month. Mag. xiv. p. 207 (1878); Ill. Typ. Lep. Het. pt. iii. p. 2, pl. xliii. fig. 4 (1879).

Several specimens in Pryer's collection, including two examples which were separated from the rest and labelled "No. 237. *Datanoides*? sp."

Yokohama (*Jonas* and *Pryer*).

264. DATANOIDES APPROXIMANS, sp. n. (Plate XXXII. fig. 4.)

♂. Primaries chocolate-brown, with purplish reflections on basal patch and outer margin; central fascia dull brown, bounded on each side by a yellowish line; discal spot black. Fringes chequered. Secondaries fuscous. Head, thorax, abdomen, and legs brown, tarsi whitish; antennæ pectinated nearly to apex. Under surface fuscous, outer border of all the wings brownish, inclining to chestnut at apex of primaries.

♀. Similar to the ♂, but paler.

Expanse, ♂ 27 millim., ♀ 34–40 millim.

This species is allied to *D. fasciata*, but the different coloration and the shape of central fascia, which in *D. approximans* is much attenuated towards inner margin, and has its outer edge twice indented, readily separates the two species. The secondaries in both sexes are also much darker than in *D. fasciata*.

Several specimens, coll. Pryer (No. 238).

Yokohama (*Pryer*).

265. ROSAMA PLUSIOIDES.

Rosama plusioides, Moore, Desc. Ind. Lep. Atk. i. p. 62 (1879).

Ptilodontis ornata, Oberth. Etud. d'Entom. x. p. 15, pl. ii. fig. 5 (1884).

Two examples in Pryer's collection, placed with the Liparidæ and labelled "167. *Orgyia*? sp."

Japan (*Pryer*); Darjeeling; Sidemi.

266. ROSAMA CINNAMOMEA, sp. n. (Plate XXXI. fig. 11.)

♂. Primaries cinnamon-brown, streaked with darker from apex to centre of wing, and with ill-defined darker basal and discal lines. Apical and discal spots blackish. Secondaries fuscous brown. Head, palpi, and thorax dark brown; abdomen fuscous. Under surface of primaries brown with paler margins; secondaries and abdomen yellowish grey.

Expanse 33–35 millim.

I took an example at Nagasaki in June, and there was one in Pryer's collection.

Nagasaki (*Leech*); Ohoyama (*Pryer*).

267. ROSAMA MACRODONTA.

Rosama macrodonta, Butl. Cist. Ent. vol. iii. p. 127 (1885).

One example, coll. Pryer.

Japan (*Pryer*).

268. PTILODONTIS PLUSIOTIS.

Ptilodontis plusiotis, Oberth. Etud. d'Entom. v. p. 65, pl. vii. fig. 3 (1880).

A female example at Gensan in July; two males, coll. Pryer.

The three specimens agree well each with the other, but neither of them are quite like Oberthür's figure of his *P. plusiotis*; however, as my insect has been identified by Herr Banghaas as that species, I am content to let it stand as such, especially as I have not seen Oberthür's type.

Nikko, Oiwake (*Pryer*).

269. PLATYCHASMA VIRGO.

Platychasma virgo, Butl. Trans. Ent. Soc. 1881, p. 596.

Four examples, three of which are from coll. Pryer, and one taken by myself at Gensan in July.

Nikko (*Pryer*); Tokio (*Fenton*); Gensan (*Leech*).

270. PTILOPHORA PLUMIGERA.

Bombyx plumigera, Esp. Schmett. iii. p. 50. pl. 50. figs. 6, 7 (1785); Hübn. Bomb. pl. 58. fig. 250.

A single example (♀) in Pryer's collection; this is no. 236 of his catalogue.

Yokohama (January, *Pryer*); Europe.

271. PTEROSTOMA PALPINA.

Bombyx palpina, Linn. F. S. p. 305; Syst. Nat. xii. p. 828; Hübn. Bomb. pl. 4. fig. 16.

Ptilodontis grisea, Brem. Lep. Ost-Sib. p. 45, pl. v. fig. 2 (1864).

A very fine series in Pryer's collection, varying much in the tone of ground-colour. I took two specimens at Nagasaki in June.

In Japanese examples of this species the fringe of the tooth-like projection on inner margin is but little, if any, darker than the ground-colour of primaries, and the specimens are, on the whole, much larger than European examples: thus, one female expands 72 millim. and a male 58 millim., whilst the smallest of Pryer's measures 52 millim. No. 222, Pryer's Catalogue, is referable to this species.

Yokohama, Oiwake (*Pryer*); Hakodate, Nagasaki (*Leech*).

272. MICRODONTA BICOLORA.

Bombyx bicoloria, Schiff. S. V. p. 49; Esp. Schmett. iii. pl. 41. fig. 7.

Bombyx bicolora, Hübn. Bomb. pl. 5. fig. 18.

Microdonta bicolora, Duponch. Cat. Lep. p. 93.

Two examples (♂ ♀) in Pryer's collection. Referring to these in his catalogue, Pryer says: "Two specimens only; one taken by my collector in my presence, on the 18th June, 1876, at Fujisan, at rest in an alder, at an elevation of 5000 feet; the other I myself took, at light, on the 19th June, 1881, at Nikko."

Fujisan, Nikko (*Pryer*); Europe.

273. NERICE BIPARTITA.

Nerice bipartita, Butl. Cist. Ent. iii. p. 119 (1885).

Two examples, coll. Pryer. "210. *Clostera*? sp." of catalogue.

Nikko, Yesso (*Pryer*); Sapporo (*Lewis*).

274. NERICE BIDENTATA.

Nerice bidentata, Walk. Cat. Lep. Het. v. p. 1076 (1855).

Nerice davidi, Oberth. Etud. d'Entom. vi. p. 17, pl. ix. fig. 2 (1881).

I took two examples of this North-American species at Hakodate in August.

Hakodate (*Leech*); North China (*David*); North America.

275. EDEMA NIVILINEA, sp. n. (Plate XXXII. fig. 1.)

Primaries olive, traversed by a longitudinal white streak from the base to just beyond the middle of wing, where it terminates in a

bluish-grey spot; at apex is an irregular shaped whitish patch enclosing some leaden-coloured spots and dashes, the inner margin broadly suffused with leaden grey. Secondaries dark brown, paler towards the base. Head and collar olive, thorax leaden grey. Abdomen fuscous grey. Under surface pale yellowish grey, with discal spots and dash on costa before the apex of primaries whitish; outer margins of primaries and secondaries fuscous, the latter has a central line also fuscous.

Expanse, ♂ 31 millim., ♀ 33 millim.

Two examples, coll. Pryer (no. 658).

Oiwake, June and July (*Pryer*).

276. NOTODONTA METICULODINA.

Notodonta meticulodina, Oberth. Etud. d'Entom. x. p. 16, pl. i. fig. 3 (1884).

One example, coll. Pryer.

Sidemi (*Jankowski*); Yesso (*Pryer*).

277. NOTODONTA LINEATA.

Notodonta lineata, Oberth. Etud. d'Entom. v. p. 61, pl. ii. fig. 7 (1880).

One example, coll. Pryer.

Japan (*Pryer*); Askold.

278. NOTODONTA MONETARIA.

Notodonta monetaria, Oberth. Etud. d'Entom. v. p. 62, pl. ii. fig. 6.

This is no. 220 of Pryer's Catalogue, and there were three specimens in his collection. I took an example at Nagahama, in July.

Yokohama (*Pryer*); Nagahama (*Leech*); Askold.

279. HUPODONTA CORTICALIS.

Hupodonta corticalis, Butl. Ann. & Mag. Nat. Hist. (4) xx. p. 475 (1877).

Yokohama (*Jonas*).

280. DRYMONIA CHAONIA.

Bombyx chaonia, Hübn. Bomb. pl. 3. figs. 10, 11.

Four specimens, coll. Pryer.

Gifu, Yokohama (*Pryer*).

281. DRYMONIA MANLEYI, sp. n. (Plate XXXII. fig. 2.)

♂. Primaries ashy white, with an almost straight dark chocolate transverse band edged internally with a narrow line of the ground-colour, and enclosing a dark chocolate basal patch, distinct only between the median nerve and inner margin; beyond the middle is another chocolate-brown band elbowed just below the costa, and then running parallel with outer margin to the inner margin, beyond this the wing is pale olive-brown, through which the nervules show up darker. Secondaries brown, with central band darker. Head chocolate. Thorax greyish, with chocolate-coloured collar. Abdo-

men olive-brown. Under surface pale olive-brown, darker towards base and costa of primaries; a central darker band on all the wings. Femora of anterior legs chocolate.

♀. Paler, and the wings longer, giving the markings a more elongate appearance.

Expanse, ♂ 47 millim., ♀ 51 millim.

This species has a superficial resemblance to *D. chaonia*, but is abundantly distinct from that insect.

A fine series in Pryer's collection.

Yokohama (*Pryer*).

282. Drymonia delia, n. sp. (Plate XXXII. fig. 3.)

♂. Silvery grey, primaries with two pairs of parallel lines near the base, the area enclosed being pale greyish brown in colour, clouded along the costa from middle to near apex with brownish; submarginal line double, dark brown, much indented; a small brown discal dot followed by a reniform spot, outlined in black, and filled in with reddish brown; a series of black-margined lunules. Secondaries olive-brown. Head and thorax greyish brown. Abdomen olive-brown. Under surface pale brown, central area of primaries darker.

Expanse 44 millim.

Also allied to *D. chaonia*.

One example, coll. Pryer.

Oiwake (*Pryer*).

283. Drymonia trimacula.

Bombyx trimacula, Esp. Schmett. iii. p. 46. t. 46. figs. 1. 2 (1785).
Bombyx dodonæa, Hübn. Bomb. pl. 3. fig. 8.

One example in Pryer's collection, without locality label.

Japan (*Pryer*); Europe.

284. Lophopteryx camelina, L.

Bombyx camelina, Linn. Syst. Nat. x. p. 507.

I took two male specimens at Gensan in June 1889, and a female at Hakodate in August of same year; there were several specimens in Pryer's collection, some of these are no. 231 and others no. 232 of his Catalogue. Of the last he observes very like *N. camelina*. Although there is some variation in size and colour, there is nothing outside the usual range of aberration, and there is not a single specimen I cannot exactly match with an example of *L. camelina* from my European series of the species.

Nikko, Fujisan, Oiwake (*Pryer*); Hakodate, Gensan (*Leech*); Amur; Europe.

285. Lophopteryx ladislai.

Lophopteryx ladislai, Oberthür, Diagn. Lép. Ask. p. 13; Etud. d'Entom. v. p. 66, pl. ii. fig. 3.

One male example in Pryer's coll. taken at Nikko. This species appears to be very closely allied to *L. cucullа*, Esp.

Nikko (*Pryer*); isle of Askold.

286. LOPHOPTERYX PRYERI.

Lophopteryx pryeri, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 355.

A long series in Pryer's collection varying much in character of markings; the extremes between which the specimens vary are a pale grey example with dark brown central band and hind marginal streaks and clouds on the one hand, and an almost unicolorous fuscous brown example on the other. A specimen of the last form referred to was separated from the series and numbered 228, whilst other examples of the same form still remained in the series of no. 229.

Yokohama, Yesso, Oiwake (*Pryer*).

287. LOPHOCOSMA ATRIPLAGA.

Notodonta (*Lophocosma*) *atriplaga*, Staud., Rom. Mém. s. Lép. iii. p. 220, pl. xii. fig. 8.

One ♀ example, coll. Pryer.

My specimen has a short black dash on the costa near the base; this in Staudinger's figure of the male is represented by a small black spot.

Japan (*Pryer*); Vladivostok; Askold.

288. HYBOCAMPA MILHAUSERI.

Bombyx milhauseri, Fabr. S. E. p. 577 (1775).

Bombyx terrifica, Schiff. S. V. p. 63 (1776); Hübn. Bomb. pl. 8. figs. 32, 33.

Three specimens, somewhat darker than European examples.

Ohoyama (*Pryer*); Yokohama (*Manley*); Europe.

289. PHALERA FUSCESCENS.

Phalera fuscescens, Butl. Trans. Ent. Soc. 1881, p. 597.

I took an example at Gensan in July. Two specimens, coll. Pryer.

Oiwake, Fujisan (*Pryer*); Gensan (*Leech*).

290. PHALERA TENEBROSA.

Phalera tenebrosa, Moore, Proc. Zool. Soc. 1865, p. 815.

One example, coll. Pryer (no. 226).

Yokohama (*Pryer*); Darjeeling.

291. PHALERA SIGMATA.

Phalera sigmata, Butl. Ann. & Mag. Nat. Hist. (4) xx. p. 473 (1877); Ill. Typ. Lep. Het. pt. ii. p. 11, pl. xxiv. fig. 9 (1878).

I have thirteen specimens, nine of which were in Pryer's collection; all are greyer in colour than Mr. Butler's figure, and in some of the examples the indented transverse line posterior to the patch of raised black and white scales is ochraceous and in others blackish. The antennæ of the males are not so strongly pectinated.

Yokohama (*Jonas*, *Pryer*, and *Manley*); ♀, Hakodate (*Whitely*).

292. PHALERA FLAVESCENS.

Phalera flavescens, Brem. Lep. Nörd. China's, p. 14 (1853).
Trisula andreas, Oberth. Etud. d'Ent. v. p. 38, pl. v. fig. 4.
Yesso (*Pryer*); Yokohama (*Pryer*, *Manley*, and *Leech*); Hakodate, Gensan.

293. MICROPHALERA GRISEA.

Microphalera grisea, Butl. Cist. Ent. vol. iii. p. 120 (1885).
Ten specimens in coll. Pryer, and several collected by myself.
Yesso (*Pryer*); Hakodate (*Leech*).

294. SOMERA ACRONYCTA.

Dasychira acronycta, Oberth. Etud. d'Ent. v. p. 35, pl. v. fig. 8 (1880).
Three examples (2 ♂, 1 ♀), coll. Pryer.
The insect figured by Oberthür as the ♂ of this species (fig. 7) is *D. lunulata*.
Yokohama, Oiwake (*Pryer*).

295. SOMERA CYANEA, sp. n. (Plate XXXII. fig. 5.)

♂. Primaries pale purplish brown, with some green and grey scales towards the base along the costa and on the outer margin, indistinct basal and submarginal lines fuscous. Secondaries smoky brown; costal margin darker. Antennæ broadly pectinated. Head and thorax grey. Abdomen smoky brown. Under surface fuscous; nerves at base of primaries thickly clothed with long hairs.
♀. Similar to male, but primaries greenish grey, and antennæ more narrowly pectinated. Under surface, the hairs at base of primaries as in male.
Expanse, ♂ 44 millim., ♀ 54 millim.
Allied to *S. lichenia*, Butl., from Borneo.

296. CNETHODONTA GRISESCENS.

Cnethodonta grisescens, Staud., Rom. Mém. sur Lép. vol. iii. p. 214, pl. 12. fig. 11.
A single male in coll. Pryer, taken at Oiwake, 1885.
Dr. Staudinger records this species from Vladivostok, Askold, Ussuri, and Suifun.

297. PERIDEA CINEREA.

Peridea cinerea, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 353 (1878).
Some very fine examples in Pryer's collection; I took specimens at Yokohama, in October.
Yokohama (*Pryer* and *Leech*); Gifu (*Pryer*).

298. PERIDEA GIGANTEA.

Peridea gigantea, Butl. Ann. & Mag. Nat. Hist. (4) xx. p. 474 (1877); Ill. Typ. Lep. Het. pt. ii. p. 12, pl. xxiv. fig. 6 (1878).

One specimen in Pryer's collection, not labelled with locality, but probably from Yokohama.

Yokohama (*Jonas*, ? *Pryer*).

299. STAUROPUS FAGI.

Bombyx fagi, Linn. Syst. Nat. x. p. 508; Hübn. Bomb. pl. 8. fig. 31.

Stauropus persimilis, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 353 (1879).

A nice series in coll. Pryer, ranging in expanse from 52 millim. ♂ to 78 millim. ♀.

Yokohama, Oiwake (*Pryer*).

300. STAUROPUS TACZANOWSKII.

Harpyia taczanowskii, Oberth. Et. Ent. v. p. 59, pl. 2. fig. 5 (1880).

Six specimens in Pryer's collection (no. 200 of his catalogue) are referable to this species. I have also an example which I took at Fushiki in July.

Yokohama (*Pryer*); Fushiki, Aug., Foochau, April (*Leech*).

301. DRYMONIA CIRCUMSCRIPTA.

Drymonia circumscripta, Butl. Cist. Ent. vol. iii. p. 125 (1885).

This species, of which there were two examples in his collection, is no. 211 of Pryer's Catalogue.

Nikko (*Pryer*).

302. DRYMONIA PERMAGNA.

Drymonia permagna, Butl. Trans. Ent. Soc. 1881, p. 21.

Three specimens from Japan.

Tokio (*Fenton*); Yokohama (*Pryer* and *Manley*); Hakodate (*Leech*).

303. DICRANURA VINULA.

Bombyx vinula, Linn. Syst. Nat. x. p. 499; Hübn. Bomb. pl. 9. fig. 34.

Dicranura felina, Butl. Ann. & Mag. Nat. Hist. (4) xx. p. 474 (1877); Ill. Typ. Lep. Het. pt. ii. p. 12, pl. xxiv. fig. 3 (1878).

Several specimens in coll. Pryer. I bred a male, April 1887, from larva found at Gensan, June 1886. Mr. Butler says that his *D. felina* "differs from both the European species in the more deeply waved discal lines, and from *D. vinula* in its white secondaries;" but I cannot see that my Japanese specimens, which are identical with *felina*, Butl., differ in any character whatever from *D. vinula*. Pryer states in his Catalogue that the larva of *D. felina*, Butl., feeds on willow, and that in all its stages it agrees with *D. vinula*.

Yokohama (*Pryer*); Gensan (*Leech*); Europe.

304. Dicranura erminea.

Bombyx erminea, Esp. Schmett. p. 19. 1, 2 (1783); Hübn. Bomb. pl. 9. fig. 35.

Cerura menciana, Moore, Ann. & Mag. Nat. Hist. (4) xx. p. 89 (1877).

One female specimen taken by my native collector at Hakodate in June. Agrees well with examples from Europe.

Hakodate; Shanghai, Foochau (*Leech*); Europe.

305. Cerura furcula.

Bombyx furcula, Linn. F. S. p. 298; Hübn. Bomb. pl. 10. fig. 39.

Cerura lanigera, Butl. Ann. & Mag. Nat. Hist. (4) xx. p. 474 (1877); Ill. Typ. Lep. Het. pt. iii. p. 10, pl. xliii. fig. 11 (1879).

The specimens in coll. Pryer and one I took at Gensan agree exactly with European examples of *C. furcula* in my collection, and also with *C. lanigera*, Butl.

Hakodate (*Whitely*); Yokohama (*Pryer*); Gensan (*Leech*); Corea (*Herz*); Europe.

306. Cerura bifida.

Bombyx bifida, Hübn. Bomb. pl. 10. fig. 38.

One example in Pryer's collection with *C. furcula*.

Yokohama (*Pryer*); Europe.

307. Destolmia insignis.

Destolmia insignis, Butl. Trans. Ent. Soc. 1881, p. 19.

Tokio (*Fenton*).

308. Fentonia ocypete.

Harpyia ocypete, Brem. Bull. Acad. Pétersb. 1861, tom. iii.; Lep. Ost-Sib. p. 44, tab. v. fig. 1.

Fentonia levis, Butl. Cist. Ent. vol. iii. p. 129 (1885).

Several examples, coll. Pryer.

Yokohama, Oiwake (*Pryer*).

309. Phragmatœcia castanea.

Phalæna-Bombyx castanea, Hübn. Beitr. ii. Theil, p. 9 (1790); Esp. Schmett. p. 94. 1, 2.

Bombyx arundinis, Hübn. Bomb. pl. 47. figs. 200–1 (1803).

I captured a specimen at Hakodate in August, and my native collector took one at the same place in June or July. There were two Yokohama examples in coll. Pryer, and I have another taken by Mr. Andrews at Hakodate, making a total of five, all males. There is not the least difference between Japanese and British specimens.

Yokohama, Hakodate; Europe.

310. Tarsolepis remicauda.

Tarsolepis remicauda, Butl. Ann. & Mag. Nat. Hist. (4) x. p. 125.

? = *Crinodes sommeri*, Hübn., *cf.* Ritsema & Butler, *op. cit.* pp. 228, 274, 446.

A battered example of this remarkable species in coll. Pryer. This has no date or locality ticket attached.

Darjeeling, Borneo, Java.

311. Gorgopis niphonica.

Gorgopis niphonica, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 357 (1879).

Two examples in Pryer's collection taken at the foot of Ohoyama, near Yokohama, and one taken by myself at Tsuruga in July.

Yokohama (*Pryer*); Tsuruga (*Leech*).

312. Hepialus hectus.

Phalæna hecta, Linn. Syst. Nat. x. App. 822; Hübn. Bomb. pl. 49. figs. 208 ♂, 209 ♀.

Hepialus hectus, Ochs. Schmetterl. Eur. iii. 116.

Two examples, coll. Pryer. These are identical with some British specimens of *H. hectus* in my possession.

Yesso (*Pryer*).

313. Hepialus excrescens.

Hepialus excrescens, Butl. Ann. & Mag. Nat. Hist. (4) xx. p. 482 (1877); Ill. Typ. Lep. Het. pt. ii. p. 20, pl. xxvii. fig. 7 (1878).

Hepialus æmulus, Butl. A. M. N. H. (4) xx. p. 482; Ill. Typ. Lep. Het. pl. xxvii. fig. 8.

Several specimens in Pryer's collection, among which are both the forms described by Mr. Butler. I have examined these most carefully, and endeavoured to find some trustworthy character that would give specific distinction; but have failed to discover anything of the kind. Intermediates between the two forms are represented in the series before me, and the range of variation is not nearly so extensive as in some well-known species of the genus found in Europe, *H. velleda* for example.

Mr. Pryer, who appears to have had excellent opportunities of deciding, was of opinion that *H. æmulus* and *H. excrescens* were identical. In his Catalogue there is a note on the economy of the species, which it may be interesting to give *in extenso*:—

"Yokohama, very abundant; it emerges late in the autumn; large specimens measuring 4½ to 5 inches in expanse; it is very destructive, particularly to imported fruit-trees, in the stem of which it burrows two years; it is extremely prolific, the body of a full-sized female is two inches long, filled with minute eggs, which it scatters loosely about the tree it feeds on; I have found it in almost all trees except conifers; it often attacks vines, and prefers to burrow in the stem of a tree to which a wisteria or other climber is attached. The ichneumon that preys upon this insect is a most extraordinary one; the body is short and oval and measures ½ an inch, but the ovipositor is 9 inches long. Expanse of wings 1½ inch."

H. excrescens is closely allied to the Indian *H. pauperatus* of Walker; some of the Japanese specimens of the former have the "small black-edged white spots" and other characters of the latter.

Yokohama (*Jonas* and *Pryer*); Yesso (*Pryer*); Hakodate (*Pryer*).

314. Phassus signifer.

Phassus signifer, Walk. Cat. Lep. Het. vii. p. 1568 (1856); Butl. Ill. Typ. Lep. Het. pt. vi. p. 30, pl. cix. fig. 2 (1886).

Phassus sinensis, Moore, Ann. & Mag. Nat. Hist. (4) xx. p. 94 (1877).

Phassus herzi, Fixsen, Rom. Mém. sur Lép. iii. p. 335, pl. xv. fig. 3.

A most variable species both as regards colour and ornamentation as well as size. In my series from Japan and Corea (which comprises three examples from Satsuma, taken in May, three from Gensan, June, one Shimonoseki, July, and six coll. Pryer) there are specimens only 46 millim. in expanse, whilst others attain a wing expansion of 110 millim. Butler gives 150 millim. as the measurement of Walker's type of *P. signifer* from Silhet. The oblique silver dash at end of cell is present in three examples; but this character is subject to considerable modification, and although never entirely absent is in two examples reduced almost to vanishing point. In other specimens this mark is of large size, and there is another round or linear spot just beyond it. The silver spot nearer the base of primaries is also inconstant in form, and sometimes very indistinct. Occasionally there are other silver spots on the disk and at apex of primaries.

Pryer says that at Yokohama the species emerges in the summer, and is rather scarce.

Yokohama, Oiwake (*Pryer*); Satsuma, Shimonoseki, Gensan (*Leech*); Corea (*Herz*); Silhet.

315. Zeuzera pyrina.

Phalæna-Noctua pyrina, Linn. F. S. p. 306.

Phalæna-Noctua æsculi, Linn. Syst. Nat. xii. p. 833.

Bombyx æsculi, Hübn. Bomb. pl. 47. fig. 202.

I got a specimen at Gensan in July, and there were four examples (3 ♂, 1 ♀) in Pryer's collection, one of which was taken at Fujisan by Mr. Maries.

Gensan (*Leech*); Yokokama (*Pryer*); Fujisan (*Maries*).

316. Cossus vicarius.

Cossus vicarius, Walk. Cat. Lep. Het. Suppl. p. 584 (1865).

I took a male example at Gensan in July, and a female bred from a larva found in the same month at Fushiki. There were also three specimens in Pryer's collection, which must have been obtained after the publication of his Catalogue, as he says, p. 40:—"I have seen the larva of a *Cossus* here, but have not taken the perfect insect; the larvæ were small, but exactly like *C. ligniperda*." My observations of the larva coincide exactly with Pryer's remarks thereon.

C. cossus is recorded by Fixsen as taken in Corea by Herz, but this is possibly an error in identification.

Shanghai; Fushiki, Gensan (*Leech*); Yokohama (*Pryer*).

317. RODONTIA LURIDA.

Rodontia lurida, Fixsen, Rom. Mém. sur les Lép. vol. iii. p. 346, pl. xv. fig. 8.

Corea (*Herz*).

318. AROA JONASI.

Aroa jonasii, Butl. Ann. & Mag. Nat. Hist. (4) xx. p. 402 (1877); Ill. Typ. Lep. Het. pt. ii. p. 10, pl. xxiii. fig. 11 (1878).

A fine series in Pryer's collection. I got specimens in Satsuma in May, Nagasaki in June, Gensan in July, and at Hakone in August. There is some variation in the size of the brownish discal spot; this is sometimes little more than a dot, and at others quite a round patch. The apical spot is also subject to modification, and in some examples assumes the form of a short stripe. In some specimens there are brownish spots and dots over the whole of the disk.

Yokohama (*Jonas* and *Pryer*); Oiwake (*Pryer*); Hakone, Satsuma, Nagasaki, Gensan (*Leech*).

319. ARGYRIS PLAGIATA.

Argyris plagiata, Butl. Trans. Ent. Soc. 1881, p. 22.

Tokio (*Fenton*).

320. ARGYRIS SUPERBA.

Argyris superba, Butl. Ill. Typ. Lep. Het. pt. ii. p. 52, pl. xxxvii. fig. 2 (1878).

An extensive series, the majority of the specimens taken by myself at Hakodate.

Yokohama (*Jonas* and *Pryer*); Oiwake (*Pryer*); Hakodate (*Leech*).

321. ARGYRIS SUPERANS.

Argyris superans, Butl. Cist. Ent. vol. iii. p. 122 (1885).

Problepsis discophora, Fixsen, Rom. Mém. Lép. iii. p. 348, pl. xv. fig. 4 (1887).

A female example in coll. Pryer. I took a male at Satsuma in May, and a female at Gensan in July; this last is remarkable for its large size, as it expands 58 millim. The largest specimen of the same sex I have from either Ningpo or Kiukiang measures only 40 millim. in expanse.

Yesso (*Pryer*); Satsuma, Gensan (*Leech*); Kiukiang (*Pratt*); Ningpo.

322. ARGYRIS MAIA, sp. n. (Plate XXXII. fig. 6.)

White. Primaries with a large pear-shaped leaden-grey blotch in centre of wing, but not reaching the costa, this is outlined in ferruginous, speckled with silvery-blue scales, and has a projection from

its inner edge about the middle, and one on its external edge above the middle; the lower half is bordered on each side by a black line and at the inner marginal extremity is a bright red spot. Secondaries with some irregular silver outlined ferruginous markings along the abdominal margin and outer half of wing. Antennæ pectinated. Head white; thorax and abdomen white, marked with ferruginous and grey. Under surface white, with a blackish central band and apical spot, the former not reaching the costa, and the latter elongated, some blackish marks along outer margin of secondaries.

Expanse 48 millim.

A single specimen taken at Gensan in July by myself.

323. CALLICILIX ABRAXATA.

Callicilix abraxata, Butl. Cist. Ent. iii. p. 124 (1885).

Yesso, Nikko (*Pryer*).

324. DREPANA SCABIOSA.

Drepana scabiosa, Butl. Ann. & Mag. Nat. Hist. (4) xx. p. 478 (1877); Ill. Typ. Lep. Het. pt. ii. p. 15, pl. xxv. fig. 9 (1878).

A nice series, coll. Pryer. I caught one specimen at Shimonoseki in May. This species is very closely allied to *D. harpagula*, Esp. (=*sicula*, Hübn.); but the spices are much less produced and there is no black angulated line internal to the grey submarginal stripe. The discal spots of *D. scabiosa* are, moreover, of a different character.

Yokohama (*Jonas* and *Pryer*); Oiwake (*Pryer*); Shimonoseki (*Leech*); Corea (*Herz*).

325. DREPANA PATRANA.

Drepana patrana, Moore, Proc. Zool. Soc. 1865, p. 816.

This is no. 245 of Pryer's catalogue, and there were three examples in his collection.

Fujisan, Nikko, Oiwake (*Pryer*); Darjeeling.

326. DREPANA PALLEOLUS.

Drepanulides? palleolus, Motsch. Bull. de la Soc. Imp. Nat. Mosc. t. xxxix. p. 193 (1866).

I took a large number of this species at Hakodate in August, and my native collector got a few in June and July at the same place, I have also one example from Hakone, and there were nine in coll. Pryer.

Hakodate (*Leech*); Hakone (*Smith*); Oiwake, Fujisan, Ohoyama, and Yesso (*Pryer*).

327. DREPANA JAPONICA.

Drepana japonica, Moore, Ann. & Mag. Nat. Hist. (4) xx. p. 94.

Several specimens, coll. Pryer. I took an example at Nagasaki in

June. The outer line terminates on the inner margin, just beyond the middle, and the inner line does not always reach the costa. Most of the specimens have a small spot at end of cell on primaries, but in only two specimens is there any trace of such spot on secondaries.

Expanse 30 to 40 millim.

Japan (*W. B. Pryer*); Yokohama, Gifu (*Pryer*); Nagasaki (*Leech*)..

328. DREPANA CURVATULA.

Bombyx curvatula, Bork. Eur. Schmett. iii. p. 460.
Bombyx harpagula, Hübn. Bomb. pl. xi. figs. 42, 43 (*non* Esp.).
Drepana acuta, Butl. Trans. Ent. Soc. 1881, p. 596.

One example taken at Gensan in June and one coll. Pryer, no. 243; these agree exactly with my European specimens of *D. curvatula*. Another specimen in Pryer's collection and two from Hakodate are very pale in colour and bear a superficial resemblance to *D. falcataria*, but the characters of marking show them to be more properly referable to *D. curvatula*.

Ohoyama (*Pryer*); Hakodate (*Leech*).

329. DREPANA CROCEA, sp. n. (Plate XXXII. fig. 7.)

♂. Yellow. Primaries suffused with reddish; dentated basal, angulated central, and wavy submarginal lines purplish brown, two paler discal spots; below the apex, which is much curved and produced, are two conspicuous black spots placed on the inner edge of a dark patch; a line of blackish crescents traverses the wing, near to and parallel with outer margin, three of these lunules in the dark apical patch are edged externally with white. Secondaries yellow, an 8-shaped mark outlined in purplish brown, filled in with whitish, from this to the inner margin are some smaller brown spots; basal and submarginal lines slender and purplish brown, a series of black linear spots parallel with outer margin. Under surface yellow, with black discal and marginal spots.

Expanse 50 millim.

Allied to *D. flava*, Moore.

One example, coll. Pryer.

330. ORETA TURPIS.

Oreta turpis, Butl. Ann. & Mag. Nat. Hist. ser. 4, vol. xx. p. 477 (1877); Butl. Lep. Het. Brit. Mus. part ii. p. 14, pl. xxv. fig. 8.

I did not meet with this species in Japan or Corea, neither is it in coll. Pryer.

Yokohama (*Jonas*).

331. ORETA CALIDA.

Oreta calida, Butl. Ann. & Mag. Nat. Hist. (4) xx. p. 477 (1877); Ill. Typ. Lep. Het. pt. ii. p. 14, pl. xxv. fig. 6 (1878).

A fine series, coll. Pryer.

The brown coloration varies in tint from greyish to laky brown; both sexes have a discal series of black dots on primaries.

Yokohama (*Jonas* and *Pryer*); Oiwake, Yesso (*Pryer*); Hakodate (*Whitely*).

332. ORETA PULCHRIPES.

Oreta pulchripes, Butl. Ann. & Mag. Nat. Hist. (4) xx. p. 477 (1877).

An extensive series, coll. Pryer.

There is much variation in tone of colour and definition of markings in this species. Some examples are dark reddish brown with a lilacine suffusion, others are pale yellowish brown, tinged with rosy lilacine, especially along the costa of primaries. Then as regards the linear markings, these in the darker-coloured examples are not very distinct; but in pale specimens they are conspicuous. Often the area enclosed by the transverse lines is darker than rest of wing, thus giving a band-like character. The costal black spots as well as that at external angle are not always clearly defined and are often quite absent, whilst two examples have a colon-like spot at external angle. When the outer grey line of primaries is well defined, it can be traced from the outer costal spot, from whence it runs for a short distance towards external margin, then turning sharply inwards continues its course to near the middle of the wing, when it curves gently and terminates on the inner margin; the costal extremity of yellow border of this line is sometimes placed in a pale apical patch.

Yokohama (*Jonas* and *Pryer*); Oiwake (*Pryer*).

333. ORETA CALCEOLARIA.

Oreta calceolaria, Butl. Ann. & Mag. Nat. Hist. (4) xx. p. 478 (1877).

A fine series, coll. Pryer.

In this species the reddish-brown colour of wing-markings is a variable quantity. Sometimes the entire areas representing the basal two thirds of primaries and basal third of secondaries are reddish brown. The sulphur colour on the outer portion of all the wings is often sprinkled with dark grey dots, and sometimes a larger spot or two occurs at external edge of primaries. All the characters, both structural and ornamental, of this species are identical with those found in *O. pulchripes*, and the only difference I can see between the two insects is one of colour.

Yokohama, Oiwake (*Pryer*).

334. HYPSOMADIUS INSIGNIS.

Hypsomadius insignis, Butl. Ann. & Mag. Nat. Hist. ser. 4, vol. xx. p. 479 (1877).

Yokohama (*Jonas*).

335. GONOPHORA DERASA.

Phalæna-Noctua derasa, Linn. Syst. Nat. xii. p. 851.

Gonophora derasa, var. *intermedia*, Brem. Lep. Ost-Sib. p. 46.
Gonophora derasoides, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 77 (1878); Ill. Typ. Lep. Het. pt. iii. p. 12, pl. xliv. fig. 1 (1879).
Coll. Pryer.
Japanese examples of *G. derasa* do not differ so much from the type as do some European specimens in my collection.
Hakodate (*Whitely*); Fujisan (*Pryer*); Corea (*Herz*); Amur; Europe.

336. THYATIRA BATIS.
Thyatira batis, Treit. Schmett. Eur. Bd. v. Abth. 2. p. 162; Walk. Cat. Lep. Het. ix. p. 7.
One example at Hakodate in August. Several very fine specimens in Pryer's collection. All are quite typical.
Yokohama, Oiwake, Yesso (*Pryer*); Europe.

337. THYATIRA FLAVIDA.
Thyatira flavida, Butl. Cist. Ent. vol. iii. p. 131 (1885).
Hakodate, Aug. 28 (*Lewis*).

338. THYATIRA TRIMACULATA.
Thyatira trimaculata, Brem. Bull. de l'Acad. tom. iii. 1861; Lep. Ost-Sib. p. 47, tab. v. fig. 5.
Corea (*Herz*); Kiukiang (*Pratt*); Amur.

339. THYATIRA VIOLACEA.
Thyatira violacea, Fixsen, Rom. Mém. sur les Lép. vol. iii. p. 343, pl. xv. fig. 11 (1887).
Corea (*Herz*).

340. THYATIRA PRYERI.
Thyatira pryeri, Butl. Trans. Ent. Soc. 1881, p. 172.
One example, coll. Pryer.
Butler says this species is closely allied to *T. pudens* of N. America.
Japan (*Pryer*).

341. THYATIRA AURORINA.
Thyatira aurorina, Butl. Trans. Ent. Soc. 1881, p. 171.
Thyatira möllendorfi, Fixsen, Rom. Mém. s. Lép. iii. p. 351, pl. xv. fig. 12 (1887).
Nearly allied to *T. batis*, but a very distinct species, also allied to *G. scripta* of North America.
Yokohama (*Pryer*); Nikko, Fujisan (*Pryer*); Corea (*Herz*).

342. CYMATOPHORA MIRABILIS.
Xylina mirabilis, Butl. Ann. & Mag. Nat. Hist. (5) vol. iv. p. 365 (1879).
Several specimens, coll. Pryer.
Yokohama (*Pryer*).

343. CYMATOPHORA TRISTIS, sp. n. (Plate XXXII. fig. 8.)

♀. Pale brownish grey, sprinkled with darker scales; two darker transverse lines on primaries, the outer one sharply angulated and deeply serrated towards costa; a dark spot on disk of secondaries.

Expanse 41 millim.

One specimen in Pryer's collection without data.

Japan (*Pryer*).

344. CYMATOPHORA ALBICOSTATA.

Cymatophora albicostata, Brem. Lep. Ost-Sib. p. 47, tab. v. fig. 6.

One example, coll. Pryer.

Oiwake (*Pryer*); Corea (*Herz*); Amur.

345. CYMATOPHORA PLUMBEA.

Cymatophora plumbea, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 357, (1879).

Cymatophora argenteopicta, Oberth. Etud. d'Entom. v. p. 67, pl. iii. fig. 2 (1880).

My native collector took two specimens at Hakodate in June or July. There was a good series in Pryer's collection.

Yokohama (*Leech* and *Pryer*); Oiwake (*Pryer*); Hakodate; Corea (*Herz*).

346. CYMATOPHORA AMPLIATA.

Cymatophora ampliata, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 78 (1878); Ill. Typ. Lep. Het. pt. ii. p. 21, pl. xxviii. fig. 1 (1879); Oberth. Etud. d'Entom. v. p. 67, pl. iii. fig. 2 (1880).

I took one example of this species at Gensan in June. A fine series, coll. Pryer.

Although the majority of the Japanese examples of *C. ampliata* in my collection are larger than European specimens of *C. or*, there are individuals of the former which are exactly the same size as most of the latter. In colour and markings of the wings the Japanese *C. ampliata* and European *C. or* agree in every particular but one, and this is the colour of head and collar.

Yokohama (*Jonas* and *Pryer*); Oiwake (*Pryer*); Corea (*Herz*); Amur, Europe.

347. CYMATOPHORA ANGUSTATA.

Cymatophora octogesima, Butl. (non Hübn.). Ann. & Mag. Nat. Hist. (5) i. p. 78 (1878); Ill. Typ. Lep. Het. pt. ii. p. 21, pl. xxviii. fig. 2 (1879).

Cymatophora angustata, Staud., Rom. Mém. s. Lép. iii. p. 231, pl. xvii. fig. 6.

One example, coll. Pryer.

Hübner's name of *octogesima* is the earlier one for the species frequently referred to as *C. ocularis*, Guen. Mr. Butler's name therefore,

for the Japanese species, must give place to that of Staudinger. *Cymatophora octogesima*, Hübn., is, according to Fixsen (Rom. Mém. ser. Lep. iii. p. 354), represented in the Corea.

Yokohama (*Jonas* and *Pryer*); Corea (*Herz*); Ussuri, Askold.

348. CYMATOPHORA DUPLARIS.

Phalæna-Pyralis duplaris, Linn. Faun. Suec. p. 352; Syst. Nat. xii. p. 883.

Cymatophora duplaris, Guén. Hist. Nat. Noct. i. p. 17. 10; Walk. Cat. Lep. Het. ix. p. 12.

One example, coll. Pryer (no. 655).

Japan (*Pryer*); Europe.

349. CYMATOPHORA ARCTIPENNIS.

Xylina arctipennis, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 198 (1878); Ill. Typ. Lep. Het. pt. iii. p. 17, pl. xlv. fig. 3 (1879).

I obtained this species at Nagasaki in June. A fine series in Pryer's collection.

Yokohama (*Pryer*); Nagasaki (*Leech*).

350. CYMATOPHORA PUNCTIGERA.

Cymatophora punctigera, Butl. Cist. Ent. vol. iii. p. 131 (1885).

Five specimens, coll. Pryer (no. 651).

This species is nearly allied to *C. ruficollis* of Europe, but, although the primaries are longer, it may only be a form of that species.

Yokohama (*Pryer*).

351. CYMATOPHORA (?) MAXIMA, sp. n. (Plate XXXII. fig. 9.)

Greyish brown tinged with violet, base and oblique dash at apex of primaries whitish, the former marked externally with yellow; an indistinct denticulated pale submarginal line; on the disk two tufts of raised whitish scales represent reniform and orbicular stigmata, there are also two series of indistinct blackish dots seated on the nervules. Secondaries yellowish grey, with a faint central band. Antennæ yellow-brown; head and collar dark brown, the latter edged with black, thorax whitish grey; abdomen fuscous. Under surface uniform whity brown.

Expanse, ♂ 66, ♀ 72 millim.

An example of each sex, coll. Pryer.

Oiwake (June or July); Fujisan (*Pryer*).

352. POLYPLOCA ORNATA, sp. n. (Plate XXXII. fig. 10.)

Primaries: ground-colour greyish brown, browner along the base and costa; a series of dark wavy lines forming a broad band, the internal border of which is curved and sharply serrated, and the outer elbowed below the subcostal nervure, and indented above the inner margin; central fascia greyish white towards the inner margin, bordered externally by a blackish double line deeply angulated towards the outer margin, followed by a dark serrated line, and a

fainter submarginal dentated line curving from the apex of wings to the outer margin; a series of black linear marks along the outer margin; three tufts of raised black scales, one forming a basal dash, the second representing the orbicular stigma, and the third, which is edged with whitish, the reniform stigma. Secondaries fuscous brown, darker towards the margins. Head and palpi greyish brown, collar and antennæ light brown, thorax greyish brown, abdomen fuscous brown. Under surface pale fuscous grey, darker towards the margins, fringes checkered with darker, four black dots along the costa towards the apex of primaries.

Expanse 38 millim.

Var. UNICOLOR. (Plate XXXII. fig. 10 *a*.)

Darker than the type and without any trace of the central fascia, the only markings noticeable being the basal dash and the submarginal bands.

The type may be compared with *P. albidisca*, Moore (P. Z. S. 1888, p. 299), from which it differs in the absence of any greenish tinge, different angulations of transverse lines, and larger size.

A long series in coll. Pryer without locality.

LITHOSIA AFFINEOLA, Brem.

NOTODONTA TREPIDA.

CNETHOCAMPA PROCESSIONEA, L.

These species are recorded from Japan by Motschulsky, but have not been subsequently received from there.

BOMBYX FLAVEOLA, Motsch.

BOMBYX FUSCATA, Motsch.

DREPANULIDES? RUFULUS, Motsch.

I have been unable to identify these species; they may possibly have been redescribed subsequently.

DESCRIPTION OF THE PLATES.

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11. *Œonistis nigricosta*, p. 598.
12. *Lithosia japonica*, p. 600.
13. —— *coreana*, p. 600.

Fig. 14. *Miltochrista butleri*, p. 603.
15. *Engoa? obscura*, p. 604.
16. *Siccia maculata*, p. 605.
17. *Nola minutalis*, p. 607.
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9. —— *aurora*, var. *fusca*, p. 629.
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2. *Drymonia manleyi*, p. 639.
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4. *Datanoides approximans*, p. 636.
5. *Somera cyanea*, p. 642.
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7. *Drepana crocea*, p. 649.
8. *Cymatophora tristis*, p. 652.
9. —— *maxima*, p. 653.
10. *Polyploca ornata*, p. 653 ; 10 *a*, var. *unicolor*, p. 654.

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[Received November 30, 1888.]

PART I.

The number and size of the primaries or metacarpo-digital quills have been examined by various ornithologists (Coues, Gerbe, Jeffries, Wallace [1]), and have often been used as taxonomic characters,

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Birds." In all cases the reduction from 11 to 10 primaries is brought about by the reduction at the terminal end of the wing.

The reduced terminal quill occasionally assumes the shape and coloration of its lower covert, and does not agree with the other primaries nor with its upper covert, as one might be predisposed to think would be the case. In *Neophron percnopterus*, for instance, the 11th quill is more than 4 centim. long and quite white like the lower wing-coverts, not black like the upper coverts and the other primaries. The same is the case with *Grus leucogeranus*. The terminal or 11th quill of *Oriolus* is very small, and yellow like the lower wing-coverts. In *Rupicola* it is very tiny, reddish like the lower coverts, and hidden by a very stiff upper covert of 4 centim. in length. This is one of many cases in which the 11th upper covert is longer and much stronger than its primary quill, so that it even acts as a substitute for the latter.

Passeres.

It is hardly necessary to mention that there are numerous transitional stages which connect the four groups A, B, C, D into which Wallace has divided the Passeres. There can be no doubt about the fact that the reduction of the 9th and 10th primaries has taken place in the various families independently ; identical conditions of the terminal quills do not therefore necessarily indicate relationship. Some Alaudidæ belong to Group D according to the state of their primaries ; *Lanius minor* differs strikingly from all the other Laniinæ. The Vireoninæ are probably now in an unsettled state, to judge from the variable relative size of their terminal quills. *Heteralocha* does not agree with the Sturnidæ.

The gradual diminution of the 10th primary can well be studied in Group D.

In some cases there might be some doubt whether the little terminal feather in question is in reality a primary, but this can easily be settled by the presence of the corresponding upper covert. Moreover there are many cases in which this primary is still longer than its covert. When the 10th or 11th quill is much shortened, the corresponding lower covert is absent in the Passeres. The Alaudidæ prove that the 10th quill is capable of being shifted dorsalwards, so that it becomes enclosed between the outer vane of the 9th primary and the 10th upper covert, instead of being situated freely visible below and in front of the 9th primary ; when seen from below, it is

especially in the Order of Passeres. The statements hitherto published are, however, not always in harmony with each other, and moreover are not free from mistakes.

Considering that the results yielded by a renewed and more comprehensive examination of the points in question may possibly influence the systematic position of some genera or even subfamilies, I submit the following tables (pp. 658–664) for the acceptance of the Zoological Society of London. They contain the results of some investigations which I have recently made. Many of the specimens examined were fresh or had been preserved in spirits. Of many species several specimens have been examined, in order to exclude doubt, which occasionally arises, in the cases of moulting or imperfect or very small birds.

The remarks which I have to offer are scanty, not only because the whole matter is rather dry, but because I have abstained from testing the taxonomic value of the arrangement of the terminal primaries by correlating their features with other known characters. At any rate the following tables show such considerable variations of the terminal quills within the limits of avowedly closely allied genera and subfamilies, that we ought to refrain from generalizations. The same remark applies to the presence or absence of the fifth cubital quill. Although this character was discovered by Gerbe in 1877, and has lately been rediscovered by Wray, it remains still unexplained, young birds not throwing any light upon the question. The presence of this fifth quill is indicated by a +, its absence by a — in the accompanying tables. The other columns contain the total number of primaries, and the way in which this number is composed of metacarpal and the various digital quills.

The most important result is evidence of the gradual reduction in number of the functional quills. With the exception of *Struthio* and the Spheniscidæ, the number of primaries or metacarpo-digital quills varies between 12 and 10. Amongst the birds which possess 12 primaries, the Podicipedidæ, many Pelargi, and *Rhea* possess 7 metacarpal and 5 digital quills, whilst *Apteryx* has 8 metacarpal and only 4 digital quills. In all other birds the reduction from 12 to 11 is due to the reduction from 7 to 6 of the metacarpal quills. *Abdimia* stands alone with 7 metacarpals, and only one quill carried by the second phalanx of the second digit. The 11th or terminal quill is never fully developed and hardly functional; it is invariably much shortened, and is hidden between its upper and lower covert; not

		Total No. of Primaries.	Meta-carpals.	Dig. III.	Ph. I. Dig. II.	Ph. I. Dig. II.	Ph. I. Dig. II.	Ph. II. Dig. II.	Ph. II. Dig. II.	Vth. Cubital.	
Ratitæ	Dromæus	12	7?	1	1	1	4	5			*Casuarius bennetti* has only 7 remiges in all, of which 5 are secondaries and 2 metacarpals. I am indebted for a sketch of the wing of this bird to Mr. R. S. Wray.
	Struthio	16	8	1	1	1	4	5			
	Rhea	12	7	1	1	1	4	5			
	Apteryx	12	8	1	1	1	4	5			
Spheniscidæ		36	6	1	1	1	1	1	1		
Lamellirostres		11	6	1	1	1	1	1	1		
Colymbidæ		11	6	1	1	1	1	1	1		
Podicipedidæ		12	7	1	1	1	1	1	1		
Steganopodes		11	6	1	1	1	1	1	1		
Tubinares		11	6	1	1	1	1	1	1		
Herodii	Ardea	11	6	1	1	1	1	1	1		
	Nycticorax	11	6	1	1	1	1	1	0		
	Scopus	10	6	1	1	1	1	0	0		
	Ibis	11	6	1	1	1	1	1	0		
Pelargi	Platalea	11	6	1	1	1	1	1	0		
	Ciconia alba	11	7	1	1	1	1	1	0		
	Abdimia	11	7	1	1	1	1	1	0		
	Myeteria	12	7	1	1	1	1	1	1		
	Leptoptilus	12	7	1	1	1	1	1	1		
	Anastomus	12	7	1	1	1	1	1	1		
	Tantalus	12	7	1	1	1	1	1	1		
	Phœnicopterus	11	6	1	1	1	1	1	1		
Laro-Limicolæ		11	6	1	1	1	1	1	1		
Grallæ	Grus	11	6	1	1	1	1	1	0		
	Aramus	11	6	1	1	1	1	1	0		
	Psophia	10	6	1	1	1	1	0	0		
	Dicholophus	10	6	1	1	1	1	0	0		
	Eurypyga	10	6	1	1	1	1	0	0		
	Rhinochetus	10	6	1	1	1	1	0	1		
	Fulica	11	6	1	1	1	1	1	1		
	Porphyrio	11	6	1	1	1	1	1	1		
	Gallinula	11	6	1	1	1	1	1	1		
	Podica	10 (11)	6	1	1	1	1	1	?		XI. very tiny, soft and occult.
	Crex	11	6	1	1	1	1	1	1		XI. very small and soft.
										+	XI. very small.

for the Japanese species, must give place to that of Staudinger. *Cymatophora octogesima*, Hübn., is, according to Fixsen (Rom. Mém. ser. Lep. iii. p. 354), represented in the Corea.

Yokohama (*Jonas* and *Pryer*); Corea (*Herz*); Ussuri, Askold.

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Cymatophora duplaris, Guén. Hist. Nat. Noct. i. p. 17. 10; Walk. Cat. Lep. Het. ix. p. 12.

One example, coll. Pryer (no. 655).

Japan (*Pryer*); Europe.

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I obtained this species at Nagasaki in June. A fine series in Pryer's collection.

Yokohama (*Pryer*); Nagasaki (*Leech*).

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Cymatophora punctigera, Butl. Cist. Ent. vol. iii. p. 131 (1885).

Five specimens, coll. Pryer (no. 651).

This species is nearly allied to *C. ruficollis* of Europe, but, although the primaries are longer, it may only be a form of that species.

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Greyish brown tinged with violet, base and oblique dash at apex of primaries whitish, the former marked externally with yellow; an indistinct denticulated pale submarginal line; on the disk two tufts of raised whitish scales represent reniform and orbicular stigmata, there are also two series of indistinct blackish dots seated on the nervules. Secondaries yellowish grey, with a faint central band. Antennæ yellow-brown; head and collar dark brown, the latter edged with black, thorax whitish grey; abdomen fuscous. Under surface uniform whity brown.

Expanse, ♂ 66, ♀ 72 millim.

An example of each sex, coll. Pryer.

Oiwake (June or July); Fujisan (*Pryer*).

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Var. UNICOLOR. (Plate XXXII. fig. 10 *a*.)

Darker than the type and without any trace of the central fascia, the only markings noticeable being the basal dash and the submarginal bands.

The type may be compared with *P. albidisca*, Moore (P. Z. S. 1888, p. 299), from which it differs in the absence of any greenish tinge, different angulations of transverse lines, and larger size.

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		Total No. of Primaries.	Meta-carpals.	Dig. III.	Ph. I. Dig. II.	Ph. I. Dig. II.	Ph. II. Dig. II.	Ph. II. Dig. II.	Vth. Cubital.	
						5				
Ratitæ	Dromæus	12	7?		4					*Casuarius bennetti* has only 7 remiges in all, of which 5 are secondaries and 2 metacarpals. I am indebted for a sketch of the wing of this bird to Mr. R. S. Wray.
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	Rhea	12	7	1			1			
		12	8			4				
	Apteryx	36	6	1	1	1	1	1		
Spheniscidæ		11	6	...	...	...	...	1		
Lamellirostres		11	6	...	...	...	...	1		
Colymbidæ		12	7	...	...	...	...	1		
Podicipedidæ		11	6	...	...	...	...	1		
Steganopodes		11	6	...	...	...	...	1		
Tubinares		11	6	...	...	...	...	0		
Herodii	Ardea	11	6	...	...	...	...	...		
	Nycticorax	10	6	...	...	...	...	...		
	Scopus	11	6	...	...	...	...	...		
Pelargi	Ibis	11	6	...	...	...	...	0		
	Platalea	11	6	...	...	...	...	...		
	Coconia alba	11	7	...	...	...	...	...		
	Abdimia	12	7	...	...	...	...	1		
	Mycteria	12	7	...	...	...	...	1		
	Leptoptilus	12	7	...	...	...	...	1		
	Anastomus	12	7	...	...	...	...	1		
	Tantalus	12	7	...	...	...	...	1		
	Phœnicopterus	11	6	...	...	...	...	1		
Laro-Limicolæ		11	6	...	...	...	...	1		
Grallæ	Grus	11	6	...	...	...	...	0		
	Aramus	10	6	...	...	...	...	0		
	Psophia	10	6	...	...	...	...	0		
	Dicholophus	10	6	...	...	...	...	0		
	Eurypyga	10	6	...	...	...	...	1		
	Rhinochetus	11	6	...	...	...	...	1		
	Fulica	11	6	...	...	...	...	1		
	Porphyrio	11	6	...	...	...	...	?		
	Gallinula	10 (11)	6	...	...	...	...	1		
	Podica	11	6	...	...	...	...			
	Crex									

XI. very tiny, soft and occult.
XI. very small and soft.

XI. very small.

Fig. 14. *Miltochrista butleri*, p. 603.
15. *Eugoa? obscura*, p. 604.
16. *Siccia maculata*, p. 605.
17. *Nola minutalis*, p. 607.
18. *Heterogenea fulgens*, p. 609.
19. *Northia tenuis*, Butl., neuration of primary, p. 596.
20. —— *sinensis*, Walk., neuration of primary, p. 595.

PLATE XXXI.

1. *Epicopeia simulans*, p. 611.
2. *Scudyra venusta*, p. 614.
3. *Spilosoma bisecta*, p. 618.
4. *Bireta plumosa*, p. 620.
5. *Artaxa pulverea*, p. 623.
6. *Chærotriche staudingeri*, p. 624.
7. *Orgyia thyelino*, Butl., ♀ ; 7 *a*, semiapterous ♀, p. 626.
8. *Limantria albofascia*, p. 629.
9. —— *aurora*, var. *fusca*, p. 629.
10. *Ocneria furva*, p. 631.
11. *Rosama cinnamomea*, p. 637.
12. *Nola triangulalis*, p. 608.

PLATE XXXII.

1. *Edema nivilinea*, p. 638.
2. *Drymonia manleyi*, p. 639.
3. —— *delia*, p. 640.
4. *Datanoides approximans*, p. 636.
5. *Somera cyanea*, p. 642.
6. *Argyris maia*, p. 647.
7. *Drepana crocea*, p. 649.
8. *Cymatophora tristis*, p. 652.
9. —— *maxima*, p. 653.
10. *Polyploca ornata*, p. 653 ; 10 *a*, var. *unicolor*, p. 654.

4. Remarks on the Numbers and on the Phylogenetic Development of the Remiges of Birds. By HANS GADOW, Ph.D., M.A., F.Z.S., Strickland Curator and Lecturer on the Advanced Morphology of Vertebrata in the University of Cambridge.

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PART I.

The number and size of the primaries or metacarpo-digital quills have been examined by various ornithologists (Coues, Gerbe, Jeffries, Wallace [1]), and have often been used as taxonomic characters,

[1] *Principal Literature referred to in this Paper.*

NITZSCH, C. L. System der Pterylographie. Halle, 1840.
SUNDEVALL, C. J. "On the Wings of Birds." Ibis, 1886, pp. 389–457. Translated from the Swedish original in Kongl. Vetenskaps-Akad. Handlingar, 1843.
WALLACE, A. R. "On the Arrangement of the Families constituting the order Passeres." Ibis, 1874, pp. 406–416.

especially in the Order of Passeres. The statements hitherto published are, however, not always in harmony with each other, and moreover are not free from mistakes.

Considering that the results yielded by a renewed and more comprehensive examination of the points in question may possibly influence the systematic position of some genera or even subfamilies, I submit the following tables (pp. 658–664) for the acceptance of the Zoological Society of London. They contain the results of some investigations which I have recently made. Many of the specimens examined were fresh or had been preserved in spirits. Of many species several specimens have been examined, in order to exclude doubt, which occasionally arises, in the cases of moulting or imperfect or very small birds.

The remarks which I have to offer are scanty, not only because the whole matter is rather dry, but because I have abstained from testing the taxonomic value of the arrangement of the terminal primaries by correlating their features with other known characters. At any rate the following tables show such considerable variations of the terminal quills within the limits of avowedly closely allied genera and subfamilies, that we ought to refrain from generalizations. The same remark applies to the presence or absence of the fifth cubital quill. Although this character was discovered by Gerbe in 1877, and has lately been rediscovered by Wray, it remains still unexplained, young birds not throwing any light upon the question. The presence of this fifth quill is indicated by a +, its absence by a — in the accompanying tables. The other columns contain the total number of primaries, and the way in which this number is composed of metacarpal and the various digital quills.

The most important result is evidence of the gradual reduction in number of the functional quills. With the exception of *Struthio* and the Spheniscidæ, the number of primaries or metacarpo-digital quills varies between 12 and 10. Amongst the birds which possess 12 primaries, the Podicipedidæ, many Pelargi, and *Rhea* possess 7 metacarpal and 5 digital quills, whilst *Apteryx* has 8 metacarpal and only 4 digital quills. In all other birds the reduction from 12 to 11 is due to the reduction from 7 to 6 of the metacarpal quills. *Abdimia* stands alone with 7 metacarpals, and only one quill carried by the second phalanx of the second digit. The 11th or terminal quill is never fully developed and hardly functional; it is invariably much shortened, and is hidden between its upper and lower covert; not

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Coues, E. "On the Number of the Primaries in Oscines." Bull. Nuttall Ornith. Club, i. (1876), pp. 60–63.

Gerbe, Z. "Sur les plumes du vol et leur mue." Bull. Soc. Zool. France, ii. (1877). pp. 289–290.

Jeffries, J. A. "On the Number of Primaries in Birds." Bull. Nuttall Ornith. Club, vi. (1881), pp. 6–11.

Wray, R. S. "On some Points in the Morphology of the Wings of Birds." Proc. Zool. Soc. 1887, pp. 343–357.

Fuerbringer, M. Untersuchungen zur Morphologie und Systematik der Vögel. Amsterdam, 4°, 1888.

Baird. Review of North-American Birds.

unfrequently it is shorter and weaker than its upper, often very stiff covert. In some birds, *e. g.* in certain Fulicariæ and in the Passeres, the 11th quill is very tiny indeed, or it is altogether absent. In this case, however, the upper covert is present as an apparently supernumerary feather, provided that the 10th quill is not likewise much reduced. The 10th primary shows every intermediate stage between the largest possible development, as in *Larus* and *Cypselus*, and a very degenerate condition, as in many of the so-called Oscines novempennatæ. In the latter birds it was first properly recognized as a true primary by Baird, in his 'Review of American Birds.' In all cases the reduction from 11 to 10 primaries is brought about by the reduction at the terminal end of the wing.

The reduced terminal quill occasionally assumes the shape and coloration of its lower covert, and does not agree with the other primaries nor with its upper covert, as one might be predisposed to think would be the case. In *Neophron percnopterus*, for instance, the 11th quill is more than 4 centim. long and quite white like the lower wing-coverts, not black like the upper coverts and the other primaries. The same is the case with *Grus leucogeranus*. The terminal or 11th quill of *Oriolus* is very small, and yellow like the lower wing-coverts. In *Rupicola* it is very tiny, reddish like the lower coverts, and hidden by a very stiff upper covert of 4 centim. in length. This is one of many cases in which the 11th upper covert is longer and much stronger than its primary quill, so that it even acts as a substitute for the latter.

Passeres.

It is hardly necessary to mention that there are numerous transitional stages which connect the four groups A, B, C, D into which Wallace has divided the Passeres. There can be no doubt about the fact that the reduction of the 9th and 10th primaries has taken place in the various families independently; identical conditions of the terminal quills do not therefore necessarily indicate relationship. Some Alaudidæ belong to Group D according to the state of their primaries; *Lanius minor* differs strikingly from all the other Laniinæ. The Vireoninæ are probably now in an unsettled state, to judge from the variable relative size of their terminal quills. *Heteralocha* does not agree with the Sturnidæ.

The gradual diminution of the 10th primary can well be studied in Group D.

In some cases there might be some doubt whether the little terminal feather in question is in reality a primary, but this can easily be settled by the presence of the corresponding upper covert. Moreover there are many cases in which this primary is still longer than its covert. When the 10th or 11th quill is much shortened, the corresponding lower covert is absent in the Passeres. The Alaudidæ prove that the 10th quill is capable of being shifted dorsalwards, so that it becomes enclosed between the outer vane of the 9th primary and the 10th upper covert, instead of being situated freely visible below and in front of the 9th primary; when seen from below, it is

		Total No. of Primaries.	Meta-carpals.	Dig. III.	Ph. I. Dig. II.	Ph. I. Dig. II.	Ph. II. Dig. II.	Ph. II. Dig. II.	Vth. Cubital.	
						5				
Ratitæ	Dromæus	12	7?							*Casuarius bennetti* has only 7 remiges in all, of which 5 are secondaries and 2 metacarpals. I am indebted for a sketch of the wing of this bird to Mr. R. S. Wray.
						4				
	Struthio	16	8	1			2	1		
	Rhea	12	7	1	1	1	1	1		
						4				
	Apteryx	12	8							
Spheniscidæ		36								
Lamellirostres		11	6	1	1	1	1	1		
Colymbidæ		11	6	...	...	...	...	1		
Podicipedidæ		12	7	...	...	...	...	1	–	
Steganopodes		11	6	...	...	...	...	1	–	
Tubinares		11	6	...	...	...	...	1	–	
Herodii	Ardea	11	6	...	...	...	...	1	–	
	Nycticorax	11	6	...	...	...	...	1	–	
	Scopus	10	6	...	...	...	...	0	–	
Pelargi	Ibis	11	6	...	...	...	...	...	–	
	Platalea	11	6	...	...	...	...	...	–	
	Ceconia alba	11	6	...	...	...	...	...	–	
	Abdimia	11	7	...	...	...	...	0	–	
	Mycteria	12	7	...	...	...	...	...	–	
	Leptoptilus	12	7	...	...	...	...	...	–	
	Anastomus	12	7	...	...	...	...	...	–	
	Tantalus	12	7	...	...	...	...	1	–	
	Phœnicopterus	12	7	...	...	...	...	1	–	
Laro-Limicolæ		11	6	...	...	...	...	1	–	
Grallæ	Grus	11	6	...	...	...	...	1	–	
	Aramus	11	6	...	...	...	...	1	–	
	Psophia	10	6	...	...	...	...	0	+	
	Dicholophus	10	6	...	...	...	...	0	+	
	Eurypyga	10	6	...	...	...	...	0	–	
	Rhinochetus	10	6	...	...	...	...	0	+	
	Fulica	11	6	...	...	...	...	1	–	
	Porphyrio	11	6	...	...	...	...	1	...	XI. very tiny, soft and occult.
	Gallinula	11	6	...	...	...	...	1	...	XI. very small and soft.
	Podica	10 (11)	6	...	...	...	...	?		
	Crex	11	6	...	...	...	...	1	...	XI. very small.

	Ocydromus	10	6	...	...	...	...	0	−	
	Eulabeornis									
	Rallus	10	6	...	..	...	...	0		
	Heliornis	10	6	...	...	...	...	0		
	Hemipodius	10	6	...	...	...	...	0		
Pterocletes	Pterocles	11	6	...	...	...	...	1	−	
	Syrrhaptes									
Columbæ	.....	...	...	...	...	...	...	...	−	
Rasores	.....	10	6	...	...	...	...	0	+	
Opisthocomidæ	.....	10	6	...	...	...	...	0	+	X. shortened.
Tinamidæ	Crypturus	10	6	...	...	...	...	0	+	
	Tinamus	10	6	...	...	...	...	0	+	
Raptores	.....	11	6	...	...	...	...	1	−	
Striges	.....	11	6	...	...	...	...	1	−	
Psittaci	.....	...	...	...	...	...	...	...	−	
Cuculidæ	.....	10	6	...	...	...	...	0	+	X. shortened.
Trogonidæ	.....	10	6	...	...	...	...	0	+	X. much shortened, but functional.
Anisodactylæ	Halcyon	11	6	...	...	...	...	1	+	XI. very tiny and occult.
	Alcedo	11	6	...	...	...	...	1	+	XI. very tiny and occult.
	Buceros	11	6	...	...	...	...	1		
	Upupa	10	6	...	...	...	...	0	+	
	Merops	10	6	...	...	...	...	0	+	
	Nyctiornis	10	6	...	...	...	...	0	...	X. sickle-shaped.
	Momotus	10	6	...	...	...	...	0	+	X. long.
	Todus	10	6	...	...	...	...	0	+	X. very long.
	Coracias	10	6	...	...	...	...	0	+	X. long.
	Leptosoma	10	6	...	...	...	...	0	...	
Galbulæ	Galbula	10	6	...	...	...	...	0	...	X. much shortened.
	Bucco	10	6	...	...	...	...	0	...	X. = ½ length of IX.
Picidæ	Picus	10	6	...	...	...	...	0	+	X. short.
	Yunx									
	Indicator	10	6	...	...	...	...	0	...	X. very tiny and occult. IX. very long.
	Rhamphastus	10	6	...	...	...	...	0	...	IX. and X. much shortened.
	Monasa	10	6	...	...	...	...	0	...	X. shortened, sickle-shaped.
	Capito	10	6	...	...	...	...	0	+	X. short.
Coliidæ	.....	...	...	...	...	...	...	...	+	
Cypselomorphæ	Cypselus	10	6	...	...	...	...	0	−	X. very long.
	Trochilus	10	6	...	...	...	...	0	+	
	Podargus	10	6	...	...	...	...	?	...	X. shortened, sickle-shaped. XIth very tiny and soft.
	Steatornis	10	6	...	...	...	...	?	...	
	Caprimulgus	10	6	...	...	...	...	0	−	X. very long and straight.
Passeres	.....	11 or 10	6	...	...	...	...	+ or −	+	

hidden by the outer vane of the 9th primary. This shifting explains the conditions which are the rule amongst the birds of Group D. The 11th primary undergoes a similar dislocation in a more marked degree.

Group A.—With 10 long primaries. The 10th quill is, with few exceptions (e. g. *Hylactes*), very little shortened, and partakes of the formation of the tip of the wing. The 11th quill is frequently present, although small and hidden. When it is absent, at least its upper covert is present as a stiff and well-developed little feather.

To this group belong all the Passeres non-oscines.

		XIth quill.	
I. Pseudoscines ...	Menura	1·5 cm. long.	Wings rounded off; the 11th quill and its upper covert are soft and broad.
	Atrichia	Very small.	
II. Desmodactyli...	Eurylæmus	+	
	Calyptomena.....	−	
III. Oligomyodi ...	Pitta	−	
	Philepitta	−	
	Xenicus	?	
	Pipra	+	(1) *Rupicola*, ♂. The 10th primary is somewhat shortened and suddenly narrowed near its end.
	Rupicola (1)		
	Tityra (2)		
	Metopia		
	Querula		(2) *Tityra*, ♂. The 9th primary is much narrowed, and considerably shorter than either the 10th or 8th. In *T. brasiliensis* it is only half the length of the neighbouring quills.
	Xipholena		
	Cotinga		
	Pyroderus	−	Young males and females have their quills regularly developed.
	Hadrostomus.....		
	Lipaugus		
	Ampelion		
	Phibalura		(3) *Phœnicocercus*, ♂. The 7th primary is suddenly narrowed at its distal portion, and considerably shorter than the neighbouring quills.
	Phœnicocercus (3)...		
	Phytotoma.....		
	Tyrannus	−	
	Milvulus.....	−	
	Pitangus.....	+−	
IV. Tracheophonæ	Formicariidæ.....	−	(4) *Hylactes* differs from the Pteroptochidæ in its rounded-off wings; the 10th primary is short, but its upper covert is still present.
	Furnariidæ		
	Pteroptochidæ (4)...		
	Dendrocolaptidæ ...		
	Conopophagidæ.....		

Group B.—With 10 distinct, functional primaries. The 10th is always considerably shortened and, as a rule, hardly reaches to one third towards the tip of the wing, rarely halfway towards the tip, as in the Corvidæ.

A small 11th quill is frequently present, but almost invariably hidden between its upper covert and the 10th primary. Where the 11th quill is absent, its covert is not always present. This indicates a further reduction of the quills in comparison with the wing of the non-oscinine Passeres.

To this group belongs the majority of the so-called Oscines decempennatæ, which correspond with Wallace's series of Typical or Turdoid Passeres.

		XIth prim.	Xth upper covert.	Size of the terminal primary.
Corvidæ	Fregilus			1·7 cm. long.
	Monedula			
	Corvus			About 1·2 cm. long.
	Gymnorhina			
	Strepera	+	+	In *Strepera* 1·2 cm. long, and somewhat shorter than its upper covert.
	Cracticus			In *Cracticus* and *Gymnorhina* very small and occult.
	Manucodia			
	Garrulus	−	+	
	Cyanocitta			
Oriolidæ	Oriolus			
	Sphecotheres	+	+	Very tiny, shorter than its upper covert.
	Mimeta			
Dicruridæ	.....	−		
Prionopidæ	Collyriocincla	−	−	
	Eurycerus			
Campophagidæ	Graucalus	+	+	
Turdidæ	Sylvia	−		
	Turdus			
	Saxicola			
Muscicapidæ	Malurus	−	+	
Timeliidæ	Hypsipetes	−	+	
	Pycnonotus	+	+	In *P. layardi* 1 cm., in other species often short.
	Pomatorhinus			In *Pomatorhinus* and *Malacocercus* more than 1 cm. in length.
	Malacocercus			
	Phylloruis	−	+	
	Crateropus			
	Liothrix			Upper 11th covert extremely small.
	Accentor	−	−	
	Sialia			
	Troglodytes			
	Cinclus			

Group B (continued).

		XIth prim.	Xth upper covert.	Size of the terminal primary.
Paridæ	Parus	–	+	10th primary of *Chamæa* more than 3 cm. in length.
	Ægithalus			
	Chamæa			
	Parisoma			
	Certhiparus			
	Orthonyx			
Laniidæ	*Vireoninæ.*			The size of the 10th primary varies very much. In *Cyclorhis* it is reduced to only one half of the length of the 9th; in *Vireo solitaria* it is hardly 2 cm. long, whilst in *Vireosylvia* it is frequently reduced to a small, pointed feather of 1 cm. in length.
	Cyclorhis	–	–	
	Vireo			
	Vireosylvia			
	Pachycephalinæ.			
	Pachycephala	–	–	*Eopsaltria* seems occasionally to possess an upper 11th covert.
	Falcunculus			
	Oreoica			
	Eopsaltria			
	Laniinæ.	+	+	The 11th primary is very distinct; only in *L. minor* it is absent, but its upper covert is present. In *L. minor* alone the 10th primary is much shortened, and the tip of the wing is formed by the 9th. All the other Laniinæ have rounded-off wings, and the 10th primary is $\frac{1}{4}$–$\frac{1}{5}$ the length of the 9th.
	Lanius			
	Urolestes			
	Laniarius			
	Telophonus			
Certhiomorphæ	Certhia	–	–?	
	Climacteris	–	+	
	Sitta	–	–	
Cinnyrimorphæ	*Nectariniidæ*	+	–	Including *Promerops*.
	Meliphagidæ.			The 11th primary is generally very small, its upper covert is perhaps occasionally absent.
	Prosthemadera			
	Acanthochæra			
	Tropidorhynchus			
	Xanthomyza			
	Ptilotis			
	Myzomela			

Group C.—Transitional group from B to D, comprising the Sturnoid Passeres of Wallace. The numerous and considerable exceptions destroy the validity of this group. General characters are:—10 distinct primaries; the 9th is long and helps to form the tip of the wing. The 10th primary is considerably shortened. The 11th primary is lost completely, but its upper covert is still present; the latter is, as a rule, very small, except in *Heteralocha*, where it reaches a length of 1·5 centim.

		Length of 10th primary in cm.	
Ploceidæ ...	Textor	4·2!	The 10th primary in *Hyphantornis* is 3 times longer than its upper covert. Traces of the 10th primary are present besides a distinct 11th covert.
	Hyphantornis	2·5	
	Chera	2·1	
	Ploceus oryx	1·2	
	—— manyar	1·8	*P. manyar*, 11th primary twice the length of its covert.
Sturnidæ ...	Sturnus	1·5	
	Acridotheres tristis	2·5	
	Gracula	3·0	
	Basilornis	2·5	
	Heteralocha	9·0!	Wings much rounded; tips formed by the 5th and 6th quills.
Artamidæ ...	Artamus	2–2·5	
Alaudidæ ...	Alauda arvensis	0·8	Stiff and not occult, smaller than its covert.
	—— calandra	1·1	
	Otocorys alpestris	0·7	Occult, between its covert and the outer vane of the 9th primary.
	—— bilopha	0·7	
	Certhilauda bifasciata	2·3	Quite visible, not hidden.
	Pyrrhulauda	1·7	
	Mirafra	3·0!	With broad and soft vanes, and considerably longer than its covert.
	Calandrella brachydactyla ...	0·8	Smaller than its covert; shifted dorsally and hidden by the outer vane of the 9th primary.

feathers have been turned ventralwards around the posterior or ulnar margin of the wing, and that these birds have retained a primitive condition. If we mark the last dorsal posterior series of the Penguin's potential primaries with A, then A will in *Struthio* represent the only existing series of greater under coverts, whilst the primaries of *Struthio* have to be marked B. This series B has overgrown the series A, as is already indicated by the fact that in the Penguins the last but one series, viz. B, contains somewhat larger feathers. Lastly, in the majority of Carinatæ A and B represent the larger under coverts, and the series C, *i. e.* the third last of the Penguins, has been developed into the series of primaries, whilst series D forms the upper larger wing-coverts.

This would mean of course that the Penguins retain a condition which in other birds is referred to their embryonic life, whilst *Struthio* represents an intermediate stage, provided, however, that in *Struthio* no secondary reduction from several to one series of under wing-coverts has taken place. Such a reduction I assume in *Rhea*, and likewise in the *Oscines*, which possess only one row of larger under wing-coverts. However, Mr. Wray has shown that *Struthio* shows various conditions which in the Carinatæ are repeated during their embryonic growth only.

Unfortunately, about the embryonic development of the Penguin's wing we know nothing; we cannot explain either the enormous number of series of the wing-feathers nor the number of the feathers in each series; we have to look upon them as the result of special modifications. There is no reason why the skin of the wing should not develop any number of feathers. Concerning the cubital quills, we know that their number increases with the length of the fore-arm, the additional increase in number taking place in the region of the elbow.

Archæopteryx does not throw much light upon the question. It possessed 6–7 primaries, most of which were carried by the third metacarpal and by the third finger. The number of cubitals was 10.

The first Reptile-like Birds probably possessed a rather uniform covering of feathers on their wings. The feathers of the under surface were soft, more downy, those of the upper surface stronger and smoother. The first feathers which grew out stronger and larger were those on the upper hinder margin of the forearm; this resulted in a protection of the sides of the body, and in the possibility of these feathers being occasionally used as a parachute. Natural selection preserved and improved these advantageous acquisitions, in a similar way as the scales on the hinder margin of the "fins" of Turtles are elongated and flattened out. Later on the elongation and strengthening of the posterior marginal feathers extended over the metacarpus and over the fingers, which at this stage were still free and not anchylosed with each other. If these ancestral birds possessed a cutaneous patagium, this was gradually restricted to the proximal region between arm and trunk, where no remiges are developed. Such a structure might have interfered with the folding-up of the wing.

Group C.—Transitional group from B to D, comprising the Sturnoid Passeres of Wallace. The numerous and considerable exceptions destroy the validity of this group. General characters are:—10 distinct primaries; the 9th is long and helps to form the tip of the wing. The 10th primary is considerably shortened. The 11th primary is lost completely, but its upper covert is still present; the latter is, as a rule, very small, except in *Heteralocha*, where it reaches a length of 1·5 centim.

		Length of 10th primary in cm.	
Ploceidæ ...	Textor	4·2!	The 10th primary in *Hyphantornis* is 3 times longer than its upper covert. Traces of the 10th primary are present besides a distinct 11th covert.
	Hyphantornis	2·5	
	Chera	2·1	
	Ploceus oryx	1·2	
	—— manyar	1·8	*P. manyar*, 11th primary twice the length of its covert.
Sturnidæ ...	Sturnus	1·5	
	Acridotheres tristis	2·5	
	Gracula	3·0	
	Basilornis	2·5	
	Heteralocha	9·0!	Wings much rounded; tips formed by the 5th and 6th quills.
Artamidæ ...	Artamus	2–2·5	
Alaudidæ ...	Alauda arvensis	0·8	Stiff and not occult, smaller than its covert.
	—— calandra	1·1	
	Otocorys alpestris	0·7	Occult, between its covert and the outer vane of the 9th primary.
	—— bilopha	0·7	
	Certhilauda bifasciata	2·3	Quite visible, not hidden.
	Pyrrhulauda	1·7	
	Mirafra	3·0!	With broad and soft vanes, and considerably longer than its covert.
	Calandrella brachydactyla ...	0·8	Smaller than its covert; shifted dorsally and hidden by the outer vane of the 9th primary.

Group D.—With only 9 functional primaries. The 9th quill always partakes of the formation of the tip of the wing, and is frequently the largest of all. The 10th quill is, as a rule, reduced to a tiny feather, which is hidden between the 10th covert and outer vane of the 9th quill. This hidden portion is always assumed by the 10th quill, even when it is still tolerably well developed, as in the Hirundinidæ and in the Icteridæ, *i. e.* in birds in which it is stated to be absent by most ornithologists. The 11th upper covert is frequently present.

To this group belong the so-called "Oscines novem-pennatæ," corresponding with the Tanagroid Passeres of Wallace, and with the section Fringilliformes of the Cat. Birds Brit. Mus.

		Length of 10th primary in cm.	
Dicæidæ	Dicæum	very small.	
	Pardalotus		
Hirundinidæ	Hirundo	1–1·3	
	Progne	1·8	
Ampelidæ	Ampelis	0·8	*Ampelis* with 11th upper covert.
	Phainopepla nitens		*Phainopepla*; 10th primary almost ½ the length of the 9th; 10th upper covert absent.
Mniotiltidæ	Mniotilta	1·0	
	Dendrœca		
	Parula		
	Periglossa		
	Seiurus		
Motacillidæ	Motacilla	0·8–1·0	10th primary very fine and pointed, of about the same length as its covert. Tip of wing formed by the 9th primary.
	Anthus		
	Grallina	2–4·0!	10th primary quite free and functional; tips of wing formed by 8th–6th; 11th upper covert present.
	Hemicurus		
Cœrebidæ	Cœreba	0·8–1·0	
	Diglossa		
	Drepanis		
Tanagridæ	Tanagra	0·8–1·0	
	Pyranga		
Icteridæ	Icterus	1·3	
	Cassicus		
	Quiscalus major	3·0	
Fringillidæ	Fringilla cœlebs	1·0	10th primary very fine and occult.
	Coccothraustes	1·0	
	Panurus	1·2	10th primary stiff and narrow.

Part II.

A few Remarks on the Phylogenetic Development of the Remiges.

Mr. Wray has shown that the one or two rows of greater under wing-coverts, Sundevall's "tectrices aversæ," were originally situated on the dorsal side of the wing, like the remiges themselves, and that the two hinder series of feathers gradually, during the growth of the embryo, are pushed into the ventral side of the wing. This is probably due to the greater development of the remiges proper, and to the formation of the fascia tendinea, which connects the basal portions of all the remiges with each other.

Since this interesting discovery has been made, it is easier to understand the relations between the remiges and greater under wing-coverts in the Ratitæ and Spheniscidæ, and moreover to arrive at a possible explanation of the phylogenesis of the remiges from a general point of view.

Struthio possesses 20–23 cubital and 16 metacarpo-digital remiges. Of the primaries, 8 are carried by the metacarpal bones, one by the remnant of the third finger, 4 by the first, and 3 by the second phalanx of the second finger. There is only one series or row of greater under wing-coverts.

Rhea has only 12 primaries, like certain Carinate birds. The total absence of greater under wing-coverts is probably due to their degeneration.

Spheniscidæ.—Fürbringer draws attention to the fact that in the Spheniscidæ there are more than 30 rows of little scale-like feathers on the dorsal and on the ventral aspect of the wing, *i. e.* a greater number of rows than there are present in any other bird, even all the median, lesser and marginal coverts included. The largest of these feathers are not, like in other birds, the most ulnar series, but the last but one series on the hand, and the second and third last dorsal rows of the forearm. Each of these rows contains 25–27 feathers on the arm, and 35–36 on the hand. Fürbringer rightly hints at two possible explanations of this exceptional condition. Either that the Spheniscidæ have lost all their true primaries, which they possibly originally possessed, and that this row of 36 feathers does not represent primaries at all; or perhaps that only every third feather represents a primary, although now degenerated, whilst the other 24 feathers are modified down-feathers. However, neither of these two assumptions is supported by facts. That the number of feathers in one row amounts to 36, *i. e.* three times the number of primaries of certain other Carinate birds, is most probably an accidental coincidence; otherwise one might assume that of every three feathers of the Penguins, one had become a primary and the other two had been transformed into tectrices aversæ.

I find that in a large specimen of *Aptenodytes pennanti* there are no tectrices aversæ, all the feathers of the ventral aspect of the wing looking ventralwards with their convex surfaces. This circumstance suggests the assumption that in the Penguins no rows of

feathers have been turned ventralwards around the posterior or ulnar margin of the wing, and that these birds have retained a primitive condition. If we mark the last dorsal posterior series of the Penguin's potential primaries with A, then A will in *Struthio* represent the only existing series of greater under coverts, whilst the primaries of *Struthio* have to be marked B. This series B has overgrown the series A, as is already indicated by the fact that in the Penguins the last but one series, viz. B, contains somewhat larger feathers. Lastly, in the majority of Carinatæ A and B represent the larger under coverts, and the series C, *i. e.* the third last of the Penguins, has been developed into the series of primaries, whilst series D forms the upper larger wing-coverts.

This would mean of course that the Penguins retain a condition which in other birds is referred to their embryonic life, whilst *Struthio* represents an intermediate stage, provided, however, that in *Struthio* no secondary reduction from several to one series of under wing-coverts has taken place. Such a reduction I assume in *Rhea*, and likewise in the *Oscines*, which possess only one row of larger under wing-coverts. However, Mr. Wray has shown that *Struthio* shows various conditions which in the Carinatæ are repeated during their embryonic growth only.

Unfortunately, about the embryonic development of the Penguin's wing we know nothing; we cannot explain either the enormous number of series of the wing-feathers nor the number of the feathers in each series; we have to look upon them as the result of special modifications. There is no reason why the skin of the wing should not develop any number of feathers. Concerning the cubital quills, we know that their number increases with the length of the fore-arm, the additional increase in number taking place in the region of the elbow.

Archæopteryx does not throw much light upon the question. It possessed 6–7 primaries, most of which were carried by the third metacarpal and by the third finger. The number of cubitals was 10.

The first Reptile-like Birds probably possessed a rather uniform covering of feathers on their wings. The feathers of the under surface were soft, more downy, those of the upper surface stronger and smoother. The first feathers which grew out stronger and larger were those on the upper hinder margin of the forearm; this resulted in a protection of the sides of the body, and in the possibility of these feathers being occasionally used as a parachute. Natural selection preserved and improved these advantageous acquisitions, in a similar way as the scales on the hinder margin of the "fins" of Turtles are elongated and flattened out. Later on the elongation and strengthening of the posterior marginal feathers extended over the metacarpus and over the fingers, which at this stage were still free and not anchylosed with each other. If these ancestral birds possessed a cutaneous patagium, this was gradually restricted to the proximal region between arm and trunk, where no remiges are developed. Such a structure might have interfered with the folding-up of the wing.

The first finger had already inherited from the Reptiles a tendency towards shortening; it remained therefore outside the series of the other fingers, and partook of the formation of the wing to a small extent only. The next two metacarpal bones and those of the second finger became elongated and thus anchylosed, because of their contemporary and one-sided use. The other bones of the middle hand and other fingers were reduced in size and number, since the newly gained and much strengthened axis necessitated their presence no longer; moreover a fully developed third, fourth, and fifth finger would have much interfered with the folding of the wing, which is effected by a strong abduction towards the ulnar side. Purely mechanical reasons caused the primaries to grow into quills stronger and larger than the secondaries. In the embryos of many birds the remiges of the forearm appear earlier and for some time grow more rapidly than those of the hand, until they are overtaken by the primaries; thus they still repeat their phylogenetic development.

After the reduction and partial anchylosis of the skeleton of the hand has once taken place it is impossible to redevelop the lost fingers and to free or separate the anchylosed metacarpals again. The wing of the Ratitæ does in no way differ from that of the typical Carinatæ. Fürbringer concludes therefore rightly that the present Ratitæ are the descendants of birds which once possessed the power of flight. Now their remiges are soft, or, as in *Casuarius*, have partly lost their vanes, but such soft quills could never have caused the anchylosis of the hand-skeleton. The relatively very considerable size of the whole anterior extremity of Ostrich embryos is an additional support to this view. In a similar way the length of the humerus of the Eocene *Palæeudyptes* is a weighty reason against the separation of the Penguins from the other Carinatæ.

APPENDIX.

LIST OF ADDITIONS TO THE SOCIETY'S MENAGERIE

DURING THE YEAR

1888.

Jan. 2. 1 Vulpine Phalanger (*Phalangista vulpina*), ♀. Born in the Menagerie.
1 Naked-footed Owlet (*Athene noctua*). Presented by the Rev. Basil Wilberforce.
9. 1 Water-Rail (*Rallus aquaticus*). Presented by Mr. G. J. Payne.
11. 1 Egyptian Vulture (*Neophron percnopterus*). Received in Exchange.
12. 1 Mexican Deer (*Cariacus mexicanus*), ♀. Presented by George Anderson, Esq.
13. 2 Common Peafowl (*Pavo cristatus*), 2♀. Presented by Richard Hunter, Esq.
14. 2 Black-headed Gulls (*Larus ridibundus*). Presented by Thomas A. Cotton, Esq.
17. 2 Viscachas (*Lagostomus trichodactylus*). Born in the Menagerie.
2 Snow-Finches (*Montifringilla nivalis*). Presented by Lord Lilford, F.Z.S.
2 Cockateels (*Calopsitta novæ-hollandiæ*). Presented by the Hon. Stormont Finch-Hatton.
2 Pale-headed Parrakeets (*Platycercus pallidiceps*). Presented by the Hon. Stormont Finch-Hatton.
18. 4 Barbary Turtle-Doves (*Turtur risorius*). Presented by John Biehl, Esq.
1 Moorish Gecko (*Tarentola mauritanica*). Presented by J. C. Warburg, Esq.
19. 2 Herring-Gulls (*Larus argentatus*). Presented by Thomas A. Cotton, Esq.
20. 1 African Buzzard (*Buteo desertorum*). Presented by Sydney H. Carr, Esq.
22. 1 Common Barn-Owl (*Strix flammea*). Presented by Hugh Bromley, Esq.
23. 1 Vulpine Phalanger (*Phalangista vulpina*), ♂. Born in the Menagerie.
25. 3 Egyptian Cobras (*Naia haje*). Presented by Capt. W. G. Burrows.

Jan. 25. 3 Cerastes Vipers (*Vipera cerastes*). Presented by Capt. W. G. Burrows.
2 Hissing Sand-Snakes (*Psammophis sibilans*). Presented by Capt. W. G. Burrows.
1 Clifford's Snake (*Zamenis cliffordi*). Presented by Capt. W. G. Burrows.
1 Egyptian Eryx (*Eryx jaculus*). Presented by Capt. W. G. Burrows.
1 Blunt-nosed Snake (*Dipsas obtusa*). Presented by Capt. W. G. Burrows.
21 Horrid Rattlesnakes (*Crotalus horridus*). Born in the Menagerie.
26. 2 Poë Honey-eaters (*Prosthemadera novæ-zealandiæ*). Presented by Capt. Brabazon J. Barlow, s.s. 'Tanui.'
27. 1 Brazilian Hangnest (*Icterus jamaicai*). Presented by George D. Morce, Esq.
28. 1 White-headed Sea-Eagle (*Haliaetus leucocephalus*, jr.). Presented by George M. Johnston, Esq. From Newfoundland.
29. 1 Pike (*Esox lucius*). Presented by F. Godden, Esq., F.Z.S.

Feb. 2. 1 Fulmar (*Fulmarus glacialis*). Presented by H. M. Upcher, Esq., F.Z.S. From the coast of Norfolk.
1 Jardine's Parrot (*Pœocephalus gulielmi*). Received in Exchange.
4. 1 Red-winged Parrakeet (*Aprosmictus erythropterus*). Presented by the Hon. Stormont Finch-Hatton.
8 Peaceful Doves (*Geopelia tranquilla*). Presented by the Hon. Stormont Finch-Hatton.
6. 2 Cockateels (*Calopsitta novæ-hollandiæ*). Deposited.
1 Pluto Monkey (*Cercopithecus pluto*). Received in Exchange.
1 Antarctic Skua (*Stercorarius antarcticus*). Received in Exchange.
7. 1 Indian Desert Fox (*Canis leucopus*), ♀. Deposited. See P. Z. S. 1888, p. 140. From Bussorah.
10. 1 Common Boa (*Boa constrictor*). Presented by Leopold Field, Esq.
1 Royal Python (*Python regius*). Presented by Leopold Field, Esq.
1 Indian Python (*Python molurus*). Presented by Leopold Field, Esq.
2 West-African Pythons (*Python sebæ*). Presented by Leopold Field, Esq.
13. 1 Bonnet-Monkey (*Macacus sinicus*), ♀. Presented by H. Austin Clow, Esq., F.Z.S.
2 Rhesus Monkeys (*Macacus rhesus*), 2 ♀. Presented by H. Austin Clow, Esq., F.Z.S.
1 Alpine Marmot (*Arctomys marmotta*), ♀. Presented by H. Austin Clow, Esq., F.Z.S.
1 Vulpine Phalanger (*Phalangista vulpina*), ♂. Presented by H. Austin Clow, Esq., F.Z.S.
14. 2 Common Gulls (*Larus canus*). Purchased.
1 Black-headed Gull (*Larus ridibundus*). Purchased.
15. 3 Esquimaux Dogs (*Canis familiaris*). Presented by W. T. Tournay, Esq., F.Z.S.
4 Parrot Finches (*Erythrura psittacea*). Purchased. See P. Z. S. 1888, p. 140.

Feb. 15. 4 Alpine Accentors (*Accentor alpinus*). Presented by the Lord Lilford, F.Z.S.
16. 3 Derbian Wallabies (*Halmaturus derbianus*). Presented by Lieut. C. M. Hepworth, R.N.R.
4 Cereopsis Geese (*Cereopsis novæ-zealandiæ*). Bred in the Menagerie.
17. 4 Lion Marmosets (*Midas rosalia*). Purchased.
1 Eyra (*Felis eyra*). Purchased.
18. 1 Cardinal Grosbeak (*Cardinalis virginianus*). Presented by Mr. Ayerst.
21. 1 Common Wolf (*Canis lupus*), ♀. Received in Exchange.
2 Suricates (*Suricata tetradactyla*). Born in the Menagerie.
1 Red Kangaroo (*Macropus rufus*). Born in the Menagerie.
3 Barred Doves (*Geopelia striata*). Presented by Mrs. G. A. Thomson.
24. 1 Red Kangaroo (*Macropus rufus*), ♀. Born in the Menagerie.
25. 1 African Civet Cat (*Viverra civetta*). Presented by Capt. Webster, R.M.S. 'Hawarden Castle.'
1 Cape Crowned Crane (*Balearica chrysopelargus*). Presented by Sir Donald Currie, M.P., K.C.M.G.
1 Gold Pheasant (*Thaumalea picta*). Deposited.
27. 5 Prince of Wales' Pheasants (*Phasianus principalis*), 2 ♂, 3 ♀. Presented by Major Peacock, R.E. See P. Z. S. 1888, p. 140. From Afghan Turkestan.
1 Spotted Eagle-Owl (*Bubo maculosus*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
5 Angulated Tortoises (*Chersina angulata*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S. See P. Z. S. 1888, p. 251, pl. xiv.
3 Tuberculated Tortoises (*Homopus femoralis*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
1 Galeated Pentonyx (*Pentonyx galeata*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
1 Infernal Snake (*Boodon infernalis*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
1 Rufous Snake (*Ablabes rufulus*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
1 Rufescent Snake (*Leptodira rufescens*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
1 Spotted Slow-worm (*Acontias meleagris*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
5 Round-throated Frogs (*Rana fuscigula*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
1 Narrow-headed Toad (*Bufo angusticeps*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
1 Natal Sternothere (*Sternothærus castaneus*). Presented by Lieut.-Col. J. H. Bowker, F.Z.S.
28. 1 Yellow-footed Rock-Kangaroo (*Petrogale xanthopus*). Born in the Menagerie.
12 Black-headed Gulls (*Larus ridibundus*). Presented by J. G. Baxter, Esq.
1 Common Gull (*Larus canus*). Presented by J. G. Baxter, Esq.

Mar. 1. 1 Rhesus Monkey (*Macacus rhesus*), ♀. Presented by Capt. R. F. Hibbert.
2 Cirl Buntings (*Emberiza cirlus*). Purchased.

Mar. 2. 1 Indian Civet (*Viverricula malaccensis*). Presented by Percy Montgomery, Esq. From Ichang, China.
1 Hog Deer (*Cervus porcinus*). Born in the Menagerie.
3. 1 Common Raccoon (*Procyon lotor*). Presented by C. J. Urquhart, Esq.
4. 1 Eland (*Oreas canna*), ♀. Born in the Menagerie.
2 Laughing Kingfishers (*Dacelo gigantea*). Presented by Mrs. Maas Buckley.
5. 1 Macaque Monkey (*Macacus cynomolgus*), ♀. Presented by Mrs. A. Ballard.
6. 4 Cape Colies (*Colius capensis*). Received in Exchange.
1 Common Quail (*Coturnix communis*). Presented by Capt. Christian.
1 Brazilian Tortoise (*Testudo tabulata*). Deposited.
7. 1 Binturong (*Arctictis binturong*). Presented by J. P. Rodger, Esq. From Selangore, Malay Peninsula.
10. 1 White-fronted Capuchin (*Cebus albifrons*), ♂. Presented by Mrs. E. A. Lediard.
13. 1 Gayal (*Bibos frontalis*). Born in the Menagerie.
2 Stock-Doves (*Columba œnas*). Presented by Lieut.-Col. W. G. Dawkins, F.Z.S.
20. 1 White-fronted Lemur (*Lemur albifrons*). Born in the Menagerie.
23. 2 Banded Grass-Finches (*Poëphila cincta*). Purchased.
2 Bicheno's Finches (*Estrelda bichenovii*). Purchased.
24. 1 Shining Parrakeet (*Pyrrhulopsis splendens*). Purchased.
2 Mandarin Ducks (*Æx galericulata*), ♀ ♂. Purchased.
28. 1 Common Swan (*Cygnus olor*), ♂. Deposited.
29. 1 Gannet (*Sula bassana*). Presented by Mrs. Richards.
1 Greater Black-backed Gull (*Larus marinus*). Presented by Mrs. Richards.
31. 1 Rock-hopper Penguin (*Eudyptes chrysocome*). Received in Exchange.
1 Hawfinch (*Coccothraustes vulgaris*). Presented by Mr. Chas. Faulkner.

Apr. 2. 1 Central-American Agouti (*Dasyprocta isthmica*). Purchased.
1 Moorish Gecko (*Tarentola mauritanica*). Presented by J. C. Warburg, Esq.
4. 1 Ortolan Bunting (*Emberiza hortulana*). Presented by W. H. St. Quintin, Esq., F.Z.S.
2 Poiret's Newts (*Molge poireti*), ♂ ♀. Presented by G. A. Boulenger, Esq., F.Z.S.
5. 2 Striped Hyænas (*Hyæna striata*). Presented by Capt. E. B. Pusey, R.N. From Algeria.
6. 1 Greater Sulphur-crested Cockatoo (*Cacatua galerita*). Deposited.
9. 2 Collared Fruit-Bats (*Cynonycteris collaris*). Born in the Menagerie.
2 White-necked Crows (*Corvus scapulatus*). Presented by Capt. Henry F. Hoste, s.s. 'Trogan.'
2 Spotted Eagle-Owls (*Bubo maculosa*). Presented by Capt. Henry F. Hoste, s.s. 'Trogan.'
10. 1 Asp Viper (*Vipera aspis*). Deposited.
1 Muscovy Duck (*Cairina moschata*), ♂. Presented by W. Shuter, Esq.
11. 1 Greater Vasa Parrot (*Coracopsis vasa*). Deposited.

Apr. 12. 1 Blue-eyed Cockatoo (*Cacatua ophthalmica*). Deposited.
1 Goffin's Cockatoo (*Cacatua goffini*). Deposited.
4 Half-collared Doves (*Turtur semitorquatus*). Presented by Mrs. Wisely.
1 Slow-worm (*Anguis fragilis*). Presented by Mr. F. W. Pilkington.
1 Nicobar Pigeon (*Calœnas nicobarica*). Received in Exchange.
13. 1 Arabian Baboon (*Cynocephalus hamadryas*), ♀. Presented by D. Wilson-Barker, Esq., R.N.R., F.Z.S.
2 Indian Swine (*Sus cristatus*), 2 ♂. Deposited.
14. 4 European Pond-Tortoises (*Emys europæa*). Purchased.
18. 1 Striped Hyæna (*Hyæna striata*). Presented by Herbert E. White, Esq. From Morocco.
19. 1 Collared Fruit-Bat (*Cynonycteris collaris*). Born in the Menagerie.
2 Sclater's Penguins (*Eudyptes sclateri*). Presented by Capt. Sutcliff, R.M.S.S. 'Aorangi.' From the Auckland Islands. See P. Z. S. 1888, p. 265, and P. Z. S. 1889, March 6.
20. 1 Common Marmoset (*Hapale jacchus*). Presented by Mrs. Leighton.
1 Chinchilla (*Chinchilla lanigera*). Born in the Menagerie.
1 Barbary Wild Sheep (*Ovis tragelaphus*), ♂. Born in the Menagerie.
1 Indian Wolf (*Canis pallipes*), ♂. Presented by Col. Alex. A. A. Kinloch, C.M.Z.S.
2 Indian Desert Foxes (*Canis leucopus*). Presented by Col. Alex. A. A. Kinloch, C.M.Z.S. See P. Z. S. 1888, p. 265.
1 Spotted Hawk-Eagle (*Spizaëtus nipalensis*). Presented by Col. Alex. A. A. Kinloch, C.M.Z.S. See P. Z. S. 1888, p. 265.
21. 1 Gannet (*Sula bassana*). Presented by Miss Serrell.
3 Common Swans (*Cygnus olor*). Purchased.
23. 1 Bonnet-Monkey (*Macacus sinicus*), ♀. Presented by Lionel H. Hanbury, Esq., F.Z.S.
1 Scarlet Ibis (*Eudocimus ruber*). Presented by Chas. Booth, Esq.
1 Roseate Spoonbill (*Platalea ajaja*). Presented by Chas. Booth, Esq.
24. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by Mrs. G. E. Buchanan.
25. 1 Hoffmann's Sloth (*Cholopus hoffmanni*). Received in Exchange.
3 Lined Finches (*Spermophila lineola*), 1 ♂, 2 ♀. Purchased.
27. 2 Chinchillas (*Chinchilla lanigera*). Born in the Menagerie.
28. 1 Common Kestrel (*Tinnunculus alaudarius*). Presented by H. Weetman, Esq., F.Z.S.
29. 2 Persian Gazelles (*Gazella subgutturosa*), ♂ ♀. Born in the Menagerie.
30. 2 Black Lemurs (*Lemur macaco*). Born in the Menagerie.
1 Asp Viper (*Vipera aspis*). Presented by Messrs. Paul & Co.

May 1. 1 Spotted Cavy (*Cœlogenys paca*). Born in the Menagerie.
2 Japanese Deer (*Cervus sika*), 2 ♂. Purchased.
2 Burrowing Owls (*Speotyto cunicularia*). Presented by J. Clarke Hawkshaw, Esq.
2 Burrowing Owls (*Speotyto cunicularia*). Deposited.
2. 1 Common Viper (*Vipera berus*). Presented by F. M. Oldham, Esq.

May 3. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Deposited.
2 Long-eared Bats (*Plecotus auritus*). Presented by F. A. Allchin, Esq.
1 Blue-and-Yellow Macaw (*Ara ararauna*). Presented by Mrs. Yarrow.
4. 2 Crested Ducks (*Anas cristata*). Presented by F. E. Cobb, Esq., C.M.Z.S. From the Falkland Islands.
1 Vulpine Phalanger (*Phalangista vulpina*), ♂. Deposited.
6. 1 Common Roe (*Capreolus capræa*), ♀. Presented by F. Harston Eagles, Esq. From Port Lazaref, S.E. coast of Corea.
7. 1 Blue-and-Yellow Macaw (*Ara ararauna*). Presented by Mrs. Warrand.
8. 2 Long-fronted Gerbilles (*Gerbillus longifrons*). Born in the Menagerie.
1 Hog Deer (*Cervus porcinus*), ♂. Born in the Menagerie.
9. 1 Puma (*Felis concolor*). Born in the Menagerie.
2 Black-backed Geese (*Sarcidiornis melanonota*), ♂ ♀. Purchased.
12. 1 Sambur Deer (*Cervus aristotelis*), ♂. Born in the Menagerie.
2 White Ibises (*Eudocimus albus*). Purchased.
14. 2 Peregrine Falcons (*Falco peregrinus*). Presented by J. Davison, Esq., C.S.
1 Three-toed Chalcis (*Chalcides tridactylus*). Presented by J. C. Warburg, Esq.
16. 7 Suricates (*Suricata tetradactyla*). Born in the Menagerie.
1 Great Kangaroo (*Macropus giganteus*), ♂. Born in the Menagerie.
1 Indian Python (*Python molurus*). Received in Exchange.
17. 1 American Bison (*Bison americanus*). Born in the Menagerie.
1 Elliot's Pheasant (*Phasianus ellioti*), ♀. Purchased.
18. 3 Cape Crowned Cranes (*Balearica chrysopelargus*). Deposited.
19. 1 Gannet (*Sula bassana*). Presented by Mr. Slowly.
21. 2 Caracals (*Felis caracal*, jr.). Deposited.
22. 1 Brazilian Tree-Porcupine (*Sphingurus prehensilis*). Presented by C. J. Bateman, Esq.
1 Barbary Wild Sheep (*Ovis tragelaphus*), ♀. Presented by E. H. Forwood, Esq.
1 Black-backed Piping Crow (*Gymnorhina tibicen*). Deposited.
1 Laughing Kingfisher (*Dacelo gigantea*). Deposited.
1 Greater Sulphur-crested Cockatoo (*Cacatua galerita*). Deposited.
23. 1 Rhesus Monkey (*Macacus rhesus*), ♀. Presented by Mr. George Somerford.
1 Red Kangaroo (*Macropus rufus*), ♂. Born in the Menagerie.
1 Greater Black-backed Gull (*Larus marinus*). Presented by Prof. E. Ray Lankester, F.R.S., F.Z.S.
6 Common Pintail (*Dafila acuta*), 3 ♂, 3 ♀. Purchased.
8 Common Teal (*Querquedula crecca*), 4 ♂, 4 ♀. Purchased.
8 Garganey Teal (*Querquedula circia*), 4 ♂, 4 ♀. Purchased.
1 Shoveller (*Spatula clypeata*), ♀. Purchased.
10 Wigeon (*Mareca penelope*), 4 ♂, 6 ♀. Purchased.
24. 1 Chimpanzee (*Anthropopithecus troglodytes*), ♀. Presented by T. J. Alldridge, Esq., F.Z.S.
1 Marabou Stork (*Leptoptilus crumeniferus*). Presented by T. J. Alldridge, Esq., F.Z.S.
1 Cape Dove (*Œna capensis*). Presented by R. H. Mitford, Esq.

May 24. 1 Tambourine Pigeon (*Tympanistria bicolor*). Presented by R. H. Mitford, Esq.
25. 1 Barbary Ape (*Macacus inuus*), ♀. Presented by Miss Waterman.
3 Red-crowned Pigeons (*Erythrœnas pulcherrima*). Deposited.
1 Praslin Parrot (*Coracopsis barklyi*). Deposited.
2 Slender Kestrels (*Tinnunculus gracilis*) Deposited.
26. 1 White-handed Gibbon (*Hylobates lar*). Deposited.
27. 2 Glass-Snakes (*Pseudopus pallasi*). Deposited.
7 Bream (*Abramis brama*). Presented by Mr. H. Goodwin.
28. 1 Nose-crested Iguana (*Iguana rhinolopha*). Presented by Dr. T. Dennehy. From St. Lucia, W. I.
1 Pudu Deer (*Pudua humilis*), ♀. Presented by G. E. Pugh Cook, Esq.
2 North-African Jackals (*Canis anthus*). Born in the Menagerie.
29. 2 Tigers (*Felis tigris*). Deposited.
2 Australian Waxbills (*Estrelda temporalis*). Presented by David S. Hodge, Esq.
7 Spotted-sided Finches (*Amadina lathami*). Presented by David S. Hodge, Esq.
2 Puff Adders (*Vipera arietans*). Deposited.
30. 2 Dwarf Squirrels (*Sciurus pusillus*). Presented by R. Forrester Daly, Esq.
2 Japanese Deer (*Cervus sika*), 2 ♂. Born in the Menagerie.
1 Tent Tortoise (*Testudo tentoria*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S. From Cradock, Cape Colony.
1 Fisk's Tortoise (*Testudo fiski*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S. From Cradock, Cape Colony.
1 Dwarf Chameleon (*Chamæleon pumilus*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
1 Purplish Gecko (*Phyllodactylus porphyreus*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
1 Hoary Snake (*Coronella cana*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
3 Narrow-headed Toads (*Bufo angusticeps*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
5 Gray's Frogs (*Rana grayi*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
1 Blue-and-Yellow Macaw (*Ara ararauna*). Presented by Mrs. Alfred Palmer.
1 Long-billed Butcher Crow (*Barita destructor*). Received in Exchange.

June 2. 1 Pallas's Sand-Grouse (*Syrrhaptes paradoxus*), ♀. From West Foulden, Berwick-on-Tweed. Presented by H. Howat Crane, Esq.
4. 1 Japanese Deer (*Cervus sika*), ♀. Born in the Menagerie.
2 Wandering Tree-Pies (*Dendrocitta vagabunda*). Received in Exchange.
5. 1 Chilian Skunk (*Conepatus mapurito*), ♀. Purchased.
5 Peafowls (*Pavo cristatus*), 2 ♂, 3 ♀. Presented by Her Majesty The Queen.
1 West-Australian Great Kangaroo (*Macropus ocydromus*), ♂. Received in Exchange.
1 Pagoda Owl (*Syrnium sinense*). Presented by C. B. Ricketts, Esq.

June 5. 1 Horsfield's Scops Owl (*Scops lempiji*). Presented by C. B. Ricketts, Esq.
1 White-throated Monitor (*Varanus albogularis*). Purchased.
7. 3 Grey-breasted Parrakeets (*Bolborhynchus monachus*). Presented by Mrs. Macnab.
9. 1 Burrhel Wild Sheep (*Ovis burrhel*), ♀. Born in the Menagerie.
1 Black-necked Swan (*Cygnus nigricollis*), ♀. Purchased.
1 Lesser Black-backed Gull (*Larus fuscus*). Presented by D. Wilson-Barker, Esq.
12. 2 Pig-tailed Monkeys (*Macacus nemestrinus*), ♂ ♀. Presented by Mr. C. W. Ellacott.
13. 2 Spotted Cavies (*Cœlogenys paca*), ♂ ♀. Presented by Mr. W. H. Stather.
14. 1 Bonnet-Monkey (*Macacus sinicus*), ♀. Presented by Mr. J. Wiltshire.
16. 1 Wapiti Deer (*Cervus canadensis*), ♂. Born in the Menagerie.
1 Pig-tailed Monkey (*Macacus nemestrinus*). Presented by Mrs. Gleig.
1 Maugé's Dasyure (*Dasyurus maugæi*). Presented by H. R. Brane, Esq.
2 Pallas's Sand-Grouse (*Syrrhaptes paradoxus*), ♂ ♀. Presented by Lieut.-Col. Irby and Capt. Savile Reid, F.Z.S. (See P. Z. S. 1888, p. 413.) From the Island of Tiree, Argyllshire.
18. 1 Larger Hill-Mynah (*Gracula intermedia*). Presented by Mrs. M. von Kornatzki.
2 Naked-footed Owlets (*Athene noctua*). Presented by Miss Pierce.
19. 1 Duyker-bok (*Cephalophus mergens*), ♀. Deposited.
1 Bennett's Kangaroo (*Halmaturus bennetti*), ♀. Born in the Menagerie.
1 Swainson's Lorikeet (*Trichoglossus novæ-hollandiæ*). Presented by Mr. H. A. Hankey.
21. 1 Macaque Monkey (*Macacus cynomolgus*). Presented by A. B. Parker, Esq.
5 Bolle's Pigeons (*Columba bollii*). Deposited by E. G. Meade Waldo, Esq. From Teneriffe.
1 Barbary Partridge (*Caccabis petrosa*). Deposited. From Teneriffe.
1 Red-legged Partridge (*Caccabis rufa*). Deposited. From Grand Canary.
22. 2 Long-fronted Gerbilles (*Gerbillus longifrons*). Born in the Menagerie.
1 Four-lined Snake (*Coluber quadrilineatus*, var. *leopardinus*). Purchased.
23. 1 Yellow-legged Herring-Gull (*Larus cachinnans*). Bred in the Menagerie.
2 Loggerhead Ducks (*Tachyeres cinereus*). Presented by Mr. Archibald McCall. From the Falkland Islands.
25. 1 Gaimard's Rat-Kangaroo (*Hypsiprymnus gaimardi*), ♂. Deposited.
2 Triangular-spotted Pigeons (*Columba guinea*). Bred in the Menagerie.
28. 1 Smooth Snake (*Coronella lævis*). Presented by Walter C. Blaker, Esq.
29. 1 Dark-green Snake (*Zamenis atrovirens*). Purchased.
1 Æsculapian Snake (*Coluber æsculapii*). Purchased.

June 30. 2 Tasmanian Wolves (*Thylacinus cynocephalus*), ♂ ♀. Deposited.
4 Bennett's Wallabies (*Halmaturus bennetti*). Deposited.
9 Silky Bower-birds (*Ptilonorhynchus violaceus*). Deposited.
10 Laughing Kingfishers (*Dacelo gigantea*). Deposited.
10 Blue-cheeked Parrakeets (*Platycercus cyanogenys*). Deposited.
2 Cereopsis Geese (*Cereopsis novæ-hollandiæ*). Deposited.
6 Maned Geese (*Bernicla jubata*). Received in Exchange.
2 Lace Monitors (*Varanus varius*). Received in Exchange.
2 Gould's Monitors (*Varanus gouldi*). Received in Exchange.
1 Black-and-Yellow Cyclodus (*Cyclodus nigroluteus*). Received in Exchange.
2 Black-backed Piping Crows (*Gymnorhina tibicen*). Deposited.

July 2. 1 White-thighed Colobus (*Colobus vellerosus*), ♂. Presented by H. H. Johnston, Esq., F.Z.S.
1 Campbell's Monkey (*Cercopithecus campbelli*), ♀. Presented by H. H. Johnston, Esq., F.Z.S.
1 White-collared Mangabey (*Cercocebus collaris*). Presented by H. H. Johnston, Esq., F.Z.S.
1 Bosman's Potto (*Perodicticus potto*). Presented by H. H. Johnston, Esq., F.Z.S.
1 Marabou Stork (*Leptoptilus crumeniferus*). Presented by H. Johnston, Esq., F.Z.S.
1 Black Sternothere (*Sternothærus niger*). Presented by H. H. Johnston, Esq., F.Z.S.
1 Patas Monkey (*Cercopithecus patas*), ♀. Deposited.
2 West-African Love-birds (*Agapornis pullaria*). Deposited.
2 Modest Grass-Finches (*Amadina modesta*), ♂ ♀. Purchased.
1 Spotted Tinamou (*Nothura maculosa*). Bred in the Menagerie.
2 Cambayan Turtle-Doves (*Turtur senegalensis*). Bred in the Menagerie.
3. 3 Chiloe Wigeon (*Mareca chiloensis*). Bred in the Menagerie.
3 Slender Ducks (*Anas gibberifrons*). Bred in the Menagerie.
2 Australian Wild Ducks (*Anas superciliosa*). Bred in the Menagerie.
3 Summer Ducks (*Æx sponsa*). Bred in the Menagerie.
3 Mandarin Ducks (*Æx galericulata*). Bred in the Menagerie.
11 Chilian Pintails (*Dafila spinicauda*). Bred in the Menagerie.
1 Cormorant (*Phalacrocorax carbo*). Deposited.
4. 3 Scarlet Ibises (*Eudocimus ruber*). Deposited.
1 Eyed Lizard (*Lacerta ocellata*). Presented by J. Hopson, Esq.
1 Hygian Snake (*Elaps hygiæ*). Presented by — Brown, Esq., M.I.C.E.
5. 2 Black-bellied Sand-Grouse (*Pterocles arenarius*). From Morocco. Presented by Sir W. Kirby Green, K.C.M.G.
1 Chipping Squirrel (*Tamias striatus*). Purchased.
6. 1 Moor-Monkey (*Semnopithecus maurus*), ♂. Received in Exchange.
5 Lesser Pin-tailed Sand-Grouse (*Pterocles exustus*), 2 ♂, 3 ♀. Purchased.
2 Common Chameleons (*Chamæleon vulgaris*). Deposited.
9 1 Grand Eclectus (*Eclectus roratus*). Presented by Lieut.-Col. R. Wolfe.
1 Red-sided Eclectus (*Eclectus pectoralis*). Presented by Lieut.-Col. R. Wolfe.
2 Hog-nosed Snakes (*Heterodon platyrhinos*). Presented by H. E. T. Glover, Esq.

July 9. 1 Summer Snake (*Cyclophis æstivus*). Presented by H. E. T. Glover, Esq.
2 Carolina Anolises (*Anolis carolinensis*). Presented by H. E. T. Glover, Esq.
2 European Tree-Frogs (*Hyla arborea*). Presented by Lionel A. William, Esq.
10. 1 Brown Capuchin (*Cebus fatuellus* ?). Presented by Roger M. Dodington, Esq.
1 Tuberculated Iguana (*Iguana tuberculata*). Presented by the West-Indian Nat. Hist. Exploration Committee. From Dominica, W. I.
2 Common Boas (*Boa constrictor*, var. *diviniloqua*). Presented by the West-Indian Nat. Hist. Exploration Committee. From Dominica, W. I.
1 Black-and-White Snake (*Dromicus leucomelas*). Presented by the West-Indian Nat. Hist. Exploration Committee. From Dominica, W. I.
11. 1 Varied Capuchin (*Cebus versicolor*). Presented by H. B. Whitmarsh, Esq.
2 Ruffed Lemurs (*Lemur varius*), ♂ ♀. Deposited.
3 Red-and-Blue Macaws (*Ara macao*). Deposited.
1 Hyacinthine Macaw (*Ara hyacinthina*). Deposited.
4 Spotted Tinamous (*Nothura maculosa*). Deposited.
12. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by Miss Chester.
1 Mona Monkey (*Cercopithecus mona*), ♀. Presented by Miss Edith Frank.
2 Mule Deer (*Cariacus macrotis*), ♂ ♀. Born in the Menagerie.
1 Green Turtle (*Chelone viridis*). Presented by Baron Henry de Worms, M.P., F.Z.S.
14. 2 Corn-Crakes (*Crex pratensis*). Presented by Mr. R. B. Spalding.
16. 1 Green Monkey (*Cercopithecus callitrichus*), ♀. Presented by Mrs. Holden.
1 Grey Parrot (*Psittacus erithacus*, white var.). Deposited.
17. 2 Californian Quails (*Callipepla californica*), 2 ♂. Presented by Mrs. Fanny Lloyd.
2 Æsculapian Snakes (*Coluber æsculapii*). Presented by P. L. Sclater, Esq., F.R.S. From Germany.
20. 1 Rhesus Monkey (*Macacus rhesus*), ♂. Presented by Herbert C. Oates, Esq.
1 Tabuan Parrakeet (*Pyrrhulopsis tabuensis*). Deposited.
7 Slender-fingered Frogs (*Leptodactylus pentadactylus*). Presented by Dr. H. A. A. Nicholls. From Dominica.
21. 2 American Black Bears (*Ursus americanus*), ♂ ♀. Deposited.
22. 1 Lesser Kestrel (*Tinnunculus cenchris*). Presented by H. Hanauer, Esq., F.Z.S.
23. 2 Mule Deer (*Cariacus macrotis*), ♂ ♀. Born in the Menagerie.
1 Black-marked Snake (*Pituophis vertebralis*). Presented by Mr. Jeremiah Garnett.
6 Martinican Tree-Frogs (*Hylodes martinicensis*). Presented by Capt. Woolward, R.M.S. 'Don.'
1 Derbian Screamer (*Chauna derbiana*). Purchased.
24. 1 Green Turtle (*Chelone viridis*). Presented by Baron Henry de Worms.
1 Hawk's-billed Turtle (*Chelone imbricata*). Presented by W. T. Manger, Esq.
2 Rose-coloured Pastors (*Pastor roseus*). Received in Exchange.

July 24. 4 Beautiful Grass-Finches (*Poëphila mirabilis*). Purchased.
4 Gouldian Grass-Finches (*Poëphila gouldiæ*). Purchased.
1 Canadian Beaver (*Castor canadensis*). Born in the Menagerie.
1 Thar (*Capra jemlaica*). Born in the Menagerie.
1 Brazilian Cariama (*Cariama cristata*). Bred in the Gardens.
25. 1 Crested Grebe (*Podiceps cristatus*). Presented by W. Nicholls, Esq.
2 Collared Fruit-Bats (*Cynonycteris collaris*). Born in the Menagerie.
26. 1 Prince Albert's Curassow (*Crax alberti*), ♀. Purchased.
1 Virginian Fox (*Canis virginianus*), ♀. Received in Exchange.
27. 1 Brazilian Cariama (*Cariama cristata*). Presented by Fredk. Rose, Esq., jun.
1 Common Viper (*Vipera berus*). Presented by F. C. Smith, Esq.
1 Feline Douroucouli (*Nyctipithecus vociferans*), ♀. Presented by Master Lester Ralph.
29. 1 Indian Kite (*Milvus govinda*). Presented by Mrs. Dean.
30. 1 Purple-faced Monkey (*Semnopithecus leucoprymnus*), ♀. Presented by Martin J. Cole, Esq.
1 Chipping Squirrel (*Tamais striatus*). Presented by Mrs. Matveieff.
1 Tayra (*Galictis barbara*), ♂. Presented by Mrs. J. H. Pollard.
1 Common Boa (*Boa constrictor*). Deposited.
1 Æsculapian Snake (*Coluber æsculapii*). Deposited.
3 Black-eared Marmosets (*Hapale penicillata*). Presented by Mr. J. A. Deintje.

Aug. 1. 1 Smooth Snake (*Coronella lævis*). Presented by E. G. Meade-Waldo, Esq.
2. 1 Common Squirrel (*Sciurus vulgaris*). Presented by R. Grant Watson, Esq.
1 Common Kestrel (*Tinnunculus alaudarius*). Presented by W. A. W. Jones, Esq.
3. 1 Rhesus Monkey (*Macacus rhesus*), ♂. Presented by Reginald S. Knott, Esq.
1 Rhesus Monkey (*Macacus rhesus*), ♂. Deposited.
1 Lesser Sulphur-crested Cockatoo (*Cacatua sulphurea*). Presented by J. Wolfe Barry, Esq.
1 White-backed Piping Crow (*Gymnorhina leuconota*). Presented by Miss Alice Rutherford.
1 Herring-Gull (*Larus argentatus*). Presented by Mrs. Huthwaite.
1 Laughing Gull (*Larus atricilla*). Presented by Dr. A. Boon, F.R.C.S., C.M.Z.S. From St. Kitts, W.I.
1 Green Bittern (*Butorides virescens*). Presented by Dr. A. Boon, F.R.C.S., C.M.Z.S. From St. Kitts, W.I.
7. 1 Ocelot (*Felis pardalis*). Deposited.
1 Orange-winged Amazon (*Chrysotis amazonica*). Presented by the Hon. N. L. Melville.
2 Fulmars (*Fulmarus glacialis*). Presented by W. C. Gilles, Esq. From St. Kilda.
2 European Tree-Frogs (*Hyla arborea*). Deposited.
8. 1 Capuchin (*Cebus*, sp. inc.), ♂. Presented by Mr. Haddon.
2 Common Genets (*Genetta vulgaris*). Presented by Philip Lemberg, Esq.
1 Barraband's Parrakeet (*Polytelis barrabandi*). Purchased.

Aug. 8. 1 Ring-necked Parrakeet (*Palæornis torquatus*). Deposited.
1 Grey-breasted Parrakeet (*Bolborhynchus monachus*). Deposited.
1 Mountain Ka-ka (*Nestor notabilis*). Received in Exchange.
9. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Deposited.
3 Palm-Squirrels (*Sciurus palmarum*). Presented by Surg.-Major W. G. King.
10. 3 Gold Pheasants (*Thaumalea picta*). Bred in the Menagerie.
1 Common Chameleon (*Chamæleon vulgaris*). Presented by Mr. Underwood.
11. 2 White-fronted Amazons (*Chrysotis leucocephala*). Deposited.
1 Common Rhea (*Rhea americana*). Deposited.
12. 2 Canadian Beavers (*Castor canadensis*). Bred in the Menagerie.
14. 1 Bonnet-Monkey (*Macacus sinicus*), ♀. Presented by Wm. Norman, Esq.
1 Tiger (*Felis tigris*), ♂. Presented by Sir E. C. Buck, C.M.Z.S.
6 Guinea Pigs (*Cavia porcellus*, var.). Presented by R. F. Bennett, Esq.
15. 1 Lesser White-nosed Monkey (*Cercopithecus petaurista*), ♂. Presented by W. Brandford Griffith, Esq.
1 Black-backed Piping Crow (*Gymnorhina tibicen*). Presented by Charles Clifton, Esq., F.Z.S.
1 Common Magpie (*Pica rustica*). Presented by Charles Clifton, Esq., F.Z.S.
2 Himalayan Monauls (*Lophophorus impeyanus*), 2 ♂. Presented by Charles Clifton, Esq., F.Z.S.
2 Gold Pheasants (*Thaumalea picta*), ♂ ♀. Presented by Charles Clifton, Esq., F.Z.S.
2 Silver Pheasants (*Euplocamus nycthemerus*). Presented by Charles Clifton, Esq., F.Z.S.
1 Javan Peafowl (*Pavo spicifer*), ♂. Presented by Chas. Clifton, Esq., F.Z.S.
2 Common Peafowl (*Pavo cristatus*), ♂ ♀. Presented by Chas. Clifton, Esq., F.Z.S.
1 Rose-crested Cockatoo (*Cacatua moluccensis*). Presented by Chas. Clifton, Esq., F.Z.S.
2 Leadbeater's Cockatoos (*Cacatua leadbeateri*). Presented by Chas. Clifton, Esq., F.Z.S.
1 Hyacinthine Macaw (*Ara hyacinthina*). Presented by Chas. Clifton, Esq., F.Z.S.
1 Blue-and-Yellow Macaw (*Ara ararauna*). Presented by Chas. Clifton, Esq., F.Z.S.
1 Great Eagle-Owl (*Bubo maximus*). Presented by Chas. Clifton, Esq., F.Z.S.
4 Common Herons (*Ardea cinerea*). Presented by Chas. Clifton, Esq., F.Z.S.
2 Mandarin Ducks (*Æx galericulata*). Presented by Chas. Clifton, Esq., F.Z.S.
2 Rose Hill-Parrakeets (*Platycercus eximius*). Purchased.
16. 1 Bengalese Cat (*Felis bengalensis*). Presented by W. L. Sclater, Esq., F.Z.S.
1 Common Kingfisher (*Alcedo ispida*). Presented by E. Hart, Esq., F.Z.S.
17. 1 Bare-eyed Cockatoo (*Cacatua gymnopis*). Presented by Mrs. Fishlock.
1 New-Zealand Parrakeet (*Cyanorhamphus novæ-zealandiæ*). Purchased.

Aug. 17. 2 American Box-Tortoises (*Terrapene carinata*). Presented by Prof. O. C. Marsh.
2 Alligator Terrapins (*Chelydra serpentina*). Presented by Prof. O. C. Marsh.
1 Speckled Terrapin (*Clemmys guttata*). Presented by Prof. O. C. Marsh.
4 Sculptured Terrapins (*Clemmys insculpta*). Presented by Prof. O. C. Marsh.
18. 2 Chinchillas (*Chinchilla lanigera*). Born in the Menagerie.
1 Imperial Eagle (*Aquila imperialis*). Presented by Mrs. Ernest H. Forwood. From Morocco.
1 Horned Lizard (*Phrynosoma cornutum*). Presented by Master Howard Sexton.
20. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Deposited.
5 Brazilian Teal (*Querquedula brasiliensis*). Bred in the Menagerie.
2 Chilian Pintail (*Dafila spinicauda*). Born in the Menagerie.
21. 2 Great White Herons (*Ardea alba*). Purchased.
1 Razorbill (*Alca torda*). Presented by T. H. Nelson, Esq.
1 Moor-Monkey (*Semnopithecus maurus*). Received in Exchange.
1 Malabar Squirrel (*Sciurus maximus*). Received in Exchange.
1 River Jack-Viper (*Vipera rhinoceros*). Received in Exchange.
22. 1 Lesser White-nosed Monkey (*Cercopithecus petaurista*), ♀. Deposited.
1 Nightingale (*Daulius luscinia*), ♂. Presented by J. Young, Esq.
1 American Wild Turkey (*Meleagris gallopavo*), ♂. Presented by F. J. Coleridge Boles, Esq.
23. 1 Ring-tailed Coati (*Nasua rufa*). Presented by Capt. James Smith.
1 Sclater's Curassow (*Crax sclateri*), ♀. Received in Exchange.
1 Red-bellied Squirrel (*Sciurus variegatus*). Received in Exchange.
24. 3 Black-headed Lemurs (*Lemur brunneus*). Presented by Capt. J. Bonneville.
1 Vulpine Squirrel (*Sciurus vulpinus*), ♂. Deposited.
2 Triangular-spotted Pigeons (*Columba guinea*). Born in the Menagerie.
3 Chinese Blue Magpies (*Cyanopolius cyanus*). Hatched in the Menagerie.
2 Pallas's Sand-Grouse (*Syrrhaptes paradoxus*), 2 ♀. Presented by Alexander Speedie, Esq. From Fifeshire, N.B.
25. 1 Wapiti Deer (*Cervus canadensis*), ♂. Born in the Menagerie.
1 Raven (*Corvus corax*). Presented by F. Steinhoff, Esq.
28. 1 Brown Bear (*Ursus arctos*), ♂. Deposited.
1 White-backed Piping Crow (*Gymnorhina leuconota*). Deposited.
4 Oyster-catchers (*Himantopus ostralegus*). Purchased.
1 Avocet (*Recurvirostra avocetta*). Presented by Mr. J. Hoogerduyn.
1 Small Hill-Mynah (*Gracula religiosa*). Presented by Alex. Robertson, Esq.
29. 2 Sallé's Amazons (*Chrysotis sallæi*). Purchased.
31. 1 Common Sheldrake (*Tadorna vulpanser*), ♀. Presented by the Rev. H. H. Slater.

Aug. 31. 12 Mandarin Ducks (*Æx galericulata*), 6 ♂, 6 ♀. Deposited.
2 Common Chameleons (*Chamæleon vulgaris*). Presented by J. Alfred Lockwood.

Sept. 3. 1 Alligator (*Alligator mississippiensis*). Presented by Michael Millard, Esq.
4. 1 Roseate Cockatoo (*Cacatua roseicapilla*). Presented by Mrs. J. de la Mare.
1 Sulphur-and-White-breasted Toucan (*Rhamphastos vitellinus*). Presented by Dr. C. E. Lister.
5. 1 Squirrel-Monkey (*Chrysothrix sciurea*). Presented by Mr. Geo. Miles.
1 Kinkajou (*Cercoleptes caudivolvulus*). Presented by Dr. A. Batchelor, F.R.C.P.
1 Black-backed Jackal (*Canis mesomelas*), ♀. Presented by Lieut. Lionel de Lautour Wells, R.N.
6. 2 Sharp-nosed Crocodiles (*Crocodilus acutus*). Presented by Mr. E. A. Williams.
1 Rhesus Monkey (*Macacus rhesus*), ♀. Presented by J. Witham, Esq.
1 Common Viper (*Vipera berus*). Presented by Col. C. S. Sturt.
1 Barbary Wild Sheep (*Ovis tragelaphus*), ♀. Deposited.
7. 1 Grey Lemur (*Hapalemur griseus*). Received in Exchange.
1 Brazilian Cariama (*Cariama cristata*). Bred in the Menagerie.
8. 1 Short-eared Owl (*Asio brachyotus*). Presented by Miss Ethel Cobb. From the Falkland Islands.
10. 2 Central-American Agoutis (*Dasyprocta isthmica*). Purchased.
1 Prince Albert's Curassow (*Crax alberti*), ♂. Purchased.
1 Mexican Guan (*Penelope purpurascens*). Purchased.
11. 2 White-fronted Amazons (*Chrysotis leucocephala*). Purchased.
3 Lacertine Snakes (*Cœlopeltis lacertina*). Presented by H. E. White, Esq.
2 Horseshoe Snakes (*Zamensis hippocrepis*). Presented by H. E. White, Esq.
2 Chameleons (*Chamæleon vulgaris*). Presented by H. E. White, Esq.
12. 1 Tuberculated Iguana (*Iguana tuberculata*, jr.). Presented by H. E. Blandford, Esq.
13. 1 Herring-Gull (*Larus argentatus*). Presented by the Marchioness of Cholmondeley.
1 White-backed Piping Crow (*Gymnorhina leuconota*). Presented by R. Hall, Esq.
14. 1 Large Hill-Mynah (*Gracula intermedia*). Presented by Lieut.-Col. Robt. Thompson.
17. 1 Ourang-outang (*Simia satyrus*), ♀. Deposited.
1 Ruffed Lemur (*Lemur varius*). Deposited.
2 Brush-tailed Kangaroos (*Petrogale penicillata*), ♂ ♀. Purchased.
1 Chinese Goose (*Anser cygnoides*), ♀. Received in Exchange.
18. 1 Capuchin (*Cebus*, sp. inc.), ♀. Purchased.
2 Vulpine Phalangers (*Phalangista vulpina*), 2 ♀. Presented by J. M. Kirdy, Esq.
19. 1 Large Hill-Mynah (*Gracula intermedia*). Deposited.
1 Common Teal (*Querquedula crecca*), ♀. Presented by Mrs. Bergman.
1 European Pond-Tortoise (*Emys europæa*). Presented by Master William Reed.

Sept. 20. 6 Robben-Island Snakes (*Coronella phocarum*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
21. 1 Suricate (*Suricata tetradactyla*). Presented by Lieut. Lionel de Lautour Wells, R.N.
24. 1 Grivet Monkey (*Cercopithecus griseo-viridis*), ♂. Presented by Lord Archibald Campbell.
1 Weka Rail (*Ocydromus australis*). Presented by Mr. H. Lindsay.
25. 1 Rose-crested Cockatoo (*Cacatua moluccensis*). Presented by Miss Eve.
1 Puffin (*Fratercula arctica*). Presented by J. M. Drew, Esq., F.Z.S.
1 Common Snake (*Tropidonotus natrix*). Presented by P. S. Hutchinson, Esq.
1 Common Slow-worm (*Anguis fragilis*). Presented by P. S. Hutchinson, Esq.
26. 1 Rhesus Monkey (*Macacus rhesus*), ♀. Presented by Major Dudley Buckle, R.A.
1 Bonnet-Monkey (*Macacus sinicus*), ♂. Presented by Mr. G. C. Gosling.
1 Canadian Beaver (*Castor canadensis*). Born in the Menagerie.
4 Chilian Pintail (*Dafila spinicauda*). Bred in the Menagerie.
1 Common Viper (*Vipera berus*). Presented by Mr. A. H. N. Smith.
27. 2 Sooty Mangabey Monkeys (*Cercocebus fuliginosus*), 2 ♀. Presented by Mr. Edward Felton, R.E.
1 Ocelot (*Felis pardalis*), ♂. Presented by E. Percy Bates, Esq.
28. 2 Collared Fruit-Bats (*Cynonycteris collaris*). Born in the Menagerie.
29. 2 Grivet Monkeys (*Cercopithecus griseo-viridis*), ♂ ♀. Deposited.
1 Axis Deer (*Cervus axis*), ♂. Born in the Menagerie.
4 European Tree-Frogs (*Hyla arborea*). Presented by Lionel A. Williams, Esq.
1 White-backed Trumpeter (*Psophia leucoptera*). Received in Exchange.

Oct. 1. 1 Common Marmoset (*Hapale jacchus*). Presented by Miss Maud Bryden.
1 Laughing Kingfisher (*Dacelo gigantea*). Deposited.
2. 1 Rhesus Monkey (*Macacus rhesus*), ♀. Presented by Miss Jessie Bone.
1 Drill Baboon (*Cynocephalus leucophæus*), ♀. Presented by the Rev. C. H. Richardson.
1 Patas Monkey (*Cercopithecus patas*), ♀. Presented by Master Lewis Levy.
2 West-African Love-birds (*Agapornis pullaria*). Presented by Miss Ethel Levy.
3. 1 Grey Ichneumon (*Herpestes griseus*), ♀. Presented by A. Creser, Esq.
1 Salt-water Terrapin (*Clemmys terrapin*). Presented by Nicholas Fenwick Hele, Esq.
4. 1 Ring-tailed Coati (*Nasua rufa*), ♀. Presented by Mr. Robert Sentenally.
5. 4 Blue-bearded Jays (*Cyanocorax cyanopogon*). Purchased.
1 Violaceous Night-Heron (*Nycticorax violaceous*). Purchased.
6. 1 Grey Ichneumon (*Herpestes griseus*), ♂. Presented by Miss A. Rutherford.

Oct. 8. 4 Esquimaux Dogs (*Canis familiaris*, var.). Born in the Menagerie.
1 Brazilian Hangnest (*Icterus jamaicai*). Presented by T. R. Tufnell, Esq.
9. 1 Gazelle (*Gazella dorcas*), ♀. Presented by Mrs. Eugenio Arbib.
1 Alexandrine Parrakeet (*Palæornis alexandri*). Purchased.
10. 1 Rhesus Monkey (*Macacus rhesus*), ♂. Presented by Miss Kate Marion Pope.
2 Alpacas (*Lama pacos*). Deposited.
5 Bare-necked Francolins (*Francolinus nudicollis*), 2 ♂, 3 ♀. Presented by Capt. Larmer.
2 Slow-worms (*Anguis fragilis*). Presented by Mr. Cecil L. Nicholson.
11. 1 Bennett's Wallaby (*Halmaturus bennetti*), ♀. Born in the Menagerie.
1 Æsculapian Snake (*Coluber æsculapii*). Hatched in the Menagerie.
12. 1 Vulpine Phalanger (*Phalangista vulpina*), ♀. Born in the Menagerie.
1 Laughing Kingfisher (*Dacelo gigantea*). Presented by H. Butler, Esq.
2 Upland Geese (*Bernicla magellanica*), ♂ ♀. Deposited.
3 Crested Pelicans (*Pelecanus crispus*), jr. Deposited.
1 Macaque Monkey (*Macacus cynomolgus*). Presented by Miss Felix Smith.
13. 1 Brush-tailed Kangaroo (*Petrogale penicillata*), ♂. Presented by Capt. Philp.
1 Cape Crowned Crane (*Balearica chrysopelargus*). Deposited.
1 Laughing Kingfisher (*Dacelo gigantea*). Presented by Capt. Philp.
15. 1 Common Otter (*Lutra vulgaris*), ♀. Presented by J. Crisp, Esq.
1 Nilotic Trionyx (*Trionyx niloticus*). Received in Exchange.
16. 2 Toque Monkeys (*Macacus pileatus*), ♂ ♀. Presented by Mrs. Ellen Hodson.
1 Moustache Monkey (*Cercopithecus cephus*), ♂. Presented by Andrew Allen, Esq.
1 Grey Ichneumon (*Herpestes griseus*). Deposited.
4 Snow-Geese (*Chen albatus*). Deposited.
17. 1 White-collared Mangabey (*Cercocebus collaris*), ♂. Presented by A. Dunn, Esq.
2 Cockateels (*Calopsitta novæ-hollandiæ*), ♂ ♀. Deposited.
1 Triangular-spotted Pigeon (*Columba guinea*). Bred in the Menagerie.
2 Cambayan Turtle-Doves (*Turtur senegalensis*). Bred in the Menagerie.
18. 1 Indian Wild Swine (*Sus cristatus*), ♂. Received in Exchange.
1 Japanese Deer (*Cervus sika*), ♂. Presented by Capt. H. C. Eagles, R.M.L.I. From Corea.
20. 3 Virginian Opossums (*Didelphys virginianus*). Presented by G. F. Whately, Esq., R.N.
1 Larger Hill-Mynah (*Gracula intermedia*). Deposited.
4 Radiated Tortoises (*Testudo radiata*). Purchased.
1 Common Chameleon (*Chamæleon vulgaris*). Presented by G. Berry, Esq.

Oct. 21. 1 Long-nosed Crocodile (*Crocodilus cataphractus*). Received in Exchange.
22. 1 Ruffed Lemur (*Lemur varius*). Deposited.
1 Starred Tortoise (*Testudo stellata*). Presented by Mr. William Ford.
1 Alligator (*Alligator mississippiensis*). Presented by G. A. Ruck, Esq.
1 Little Grebe (*Tachybaptes fluviatilis*). Presented by Mr. Bibby.
23. 1 Common Seal (*Phoca vitulina*). Presented by Geo. Stevenson, Esq.
1 Red-crested Pochard (*Fuligula rufina*), ♂. Purchased.
24. 1 Malbrouck Monkey (*Cercopithecus cynosurus*), ♀. Deposited.
3 Red Deer (*Cervus elaphus*), 1 ♂, 2 ♀. Deposited.
25. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Deposited.
1 Large Hill-Mynah (*Gracula intermedia*). Deposited.
26. 2 White-tailed Gnus (*Connochætes gnu*), ♂ ♀. Deposited.
1 Tawny Owl (*Syrnium aluco*). Presented by Mr. J. Weston.
27. 1 Puff Adder (*Vipera arietans*). Presented by Herbert E. White, Esq. From Marocco.
1 African Cobra (*Naia haje*). Presented by Herbert E. White, Esq. From Marocco.
29. 1 Polar Bear (*Ursus maritimus*). Deposited.
1 Blue Jay (*Cyanocitta cristata*). Purchased.
30. 1 Bonnet-Monkey (*Macacus sinicus*), ♀. Presented by Miss D. Hughes.
1 Indian Fox (*Canis*, sp. inc.). Presented by Col. Sir Oliver B. C. St. John, K.C.S.I., F.Z.S. From Mysore.
2 Hobbies (*Falco subbuteo*). Presented by Mons. P. A. Pichot.
2 Edible Frogs (*Rana esculenta*, var. *ridibunda*). Deposited.
31. 1 Axis Deer (*Cervus axis*), ♀. Presented by Capt. W. Miller.
1 Crested Pigeon (*Ocyphaps lophotes*). Bred in the Gardens.
1 Bolle's Pigeon (*Columba bollii*). Bred in the Gardens.
1 Peregrine Falcon (*Falco peregrinus*). Presented by Capt. J. Smith.
1 Egyptian Vulture (*Neophron percnopterus*). Presented by Capt. A. Kent.

Nov. 1. 1 Knot (*Tringa canutus*). Presented by Chas. Whymper, Esq., F.Z.S.
2. 1 Ruffed Lemur (*Lemur varius*). Deposited.
3. 1 Yak (*Poëphagus grunniens*), ♀. Deposited.
1 Pallas's Sand-Grouse (*Syrrhaptes paradoxus*), ♀. Presented by John Duncan, Esq. From Fifeshire, N.B.
1 Vervet Monkey (*Cercopithecus lalandii*), ♂. Presented by Miss Helena Blow.
1 Common Genet (*Genetta vulgaris*). Presented by Lord Lilford, F.Z.S.
6. 1 Petz's Conure (*Conurus petzi*). Deposited.
2 White-tailed Eagles (*Haliaetus albicilla*). Presented by R. H. Venables Kyrke, Esq.
4 Knots (*Tringa canutus*). Purchased.
7. 2 Short-eared Owls (*Otus brachyotus*). Presented by Capt. John Marr.
9. 1 Little Grebe (*Tachybaptes fluviatilis*). Presented by Mr. Howard Bunn.
10. 2 Spotted Ichneumons (*Herpestes nipalensis*). Presented by W. L. Sclater, Esq., F.Z.S.

Nov. 10. 1 Small-clawed Otter (*Lutra leptonyx*). Presented by W. L. Sclater, Esq., F.Z.S. See P. Z. S. 1888, p. 564.
1 Sclavonian Grebe (*Podiceps auritus*). Deposited.
12. 1 Spotted Salamander (*Salamandra maculosa*). Presented by F. C. S. Roper, Esq., F.Z.S.
1 Chameleon (*Chamæleon vulgaris*). Deposited.
13. 1 Peregrine Falcon (*Falco peregrinus*). Presented by R. H. Armstrong, Esq.
2 American Bitterns (*Botaurus lentiginosus*). Presented by J. B. Williams, Esq.
2 Common Swans (*Cygnus olor*), 2 ♀. Deposited.
15. 1 Indian Antelope (*Antilope cervicapra*), ♂. Presented by J. W. Shand-Harvey, Esq., J.P.
16. 1 Samango Monkey (*Cercopithecus samango*). Presented by L. B. Lewis, Esq. See P. Z. S. 1888, p. 564.
1 Himalayan Bear (*Ursus tibetanus*), ♀. Presented by H. S. Naylor-Leyland, Esq., Lieut. 2nd Life-Guards.
1 Axis Deer (*Cervus axis*), ♀. Presented by Lady Donaldson.
1 Roseate Cockatoo (*Cacatua roseicapilla*). Presented by Mrs. Wond.
17. 2 Golden Plovers (*Charadrius pluvialis*). Purchased.
1 Royal Python (*Python regius*). Deposited.
19. 1 Black-eared Marmoset (*Hapale penicillata*). Presented by Miss B. Pollock.
1 Tawny Owl (*Syrnium aluco*). Deposited.
22. 1 Malbrouck Monkey (*Cercopithecus cynosurus*), ♂. Presented by Miss Hilda Baumann.
1 Californian Toad (*Bufo boreas*). Presented by D. E. Cardinall, Esq.
24. 1 American Wild Turkey (*Meleagris gallopavo*), ♀. Presented by F. J. Coleridge Boles, Esq.
26. 2 Squirrel-Monkeys (*Chrysothrix sciurea*). Presented by Master H. B. Young.
1 Raven (*Corvus corax*). Presented by Mr. C. Petrzywalski.
1 Sparrow-Hawk (*Accipiter nisus*). Presented by Mr. G. Skegg.
1 Blue-cheeked Barbet (*Megalæma asiatica*). Purchased.
1 Golden-crowned Conure (*Conurus aureus*). Purchased.
1 Golden-winged Parrakeet (*Brotogerys chrysopterus*). Purchased.
27. 1 Silvery Gibbon (*Hylobates leuciscus*), ♂. Presented by Capt. D. L. Delacherios. From Burmah.
28. 1 Lion Marmoset (*Midas rosalia*). Deposited.
29. 1 Common Polecat (*Mustela putorius*). Presented by F. D. Lea Smith, Esq., F.Z.S.
2 Common Barn-Owls (*Strix flammea*). Presented by E. Hart, Esq., F.Z.S.
30. 1 Pig-tailed Monkey (*Macacus nemestrinus*), ♀. Presented by W. Merryweather, Esq.

Dec. 3. 3 Dwarf Chameleons (*Chamæleon pumilus*). Deposited.
1 Black Salamander (*Salamandra atra*). Presented by G. A. Boulenger, Esq., F.Z.S.
4. 1 Hawk's-billed Turtle (*Chelone imbricata*). Presented by Capt. J. Sommer.
1 Indian Crocodile (*Crocodilus palustris*). Presented by Capt. J. Sommer.
2 Philippine Paradoxures (*Paradoxurus philippensis*). Presented by Mr. Geo. P. Ogg.
5. 1 Meyer's Parrot (*Pœocephalus meyeri*). Presented by Hugh Exton, Esq., M.D., F.G.S.

Dec. 5. 2 Common Quails (*Coturnix communis*). Presented by W. H. St. Quintin, Esq., F.Z.S.

6. 1 Bald-headed Chimpanzee (*Anthropopithecus calvus*), ♀. Purchased. See Nature, xxxix. p. 254 (1889), and P. Z. S. 1889.
1 Molucca Deer (*Cervus moluccensis*). Born in the Menagerie.
1 Common Guillemot (*Lomvia troile*). Presented by E. Hart, Esq., F.Z.S.

7. 1 Brazilian Tapir (*Tapirus americanus*), ♂. Presented by Anthony Taaffe, Esq. From the Province of Paraná, S. Brazil.
1 Moorish Gecko (*Tarentola mauritanica*). Presented by J. C. Warburg, Esq.

8. 1 Long-fronted Gerbille (*Gerbillus longifrons*), ♀. Presented by Lionel Hanbury, Esq.

11. 1 Australian Cassowary (*Casuarius australis*). Deposited.
5 Moorish Geckos (*Tarentola mauritanica*). Presented by J. C. Warburg, Esq.

12. 3 Barbary Turtle-Doves (*Turtur risorius*). Deposited.
1 Nankeen Kestrel (*Tinnunculus cenchroides*). Presented by A. J. Wilkins, Esq.
8 Wild Geese (*Anser cinereus*). Presented by E. S. Cameron, Esq.
1 White-fronted Goose (*Anser albifrons*). Presented by E. S. Cameron, Esq.
1 Herring-Gull (*Larus argentatus*). Presented by E. S. Cameron, Esq.
3 Black Tortoises (*Testudo carbonaria*). Presented by Leonard Cooper, Esq. From Matto Grosso, S. Brazil.

13. 1 European Hawk-Owl (*Surnia ulula*). Presented by Lord Lilford, F.Z.S. From Russian Finland.

14. 2 Galeated Pentonyces (*Pelomedusa galeata*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
6 Robben-Island Snakes (*Coronella phocarum*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.

15. 1 White Stork (*Ciconia alba*). Deposited.

17. 1 Yellow-footed Rock-Kangaroo (*Petrogale xanthopus*), ♂. Born in the Menagerie.
3 Common Partridges (*Perdix cinerea*). Presented by the Rev. F. T. Scott.

19. 1 Egyptian Cat (*Felis chaus*). Deposited.
1 Common Paradoxure (*Paradoxurus typus*). Deposited.

21. 1 Blue-fronted Amazon (*Chrysotis æstiva*). Presented by Miss Hayes.
2 Moorish Geckos (*Tarentola mauritanica*). Presented by Masters F. and O. Warburg.

22. 1 Ring-tailed Coati (*Nasua rufa*). Presented by J. W. Bell, Esq.
2 Long-tailed Japanese Fowls (*Gallus domesticus*, var.). Deposited.

24. 1 Prevost's Squirrel (*Sciurus prevosti*). Purchased.
1 Pyxis Tortoise (*Pyxis arachnoides*). Presented by Col. J. H. Bowker, F.Z.S. From Durban, Natal.

25. 1 Common Kestrel (*Tinnunculus alaudarius*). Presented by Mr. Thomas Austin.

28. 2 Concave-casqued Hornbills (*Dichoceros bicornis*). Deposited.
2 Ceylonese Hanging Parrakeets (*Loriculus asiaticus*), ♂ ♀. Purchased.

29. 1 Rat-tailed Snake or Fer de Lance (*Trigonocephalus lanceolatus*). Presented by the West Indian (Nat. Hist.) Exploration Committee.

31. 4 Ruffs (*Machetes pugnax*). Purchased.

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