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# THE ANNALS

AND

# MAGAZINE OF NATURAL HISTORY,

INCLUDING

## ZOOLOGY, BOTANY, AND GEOLOGY.

(BEING A CONTINUATION OF THE 'ANNALS' COMBINED WITH LOUDON AND CHARLESWORTH'S 'MAGAZINE OF NATURAL HISTORY.')

CONDUCTED BY

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VOL. III.—EIGHTH SERIES.

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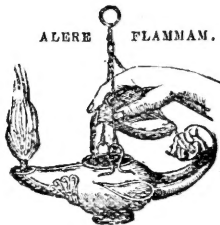
“Omnes res creatæ sunt divinæ sapientiæ et potentiæ testes, divitiæ felicitatis humanæ:—ex harum usu *bonitas* Creatoris; ex pulchritudine *sapientia* Domini; ex œconomiâ in conservatione, proportione, renovatione, *potentia* majestatis elucet. Earum itaque indagatio ab hominibus sibi relictis semper æstimata; à verè eruditis et sapientibus semper exulta; malè doctis et barbaris semper inimica fuit.”—LINNÆUS.

“Quel que soit le principe de la vie animale, il ne faut qu’ouvrir les yeux pour voir qu’elle est le chef-d’œuvre de la Toute-puissance, et le but auquel se rapportent toutes ses opérations.”—BRUCKNER, *Théorie du Système Animal*, Leyden, 1767.

. . . . . The sylvan powers  
 Obey our summons; from their deepest dells  
 The Dryads come, and throw their garlands wild  
 And odorous branches at our feet; the Nymphs  
 That press with nimble step the mountain-thyme  
 And purple heath-flower come not empty-handed,  
 But scatter round ten thousand forms minute  
 Of velvet moss or lichen, torn from rock  
 Or rifted oak or cavern deep: the Naiads too  
 Quit their loved native stream, from whose smooth face  
 They crop the lily, and each sedge and rush  
 That drinks the rippling tide: the frozen poles,  
 Where peril waits the bold adventurer’s tread,  
 The burning sands of Borneo and Cayenne,  
 All, all to us unlock their secret stores  
 And pay their cheerful tribute.

J. TAYLOR, *Norwich*, 1818.

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ERRATA.

- Page 449, line 12, *after* Sta. 19 A *insert* 60° 36' N., 4° 46' W.  
" 451, " 11, *for* Sta. 15 c *read* Sta. 15 A, 61° 27' N., 3° 42' W.  
" 453, " 17, *for* 60° 3' N., 3° 53' W., *read* 60° 31' N., 3° 53' W.

# THE ANNALS

AND

## MAGAZINE OF NATURAL HISTORY.

[EIGHTH SERIES.]

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"..... per litora spargite muscum,  
Naiades, et circum vitreos considite fontes:  
Pollice virgineo teneros hic carpite flores:  
Floribus et pictum, divæ, replete canistrum.  
At vos, o Nymphæ Craterides, ite sub undas;  
Ite, recurvato variata corallia trunco  
Vellite muscosis e rupibus, et mihi conchas  
Ferte, Deæ pelagi, et pingui conchyliis succo."  
*N. Parthenii Giannettasi, Ecl. 1.*

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No. 13. JANUARY 1909.

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I.—*A Case of Abnormal Oviducts in Homarus vulgaris.*  
By W. G. RIDWOOD, D.Sc., Lecturer on Biology at  
St. Mary's Hospital Medical School, London.

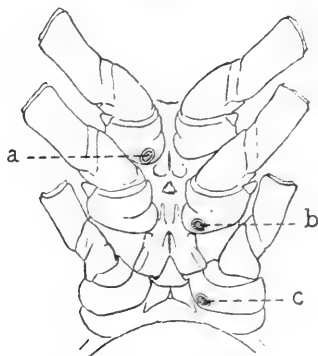
THE lobster which forms the subject of the present note was given me by Dr. W. T. Calman, carcinologist at the British Museum, whom I have to thank not only for the specimen, but also for information respecting the literature of abnormal genitalia in the higher Crustacea generally. The specimen was sent to the Museum from Billingsgate Fish Market, and was stated to have been caught off the Orkney Isles.

On the right side of the body the normal oviducal aperture is present on the base of the third or antepenultimate leg (fig. 1, *a*), but on the left side there is no aperture on the third leg; instead there is an opening on the basal joint of the fifth or last leg (where the vas deferens of the male normally opens), and another aperture on the fourth leg (fig. 1, *c* & *b*).

Abnormalities in the generative system of the lobster (*Homarus vulgaris*) are apparently very rare, although in the Norway lobster or Dublin prawn (*Nephrops norvegicus*) and in freshwater crayfishes they occur with comparative frequency.

In *Nephrops* it is no uncommon circumstance for additional genital apertures to be present. F. H. A. Marshall\*, writing in 1901, records how, on an examination of 1000 male specimens, he found 12·2 per cent. abnormal in having supernumerary genital openings, and more recently D. C. M'Intosh † examined 4429 males, and found that 287 were

Fig. 1.



Ventral view of the bases of the last three thoracic legs. *a*, aperture on the base of the third leg on the right side; *b* and *c*, the apertures on the fourth and fifth legs on the left side. Two-thirds natural size.

abnormal, a percentage of 6·5. In none of these specimens were the usual ducts on the last pair of walking-legs wanting, the abnormality invariably consisted in the occurrence of genital ducts in addition to the normal pair. These specimens were caught in the Firth of Forth and Moray Firth. Of 319 males captured in the Clyde, M'Intosh found 2·5 per cent. to be abnormal in having supernumerary genital openings. In no female specimen examined by him was any abnormality observed, either in the position or the number of the apertures, a truly remarkable circumstance in view of the large percentage of abnormal cases among the males. Marshall ‡, however, mentions one case in which, in addition to the normal oviducal openings on the third or antepenultimate walking-legs, there were a pair of apertures on the last walking-legs.

M'Intosh makes no mention of the manner in which the

\* Marshall, F. H. A., Proc. Zool. Soc. Lond. 1902, i. pp. 2-12.

† M'Intosh, D. C., Proc. Roy. Physical Soc. Edinb. xvii. 4, 1908, pp. 129-142.

‡ *L. c.* p. 6.



supernumerary vasa deferentia of *Nephrops* were connected with the testes, but Marshall\* states that in some of the abnormal males examined by him the apertures opened internally into blind sacs, in others the connection, partial or complete, between the testis and the supernumerary aperture was by means of a branch of the normal vas deferens belonging to the last thoracic somite.

As regards the European crayfishes of the genus *Astacus*, the gonad is sometimes hermaphrodite †, and females are known sometimes to bear on the first abdominal somite large appendages like those of the male instead of the usual vestigial structures ‡. Desmarest§ records a female *Astacus* with supernumerary orifices on the fourth or penultimate legs, and oviducts which on each side forked downward so as to become connected with the apertures on both third and fourth legs. A somewhat similar case is given by Benham||, only in this animal there were on each side two oviducts, opening on the third and fifth legs. Bateson¶ mentions twenty cases of female crayfishes having a unilateral supernumerary opening on one of the fourth legs; he also cites one case with additional oviducal openings on both of the fourth legs, one case with extra openings on both fourth and fifth legs, and eight cases in which the oviduct was suppressed on one side, so that the animal had but one oviduct in all. Abnormalities in the males are much less common than in females, for Bateson found only one abnormal male in 714; this one departed from the normal in the suppression of the lower part of the vas deferens, and its external opening, on one side of the body. In most of the twenty females with an additional oviducal aperture on one of the fourth legs, the oviduct on the abnormal side of the body was in the form of an inverted Y, as in Desmarest's case.

In *Parastacus hassleri*\*\* , a South American species of cray-

\* *L. c.* p. 8.

† See v. la Valette St. George, Arch. f. mikr. Anat. xxxix. 1892, pp. 504-524.

‡ Bergendal, D., Bihang k. Sv. Vet.-Akad. Handlingar, Stockholm, xiv. iv. 3, 1888, pp. 35; and xv. iv. 5, 1889, pp. 15.

§ Desmarest, E., Ann. Soc. Entomol. France, sér. 2, vi. 1848, pp. 479-484.

|| Benham, W. B., Ann. & Mag. Nat. Hist. ser. 6, vii. 1891, p. 256.

¶ Bateson, W., Materials for the Study of Variation (London, 1894), p. 153.

\*\* Lönnberg, E., Zool. Anzeiger, xxi. 1898, pp. 334-335 and pp. 345-352. For other observations on supernumerary genital orifices in *Parastacus* see von Martens, E., Sitz.-Ber. Ges. naturf. Fr. Berlin, 1870, p. 3; von Ihering, H., Congrès International de Zoologie à Moscou, 1892, part ii. (1893) pp. 43-49; and Faxon, W., Proc. U.S. Nat. Mus. xx. (Washington, 1898), pp. 643-694 (see particularly pl. 70. fig. 3).

fish, there are regularly two pairs of genital ducts, one leading from the gonad to the coxal joints of the third pair of legs and the other to those of the fifth. In the male the anterior duct is somewhat narrower than the other and does not really open to the exterior, the "orifice" on the third leg not being patent. In the female the posterior duct is considerably thinner than the anterior; it is too narrow to allow of the passage of ova, and ends blindly on the coxopodite of the fifth leg. There are thus vestigial oviducts in the male and vestigial vasa deferentia in the female. Lönnberg found in the testis large bodies resembling ova, and he is inclined to regard the species as exhibiting a partial structural, but not functional, hermaphroditism.

In *Cambarus*, a North American Astacid, Faxon\* has observed four cases in which external features of the two sexes are combined in the same individual; and Lönnberg† speaks, with some hesitation, of rudimentary ducts passing to the third legs in two males.

In *Cheraps preissii*, an Australian crayfish, von Martens‡ has described three males with additional orifices on the third pair of legs; there were no tubes connecting these openings with the gonad.

In the Indian deep-sea species of the family Axiidæ it is common to find in adult females orifices corresponding with the genital orifices of the male§.

In male specimens of a Pacific hermit-crab, *Pagurus deformis*, supernumerary apertures on the third or antepenultimate legs seem to be regularly present||, although Borradaile¶ mentions a case in which the supernumerary aperture was absent on one side of the body.

In the lobster, *Homarus vulgaris*, abnormal genitalia are very rare, if one may judge from the paucity of recorded cases of abnormality. Nicholls\*\* in 1730 described a case of complete hermaphroditism in a lobster, the left side of the gonad being testicular, and furnished with a duct leading to the last walking-leg, and the right half being ovarian, with

\* Faxon, W., Mem. Mus. Comp. Zool. x. 4 (Camb., Mass., 1885), pp. 13-14.

† L. c. pp. 349-350.

‡ Von Martens, E., Sitz.-Ber. Ges. naturf. Fr. Berlin, 1870, pp. 1-2.

§ Alcock, A., Indian Deep-sea Crustacea Decapoda Macrura and Anomala in the Indian Museum (Calcutta, 1901), p. 187.

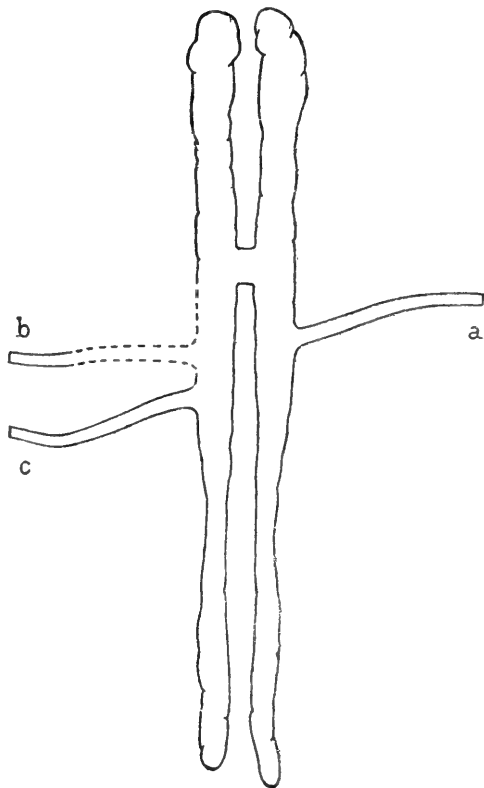
|| Hilgendorf, F., Mon.-Ber. Ak. Wiss. Berlin, 1878, p. 818; and Ortmann, A., Zool. Jahrb., Abth. Syst. vi. 1892, p. 288.

¶ Borradaile, L. A., Proc. Zool. Soc. Lond. 1898, p. 460.

\*\* Nicholls, F., Phil. Trans. xxxvi. 1730, pp. 290-294.

a duct to the third or antepenultimate leg ; and Herrmann \*, in 1890 described the presence of ova in the fore part of the testis of a lobster.

Fig. 2.



Dissection of the ovary and its ducts, seen from above. *a*, the duct to the third leg on the right side ; *b* and *c*, the ducts to the fourth and fifth legs on the left side. Two-thirds natural size.

In the case under consideration there is no question of hermaphroditism, in spite of the fact that one of the three ducts opens in the position of the vas deferens of the male. The specimen is clearly a functional female, since it carries numerous ova attached to the abdominal appendages. The first pair of abdominal appendages differ in no respect from those of the normal female, and the sternal pouch or seminal receptacle, between the bases of the last two pairs of legs, is

\* Herrmann, G., Bull. sci. France et Belg. xxii. 1890, p. 43.

exactly as in a normal female. Of the three apertures the first and second, on the third leg of the right side and the fourth leg of the left (fig. 1, *a* & *b*), are dark in colour and with a hairy front edge. The third opening, on the fifth leg of the left side (fig. 1, *c*), is pale in colour; it has no hairs and is rather more raised than the first and second apertures, but its hind edge is not so elevated as is that of the opening of the vas deferens of the male. The third opening is very slightly smaller than the other two. All three are patent.

The ovary is fully ripe, and a microscopic examination of portions of the anterior and posterior ends fails to show any evidences of hermaphroditism. The duct to the third right leg (fig. 2, *a*) arises from the right side of the ovary at about the same distance behind the ovarian bridge as in a normal female. The duct on the left side to the last leg arises from the left side of the ovary at a more posterior level (fig. 2, *c*). The tube is exactly like a normal oviduct, gently tapering, and without any differentiation of middle glandular segment and terminal ejaculatory segment that one finds in the vas deferens of the lobster\*.

The duct to the penultimate leg of the left side (fig. 2, *b*) could not be traced in its entirety, owing to the fact that in the interval between the death of the animal and the dissection of its body the liver had exerted a digestive action upon the surrounding parts, particularly in the regions represented in fig. 2 by the dotted lines. There is no indication that the duct to the fourth leg arose as a branch from the duct to the fifth leg; if it existed at all it must have come direct from the gonad. The lower part of the duct (the part near the letter *b* in fig. 2) is as wide as the corresponding part of the other two ducts, and like them contains ova, so that there can hardly be any doubt that the duct was a functional oviduct, and not a short tube ending blindly internally.

The specimen is deemed worthy of description, partly because of the scarcity of recorded cases of abnormality in the genitalia of the lobster, partly because the specimen was sufficiently fresh for the relations of the internal parts to be ascertained, and partly because, as I have urged before †, it behoves one to place on record cases of abnormality, even though as solitary instances they may be of no particular interest, in order that it may be possible for later writers to

\* For structure of vas deferens, see Grobben, C., Arb. Zool. Inst. Wien, i. 1878, pl. i. fig. 6; also Herrick, F. H., "The American Lobster," Bull. U.S. Fish. Comm., Washington, 1895, pl. xxxvi. fig. 120.

† Anat. Anzeiger, 1888, p. 333; and Proc. Zool. Soc. Lond. 1901, i. p. 46.

collate the recorded examples and gain some insight into the general principles underlying the irregularities.

Since the above was written, Dr. Calman has shown me a living specimen of the edible crab, *Cancer pagurus*, with no oviducal aperture on the left side. All the other external features of the animal were as in the normal female.

## II.—*Description of a new* *Lemonia*.

By the Hon. WALTER ROTHSCHILD, Ph.D.

### *Lemonia taraxaci terranea*, subsp. n.

This very distinct local form was taken by Dr. Jordan and myself at Le Lautaret, Hautes Alpes, in August 1908, at light. We secured nine specimens, all males.

♂. Differs from *L. taraxaci taraxaci* in having all the wings brownish clay-colour instead of dull yellow. Thorax brownish orange; antennæ yellow; abdomen black above, orange below. Wings below as above, only paler; fringe orange-buff. Some specimens are also paler above than the type, with the costa broadly buffish.

9 ♂♂, Le Lautaret, Hautes Alpes, 2000–2300 metres, 1st–2nd August, 1908.

## III.—*The Collections of William John Burchell, D.C.L., in the Hope Department, Oxford University Museum.*

### IV. *On the Lepidoptera Rhopalocera collected by W. J. Burchell in Brazil, 1825–1830.* By J. C. MOULTON, of Magdalen College, Oxford.

[Continued from ser. 8, vol. ii, p. 195.]

## VI. NYMPHALINÆ (continued).

### *Eubagis (Dynamine) agacles*, Dalm.

Bz. 581. I. [21. 10. 25]. = 836. Minas Geraës. “*Pap[ilio]*.”

In a rossa at Discoberto, and along a channel (on the margin of the forest) which conducts water to the house.”

10. 11. 25. = 837. Minas Geraës.

Bz. 24. 3. 27. = 838. “*Pascuis prope sylvulis.*” On road W. beyond Praça da Alegria. Vicinity of S. Paulo.

Under this date in Westwood's list is written the word "Pascuis."

27. 4. 27. = 839. S. Paulo.

Bz. 27. 4. 27. = 840. S. Paulo.

9. 5. 27. = 841. Near the Convênto da Luz. S. Paulo.

26. 8. 27. = 842. R. Pardo to Cubatão. (As 731.) A label on this specimen bears Westwood's number "Nymph. 79," and the following note in his handwriting:—"Eub. cœnus, ♀ vel var."

24. 10. 27. = 843. Meiaponte to S. Joaquim (Joaq. Alves).

Bz. a. 24. 8. 28. = 844. Retiro. "All at the rivulet near the house at Retiro." Between Goyaz and Jeraguá.

20. 9. 29. = 845. Pará. S.E. of S. Jozé.

Westwood's list (N. 79) agrees.

*Eubagis (Dynamine) cœnus*, F.

4. 11. 25. 2 = 846, 847. Minas Geraës. (As 559.)

Bz. 11. 1. 27. = 848. Cubatão.

Bz. 1. 8. 27. = 849. "On the road." Between Jundiahý and Capivary.

Bz. + 25. 8. 27. 2 = 850, 851. Ollaria to Rio Pardo.

25. 8. 27. 2 = 852, 853. As above. A label on 852 bears Westwood's number N. 80, and the following note in his handwriting:—"Eub. Cœnus, Donov. Ins. Ind."

a. 26. 8. 27. 2 = 854, 855. R. Pardo to Cubatão. (As 734.)

Westwood's list (N. 80) agrees.

*Eubagis (Dynamine) athemon*, Linn.

Bz. 361. I. [15. 10. 25.] = 856. Minas Geraës. "P[apilio]. At the Discobérto do Antonio Velho."

28. 10. 25. 2 = 857, 858. Minas Geraës. (As 635.) No. 858 bears Westwood's number "Nymph. 78."

Westwood's list (N. 78) agrees.

*Eubagis (Dynamine) tithia*, Hübn.

Bz. + 1004. I. 27. 10. 25. = 859. Minas Geraës. "P[apilio]. At San João de Nepomucéna and on the road from Discoberto."

10. 11. 25. = 860. Minas Geraës.

Bz. + a. 26. 8. 27. = 861. R. Pardo to Cubatão. (As 734.)

30. 10. 27. = 862. Sapezal to Conceiçãõ. This specimen bears Westwood's number N. 83.

Westwood's list (N. 83) agrees.

*Eubagis (Dynamine) glauca*, Bates.

a. 24. 8. 28. ♂ = 863. Retiro. "All at the rivulet near the house at Retiro." (As 844.)

Westwood's list (N. 98) agrees, and the number, "Nym. 98," is also borne by 863.

This specimen is unfortunately in very bad condition, thus rendering determination rather difficult. However, on comparing with specimens in the Godman-Salvin Collection and with Bates's description in the 'Journal of Entomology,' ii. p. 324, it seems nearly certain that the species is *E. glauca*.

*Eubagis (Dynamine) mylitta*, Cram., = *postverta*, Cram.

28. 10. 25. ♂ = 864. Minas Geraës. (As 635.)

24. 12. 25. ♂ = 865. Rio de Janeiro. Aqueduct (on the first hill on the left). This specimen bears Westwood's number N. 84.

31. 12. 25. ♀ = 866. Rio de Janeiro. (As 668.)

10. 1. 26. 2, ♂ & ♀ = 867, 868. Rio de Janeiro. Práia Grande and S. João de Carahý. 868 bears Westwood's number N. 82. (As 670.)

Bz. 13. 3. 26. ♂ = 869. "Aqueduct." Rio de Janeiro.

Bz. 15. 3. 26. ♀ = 870. "Catombi." Rio de Janeiro. "Catombi, in plantis."

22. 3. 26. ♀ = 871. Rio de Janeiro. Along the [Carioca] Aqueduct, to the head of the Valley of Laranjeiros.

Bz. 22. 3. 26. ♀ = 872. Rio de Janeiro. (As 871.)

Bz. 3. 4. 26. ♂ = 873. Rio de Janeiro. "Along the Carioca Aqueduct."

Bz. 16. 3. 27. ♂ = 874. Between Morumbi and S. Paulo.

No males in the above series have the black spot at the anal angle of the hind wing (upperside), which is a characteristic of most of the males in the Hope Collection, especially strongly marked in two from Chapada. In the British Museum also, the majority are without it; and in the Godman-Salvin Collection out of a large series only a small minority have it marked—noticeably in specimens from Chapada, Corumba, Peru, and Ecuador, where it is well defined. In one specimen from Paraguay it is very strongly marked.

Westwood's list (N. 82 and N. 84) adds three more individuals captured:—

12. 3. 26. Rio de Janeiro. "Aqueduct." (Under N. 84.)

1. 4. 26. Rio de Janeiro. "In the valley of Catombi." (Under N. 82.)

9. 5. 27. S. Paulo. Near the Convénito da Luz. (Under N. 82.)

*Eubagis (Dynamine) arene*, Hübn.

7. 4. 29. ♀ = 875. Porto Réal (Naçãoale).

26. 5. 29. ♂ = 876. "Silva." Between Itabóca and Baião. North of the falls of Guaríba.

Westwood's list (N. 97) agrees, and both specimens bear this number.

This species is unrepresented in the British Museum.

*Epicalia (Catonephile) acontius*, Linn.

4. 12. 28. ♀ = 877. Porto Real. Walk to the Igarapé. "Papiliones, caught in the woody campo; but the long-wing[ed] one is only found in forests in the shade." As yet the identity of "the long-winged one" has not been established, but as the working out of the collection progresses no doubt this will become apparent.

This specimen bears Westwood's number (N. 32), and his date agrees: in his list Westwood wrote "*Epicalia Pierretii*, ♀." *Epicalia pierrettii*, Dbl. & Hew., is an allied species.

*Epicalia (Catonephile) penthia*, Hew.

8. 2. 26. ♂ = 878. Organ Mtns. (In a ride to the Cattle Pounds and the Milho Roça.)

This specimen bears Westwood's number (N. 11).

- Bz. 13. 3. 26. ♀ = 879. Rio de Janeiro.

13. 3. 26. ♀ = 880.

Both these specimens bear Westwood's number (N. 10).

- a. 29. 8. 27. ♂ = 881. Cérvó. (As 527.)

Westwood's list (N. 10 and N. 11) agrees.

*Nica flavilla*, Godt.

- Bz. 189. I. [8. 9. 25]. = 882. Rio de Janeiro. "*Papilio*. Along the Aqueduct."

27. 1. 26. = 883. Rio de Janeiro.

- Bz. + 7. 3. 26. 2 = 884, 885. Rio de Janeiro. "At Catombí."

7. 3. 26. 2 = 886, 887. Rio de Janeiro. "At Catombí."

9. 3. 26. 2 = 888, 889. Rio de Janeiro. A label on 889 bears Westwood's number "Nym. 94," and the following note in his handwriting:—"Nica flavilla, Godt., 406, Hb. Samml., Ex. Sch."

- Bz. 9. 3. 26. = 890. Rio de Janeiro.

10. 3. 26. 3 = 891-893. „



Bz. 12. 3. 26. = 894. " Carioca Aqueduct." Rio de Janeiro.

Westwood's list reads 12. 3. 25, an obvious slip, because Burchell did not land at Rio till 18. 7. 25.

16. 3. 26. = 895. Rio de Janeiro. (As 647.)

21. 3. 26. = 896. " Along the Carioca Aqueduct."

26. 8. 27. = 897. R. Pardo to Cubatão. (As 731.)

This specimen bears the number N. 12\*, and is mentioned under it in Westwood's list. It is the only specimen under that number.

21. 2. 28. = 898. Goyaz. W.N.W. beyond Forca. " All in woods."

Westwood's list (N. 94 and N. 12\*) agrees.

*Temenis laothöe*, Cram., f. *ariadne*, Cram.

30. 10. 25. = 899. Minas Geraës. " (In the forest). On the N.E. side of the arraial of São João de Nêpomucéna."

This specimen bears Westwood's number N. 12.

4. 11. 25. = 900. Minas Geraës. (As 559.)

These two specimens are under a separate number (N. 12) in Westwood's list.

Bz. + 25. 8. 27. = 901. Ollaria to Rio Pardo.

a. 29. 8. 27. 2 = 902, 903. Cérvó. (As 527.)

1. 9. 27. = 904. " On the road." Veravínha to França [Villa Franca].

28. 10. 27. = 905. " In sylvá." S. Joaquim to Sapezál.

a. 24. 8. 28. = 906. Retiro. " All at the rivulet near the house at Retiro." Between Goyaz and Jeraguá.

This specimen bears Westwood's number " Nym. 93."

Bz. p. 24. 8. 28. = 907. Retiro. (As 514.)

p. 24. 8. 28. = 908. Retiro. (As 514.)

Instead of 906, 907, 908, Westwood's list (N. 93 except for 899, 900 mentioned above) gives two specimens dated a. 24. 8. 27 and p. 24. 8. 27 (the first probably mistaken for 906, and the second for either 907 or 908).

In the British Museum this insect is placed as the *ariadne* form of *laothöe*; in the Godman-Salvin collection as the *laothöe* form of *ariadne*. *Laothöe* and *ariadne* were both described by Cramer in the same work, but inasmuch as *ariadne* appears on the later page, it would seem that *laothöe* should stand.

*Epiphile orea*, Hübn.

9. 2. 26. = 909. Organ Mtns. (By the river Pacaqué.)

Bz. p. 24. 8. 28. = **910**. Retiro. (As **514**.)

Westwood's list (N. 9) agrees, and this number is borne by both specimens.

*Libythina cuvierii*, Godt.

10. 10. 27. = **911**. Bomfim to Forquílho.

Westwood's list (N. 100) agrees, and his number is on this specimen. Burchell's example is a good deal smaller than any in the British Museum series.

*Myscelia orsis*, Drury.

Bz. + 8. 11. 25. ♂ = **912**. "Sylvatica" on the English label, "Pap<sup>s</sup>. sylvat." on Brazilian label. Minas Geraës.

10. 11. 25. ♀ = **913**. Minas Geraës.

12. 3. 26. 3 ♂ = **914, 915, 916**. Rio de Janeiro. "Aqueduct."

Westwood's list gives two more of this date (under N. 14).  
Bz. 1056. [17. 3. 26]. ♀ = **917**. Rio de Janeiro. "Along the Carioca aqueduct, and descending the high hill (mentioned 31. 1. 26) into the Valley of Catombi.—But they were mostly along the Aqueduct; and only a few on the hill."

A further note on this date says:—"Papiliones. These 3 species frequent the woods." [The Satyrine butterfly *Euptychia ocirrhoe*, F., Ann. Mag. N. H., May 1904, p. 362, and the Nymphaline *Myscelia orsis*, Drury.] As yet it has been impossible to find out the third species here mentioned.

17. 3. 26. 3 ♂ 1 ♀ (**920**) = **918-921**. Rio de Janeiro.  
(As above.)

Westwood's list gives altogether two specimens numbered 1056 (under N. 13 and N. 14), four with 17. 3. 26 under N. 14 and one under N. 13. **919** and **921** bear Westwood's number N. 14.

18. 3. 26. ♀ = **922**. Rio de Janeiro. "Along the Carioca Aqueduct."

20. 3. 26. ♀ = **923**. Rio de Janeiro. "Along the Carioca Aqueduct."

This specimen bears Westwood's number N. 13.

Westwood's list gives another specimen captured on this and the previous date. His list contains a specimen of each date under N. 13 and a similarly dated pair under N. 14.

21. 3. 26. ♀ = **924**. Rio de Janeiro. "Along the Carioca Aqueduct."

3. 4. 26. ♀ = **925**.                    ,,                    "Along the Carioca Aqueduct."

Westwood's list gives three altogether of this date, two under N. 14 and one under N. 13.

20. 9. 26. ♀ = 926. "Sylva." Santos. "In the forest above the Monastery of S. Bento."

26. 9. 26. ♀ = 927. Santos. In a walk to the Chapel on Montserrat. "These Papiliones very plentiful in the woods."

Westwood's list (N. 13) includes a date, 29. 9. 26, probably an erroneous copy of 26. 9. 26, which is otherwise unaccounted for. Except for the above additions his list (N. 13 and N. 14) agrees.

*Eunica bechina*, Hew.

4. 12. 28. = 928. Porto Real (Nacional). Walk to the Igarapé. "Papiliones, caught in the woody campo; but the long-wing[ed] one is only found in forests in the shade." See note on 877.

Bz. + 28. 3. 29. ♀ = 929. Porto Real. This specimen bears Westwood's number N. 15\*.

Westwood's list (N. 15\*) agrees.

*Eunica maia*, F.

Bz. 558. II. [19. 10. 25]. ♂ = 930. Minas Geraës. "Pap[ilio]."

Westwood's list gives another of this date.

Bz. + 896. V. 25. 10. 25. 4 ♂ = 931-934. Minas Geraës. "Pap[ilio]. At Discoberto, near João Pedro's house."

896. 25. 10. 25. ♂ = 935. Minas Geraës. One of the above without the Brazilian label.

This specimen bears Westwood's number N. 15\*\*.

29. 10. 25. ♂ = 936. Minas Geraës. "In the forest on the S.E. side of S. João de Nepomucena."

4. 11. 25. ♂ = 937. Minas Geraës. (As 559.)

Westwood's list (N. 15\*\*) adds another specimen captured 10. 10. 27. Bomfim to Forquilha. He also includes the next species. His dates agree.

*Eunica mygdonia*, Godt.

10. 4. 28. ♂ = 938. Goyaz. Caminho de Carréira. (As 733.)

Westwood's date agrees.

*Eunica taurione*, Hübn.

7. 11. 25. = **939**. Minas Geraës.

Westwood's list (N. 15) agrees, and his number is borne by this specimen.

*Eunica volumna*, Godt., = *tithonia*, Feld.

10. 10. 27. = **940**. Bomfim to Forquílho.

Westwood's list (N. 99) agrees, and his number is on this specimen.

*Eunica carea*, Hew.

4. 11. 25. = **941**. Minas Geraës. (As **559**.) Westwood's number (N. 31) is borne by this specimen.

Westwood's date (under N. 31) agrees, but he gives the name "*Myselia sydonia*." A label on the specimen bears in Westwood's handwriting:—"Mys. Sydonia, Godt., 416?"

*Eunica margarita*, Godt.

20. 6. 27. = **942**. "Rita." Vicinity of S. Paulo. Westwood's number "Nym. 96" is on this specimen.

Westwood's list (N. 96) gives two specimens captured on this date.

*Anartia amalthea*, Linn.

*Bz.* 349. III. [15. 10. 25]. 2 = **943, 944**. Minas Geraës. "*P[apilio]*. (Visa quoque ad Rio de Janeiro.) At the Discobérto do Antonio Velho."

Westwood adds another of this date.

*Bz.* + 895. III. 25. 10. 25. 3 = **945, 946, 947**. Minas Geraës. "*Papilio*. At Discoberto, near João Pedro's house."

14. 1. 26. 3 = **948, 949, 950**. Rio de Janeiro. (As **698**.)

27. 1. 26. = **951**. Rio de Janeiro.

31. 1. 26. 2 = **952, 953**. Rio de Janeiro. (As **474**.)

9. 2. 26. = **954**. Organ Mtns. (By the river Pacaqué.)

12. 2. 26. = **955**. Organ Mtns.

*Bz.* + a. 25. 2. 26. = **956**. "Frexaes." Organ Mtns. Burchell sometimes wrote "Frexaes" for "Frechál."

a. 25. 2. 26. = **957**. "Frexaes." Organ Mtns. See note on **956**.

*Bz.* + 26. 2. 26. = **958**. Organ Mountains. Near Magé.

28. 2. 26. = **959**. Organ Mountains. On the Rio Magé.

Westwood's list adds another of this date.

1. 3. 26. = 960. Organ Mtns. Along the River Magé, upwards to the Fazénda da Lagóa. Westwood's list adds three more individuals captured on this date.
- Bz. + 2. 3. 26. = 961. Rio de Janeiro or Organ Mtns. Westwood's list gives another of this date.
7. 3. 26. 2 = 962, 963. Rio de Janeiro. "At Catombí."
10. 3. 26. = 964. Rio de Janeiro.
16. 3. 26. ♂ = 965. Rio de Janeiro. (As 647.) This specimen bears Westwood's number (N. 1).
16. 3. 26. 966. Rio de Janeiro.
- Bz. 15. 9. 26. = 967. Santos. "Papil. at edge of the forest at S. Bento Monastery."
19. 9. 26. = 968. Santos. Westwood's list gives two more individuals captured on this date.
- a. 29. 8. 27. = 969. Cérvó. (As 527.)
9. 1. 28. 3 = 970, 971, 972. Goyaz. By the Horta etc.
4. 3. 28. 5 = 973-977. Goyaz. "Caught by the rio Vermelho, near the Carioca aqueduct: by C[ongo]."
- Bz. 2. 2. 29. = 978. Porto Real. "On the western side of the Tucantins."
19. 2. 29. = 979. Porto Real.
18. 12. 29. = 980. "in locis apertis." Pará. Rivulet above arsenal.
- Form *amalthea*, L., in British Museum.

With the exception of 980, all the above specimens are named form *rocseia*, Esch., in British Museum. The form *amalthea* seems to be more prevalent in Trinidad, Honduras, Guiana, and Bolivia. In Colombia an intermediate form exists. The difference between them is that the subapical white bar of the fore wing of f. *rocseia* is replaced in f. *amalthea* by faint and indistinct white spots.

Westwood's list (N. 1) omits 969, and adds two specimens captured respectively, 8. 2. 26, Organ Mtns., and 5. 2. 29, Porto Real. The dates otherwise agree.

No date. = 981. Placed by Westwood in his list of *Anartia jatrophe*, Linn. Considering the obvious differences between these two species, it is, perhaps, probable that Burchell's label has become displaced from the original specimen. There is no *A. jatrophe* without a date in the collection, and there is no *A. amalthea* mentioned in Westwood's list without a date.

*Anartia jatrophae*, Linn.

10. 1. 26. 3 = 982, 983, 984. Rio de Janeiro. (As 670.)  
 14. 1. 26. = 985. Rio de Janeiro. (As 698.)  
 26. 1. 26. = 986. " " Morro de Ladéira and  
 Catombý. (As 672.)  
*Bz.* + 27. 1. 26. = 987. Rio de Janeiro.  
 31. 1. 26. = 988. (As 474.)  
 26. 2. 26. 2 = 989, 990. Organ Mtns. Near Magé.  
 Westwood's list gives another of this date.  
 1. 3. 26. = 991. (As 960.)  
 9. 3. 26. = 992. Rio de Janeiro.  
 19. 3. 26. = 993. " " "In the valley of Ca-  
 tombí."  
*Bz.* 27. 3. 26. = 994. Rio de Janeiro. From the Village of  
 São Domingos to the island of Boa Viagem. "On the  
 main-land about Fort Boa Viagem."  
 27. 3. 26. 3 = 995, 996, 997. (As 994.)  
 Westwood's list gives another specimen captured on this  
 date. On 995 his label gives both catalogue numbers (N. 5  
 and 34) and the name "*Anartia Jatrophae*, Linn."  
 14. 4. 27. = 998. Near S. Paulo. In the Campo beyond  
 Boa Morte.  
 26. 4. 27. 15 = 999-1013. Vicinity of S. Paulo.  
 1001 bears Westwood's label N. 5.  
*Bz.* 26. 4. 27. 2 = 1014, 1015. Vicinity of S. Paulo.  
 Westwood's list adds three more specimens of this date.  
 6. 5. 27. = 1016. Vicinity of S. Paulo.  
 20. 6. 27. = 1017. "Rita." Vicinity of S. Paulo.  
 20. 6. 27. = 1018. Vicinity of S. Paulo.  
*Bz.* 20. 6. 27. = 1019. Vicinity of S. Paulo.  
 Westwood's list gives two more specimens captured on  
 this date.  
 23. 6. 27. = 1020. "Rita." Vicinity of S. Paulo.  
 9. 1. 28. = 1021. Goyaz. By the Horta, etc.  
 18. 1. 28. = 1022. Goyaz. Rio Manoel Mines, etc.  
 23. 1. 28. = 1023. Goyaz.  
 30. 4. 28. = 1024. Goyaz.  
*Bz.* + 29. 1. 29. = 1025. Porto Real (Nacionale). "Caught  
 on the bank of the Tucantins, while measuring the base  
 line."  
*Bz.* + 19. 5. 29. = 1026. Araguáy. [S. João da Ara-  
 guay.]  
*Bz.* + 7. 6. 29. = 1027. Sta. Anna. Rio Tocantins, be-  
 tween Baião and Pará.

1386. 26. 6. 29. 2 = 1028, 1029. Pará, near my house (Pombo roçinha).  
 Bz. + 1386. 26. 6. 29. = 1030. Pará, near my house (Pombo roçinha).  
 Bz. + 17. 7. 29. = 1031. Pará.  
 23. 7. 29. = 1032. Pará, between my house and the City.  
 21. 9. 29. = 1033. Pará.

Westwood's list adds three individuals captured 10. 2. 27, 24. 4. 27, 7. 6. 27, near S. Paulo; and one, 4. 3. 28, Goyaz. "Caught by the rio Vermelho, near the Carioca aqueduct; by C[ongo]."

Westwood had put this species under two numbers (N. 5 and N. 34), and against these he wrote the name *Anartia jatrophe*, and against N. 34 the additional note "Same as N. 5."

*Junonia (Precis) hübnéri*, Kirb.

- Bz. 145. I. [16. 8. 25]. = 1034. Rio de Janeiro. "*Papilio*". Above the Teresa Convent; and on the woody hilly [hills] along the Aqueduct." Dry-season form.  
 7. 11. 25. = 1035. Minas Geraës. Dry season.  
 10. 11. 25. 2 = 1036, 1037. Minas Geraës. 1036 is dry side of intermediate; 1037 is much worn, but probably intermediate.  
 24. 12. 25. = 1038. Rio de Janeiro. Aqueduct (on the first hill on the left). Dry season. Slightly inclined to intermediate.  
 Bz. + 1. 3. 26. 2 = 1039, 1040. (As 960.) 1039 is intermediate side of dry; 1040 is a typical dry-season form.  
 1. 3. 26. = 1041. (As 960.) Intermediate side of dry.  
 Bz. 15. 3. 26. = 1042. Rio de Janeiro. "Catombi, in plantis." Intermediate.  
 17. 3. 26. = 1043. Rio de Janeiro. (As 917.) Intermediate side of wet.  
 Bz. 20. 3. 26. = 1044. Rio de Janeiro. "Along the Carioca Aqueduct." Wet season.  
 27. 3. 26. = 1045. Rio de Janeiro. (As 994.) Wet season.  
 4. 3. 27. = 1046. Morumbý. E<sup>d</sup>. of the house. Wet season.  
 9. 1. 28. = 1047. Goyaz. By the Horta, etc. Intermediate.  
 18. 1. 28. = 1048. Goyaz. Rio Manoel Mines, etc. Intermediate, inclined to dry.

4. 3. 28. = **1049**. Goyaz. "Caught by the rio Vermelho, near the Carioca Aqueduct, by U[ongo]." Wet season.
3. 4. 28. = **1050**. Goyaz. Caminho de Bacopary. Intermediate.
10. 4. 28. = **1051**. Goyaz. Caminho de Carréira. (As **733**.) Intermediate, inclined to wet.
- Bz. 4. 9. 28. = **1052**. "Very common in the Campos." Estiva to Fazenda seca. "Papiliones, at a rivulet on the road." Typical dry season.
8. 11. 28. = **1053**. Canga. Corrego Raiz. "At Corrego Raiz, drinking on the moist sand in the road where it crosses the rivulet." Intermediate.
- Westwood's list gives two specimens captured 8. 11. 28.
- Bz. 28. 11. 28. = **1054**. Porto Real (Nacional). Wet side of intermediate.
28. 11. 28. = **1055**. Porto Real: Intermediate.
- Bz. + 1265. 1. 12. 28. = **1056**. Porto Real. "*Papilio*. This merits most decidedly the name of *campestris*, as it is very common in all the Campo beyond and on this side of Goyaz, but I have always found it difficult to catch them which accounts for my collection possessing so few of so common a butterfly." Wet season.
- Burchell's ideas of an adequate series may be inferred from the fact that his collection contained twenty-six specimens (including three in Westwood's list and now missing) at the date when he spoke of the numbers as "so few."
- Bz. 30. 12. 28. = **1057**. Porto Real. Dry, inclined to intermediate.
- Bz. 2. 2. 29. = **1058**. Porto Real. "On the western side of the Tucantins." Dry season.
1316. 17. 2. 29. 2 = **1059, 1060**. Porto Real. "Feeding on the flowers of the *Waltheria* bushes" (v. II. 8632 x). See note on **663** in Ann. & Mag. Nat. Hist. ser. 8, vol. ii. p. 183. Worn, but probably dry.
17. 2. 29. = **1061**. Porto Real. Dry to intermediate.
11. 3. 29. = **1062**. Porto Real. Dry to intermediate. This and the above are very worn.
- Bz. + 28. 3. 29. = **1063**. Porto Real. Wet season.
18. 12. 29. = **1064**. "in locis apertis." Pará. Rivulet above Arsenal. Dry side of intermediate.

This specimen bears Westwood's number (N. 2); his list adds four more individuals, captured 31. 1. 26, Rio de Janeiro (as **474**); 7. 3. 26, Rio de Janeiro, "At Catombi"; 21. 9. 27, between Lanboso and Bomfim; and 20. 8. 29, Pará.



*Pyrameis myrinna*, Doubl.

Bz. + p. 25. 2. 26. = 1065. Organ Mtns. Between Frechal and Magé.

18. 10. 26. = 1066. Santos. In a walk from the Outeir-hinhos to the town.

Westwood's list (N. 3) makes this last date 28. 10. 26, probably a clerical error. He also places these two specimens in his list of the next species under the name of "*Vanessa Huntera*." These Burchell specimens have been compared with the types of *P. myrinna*, Doubl., in the British Museum.

*Pyrameis huntera*, Fabr., form *brasiliensis*, Moore.

10. 11. 25. = 1067. Minas Geraës.

6. 12. 25. = 1068. Rio de Janeiro. On the Corcovado Mountain. (As 667.)

This specimen bears Westwood's number N. 3.

7. 6. 27. = 1069. Vicinity of S. Paulo.

Westwood's list (N. 3) gives two more specimens, one captured 4. 11. 25, Minas Geraës (as 559), and one 20. 6. 27, S. Paulo. He names it *Vanessa huntera*.

Mr. F. A. Heron, of the British Museum, kindly informs me that *brasiliensis* is the name given to the southern form of *huntera*, and he mentions the following chief points of difference:—in *huntera* there is no white in the cell of the fore wing, while in *brasiliensis* there is usually a white patch on the discocellulars; again, in the hind wing of *huntera* the eye-spots are usually confluent to form a postdiscal band, while in *brasiliensis* the eye-spots are well separated, and in some cases reduced to mere points. In the latter form also there is always a strongly marked discal band in both sexes, which is hardly ever found in *huntera* males, and never in the females.

*Eurema (Hypanartia) lethe*, Fabr.

9. 2. 26. 2 = 1070, 1071. Organ Mtns. (By the River Pacaqué.)

a. 26. 8. 27. = 1072. R. Pardo to Cubatáo. (As 734.)

This specimen bears Westwood's number N. 4\*.

Bz. + a. 28. 8. 27. = 1073. "At Reíro." Just N. of R. Pardo.

Westwood's list (N. 4\*) adds another specimen, captured a. 29. 8. 27, at Cérvó. (As 527.) Against this and the next species Westwood had written in his list the generic name "*Eurema*."

*Eurema (Hypanartia) bella*, Fabr.

4. 11. 25. = 1074. Minas Geraës. (As 559.)

Bz. 9. 3. 26. = 1075. Rio de Janeiro.

This specimen bears Westwood's number N. 4; his list adds another, captured 26. 11. 26 at Santos.

These two species, originally placed under one number (N. 4) in a clerk's handwriting, were differentiated by Westwood, who placed the examples of *lethe* under a new number (N. 4\*).

[To be continued.]

IV.—Notes on the Genus *Acerodon*, with a Synopsis of its Species and Subspecies, and Descriptions of Four new Forms. By KNUD ANDERSEN.

## The Genus ACERODON.

*Type*.—*Pteropus jubatus*, Eschscholtz.

*Species*.—Six (nine recognizable forms), viz. *A. mackloti* (three subspecies), *gilvus*, *celebensis*, *humilis*, *lucifer*, *jubatus* (two subspecies).

*Range*.—Timor group (Timor, Flores, Alor, Sumba); Celebes group (Celebes, Selayar); Talaut Islands; Philippines\*.

*Differential characters*.—*Acerodon* differs from *Pteropus* by the combination of the following dental characters: (1) Posterior basal ledge of  $p_4$ ,  $m_1$ , and  $m_2$  extending along inner base of teeth as a broad, sharply defined shelf; this character is sufficient to distinguish *Acerodon* from any species of *Pteropus*, except *Pt. anetianus*, which possesses a perfectly similar inner basal ledge in the same teeth, but in every other respect is closely allied to the genuinely Pteropine *Pt. samoënsis*: (2) a well-developed antero-internal basal cusp in  $p^4$  and  $m^1$  (a similar, but smaller, antero-internal cusp developed in

\* The range of the "subgenus" *Acerodon* is stated by Matschie to be the Philippines, Gilolo, Batjan, Celebes, Flores, and Timor (Megachir. p. 99, 1899), and essentially the same distribution is given by Miller (Fam. & Gen. Bats, p. 59, 1907). Gilolo and Batjan must be excluded from the known range of the genus. The records of *Acerodon* from the Gilolo group are based on mistaken identifications of Gray's *Pteropus caniceps* and his *Pteropus mackloti* var. *batchiana*; the latter name is a synonym of the former, and *Pteropus caniceps* a perfectly typical *Pteropus*.

$p^3$  of most species and in  $p_3$  of *A. humilis*, *jubatus*, and *lucifer*); a corresponding cusp indicated in certain species of *Pteropus*, but never as well developed and sharply differentiated as in *Acerodon*: (3) molariform teeth above and below ( $p^4$ ,  $m^1$ ,  $p_4$ ,  $m_1$ ,  $m_2$ ) rather shorter and broader, and main cusps with more trenchant edges: (4)  $m^2$  rather less reduced: (5) upper incisors slenderer and more acutely pointed\*.—Skull and external characters not differing from those of *Pteropus*.

*Original description of genus*.—Palmer † gives as primary reference for the genus *Acerodon*, Jourdan, the "Ann. Sci. Nat., Paris, 2° sér., viii, Zool. 369–370, Dec. 1837," and as secondary reference the "Comptes Rendus, Paris, vi, 3, 1838." To this it must be remarked, first, that these two papers give, the one exclusively, the other chiefly, F. Cuvier's "Rapport" and critical remarks on a memoir by Jourdan, and that therefore, really as well as formally, not Jourdan but F. Cuvier is the author of the two papers referred to by Palmer; second, that in both of these papers the name of the present genus occurs only in its French form (*Acérodon*), and therefore cannot, technically, date from these papers; third, that *prima facie* it appears unlikely that F. Cuvier's "Rapport," which was read before the Paris Academy, should have been published earlier in the 'Annales des Sciences Naturelles' than in the 'Comptes Rendus' of the meetings of the Academy. In these circumstances I have

\* Some of the differential characters of *Acerodon* given by Miller in his highly useful 'Revision of the Families and Genera of Bats' (p. 59, 1907) prove, on examination of a larger material of *Pteropus* and *Acerodon* than that studied by Miller, to be untenable. "Lower incisors [Miller writes] differing from those of *Pteropus* in the much greater contrast in size between the inner and outer tooth of each pair." In *Acerodon*  $i_2$  is in cross-section of the crown from twice to three times the bulk of  $i_1$ ; practically the same is the case in a majority of species of *Pteropus*, while in others (e. g. *Pt. lombocensis*, *solitarius*, *samoënsis*, *anetianus*, *pselaphon*, *pilosus*, *tuberculatus*) the disproportion in the size of these teeth is greater than in any *Acerodon*,  $i_2$  being sometimes four, five, or six times the bulk of  $i_1$ . "Canines much shortened as compared with *Pteropus*, the mandibular canine little exceeding the height of  $pm_2$ ." There is in *Pteropus* every intergradation from short, stout, and distinctly recurved, to very long, slender, and nearly straight canines. "Though reduced in length the canines retain their thickness, and the cingulum is even better developed than in the related genus." The numerous species of *Pteropus* show any intermediate stage from a very narrow to an excessively broad cingulum of the canines (the latter extreme exhibited by *Pt. samoënsis*, *anetianus*, *pselaphon*, *pilosus*, *tuberculatus*, *insularis*, *pheocephalus*); the cingulum of the canines is in these species of *Pteropus* much broader than in any *Acerodon*.

† Index Gen. Mamm. p. 73 (1904).

had to trace the history of Jourdan's paper and F. Cuvier's report, which appears to be as follows:—

(1) "9 Oct. 1837"—C. R. Ac. Sci. Paris, v. pp. 521–524. This is Jourdan's original paper. It contains descriptions of two new genera of mammals (*Heteropus* and *Nelomys*) and five new species (*Heteropus alboocularis*, *Nelomys brasiliensis*, *Halmaturus irma*, *Hydromys fulvogaster*, and *Paradoxurus philippinensis*). No reference to *Acerodon*. The paper was read before the Academy on 9 Oct. 1837, and presumably published very soon after.

(2) "14 Oct. 1837"—L'Echo du Monde Savant et L'Hermès \*, iv. no. 275, p. 156. Jourdan describes "three" new genera, *Nelomys* (see above), *Acerodon*, and *Heteropus* (see above). This is apparently the earliest description of the genus *Acerodon* † (not known to Palmer). The issue of the weekly periodical 'L'Echo' in which it appeared is dated "Samedi, 14 octobre 1837," and was very likely published on that day.

(3) "Nov. 1837"—L'Institut, v. no. 221, p. 351. Reprint of no. (1), *suprà*.

(4) "2 Jan. 1838"—C. R. Ac. Sci. Paris, vi. pp. 2–6. F. Cuvier's "Rapport sur un mémoire de M. Jourdan, de Lyon, concernant quelques mammifères nouveaux." This is Palmer's secondary reference. Author, F. Cuvier, not Jourdan; no quotations of Jourdan's own words; *Acerodon*

\* I have to thank Mr. B. B. Woodward and Mr. C. Davies Sherborn for having directed my attention to this periodical. It is not in the library of the Natural History Museum. I have seen a copy in the Bloomsbury Museum.

† The chief character of *Acerodon* is pointed out by Jourdan in the following words: it "diffère de toutes les autres Roussettes, parce que ses molaires sont larges transversalement, presque carrées, et que celles de la mâchoire inférieure ont trois collines," and as type is fixed by the author himself "la Roussette . . . qui habite l'île Luçon, ainsi que les petites îles voisines." From this there is no doubt whatever that the type of *Acerodon* is *A. jubatus*. But Jourdan makes also, in this connexion, some remarks on the "Roussette . . . rapportée de Vanikoro par MM. Quoy et Gaimard" [i. e. "*Pteropus vanikorensis*"], the dentition of which shows, in Jourdan's opinion, some leanings towards that of *Acerodon*. Here is the explanation of the fact that Lesson, the only author, between 1837 and 1896, who recognizes *Acerodon* as a distinct genus, includes in the genus two species, *A. vanikorensis* and *A. jubatus* (N. Tabl. R. Anim., Mamm. p. 14, 1842). *Pt. vanikorensis*, in its original sense, is a mixture of two widely different species, the true *Pt. vanikorensis* (the skins described by Quoy et Gaimard), a species closely allied to *Pt. tonganus*, and *Pt. tuberculatus* (the skull described by the same authors, and erroneously believed by them to belong to the same species as the skins), which is allied to *Pt. psclaphon*. *Pt. vanikorensis* and *tuberculatus* are typical members of the genus *Pteropus*.

occurs only in the French form, "Acérodon." The meeting was held on 2 Jan. 1838, the "Comptes Rendus" presumably published a few days later\*.—It appears rather strange that Cuvier's Report on Jourdan's paper contains remarks on Acérodon, whereas Jourdan's original paper, as printed in the "Comptes Rendus" (see no. (1), *suprà*), has no reference to this genus. The explanation may be this: Cuvier's remarks on Acérodon are not very favourable for its validity as a distinct genus; as Cuvier, together with Duméril, was the Academy's "Commissaire" for zoological papers, he may (privately) have informed Jourdan of this opinion, and Jourdan therefore have withdrawn the description of *Acerodon* from the paper laid before the Academy, but almost simultaneously published it in the "Echo" (no. (2), *suprà*). But this is, of course, only conjecture.

(5) After 5 Feb. 1838—Ann. Sci. Nat. (2) viii. Zool. pp. 367-374. A reprint of no. (4), *suprà*, but with the addition, in footnotes, of quotations from Jourdan's original paper, these quotations, taken together, amounting to a complete reprint of no. (1). This is Palmer's primary reference, evidently because this number of the 'Annales' is dated December 1837; but since it contains a paper read before the Paris Academy on Feb. 5, 1838, it must have been published after this date.

*Principal subdivisions of genus.*—The six species of *Acerodon* recognized in this paper fall into two natural sections, the one confined to the Timor and Celebes groups, the other to the Talaut and Philippine Islands. The three species of the former section are more primitive, in so far as  $p_3$  is typical Pteropine, without antero-internal basal cusp; the ears are relatively longer and the colour of the fur pale above and beneath. The two species inhabiting the Timor group, viz. *A. mackloti* (Timor, Flores, Alor) and *A. gilvus* (Sunba), are closely related, differing chiefly in size, whereas the Celebean species (*A. celebensis*) is characterized by its much weaker dentition. The three species of the latter group are more specialized in having a distinct antero-internal basal cusp in  $p_3$ ; the ears are relatively shorter, the colour of the fur much darker; in general aspect the coloration of these

\* This statement, that the "Comptes Rendus" of the meeting of the Paris Academy held on Jan. 2, 1838, were probably published a few days after that date, might seem to be contradicted by the fact that this number of the C. R. contains (p. 22) a table of meteorological observations for every day of "janvier 1838." But "janvier 1838" is obviously a misprint for "décembre 1837"; compare p. 184 of the same volume, in which page the true table for Jan. 1838 appears.

species is much nearer to that of an ordinary *Pteropus*: head, back, and underparts dark, mantle paler. The single species of this group inhabiting the Talaut Islands (*A. humilis*) is easily recognizable by its small size; externally it is much like certain dark-coloured forms of *Pteropus hypomelanus*; the two Philippine species (*A. jubatus* and *lucifer*) are chiefly characterized by their larger size and strikingly pale-coloured nuchal patch; *inter se*, they differ only in size.

*Synopsis of Species and Subspecies.*

- I. No antero-internal basal cusp in  $p_3$ ; ears longer than muzzle (front of eye to tip of nose); pale-coloured forms: back and underparts approximately mars-brown or vandyck-brown, lightened with golden buffy, head and mantle essentially buffy. (Timor and Celebes groups.)
- a. Dentition heavy:  $m^1$ , length (antero-posterior diameter of crown) 5.6-6 mm.; skull, total length 66-72 mm. (Timor group.)
- $a^1$ . Larger: skull, total length 69-72 mm.; forearm 139-156 mm. (Timor; Flores; Alor.) . . . . . 1. *A. mackloti*.
- $a^2$ . Forearm about 139-146 mm.
- $a^3$ . Underside of body rather thinly sprinkled with buffy hairs. (Timor.) . . . . . 1 a. *A. m. mackloti*.
- $b^3$ . Underside of body thickly sprinkled with buffy hairs. (Flores.) . . . . . 1 b. *A. m. floresii*.
- $b^2$ . Forearm about 156 mm. (Alor.) . . . . . 1 c. *A. m. alorensis*.
- $b^1$ . Smaller: skull, total length 66 mm.; forearm 135 mm. (Sumba.) . . . . . 2. *A. gilvus*.
- b. Dentition much weaker:  $m^1$ , length 4.7-5 mm.; skull, total length 62.5-63 mm. (Celebes group.) . . . . . 3. *A. celebensis*.
- II. A distinct antero-internal basal cusp in  $p_3$ ; ears shorter than muzzle; dark-coloured forms: back and underparts seal-brown or burnt umber, more or less sprinkled with pale hairs; mantle chestnut or dark cinnamon-rufous. (Talaut Is.; Philippines.)
- c. Small: forearm about 140 mm.; no buffy nuchal patch. (Talaut Is.) . . . . . 4. *A. humilis*.
- d. Large: forearm 165-205 mm.; a buffy nuchal patch strongly contrasting with dark mantle and sides of neck. (Philippines.)
- $c^1$ . Forearm about 165 mm. (Panay.) . . . . . 5. *A. lucifer*.
- $d^1$ . Forearm 182-205 mm. (Philippines generally.) . . . . . 6. *A. jubatus*.
- $c^2$ . Averaging smaller: forearm 182-198 mm. (Philippines north of Mindanao.) . . . . . 6 a. *A. j. jubatus*.
- $d^2$ . Averaging larger: forearm about 205 mm. (Mindanao.) . . . . . 6 b. *A. j. mindanensis*.

*Acerodon mackloti alorensis*, subsp. n.

Skull and teeth as in *A. m. mackloti* and *floresii* (skull of type, total length 71.8 mm.; maxillary tooth-row,  $c-m^2$  29.7;  $m^1$ , length 5.8, breadth 4.5), but external dimensions larger: forearm 156 mm., against 139–146 in nine adult specimens of the allied forms. Colour of fur scarcely differing from that of *A. m. floresii*.

*Type.* ♂ ad. (alc., skull), Alor (Ombay), Lesser Sunda Islands, April 16, 1896; collected by A. Everett; B.M. 98. 3. 11. 1.

*Acerodon gilvus*, sp. n.

Skull similar to that of *A. mackloti*, but considerably smaller: total length (type) 66 mm., against 69–72. Upper premolars and molars scarcely differing from those of *A. mackloti*, but lower incisors,  $p_1$ ,  $p_3$ ,  $p_4$ , and  $m_1$ , distinctly smaller. Forearm (type) 135 mm., against 139–156 in *A. mackloti*. General style of colour as in *A. mackloti*, but back conspicuously paler, light cream-buffy, with the Prout's-brown or vandyck-brown bases of the hairs perfectly concealed on back, slightly showing through on rump.

*Type.* ♂ ad. (skin, skull), Waingapo, Sumba, Lesser Sunda Islands, Sept. 1896; collected by A. Everett; B.M. 98. 11. 3. 19.

*Acerodon humilis*, sp. n.

Allied to *A. jubatus*, with which it accords in the characters of the teeth (a distinct antero-internal basal cusp in  $p_3$ ), the size of the ears (shorter than muzzle), and general colour of the fur of the body and mantle, but much smaller, and without buffy nuchal patch. Forearm about 140 mm. *Hab.* Talaut Islands.

Back and rump nearly seal-brown, sprinkled all over with broccoli-brown hairs, producing the general effect of a very dark shade of hair-brown. Breast, belly, and flanks essentially like back, but pale hairs more buffy hair-brown. Mantle, sides of neck, and foreneck dark russet, slightly paler on foreneck than on nape, forming a complete collar round neck and narrowly encircling base of ears; base of hairs nearly seal-brown. Occiput, crown, interocular space, and sides of muzzle essentially similar to back; temporal region, chin, and throat blackish seal-brown, mixed with a few silvery-whitish and buffy hairs.

*Type.* ♀ ad. (skin, skull), Lirong, Talaut Islands, March

1897; collected by John Waterstradt; presented by the Hon. W. Rothschild; B.M. 8. 7. 26. 6.

*Acerodon jubatus*, Eschsch.

*Specimens examined*.—Nineteen from the collections of the Berlin, U.S. National, and British Museums, viz. :—Luzon, ten, including the two cotypes of *Pt. pyrrocephalus* (Berlin Museum, nos. 340, 341, ♂ ad., ♀ ad., mounted, skulls separate, that of 340 (marked 7202) being the original of Meyen's skull figures, *l. s. c.*); "Philippines" (probably Luzon), two; Leyte, three, topotypes of *Pt. auri-nuchalis*; Negros, two; Dinagat, one; Mindanao, one.

*Remarks*.—An examination of the above material has satisfied me that the Philippine Islands are inhabited by two races of *A. jubatus*, the one distributed over all the islands from Luzon southward to Dinagat (specimens examined from Luzon, Leyte, Negros, Dinagat), the other confined to Mindanao. The Mindanao race differs from typical *jubatus* only by its larger average size. There is no tangible difference in the colour of the fur of the two races. Such variations in colour as do occur (more blackish or more dark brownish tinge of back, greater or lesser amount of pale sprinkling of underparts, blackish or chocolate tinge of foreneck, more cream-buffy or yellowish-buffy or ochraceous-buffy colour of nuchal patch) are perfectly individual, independent of sex, age, and locality; practically all colour-variations are represented in the series of ten specimens from Luzon.

The subjoined tables (pp. 27–29) give a summary of the measurements of the series of specimens.

According to the above, the two races of *A. jubatus* would have to stand as follows:—

*Acerodon jubatus jubatus*, Eschsch.

1831. *Pteropus jubatus*, Eschscholtz, Zool. Atl. pt. iv. p. 1, pl. xvi. (animal, incisors, and canines) (Manila).

1833. *Pteropus pyrrocephalus*, Meyen, N. Act. Acad. Cæs. Leop.-Car. xvi. pt. 2, p. 604, pl. xlv. (animal), pl. xlvi. figs. 1, 2, 3 (skull, teeth) (Manila).

1896. *Pteropus auri-nuchalis*, Elliot, Field Col. Mus. Publ., Zool. i. p. 77, pl. xii. (skull) (Leyte).

Forearm about 182–198 mm., lower leg 86–94. *Hab.* Philippines, north of Mindanao.

*Acerodon jubatus mindanensis*, subsp. n.

Averaging larger: forearm about 205 mm., lower leg 96. *Hab.* Mindanao.

*Type*. ♂ ad. (skin, skull), Mindanao; collected by Dr. J. B. Steere; B.M. 76. 10. 4. 1.



*External measurements of Acerodon jubatus.*

	<i>A. j. jubatus.</i>						<i>A. j. mindanensis.</i>	
	Luzon. 7 ad.		Leyte. 3 ad.		Negros. 2 ad.			Dinagat.
	Min.	Max.	Min.	Max.	♂ ad.	♀ ad.		
Forearm.....		mm.		mm.	mm.	mm.		♂ ad.
1st digit, total length, c. u. ....	182	191	190	198	182.5	187	184	mm.
" metacarpal .....	77	82	80	86.5	80	80	82	205
" 1st phalanx .....	16.5	18.5	17.5	19	16.5	18	17	.....
" 2nd digit, metacarpal .....	39	42.5	40	45	40	41	42	.....
" 1st phalanx .....	89.5	92.5	94	99	85	89.5	86	93.5
" 2nd phalanx .....	18	23.5	23	24	22	25	22	20
" 3rd phalanx, c. u. ....	19	22	20	24	21.5	24	22.5	25
" 3rd digit, metacarpal .....	120	127	128	132.5	123.5	126	122	132
" 1st phalanx .....	92	99.5	98	99	92.5	96.5	92	100.5
" 2nd phalanx .....	130	139.5	130	143.5	141	137.5	128	.....
" 4th digit, metacarpal .....	117.5	124	126	130	120.5	125	117.5	128
" 1st phalanx .....	74.5	82	80	82	76.5	77.5	79	81.5
" 2nd phalanx .....	72	82	72	79	80.5	74	70	81
" 5th digit, metacarpal .....	124	128.5	130.5	136	123.5	129.5	122	136
" 1st phalanx .....	54	59.5	57	58.5	55	59.5	54	56
" 2nd phalanx .....	51.5	59	50	55	57	56	53	60.5
Ears, length from notch .....	30.5*	32.5*	30.5†	.....	33	30.5	32.5	.....
" greatest breadth, flattened .....	20.5*	21.5*	20†	.....	20.5	20	19	.....
Lower leg .....	86	90	89	94	86	.....	86.5	96
Foot, c. u. ....	56	59	.....	.....	.....	.....	60	62
Calcaneus .....	21.5	26	.....	.....	.....	.....	23	.....
Interfemoral, depth in centre.....	8*	8.5*	.....	.....	.....	.....	8	.....

\* Measurements from two specimens.

† Measurements from one specimen.

Measurements of skulls and tooth-rows of *Accrodon jubatus*.

	<i>A. j. jubatus</i> .						<i>A. j. mindanensis</i> .	
	Luzon. 7 ad.		Leyte. 3 ad.		Negros. 2 ad.			Dinagat.
	Min. mm.	Max. mm.	Min. mm.	Max. mm.	♂ ad. mm.	♀ ad. mm.		
Total length, to gnathion .....	77.2	84	83*	84*	77.2	80.5	♂ ad. 85	
Palation to incisive foramina .....	39.2	43	42.5	43	40	41	.....	
Front of orbit to tip of nasals .....	25.8	27.5	26.8	29	25	25.5	29	
Breadth of brain-case at zygomatic ..	27	29.5	28.5	29.5	26.7	27.2	29.5	
Zygomatic breadth .....	41.3	46	44.5	47	41.7	42	46.8	
Breadth across $m^1$ , externally .....	23.5	26	25	27	24.2	25	26.5	
Lachrymal breadth .....	16.7	18.2	18	19	16.8	18.2	.....	
Breadth across canines, externally ..	15	17	15.3*	17.2*	15.8	.....	18	
Postorbital breadth .....	8	9.2	8.7	10.2	8.5	9.5	11	
Interorbital breadth .....	10.5	13.2	12.5	13	12	12.5	14	
Breadth of mesopterygoid fossa .....	9.8	11	10	11	9	10.8	.....	
Between $p^1-p^4$ .....	11.7	13.3	13*	13.2*	12.2	12.8	13.7	
Between cingula of canines .....	7.8	9	7.7*	8.7*	8	.....	9.2	
Orbital diameter .....	14.8	16	16	16	14.8	16	16	
Mandible, length .....	62	67.5	66.5	68	62	65.2	69.5	
Upper teeth, $c-m^2$ .....	32	36	35*	35*	33	32.2	34	
Lower teeth, $c-m_3$ .....	34.2	40	36.8	37.8	36.5	35.7	37.8	
Upper incisors, combined breadth .....	7	8.5	7.2*	7.8*	7.5	7.5	8.8	

\* Measurements of two skulls only.

Measurements of individual teeth of *Acerodon jubatus*.

	<i>A. j. jubatus</i> .				<i>A. j. mindanensis</i> .
	Luzon. 7 skulls.	Leyte. 3 skulls.	Negros. 2 skulls.	Dinagat.	
$p^3$ , length*	Min. 5.7	Min. 6.2†	♂ ad. 5.8	♀ ad. 6	♂ ad. 6.5
" breadth	Max. 6.6	Max. 5.2†	mm. 4.7	mm. 4.8	mm. 4.8
$p^1$ , length	5	6.2	6.2	6.2	6.8
" breadth	6.3	7.2	5.3	6	6.8
$m^1$ , length	5.1	5.9	6.9	7.2	5.8
" breadth	6.8	7.7	5.1	5.6	7
$m^2$ , length	5	5.5	3.8	3.8	5.2
" breadth	3.8	4	3.1	3	4.3
$p_1$ , length	3	2.8	3	3	3.7
" breadth	3.7	3.2	2.6	2.8	3
$p_2$ , length	2.8	2.8	2.8	2.8	2.8
" breadth	2.5	3.1	6	6.2	6.2
$p_3$ , length	5.8	6.3	3.8	3.8	3.8
" breadth	3.7	3.9	6.5	6.2	6.5
$p_4$ , length	6.3	7	4.5	4.8	4.8
" breadth	4.5	5	6.8	6.8	6.2
$m_1$ , length	6.5	6.8	5	5	5.4
" breadth	4.9	5.7	5	5	5.2
$m_2$ , length	4.8	5.5	4.1	4.3	5
" breadth	4.2	5	2.7	2.7	3
$m_3$ , length	2.8	3.2	2.5	2.5	3
" breadth	2.2	2.8	2.7	2.7	2.8

\* Antero-posterior extent of crown.

† Measurements from two skulls only.

V.—*On a new Crab taken from a Deep-sea Telegraph-Cable in the Indian Ocean.* By W. T. CALMAN, D.Sc., British Museum (Natural History).

THE crab described below was presented to the British Museum, along with a number of other rare and interesting deep-sea Crustacea, by Mr. O. G. F. Luhn, M.A., M.B., who obtained them while acting as medical officer on board the cable-ship 'Colonia,' of the Telegraph Maintenance and Construction Company. The specimens were found in repairing the cable between Aden and Zanzibar. Most unfortunately the exact locality has not been recorded, but the depth is given as "about 600 fathoms."

It is most desirable that advantage should be taken of the opportunities afforded by cable repair work of adding to our knowledge of the deep-sea fauna. At present these opportunities are mostly wasted; but a special leaflet, with instructions for the preservation of specimens found on the cables, has recently been issued by the Zoological Department of this Museum, and will be sent on application to anyone interested in the subject. It is hoped in this way to induce some of the officers of these ships to preserve, instead of throwing overboard, the valuable material which comes to their hands.

#### Family Xanthidæ.

#### CALOCARCINUS\*, gen. nov.

Carapace transversely octagonal, fronto-orbital margin between a half and two-thirds of its greatest width; surface smooth. Antero-lateral margin with two teeth behind outer angle of orbit. Orbits nearly concealing eyes, without fissures, completely closed, the inner suborbital angle meeting the front and excluding the antennæ. Antennules folding transversely. Basal segment of antenna not reaching front. Endostomial ridges extending to anterior margin of buccal frame, which is notched on either side. Chelipeds long, massive, and unequal, the greater part of the merus extending beyond the carapace; fingers pointed. Propodus of legs having a "pulley-like" articulation with dactylus on posterior

\* From *κάλως*, a rope or cable, in allusion to the circumstances under which the specimens were captured; if the ambiguity may be pardoned, the alternative derivation from *καλὸς*, beautiful, is not inapplicable to the species.

side. Abdomen of male with seven segments distinct, the third to fifth more firmly connected than the others.

Type species, *Calocarcinus africanus*, sp. n.

This genus approaches closely to *Sphenomerides*, Rathbun (*Sphenomerus*, Wood-Mason), though differing from it in several important characters. In having the orbital gap completely closed it agrees with the more typical Trapeziinæ, but in the general shape of the carapace, and especially in the relative narrowness of the frontal region, it differs from these and from all the related subfamilies, and assumes more the typical Xanthine aspect. On comparing the species described below with *Sphenomerides trapezioides*, W.-M.\*, and with a *Trapezia*, it is impossible to doubt that all three are closely related, although *Sphenomerides* is excluded by its open orbital gap and *Calocarcinus* by its narrow front from current definitions of the Trapeziinæ. It is very easy to point out that the characters hitherto relied on for the subdivision of the Xanthidæ are all of very slight importance, but it is very difficult to suggest any better. Borradaile † has shown that such characters as the "pulley-like" articulation of the dactylus of the walking-legs and the closure of the orbital gap, which might be supposed to be of systematic importance, recur in groups apparently unrelated, and *Calocarcinus* only adds to evidence already existing that the general proportions of the carapace are not always trustworthy as a guide to affinity.

#### *Calocarcinus africanus*, sp. n.

Carapace about three-fourths as long as broad, convex in both directions, smooth and polished, with only slight traces of inter-regional grooves; octagonal in outline, the antero-lateral margins between the two pairs of antero-lateral teeth being straight and parallel. Front about three-eighths of greatest width of carapace, with a very shallow median notch and with the supraorbital angles slightly produced, but not acute. There is no tooth at the outer angle of the orbit. Antero-lateral margin straight to the first tooth, the distance being a little more than that between the first and second teeth, which are both blunt. Postero-lateral margin distinctly longer than antero-lateral.

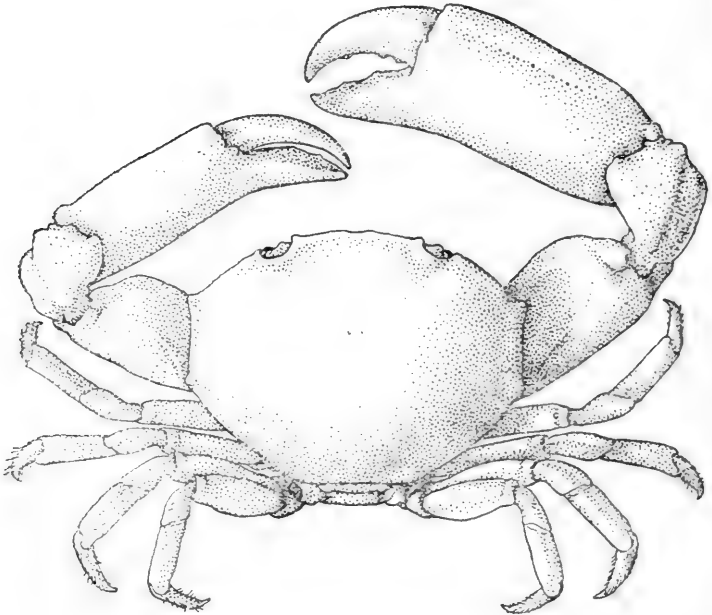
Eyes smaller than in *Sphenomerides*, nearly concealed when retracted. Antennal flagellum as long as major

\* I am indebted to Dr. N. Annandale, Superintendent of the Indian Museum, Calcutta, for a specimen of this crab.

† Gardiner's 'Fauna . . . Maldives,' i. p. 239 (1902).

diameter of orbit. Buccal frame slightly narrowed anteriorly. Merus of third maxillipeds about as broad as long, its anterior margin straight.

Larger cheliped about two and a half times the length of the carapace; merus shaped as in *Trapezia*, but its front edge not expanded or serrated; carpus with two longitudinal ridges on its outer and upper surface, somewhat rugose externally, its inner angle forming a blunt tooth. Hand compressed, smooth and polished except above, where it is faintly rugulose; the upper margin forms a ridge defined



*Calocarcinus africanus*, male, twice natural size.

externally and internally by a groove; lower edge rounded. In the larger cheliped the depth of the palm increases slightly distally, where it is about one-half of its length and equal to the length of the fingers; in the smaller cheliped the depth does not increase, is less than half the length, and shorter than the fingers. Both fingers furrowed, slightly curved, sharp-pointed. Walking-legs moderately slender, smooth, without hairs except on the dactyli, first pair equal to or a little longer than the breadth of carapace.

*Measurements in millimetres.*

	♂.	♀.	♀.
Length of carapace . . . . .	16·5	15·3	14·75
Breadth of carapace . . . . .	22·3	20·5	20·0
„ front . . . . .	8·3	7·75	7·5
„ fronto-orbital margin . . . . .	13·0	12·0	12·0
Length of larger cheliped . . . . .	45·0	35·0	34·0
„ smaller cheliped . . . . .	40·0	29·0	29·0
„ first walking-leg . . . . .	25·0	20·5	20·5

*Occurrence.* “On submarine telegraph-cable between Aden and Zanzibar, depth about 600 fathoms.” One male and two ovigerous females. The eggs are minute, about ·45 mm. in diameter.

VI.—*On Mammals from the Upper Zambezi River.*

By E. C. CHUBB.

THE Rhodesia Museum is indebted to Mr. T. N. Micklem for a collection of small mammals made by him on the Upper Zambezi River between Sesheke and the junction of the Kabompo River with the Zambezi.

It is of interest as being the first collection of properly prepared specimens from this region, and also in that it contains a very distinct new species of rodent-mole, which Mr. Micklem is to be congratulated upon obtaining.

The country, except for a mile or so on either side of the Zambezi, consists of thick forests alternating with large open vleis, through the middle of which run streams flowing down into the Zambezi.

1. *Crocidura neavi*, Wrough.

♀. 23rd Aug., 1908. Sonso River.

“Trapped with meat at night.

“Barotse name ‘Nyundi.’”—*T. N. M.*2. *Crocidura* sp.

♀. 17th Aug., 1908. Sonso River.

“Barotse name ‘Nyundi.’”—*T. N. M.*3. *Crocidura* sp.

♀. 17th Aug., 1908. Sonso River.

“Barotse name ‘Nyundi.’”—*T. N. M.*

4. *Felis servalina*, Ogilby.

A native skin from Mongu.

This appears to be somewhat like *F. s. pantasticta*, Pocock, but the stripes on the neck and the spots on the back are much more indistinct. It would be interesting to get a series of skins from this locality, to see whether they are all the same. I do not feel disposed, however, to distinguish it as a new form on a single skin, knowing how liable its near relative, *F. serval*, is to vary in the same locality.

5. *Felis* sp.

♂. 5th Aug., 1908. Mongu.

"Caught in tree by native.

"Barotse name 'Sinono.'"—*T. N. M.*

This seems to be a member of the *F. ocreata* group, but it is considerably darker on the back and its ears are less red than examples from Bulawayo and Salisbury, although its tail is almost identical in length and coloration. What is most remarkable, however, is the large amount of white on it. Its nose, chin, underside of neck, chest, and the greater part of the fore and hind limbs are white. At first sight it might be taken for a hybrid between *F. ocreata* and the domestic cat; but Mr. Micklem tells me that the natives in the district have no domestic cats, and, moreover, they told him that all the wild cats of this class there were similarly coloured.

6. *Ictonyx capensis*, Kauf.

♀. 13th Sept., 1908. Kataba.

"Dug out of a hole.

"Barotse name 'Singaba.'"—*T. N. M.*

7. *Funisciurus annulatus*, Desm.

♂. 30th Aug., 1908. Mongu.

In many respects intermediate between the typical form and *F. a. rhodesiae*, Wrough.

"Caught in hole in tree as natives were cutting wood.

"Barotse name 'Sisikwe.'"—*T. N. M.*

8. *Funisciurus cepapi*, Smith.

♂. 10th Aug., 1908. Mulonda Pan.

Shot in forest of native teak during daytime.

"Very common.

"Barotse name 'Nanali.'"—*T. N. M.*



9. *Graphiurus angolensis*, de Wint.

- ♂. 22nd Aug., 1908. Kwemba River.  
 "Trapped at night, with meat for bait.  
 "Barotse name 'Indundu.'"—*T. N. M.*

10. *Tatera* sp.

- ♂. 12th Aug., 1908. Mambova.  
 ♀. 28th Aug., 1908. Kataba River.  
 A bright-coloured form not unlike *T. lobengulæ*.  
 "This rat lives in colonies and makes burrows, communicating with one another underground, in the hard ground on the edges of the forests bordering the large open vleis.  
 "Eaten by natives.  
 "Barotse name 'Peva.'"—*T. N. M.*

11. *Tatera neavei*, Wrough.

- ♂ ♀. 29th Aug., 1908. Mongu.  
 "Barotse name 'Mtakwa.'"—*T. N. M.*

12. *Saccostomus* sp.

- ♂. 21st Aug., 1908. Njoko River.  
 ♂. 9th Sept., 1908. Mongu.  
 ♂. 10th Sept., 1908. Mongu.  
 "Feeds on seeds of trees. Trapped at night.  
 "Barotse name 'Situtu.'"—*T. N. M.*

13. *Mus chrysophilus*, de Wint.

- ♂. 28th Sept., 1908. Nanziti River.  
 "Makes nests of grass at bottom of hollow trees."—*T. N. M.*

14. *Mus* sp.

- ♂ ♂. 28th Sept., 1908. Kataba River.  
 Lives in holes in the swampy ground in the middle of the large vleis, and feeds on the roots of grass and plants.  
 "Barotse name 'Litundu.'"—*T. N. M.*

15. *Georychus micklemi*, sp. n.

- ♀ imm. 18th Aug., 1908. Kataba River.  
 ♂. 25th Aug., 1908. Kataba River.  
 ♂. 28th Aug., 1908. Kataba River.

A black-coloured species, in this respect differing entirely from any other members of the genus.

General colour, including limbs and tail, dark bluish black except for a large triangular patch of white on the crown, which is continued as a white dorsal stripe down to the middle of the back; and in one example there are traces of irregular white markings on the nose, chin, and around the mouth. Individual hairs, both black and white, uniformly coloured for their entire length.

Skull very similar in appearance to other species of *Georychus*. Nasals almost parallel, ending in a broad rounded suture a little behind the lachrymal projection. Ascending processes of premaxillaries ending in points about 1.5 mm. behind the nasals posteriorly, and not closing in towards the middle line. Anteorbital foramina higher than broad, almost elliptical in shape.

Dimensions of the cotypes (measured in the dry skins):—

Head and body 170, 165 mm.; tail 18, 20; hind foot 24, 23.5.

Skulls: basal length 36, 32.5; basilar length 31.5, 28.5; greatest breadth 26.5, 24; nasals 14, 12.5 × 3.8, 3; interorbital breadth 8, 7.5; intertemporal breadth 16, 15.5; supra-auricular breadth 19, 18; height of anteorbital foramen 1.8, 1.8; palatilar length 22.2, 20; diastema 12.8, 11; upper molar series 6.5, 6.5.

*Hab.* Kataba River, Upper Zambezi, North-western Rhodesia.

*Cotypes.* Two males. Collected by T. N. Micklem on the 25th and 28th Aug., 1908.

Very common; I saw about a dozen, all of which were coloured similar to the three skins brought back, including the white markings. These three were dug out of the ground by natives. They burrow and throw up heaps of sand similar to the English mole.

“Barotse name ‘Ngeti.’”—*T. N. M.*

### 16. *Cephalophus melanorrhæus*, Gray.

A flat skin purchased from natives, which had been killed on the Kabompo River.

“Monkoya name ‘Kashenda.’”—*T. N. M.*

VII.—A Revision of the Fishes of the Genus *Elops*.  
By C. TATE REGAN, M.A.

*Synopsis of the Species.*

- I. Lower jaw included, the whole of the præmaxillary band of teeth exposed when the mouth is closed.
- A. 78 or 79 vertebræ; 102 to 118 scales in a longitudinal series.
- 12 to 15 gill-rakers on the lower part of the anterior arch ..... 1. *saurus*.
- 18 to 20 gill-rakers on the lower part of the anterior arch ..... 2. *affinis*.
- B. 68 or 69 vertebræ; 94 to 98 scales in a longitudinal series; 12 to 15 gill-rakers on the lower part of the anterior arch.
1. Pectoral  $\frac{3}{5}$  the length of head, extending a little more than  $\frac{1}{2}$  of the distance from its base to the pelvics ..... 3. *senegalensis*.
2. Pectoral  $\frac{1}{2}$  or a little more than  $\frac{1}{2}$  the length of head, extending a little less than  $\frac{1}{2}$  of the distance from its base to the pelvics.
- Interorbital width 5 to  $5\frac{1}{3}$  in the length of head; length of lower jaw nearly  $\frac{2}{3}$  the length of head ..... 4. *hawaiiensis*.
- Interorbital width  $4\frac{1}{2}$  in the length of head; length of lower jaw a little less than  $\frac{2}{3}$  the length of head .. 5. *australis*.
- II. Lower jaw projecting, covering the anterior part of the præmaxillary band of teeth when the mouth is closed.
- 63 or 64 vertebræ; 94 to 98 scales in a longitudinal series; 28 to 32 branchiostegals; 14 gill-rakers on the lower part of the anterior arch ..... 6. *machnata*.
- 74 vertebræ; 74 to 83 scales in a longitudinal series; 24 to 26 branchiostegals; 17 to 19 gill-rakers on the lower part of the anterior arch ..... 7. *lacerta*.

1. *Elops saurus*, Linn., 1766.

*Argentina carolina*, Linn., 1766, and *Elops inermis*, Mitch., 1815.

Depth of body nearly 6 in the length, length of head  $3\frac{2}{3}$  to  $4\frac{1}{3}$ . Snout as long as or longer than eye, the diameter of which is  $4\frac{1}{2}$  to 6 in the length of head; interorbital width  $4\frac{2}{3}$  to  $5\frac{1}{3}$  in the length of head. Maxillary extending beyond the eye; lower jaw included, the whole of the præmaxillary band of teeth exposed when the mouth is closed; length of gular plate from less than  $\frac{2}{5}$  to  $\frac{2}{3}$  that of the lower jaw, which is  $\frac{3}{5}$  or a little more than  $\frac{3}{5}$  of the length of head; 28 to 36 branchiostegals; 12 to 15 gill-rakers on the lower part of the anterior arch. 102 to 118 scales in a longitudinal series. Dorsal 23–26, with 18 to 20 branched rays; anal 15–16,

with 11 or 12 branched rays; pectoral  $\frac{1}{2}$  or a little more than  $\frac{1}{2}$  the length of head, extending  $\frac{1}{2}$  or less than  $\frac{1}{2}$  of the distance from its base to the pelvics; origin of pelvics a little nearer to base of caudal than to end of snout. Least depth of caudal peduncle  $\frac{1}{3}$  the length of head. 78 or 79 vertebræ\*.

Atlantic coast of America from the United States to Brazil.

Here described from eight specimens, 160 to 620 mm. in total length, from Wood's Hole, Cuba, St. Croix, and Rio Janeiro.

### 2. *Elops affinis*, sp. n.

Differs from the preceding species in having 18 to 20 gill-rakers on the lower part of the anterior arch, but is extremely similar to it in other respects. 79 vertebræ.

Pacific coast of Mexico, and probably from California to Ecuador.

Two specimens, 230 and 320 mm. in total length, from Mazatlan (*Jordan*) and Jalisco (*Buller*).

### 3. *Elops senegalensis*, sp. n.

Depth of body nearly 5 in the length, length of head  $3\frac{3}{4}$  to 4. Snout as long as or longer than eye, the diameter of which is  $4\frac{1}{3}$  to  $5\frac{1}{4}$  in the length of head; interorbital width 5 to  $5\frac{1}{3}$  in the length of head. Maxillary extending beyond the eye; lower jaw included, the whole of the præmaxillary band of teeth exposed when the mouth is closed; length of gular plate  $\frac{1}{2}$  to  $\frac{2}{3}$  that of the lower jaw, which is nearly  $\frac{2}{3}$  that of the head; 30 to 33 branchiostegals; 12 to 14 gill-rakers on the lower part of the anterior arch. 94 to 98 scales in a longitudinal series. Dorsal 23–26, with 17 to 20 branched rays; anal 16–17, with 12 or 13 branched rays; pectoral  $\frac{2}{3}$  the length of head, extending a little more than  $\frac{1}{2}$  of the distance from its base to the pelvics; origin of pelvics equidistant from end of snout and base of caudal. Least depth of caudal peduncle more than  $\frac{1}{3}$  the length of head. 69 vertebræ.

West Africa.

Three specimens, 170 to 320 mm. in total length, from St. Louis, Senegal (*Delhez*).

\* The last three vertebræ included in my count are directed upwards, but have distinct and separate centra, which, however, are overlapped by the bases of the enlarged neural spines which support the upper caudal fin-rays, so that by some these three vertebræ might be reckoned together as *hypural*.

4. *Elops hawaiiensis*, sp. n.

Depth of body  $5\frac{1}{2}$  in the length, length of head  $3\frac{2}{3}$  to 4. Snout nearly as long as or a little longer than eye, the diameter of which is 4 to 5 in the length of head; interorbital width 5 to  $5\frac{1}{3}$  in the length of head. Maxillary extending beyond the eye; lower jaw included, the whole of the præmaxillary band of teeth exposed when the mouth is closed; length of gular plate  $\frac{2}{3}$  or more than  $\frac{2}{3}$  that of the lower jaw, which is  $\frac{2}{3}$  or a little less than  $\frac{2}{3}$  that of the head; 27 to 31 branchiostegals; 13 or 14 gill-rakers on the lower part of the anterior arch. 96 to 98 scales in a longitudinal series. Dorsal 24, with 18 branched rays; anal 15-16, with 11 or 12 branched rays; pectoral a little more than  $\frac{1}{2}$  the length of head, extending a little less than  $\frac{1}{2}$  of the distance from its base to the pelvics; origin of pelvics a little nearer to base of caudal than to end of snout. Least depth of caudal peduncle about  $\frac{1}{3}$  the length of head. 68 vertebræ.

Hawaii.

Two specimens, 220 and 400 mm. in total length.

This species is very close to *E. senegalensis*, but has the eye a little larger, paired fins shorter, &c.

5. *Elops australis*, sp. n.

Depth of body 5 in the length, length of head  $4\frac{1}{4}$ . Snout a little longer than eye, the diameter of which is 5 in the length of head; interorbital width  $4\frac{1}{2}$  in the length of head. Maxillary extending beyond the eye; lower jaw included, the præmaxillary band of teeth exposed when the mouth is closed; length of gular plate a little less than  $\frac{2}{3}$  that of the lower jaw, which is a little less than  $\frac{2}{3}$  the length of head; 31 branchiostegals; 13 gill-rakers on the lower part of the anterior arch. 95 scales in a longitudinal series. Dorsal 24, with 18 branched rays; anal 15, with 11 branched rays; pectoral slightly more than  $\frac{1}{2}$  the length of head, extending a little less than  $\frac{1}{2}$  of the distance from its base to the pelvics; origin of pelvics equidistant from end of snout and base of caudal. Least depth of caudal peduncle nearly  $\frac{2}{5}$  the length of head. 69 vertebræ.

New South Wales.

A single specimen, 330 mm. in total length, from Port Jackson.

6. *Elops machnata*, Forsk., 1775.

*Elops capensis*, Smith, 1845, and *Elops purpurascens*, Richards., 1846.

Depth of body 5 to  $5\frac{2}{3}$  in the length, length of head  $4\frac{1}{2}$  to

$4\frac{2}{5}$ . Snout as long as or longer than eye, the diameter of which is  $4\frac{2}{3}$  to  $5\frac{1}{2}$  in the length of head; interorbital width  $4\frac{1}{2}$  to  $4\frac{2}{3}$  in the length of head. Maxillary extending beyond the eye; lower jaw projecting, covering the anterior part of the præmaxillary band of teeth when the mouth is closed; gular plate  $\frac{3}{5}$  or a little less than  $\frac{3}{5}$  the length of the lower jaw, which is more than  $\frac{3}{5}$  that of the head; 28 to 32 branchiostegals; 14 gill-rakers on the lower part of the anterior arch. 94 to 98 scales in a longitudinal series. Dorsal 21-23, with 16 or 17 branched rays; anal 15-16, with 11 or 12 branched rays; pectoral  $\frac{3}{5}$  the length of head, extending a little less than  $\frac{1}{2}$  of the distance from its base to the pelvics; origin of pelvics a little nearer to base of caudal than to end of snout. Least depth of caudal peduncle  $\frac{1}{3}$  to  $\frac{2}{5}$  the length of head. 63 or 64 vertebræ.

From the Cape of Good Hope to China and Japan.

Here described from a Madras specimen of 350 mm. and one from the Cape measuring 680 mm. in total length. The latter is a more slender fish than the former, but seems to be the same species. Counts of scales, fin-rays, &c. in two small specimens (110 mm.) from Madras, and of stuffed examples from South Africa and China, are included in the description. Two skins from Dr. Kirk's collection, labelled respectively Lake Nyasa and Shiré River, may belong to this species.

#### 7. *Elops lacerta*, Cuv. & Val., 1846.

*Elops congicus*, Bouleng., 1898.

This small species, reaching a length of 560 mm. in West-African rivers, agrees with the preceding in the structure of the mouth, but has fewer branchiostegals, more numerous gill-rakers, larger scales, vertebræ in greater number, &c.

### VIII.—*Descriptions of Two new Species of Rhynchota from Bengal.* By W. L. DISTANT.

#### HETEROPTERA.

#### Fam. Saldidæ.

#### Subfam. SALDINÆ.

#### *Valleriola cicindeloides*, sp. n.

Greyish ochraceous, thickly shortly palely pilose; head, anterior lobe of pronotum, and four short longitudinal fasciæ

(not reaching basal margin and sometimes fused in pairs) to posterior lobe greyish fuscous; eyes, ocelli, anterior collar to pronotum, and a small spot near each posterior pronotal angle piceous; scutellum greyish fuscous, with the apex pale; body beneath and legs greyish ochraceous; longitudinal streaks and apices to femora and transverse segmental shadings to abdomen beneath piceous; corium greyish fuscous, costal and inner claval margins, two spots on clavus (one near base, the other near apex), two spots near middle of corium, and a cluster of spots at its apex very pale ochraceous; membrane pale greyish ochraceous, the veins fuscous; antennæ pale fuscous, basal joint and apex of apical joint very pale ochraceous, second joint ochraceous, with its apex darker; head transversely concave between the eyes; pronotum strongly transversely impressed behind the dark anterior collar, the anterior lobe with the anterior and lateral margins and a central longitudinal line greyish ochraceous, its surface with some large and coarse punctures, posterior lobe subgranulose, giving the appearance of dense paler spots, the lateral margins longly pilose; scutellum foveately depressed on basal area, its apical area ridged; legs finely pilose, the femora more strongly so; ocelli two.

Length  $5\frac{1}{2}$  mm.

*Hab.* Bengal; Pusa (*Maxwell-Lefroy*).

## HOMOPTERA.

### Fam. Fulgoridæ.

#### Subfam. *ISSINÆ*.

#### *Hilda bengalensis*, sp. n.

Vertex, pronotum, and scutellum pale green, extreme apical margin of vertex almost continuously black; pronotum with the margins testaceous; basal area of face between the eyes black, with four prominent small white spots, in some specimens the spots near the eyes are obsolete and only the two central spots are visible, this black area margined posteriorly with greyish white; clypeus, body beneath, and legs ochraceous; tegmina pale testaceous, basal half of clavus castaneous, with an apical white margin and this dark area outwardly continued on corium, with a large whitish spot varying in size and shape, corium also crossed beyond middle by a whitish transverse fascia narrowly margined with black and broadly angulated on each side at costal margin, apical area a little paler in hue and inwardly defined and margined by a

waved pale greyish line, and preceded near suture by a dark spot containing one or more small pupillate white spots; wings hyaline; face strongly transversely impressed between the insertions of the antennæ, medially angulate, the lateral margins before the angulation moderately concave; vertex with a distinct longitudinal impression.

*Vars.*—Becoming darker in hue, the pale green coloration replaced by dark testaceous, and with a large piceous or dusky spot in the white subbasal spot to corium and in the postmedial transverse whitish fascia to same.

Long., incl. tegm., 5-5½ mm.

*Hab.* Bengal; Pusa, Muzaffarpur, Barisal.

Allied to *H. malayensis*, Dist., from which it differs by the longitudinally impressed vertex, the angulate face, concolorous legs, partial or complete absence of the ocellate spots on apical area of tegmina, &c. The life-history of this insect is being studied by Mr. Maxwell-Lefroy, and it will be figured in my conclusion of the Appendix to the Rhynchotal portion of the 'Fauna of British India.'

IX.—*Description of a new Freshwater Gobiid Fish from the Niger.* By G. A. BOULENGER, F.R.S.

*Eleotris pleurops.*

Body rather strongly compressed, its depth 3 times in total length; length of head 3½ times in total length. Head as broad as deep, flat above, upper surface and sides scaled; snout broad, truncate, as long as eye; eye perfectly lateral, 4 times in length of head and twice in interorbital width; lower jaw not projecting; maxillary not quite reaching to below anterior border of eye; no canine teeth; no præopercular spine. Dorsals VII, I 8, well separated from each other, longest rays ⅔ length of head. Anal I 10, opposite to second dorsal. Pectoral ⅔ length of head, ventral ⅔. Caudal rounded-subacuminate, as long as head. Caudal peduncle 1½ times as long as deep. Scales strongly ciliated, 32 in a longitudinal series, 10 between origin of dorsal and anal. Dark brown, lighter on the belly; fins brown, dorsals with round whitish spots.

Total length 75 mm.

A single specimen from the Lower Niger, presented to the British Museum by Mr. J. Paul Arnold, of Hamburg.



X.—*Eocidaris* and some Species referred to it.

By F. A. BATHER, Brit. Mus. (Nat. Hist.).

[Plate I.]

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#### PREVIOUS HISTORY OF "*Eocidaris*," AND SELECTION OF GENOTYPE.

In my note on "*Echinocrinus* versus *Archæocidaris*"\*

\* It is surprising that this note should thus far have produced but a single protest. With that protest—made by Professor J. W. Gregory (Feb., 1908)—I am in complete sympathy. Dr. Gregory says that I

(Nov. 1907) allusion was made to *Eocidaris*. This is a generic name that has been variously interpreted, and some decision concerning it and other names involved had to be come to for my memoir on "The Triassic Echinoderms of Bakony" (in the press). After pages 84-88 containing my conclusions had been passed for press, I learned from Professor R. T. Jackson's letters that he had come to a different conclusion concerning *Eocidaris*, and I now find his view supported by Professor H. Lyman Clark in his valuable synopsis of "The Cidaridæ" (Dec. 1907).

Professor Jackson and I agree that "*Eocidaris*" is a nuisance, and we should be only too glad to get it decently out of the way. The process of sepulture adopted by Professors Jackson and Clark is to take *Cidaris keyserlingi* Geinitz as genotype, and in consequence to regard *Eocidaris* as a synonym of *Cidaris*. This seems to me to be rather a mock funeral. Granting for the moment that *C. keyserlingi* might be the true *Eocidaris*, then, in the first place, one would want to be quite certain as to the meaning of "*Cidaris*," a question to which every recent authority gives a different answer (Bather, March & July, 1908); secondly, I should deny that *C. keyserlingi* was a *Cidaris*, even as that genus is interpreted by Professor Clark, and I should feel obliged to retain the name *Eocidaris* for a genus better known by at least one other name, namely *Miocidaris*.

But I did not feel bound to take *Cidaris keyserlingi* as genotype of *Eocidaris*; on the contrary, simple adherence to

---

advocate the use of *Echinocrinus*. Not so: I have merely pointed out that all accepted rules compel such use. Were there any tribunal before which this question might be laid as an open one, I should plead for the absolute rejection of *Echinocrinus*. If the Committee on Nomenclature appointed by the International Congress of Zoologists is to be constituted such a tribunal, I hope that Dr. Gregory, Dr. Jackson, and others will join me in submitting this case for its decision. I am ready to accept its decision. Is Dr. Gregory likewise ready?

Unless zoologists wish to go on wasting their time in futile squabbling over these dreary questions of nomenclature, they must adhere rigidly to the rules drawn up by the only existing body that can be considered at all representative; or, in cases of doubt and obvious grave inconvenience, they must accept as final the ruling of that same body. In these debatable matters there is no other method of applying "common sense"; the alternative is independent judgment, and from that we have suffered too long already.

P.S.—This footnote was written some months before several British zoologists raised the general question in 'Nature' (p. 394; 27 Aug., 1908) and at the Dublin Meeting of the British Association (see 'Nature,' p. 647; 22 Oct., 1908). With their protest I agree, so far as I understand it; but I do not understand what practical results are expected from the resolution that was passed.

the rules of nomenclature, without regard to ulterior consequences, seemed to have reduced *Eocidaris* to two species so obscure that no one was likely ever to learn more about them. Thus *Eocidaris* was, one hoped, quietly laid on the shelf.

It now seems advisable to defend in greater detail the conclusions set forth in my memoir with a brevity that might have been praiseworthy had everyone been prepared to accept them.

Desor (1856, 'Synopsis,' p. 155) based the genus *Eocidaris* on interambulacral plates and radioles. "Ces plaques étant hexagonales, elles doivent par conséquent rentrer dans la tribu des Tessellés. Un gros tubercule par plaque. Ce tubercule est à base lisse et perforé au sommet, mais il diffère de ceux du genre *Archæocidaris* par l'absence d'un second anneau. Ambulacres inconnus. Radioles grêles, garnis de petites épines sporadiques." It is clear from this that, not only was *Eocidaris* defined as one of the Tessellati, but that it belonged to the Family now called Archæocidaridæ or Lepidocidaridæ. In short, the generic concept was precisely that which has subsequently given rise to *Cidarotropus* (see Bather, Nov. 1907).

To *Eocidaris* Desor referred six species, in an order governed by their stratigraphical position, the newest coming first:—

[ <i>Cidaris</i> ] <i>kaiserlingii</i> [sic] Geinitz.	Lower Zechstein.
<i>Palæchinus verneuillanus</i> King.	Permian.
<i>Cidaris rossica</i> Buch.	Carboniferous.
<i>Echinocrinus munsterianus</i> Koninck, M'Coy.	Carboniferous.
<i>Cidaris lavispina</i> Sandberger.	Devonian.
<i>Cidaris scrobiculata</i> Sandberger.	Devonian.

Of these species *C. rossica* was included with doubt, since Desor was not certain that the plate was hexagonal. *E. munsterianus* was placed here only on the doubtful evidence of a radiole. It therefore follows that the genotype, whenever selected, must be one of the other four species.

We have now to see what action has been taken by subsequent authors.

H. B. Geinitz (1861, p. 108) accepted Desor's reference of *Cidaris keyserlingi* to *Eocidaris*, and said that the interambulacral plates were "sehr deutlich sechsseitig," but his figures (Taf. xx. figs. 7, 8, 9) show plates that are obviously five-sided. The same author (1866, p. 61), describing a new species, *Eocidaris hallianus*, did not discuss the genus in any way.

J. Hall (1867-70, p. 341) referred *Echinus drydenensis*

Vanuxem to *Eocidaris*, and based on that species a more detailed diagnosis of the genus. He did not discuss the European species of *Eocidaris*.

Quenstedt (1872-5, p. 162) compared *Palæchinus verneu-  
iliana* [sic] King with his own *Cidaris coævus* [sic], but did not regard them as *Eocidaris*. He mentioned Desor's reference of *Cidaris keyserlingi* Geinitz to *Eocidaris*, but pointed out that the later figures showed the species to have interambulacra of true Cidarid type. On p. 374 he alluded to Desor's reference of *Cidaris rossica* to *Eocidaris* because of its lack of a basal terrace, but preferred with Trautschold to leave it in *Archæocidaris* (= *Echinocrinus*). "According to this criterion," he said, apparently with a touch of sarcasm, "the little remains of *Cidaris levispina* and *C. scrobiculata* . . . should belong to *Eocidaris*." These at any rate are the only species that Quenstedt left in *Eocidaris* in so far as he accepted the genus at all.

S. Lovén (1875, p. 42) gave a diagnosis based on Desor, and included the following species in order: *E. keyserlingi*, *E. verneuiliana*, *E. scrobiculata*, *E. levispina*, *E. drydenensis*. He placed the doubtful *C. rossica* and *C. munsteriana* in *Archæocidaris*. Otherwise his remarks are not so helpful as those of Quenstedt.

A. Pomel (1883, p. 113) says that *Eocidaris* "Ne paraît différer d'*Archæocidaris* que par ses tubercules, dont la base manque de la crête concentrique au cercle scrobiculaire." He thinks it may include the radioles known as *Xenocidaris*, and mentions the following species in order: *E. keyserlingi*, *E. verneuiliana*, *E. scrobiculata*, *E. drydenensis*. It is clear that Pomel was acquainted neither with the fossils themselves nor with the remarks of Quenstedt.

The latter, at any rate, were known to W. Waagen (1885, p. 818), who, however, erroneously says "Quenstedt admits only the carboniferous species in the genus *Eocidaris*." Waagen probably meant that Quenstedt removed from *Eocidaris* the Permian and possible Triassic species. Waagen himself makes the curious and untenable suggestion that *C. grandæva* Goldf. has hexagonal interambulacral plates figured by Quenstedt, and had better be transferred to *Eocidaris*. In *Cidaris forbesiana* Kon., which he here refers to *Eocidaris*, Waagen describes "a deeply crenulated collar" round the mamelon, and in comparing this species with *Eocidaris rossica* he twice insists that the absence of crenelation in that species is only apparent, and due to weathering. Why Waagen, in opposition to Desor's clear statement, should have thought crenelation a character of *Eocidaris* is nowhere explained.

Down to this point it is perfectly plain that *Eocidaris* was universally regarded as a Palechinoid or Tessellate, with hexagonal interambulacrals of Lepidocidaroid type, differing from those of *Echinocrinus* (or *Archæocidaris*) in the absence of a basal terrace. It had further been pointed out by Quenstedt that *Cidaris keyserlingi* and *C. verneuilliana*, not to mention *C. coæva*, could not be placed in *Eocidaris* because they were Cidaridæ and not Palechinoids. The two species *C. rossica* and *C. munsteriana*, in addition to having been doubtful from the beginning, were now generally referred to *Echinocrinus*. There remained then available for the type of *Eocidaris* only the two Devonian species *C. levispina* and *C. scrobiculata*. The various American species, notably *E. drydenensis*, though often utilised for the interpretation of the genus, never had any claim to be regarded as genosyntypes.

This clear and, from the nomenclatorial standpoint, satisfactory state of affairs was all of a sudden complicated by the irruption of an enthusiastic student of recent sea-urchins. In giving a summary of various Cidaridæ with flexible test, L. Doederlein (1887, p. 39) correctly turned his attention to *Cidaris keyserlingi* Geinitz, and, being desirous of keeping this in a genus distinct from the recent *Cidaris*, he retained for it the name *Eocidaris* given to it by Desor and accepted by Geinitz at a time when its true structure was not realised. Dr. Doederlein himself gave a more detailed and more correct description of an interambulacrum of the species from the Zechstein of Pössneck, and, in consequence of the facts thus elicited by him, he drew up the following diagnosis of *Eocidaris*:—"Palæozoische Cidariden von geringer Grösse, mit schneidendem ambulacralen Rand des I[nter]A[mbulacral] F[eld]. Coronalplatten in geringer Anzahl; Hauptwarzen klein, gekerbt; Warzenhöfe elliptisch, etwas vertieft, zusammenfliessend; Scrobicullarring nicht auffallend. Arten: *Keyserlingi* aus dem Zechstein u. a." Note the plural, "und andere."

Into the details of Doederlein's account, more than confirmed in the contemporary description by Kolesch (June 1887), we need not enter for the present. Sufficient to note that both these accurate observers followed Quenstedt in maintaining the truly Cidarid nature of the species before them. The questions that now concern us are: first, did Doederlein intend to fix on *C. keyserlingi* as the genotype? Secondly, had he the right so to do? Both these questions I answer in the negative. As for the first, there is no reason to suppose any such thing, since Doederlein fixed on

no genotype for any of the other genera, whether new or old, discussed by him. He mentioned *E. keyserlingi* by name because it was the form next to his hand, and it was not his purpose to investigate all the other species of the genus; or, to look at the matter from the other side, he used the name *Eocidaris* for his new generic concept merely because he found the name already in use\*. But, even assuming that he did mean to fix on *C. keyserlingi* as the genotype of *Eocidaris* Desor, I maintain that he was prevented by the prior action of Quenstedt, who had seized on the essential point and removed *C. keyserlingi* from *Eocidaris*.

In coming to this conclusion, I am glad to find myself essentially in accord with Dr. A. Tornquist, who, since he too hailed from Strassburg University, was doubtless familiar with the views of his colleague. In 1896 (p. 38) he discussed the validity of *Eocidaris*, and once again pointed out that *C. keyserlingi* was a true Cidarid. But to interpret *Eocidaris* by *C. keyserlingi*, and to place it in the Cidaridæ, as Zittel had done (1895, p. 186), was, he maintained, far from Desor's intention. *Eocidaris* must remain in the Archæocidaridæ; that there really did exist forms corresponding to the diagnosis of Desor, had been proved by the American *Eocidaris drydenensis* and *Lepidocidaris squamosa*, while European representatives were *E. scrobiculata* and *E. verneuilliana*. As for *Cidaris rossica*, though some of its interambulacra, notably in the adambulacral columns, were devoid of a basal terrace, and therefore of *Eocidaris* type as Desor supposed, others had that structure and therefore justified the reference of the species to *Archæocidaris* (= *Echinocrinus*). Both here and in a later paper (1897, p. 48=770), Dr. Tornquist showed a strong inclination to interpret *Eocidaris* in the light of *E. drydenensis*. But this species, being unknown to Desor, could not be taken as genotype. Essentially, then, Tornquist confirmed Quenstedt, by transferring *C. rossica* and by eliminating *C. keyserlingi*: "für diese ist allenfalls eine neue Gattung aufzustellen, wenn man sie nicht mit *Cidaris* vereinigen will."

So far as *Eocidaris* was concerned, the same position was taken up by that very learned writer on fossil Echinoids, Mr. J. Lambert (1900, p. 38). Having pointed out that *E. keyserlingi*, *E. verneuilliana*, and *E. rossica* did not agree in essential points with Desor's diagnosis, he referred them

\* The International Code of Zoological Nomenclature (1907) says under Article 30, rule *g*: "The meaning of the expression 'select a type' is to be rigidly construed. Mention of a species as an illustration or example of a genus does not constitute a selection of a type."

respectively to *Eotiaris* n. g., *Permocidaris* n. g., and *Archaeocidaris* sens. restr. The last of these was discussed in my previous paper (Nov. 1907); to the other two we shall recur. Here it need only be noted that the result of Lambert's action, as of Quenstedt's, was to leave in *Eocidaris* only two of the original species—*E. levispina* and *E. scrobiculata*.

I conclude, then, in opposition to Professors Jackson and Clark, that we are bound by the actions of Quenstedt, Tornquist, and Lambert to regard *Eocidaris* as restricted, partly by elimination, partly by definite statement, to the two Devonian species of Sandberger\*. To prevent further confusion it is necessary to fix on one of these as genotype, and, in making a choice, regard should be had to the fact that in *E. levispina* the radiole has been described as well as the interambulacra. Therefore I decide on that species, and to avoid all other sources of confusion I indicate as its type (lecto-holotype) the original of Sandberger's pl. xxxv. fig. 2 a, which figure corresponds most closely with Sandberger's own description (1855, p. 382).

Whether this conclusion is fortunate or unfortunate we need not stop to decide, since that can have no bearing on its correctness. At any rate, as will appear in the sequel, it disposes of the name *Eocidaris* more effectually than the action of Professors Clark and Jackson; therefore they, at least, should be satisfied.

#### *EOCIDARIS LEVISPINA* AND *E. SCROBICULATA*.

It would be of more interest to discuss the validity and systematic position of *Eocidaris* as thus interpreted, and here it is indeed unfortunate that the materials for a decision are so scanty. A few remarks may, however, be ventured on Sandberger's specimens, which were very kindly lent to me in January, 1908, by the Natural History Museum of the town of Wiesbaden. My thanks are due to Geheimer-Sanitätsrath Dr. Arnold Pagenstecher and to Dr. E. Lampe for leaving the specimens in my hands so long.

The specimens, which come from the Middle Devonian Stringocephalus Limestone of Villmar, are all much broken, with surfaces weathered and decorticated, and with the natural margins of the plates destroyed.

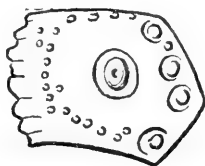
Taking the first genotype, *Eocidaris levispina*, we turn to the lecto-holotype, the original of Sandberger's fig. 2 a

\* G. & F. Sandberger, 1855. The expression "Sandberger" is used throughout, to avoid cumbrous repetition.



(our Pl. I. fig. 1). This is an interambulacral plate, with mamelon elongate, probably in a meridian direction, perforate, the perforation similarly elongate, rising from a slight platform, now almost entirely broken away and retaining no trace of a parapet if ever there was one. The boss passes with a gentle convexo-concave slope, and no trace of a basal terrace, into the slightly depressed area, which is bounded by no distinct rim. There appears to have been a complete circle, perhaps a trifle flattened above and below, of scrobicular tubercles. Those on one side, to the number of four, were larger than the others, were doubtless mamelonate, and though much worn still show faint traces of scrobiculation; they may be called secondary tubercles. Those on the other side were much smaller, more numerous, numbering 8 or 9, and rather irregular in position; they may be called tertiary tubercles. Their mamelons, still clearly preserved in some cases, were almost certainly imperforate, as stated by Sandberger, and in no way justify Desor's suggestion of perforation, which was doubtless based on some obscure marking in Sandberger's figure. The tertiary tubercles can be traced across one end of the scrobicule (the left in our figure), and

Fig. 1.



Restored diagram of holotype of *Eocidaris levispina*,  
enlarged  $2\frac{1}{4}$  diameters.

there is some indication that they formed a similar line at the other end, but that margin is more broken away. The extra-scrobicular tract adjoining the lateral tertiary tubercles slopes sharply downwards, and bears three elevations (there may have been a fourth, to the right in our figure). These elevations do not appear to be the remains of tubercles, but seem rather to represent a folding or denticulation of that margin of the plate. This suggests that the margin in question is adambulacral, a view consonant with the position of the larger (secondary) tubercles on the opposite side of the scrobicule. On this evidence we may, perhaps, venture to reconstruct the plate as shown in the annexed diagram (text-fig. 1).

The original of Sandberger's fig. 2*b* (our Pl. I. fig. 2) is  
4\*

a fragment, preserving only the mamelon, part of the boss, and faint traces of about half the scrobicular ring of tubercles, all apparently tertiary; there is no trace of any secondary tubercle. Since this agrees with the lecto-holotype in all those characters that are preserved, it may well belong to the same species; and, if so, it indicates that the platform round the mamelon was slightly hollowed, or, in other words, had a slight parapet; the mamelon itself is much depressed, and has a very short neck, which is not undercut.

The original of Sandberger's fig. 2 (our Pl. I. fig. 3) is too much broken and worn to afford any safe evidence. It may belong to the same species, and at any rate presents no features inconsistent with the preceding account. There is another imperfect plate, unfigured, of much the same character.

The original of Sandberger's fig. 2 *d* is the proximal end of a primary radiole (our Pl. I. fig. 4). The evidence on which this is referred to the same species as the three interambulacral plates is merely the occurrence of this and similar fragments in the same stratum as those plates, and the general correspondence in size between its acetabulum and the primary tubercles of the plates. The shaft is subcylindrical and smooth, but the radiate septa of its microstructure are just visible on the surface as fine longitudinal striæ. Its diameters are 3.9 mm. and 3.3 mm. There is no trace of an axial lumen. No collerette can be detected. The annulus swells out gently to diameters of 4.8 and 3.7 mm., and passes with a slight concave curve into the gently rounded base. The acetabular margin is a smooth raised rim, much worn in the specimen, with outside diameters of 2.9 mm. and 2.1 mm. Since the base has been cracked and is traversed by a vein of calcite, the longer diameters of annulus and acetabulum should be taken as about .5 mm. shorter than the measurements given.

The original of Sandberger's fig. 2 *c* is the proximal portion of a radiole, 14.6 mm. long. It is attached to a fragment of crystalline limestone, and its outer layers are stained, like most of the limestone, a light pinkish red. All the other specimens are of a dull grey colour. In this radiole the shaft appears to have been relatively thinner than in the original of fig. 2 *d*, being 2.7 mm. in both directions at the distal end, and to have tapered more towards the proximal end, where it has a diameter of 2.3 mm., and then expands again towards the annulus. The base is of the same general character as in fig. 2 *d*. The chief difference lies in traces of a longitudinal ridging, exceedingly obscure, but apparently

quite different from the smooth surface of fig. 2 *d*. The longitudinal striation due to the microstructure is seen on the ridges and in the spaces between them. The number of ridges to be detected on one side of the shaft is 13 or 14; but I am unable to see that they occur on the other side of the shaft. The difference in form of the shaft, the different matrix, and the suggestion, obscure though it be, of a different ornament, render it probable that this radiole does not belong to the same species as the other radiole; and, if either be conspecific with the lecto-holotype of *Cidaris levispina*, it is more likely to be the original of Sandberger's fig. 2 *d*. Two other fragments, unfigured, are of the same nature as the latter specimen, and show that the radiole was slightly fusiform, smooth, and finely striate throughout.

Miss Mary Klem (1904, p. 69) gives as the sole description of this species: "Primary spines cylindrical and ornamented with about twenty-three longitudinal ribs. These ribs are muricated oppositely." This information is not given by any of the authors quoted by Miss Klem, and she does not say that she has herself examined any specimens. Of the two radioles figured by Sandberger, that which probably belongs to the species is neither cylindrical nor ribbed; the other one may possibly have been ribbed, but there is no evidence that its ribs were muricate.

The holotype of *Cidaris scrobiculata* Sandberger (their fig. 3, our Pl. I. fig. 5) is an interambulacral plate of about the same area as the lectotype of *C. levispina*, but apparently less thick and with a less prominent boss. The mamelon, platform, boss, and scrobicule are of the same general character as in *C. levispina*; but the mamelon is not so much extended, the scrobicular ring is circular, its tubercles, which show faint traces of scrobiculation, are intermediate in size between the secondaries and tertiaries of *C. levispina*, and appear to have been more regular and more equally spaced. The extra-scrobicular surface was probably smooth.

The Sandbergers may have been right in regarding this specimen as of a different species; but if one were to maintain that it came merely from a different part of the test of *C. levispina*, I do not see how that could be disproved. There certainly seems no reason for Desor's suggestion that it may belong to a different genus.

The systematic position of these two species is doubtful. Since the outlines are not preserved in any of the plates, the only evidence that they belong to a genus with more than two columns of interambulacrals to an area is the *à priori* evidence afforded by their antiquity. This, however, must be accepted in the absence of proof to the contrary.

The feature seized on by Desor, the absence of a basal terrace, is not enough to distinguish these species from *Echinocrinus* (= *Archæocidaris*), especially when so few plates are known. Still the general nature of the ornament, at least in *C. lævispina*, and more particularly the character of the radioles, are enough to warrant the separation. The radiole of *C. lævispina* rather resembles those of *Lepidocidaris squamosa*, as I judge from excellent photographs kindly lent me by Professor Jackson, but that species has slight extra-scribicular ornament. Without knowledge of larger portions of the test, it would be quite unsafe to refer *Cidaris lævispina* to either *Echinocrinus* or *Lepidocidaris*; but there seems no reason why it should not remain in the *Lepidocidaridæ*, as genotype of a distinct genus, *Eocidaris* Desor.

#### CARBONIFEROUS SPECIES REFERRED TO *Eocidaris*.

The discussion of the American species at one time or another referred to *Eocidaris* may safely be left to Professor Jackson, who will, one hopes, at last provide a figure of the much-discussed *E. drydenensis*. The others are *E. blairi* Miller (1891, p. 73, pl. xii. ff. 1, 2) and *E. hallianus* Geinitz (1866).

Neither does it seem necessary to say more about *Eocidaris rossica* and *E. munsteriana*, which have been dealt with by Tornquist, Hesse, and others, and will receive further attention from Jackson. Both doubtless belong to *Echinocrinus*.

#### PERMIAN SPECIES REFERRED TO *Eocidaris*.

For detailed information regarding *C. keyserlingi* we are indebted mainly to K. Kolesch (1887), but also to Doederlein (1887), E. Spandel (1898, pp. 33-37, pl. xiii. ff. 1-6), and E. K. Hesse (1900, pp. 213, 214). Good specimens from Pössneck in the British Museum (E 1119, E 1121) have enabled me to check several of the statements made by these authors.

In supposing the shape to be that of an ordinary *Cidaris* or *Hemicidaris*, Spandel seems to be more correct than Kolesch, who perhaps forgot to leave enough room for the apical system.

In assigning to a single interambulacral column six full plates, Spandel is probably nearer the truth than Kolesch with his seven plates, and certainly nearer than Doederlein with his four or five.

Spandel, however, seems to think that there was at the

adoral end of each interambulacrum "ein Halbtäfelchen, wodurch die paarigen Interambulacralreihen, in welchen die Asseln alternieren, gegen das Peristom beglichen werden." It must not be inferred from this that there was any relic of the primitive median single interambulacral; the plate in question is merely the adoral plate of either the *a* or *b* column in process of resorption. This, if reckoned in, gives 7 plates to the column in which it lies.

Doederlein, Kolesch, and Spandel agree with Quenstedt in describing the interambulacral plates as five-sided. It is only the extreme adoral or adapical plates that may be four-sided in consequence of resorption or incomplete growth respectively. As regards the normal interambulacrals, Spandel is right in describing the adoral margin as convex, the adapical as concave; but this is not always obvious, nor is the curve very regular.

Doederlein noticed that the adambulacral margin was sharply bevelled underneath, "schneidend"; but it was left for Spandel to observe the denticles on the bevel (see his pl. xiii. f. 4 *b*). This is confirmed by Brit. Mus. E 1121 (Pl. I. fig. 6), which further shows that the regular denticulation seen in Spandel's figure is characteristic of the ambital interambulacrals. Nearer the peristome the bevel forms a less acute angle and the denticulation is less regular. This agrees with what may be observed in allied species; but for a full discussion of these interesting structures I must refer to my memoir on the Bakony fossils. The same specimen shows that there are about four denticles to each ambital interambulacral (as figured by Spandel), whence it may be inferred that there were also about four ambulacrals to the interambulacral. Kolesch, arguing from the external view of the margin, likewise inferred that 3-4 ambulacrals went to a small interambulacral, 5-6 to the largest ones. The denticles are not quite at right angles to the adradial margin, as might be inferred from Spandel's figure, but slope slightly adradially and adorally, and from this it follows that the ambulacrals lay at a corresponding angle.

In the 'Triassic Echinoderms of Bakony' the structure of the sutures between the interambulacral plates in this and allied species is discussed at some length, and my inability to follow Spandel's account is there explained. Here it will be enough to give the conclusions based on an independent examination of the British Museum specimens as interpreted in the light of the *Lepidocidaridæ*.

MARGIN	<i>adradial.</i>	<i>adapical.</i>	<i>adoral.</i>	<i>apicad-interradial.</i>	<i>orad-interradial.</i>
BEVEL FACING	inwards.	inwards.	outwards.	inwards.	outwards.
NATURE OF SUTURE:	transverse denticles.	ridge on inner margin, sometimes.	ridge on outer margin, usually.	smooth.	smooth.

According to Spandel, the ridge serves as a stop ("Widerlager") for the adjoining plate; but his view is inconsistent with the existence of a ridge on both upper and lower margins. There is more probability in the opinion expressed by Tornquist (1896), in reference to a similar structure in *Echinocrinus*, that the ridge merely marks a groove for the attachment of the uniting ligament. On this view, the presence of a ridge would indicate greater rather than less flexibility. The interambulacra of *Cidaris keyserlingi* must, however, have been united somewhat firmly, since large portions of ambulacra are more common than isolated ambulacra, and, except on the adradial margins, they are bounded by fractures rather than by sutural surfaces.

The same fragment (E 1121) that shows the denticulation so plainly also bears witness to considerable thickening of the interambulacrum towards the peristome and to the existence of an internal prominence on each side of the interambulacrum, for the attachment of the jaw-muscles. It is curious that no remains of the jaw-apparatus, which this species certainly possessed, have yet been recorded.

In reference to the structure of the main tubercle, Kolesch criticises Geinitz and is in turn criticised by Spandel. Briefly put, the mamelon is perforate, depressed hemispherical, with slightly undercut neck, supported on a flush platform of nearly twice the diameter of the neck, having well-marked crenellæ, of which the number rises to thirteen in the larger ambital plates; from this the boss slopes with slightly concave curve to the depressed definite scrobicule, and, while generally smooth, is occasionally marked by slight folds apparently continuous with the crenellæ. The scrobicule is not so much a transverse ellipse as a circle, which is truncate above and below where contiguous or, as in younger individuals and plates, confluent with the adjacent scrobicules. There is no definite ring of scrobicular tubercles, but the extra-scrobicular surface is covered with close-set,

imperforate, rounded eminences, varying in size, and the larger of them apparently mamelonate (*i. e.* tubercles). From 5 to 7 of them border one side of a larger scrobicule, and the same number its other side. The larger scrobicules are usually separated by a single line of about 3 to 5 miliaries (or possibly tubercles).

As regards the radioles, I have nothing to add to the accounts of Kolesch, Spandel, and Hesse (Pl. I. fig. 7).

Most of the writers who have dealt with *Cidaris keyserlingi* have discussed its relations to *C. verneuiliana* (King). While King, Geinitz, and Spandel have regarded them as a single species, Desor and Kolesch have separated them, though admitting their close relationship; but it has been reserved for Lambert (1899, 1900) to place them in two distinct genera—*Eotiaris* and *Permocidaris*.

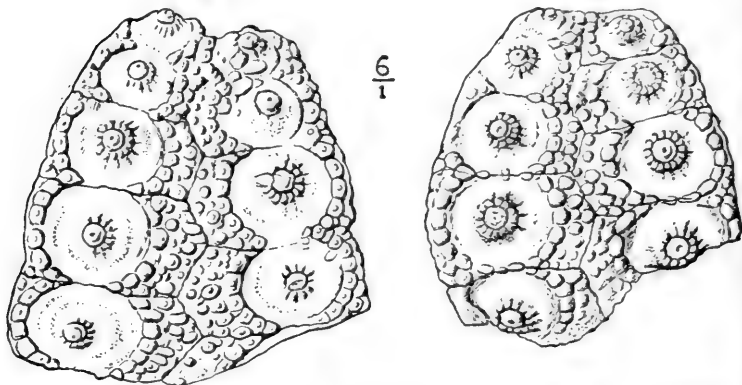
How far any of these writers have based remarks on a study of actual specimens of the two species, they have not told us. The following remarks are based on the specimens of *Cidaris keyserlingi* in the British Museum, which have just been described, and on a large series of specimens of *Cidaris verneuiliana* from Tunstall Hill now preserved in the Hancock Museum, Newcastle-on-Tyne, and kindly lent me by the Natural History Society of Northumberland, Durham, and Newcastle-upon-Tyne. Unfortunately the originals of King's figures (1850, pl. vi. ff. 22-24) are not among these specimens, and Mr. E. Leonard Gill, the curator of the Hancock Museum, has not been able to find them. There can, however, be no doubt as to the specific identity of the interambulacra with those originally described (1848) and subsequently figured by King.

The differences that Desor thought could be seen in *C. verneuiliana* were the more granular interradiar tract, the more complete scrobicular rings, and the radiating folds around the base of the mamelon. These differences are clearly shown in his figures; but in them certain small details of the original figures have been grossly exaggerated. It should be quite clear from the preceding description that the interradiar tract is quite as closely crowded with miliaries or with small tubercles (the granules of Desor), and the scrobicular ring is often quite as complete, in *Cidaris keyserlingi* as in any specimen of *C. verneuiliana*. This was admitted by Kolesch, who, however, still maintained that, "die radiären Vertiefungen, welche sich an der Warzenbasis von *Eocidaris verneuiliana* befinden, charakterisieren den letzteren als besondere Spezies" (p. 661). Now it is a little difficult to understand what Desor and Kolesch meant by these "plis

rayonnants" or "radiären Vertiefungen." King merely said "*Glennoid circles* radiately crenulated," words that refer solely to what is here called the crenulate platform of the boss, and in this respect there is no difference between the German and the British specimens. If the words of Kolesch are due to an independent study of interambulacra from the Magnesian Limestone, he may be referring to the fact that the depressions between the crenellæ are occasionally prolonged faintly down the slope of the boss. Such an occurrence, however, is not uncommon in other allied species, and has been observed by both Spandel and myself in *C. keyserlingi*. What differences Lambert thought he could see between these two species, does not appear in his writings: we shall return to *Permocidarid*, which he defines as an *Archæocidarid*, and it will then be clear that *C. verneuiliana* can have nothing to do with such a genus.

Fig. 2.

Fig. 3.



*Miocidarid keyserlingi*. Two of the most perfectly preserved fragments of interambulacra from the Magnesian Limestone of Tunstall Hill, co. Durham, showing the association and general shape of the plates. In fig. 2 the scrobicules are confluent; in fig. 3 they are confluent above, but merely contiguous in the ambital region.

The species described by King, though referred by him to *Archæocidarid* in his text (1850, p. 53) and to *Palæchinus* in the legend to his plate, is in fact a *Cidarid*. "The sub-hexagonal form of the plates which . . . principally led" him "to regard it as an *Archæocidarid*" must be assigned to the imperfection of his specimens. There are before me 11 fairly large fragments of interambulacra, each with two columns, but none with more. The outer lateral margins of



the individual plates may occasionally be convexly curved, and a slight accentuation of this appearance might give rise to the idea that the plates were subhexagonal or heptagonal. But that these are the adambulacral margins, and that the interambulacra therefore are pentagonal, is conclusively proved by one portion of an interambulacrum. This consists of two columns, with apparently six plates to each column, and its inner surface is fully exposed (Pl. I. fig. 9). This in all essential details resembles the similar inner view of an interambulacrum of *C. keyserlingi* from Pörsneck; it has the same denticulate margins and the same thickenings at the peristomial end for the jaw-muscles. It confirms not only the view that the two specimens belong to the same species, but also the reference of that species to *Miocidaris*.

The secondary tuberculation of the interambulacra from Tunstall Hill displays slight variation. In some the whole extra-scribicular surface is filled with closely set secondaries of equal size (Pl. I. fig. 12); in others the tubercles of the scribicular ring are slightly, but distinctly, larger than those in the interradiar space (Pl. I. fig. 11); in others again the tubercles are less closely set, and bare tracts are seen between them (Pl. I. figs. 10, 13). The development of the secondary tubercles is of course greatest in the ambital region and in individuals of largest size; but apart from this there are individual differences. The relative width of the interradiar tract also varies, and the wider tracts naturally have more tubercles; thus in an interambulacrum 8 mm. wide at the ambitus, the width of the interradiar tract, including the scribicular rings, is 2.1 mm., and there are 5 or 6 tubercles in that width (Pl. I. fig. 13); in another specimen the corresponding measurements are 9.4 mm. and 3.5 mm., and the number of tubercles is 7 or 8 (Pl. I. fig. 12).

The secondary tubercles, when well preserved, are seen to have small, apparently imperforate mamelons.

The material from Tunstall Hill includes 7 radioles; the one figured by King came from Humbleton Hill and was the property of Mr. Geo. Tate. Of these 7, the longest complete (or almost complete) one is just 8 mm. long, and the greatest diameter of its shaft is 1.1 mm., this being at about one-third from the distal end. The greatest thickness exhibited by any of these radioles is 1.6 mm., but this is largely due to the prominence of the thorns. The annulus is prominent, with a diameter nearly equal to that of the shaft—1 mm. in the first-mentioned example; from it a straight slope leads to the crenelate acetabular rim. No definite collerette can be distinguished, but the proximal

region (about one-third) of the shaft is smooth, with a fine longitudinal striation. The distal region is beset with small thorns having a distal rake; in some of the specimens these are not clearly seen, in one they are in distinct longitudinal rows (Pl. I. fig. 15), and in another, where they are particularly prominent, they form curved transverse rows (Pl. I. fig. 16). King thought that there were two sorts of radioles: muricate and striate. The specimens are so obscured by grains of matrix that interpretation is difficult, but I fancy the above account represents the facts. There was no doubt a good deal of variation in the radioles of even a single individual, but the general character of the radioles agrees with that of those found in the Zechstein. There is nothing to warrant the separation of the species.

There is therefore no ground for separating *C. verneuiliiana* and *C. keyserlingi* even specifically. Which trivial name should be adopted is a question not hitherto discussed. K. v. Schauroth (1854, p. 182) said "Der King'sche und der Geinitz'sche Name sind gleichzeitig entstanden, ein Prioritätsrecht besteht also nicht." This statement is surely unwarranted. King's 'Catalogue of the Organic Remains of the Permian [sic] Rocks of Northumberland and Durham' was "published by the author" at Newcastle-upon-Tyne, during the afternoon of Saturday, 19th August, 1848\*. The description of "*Cidaris Verneuiliiana* n. sp." occurs on pp. 6 and 7 of that Catalogue. *Cidaris keyserlingi* was first described on p. 16 of H. B. Geinitz: 'Die Versteinerungen des deutschen Zechsteingebirges' (being Heft 1 of Geinitz and Gutbier: 'Die Versteinerungen des Zechsteingebirges und Rothliegenden'). The titlepage of this Heft is dated "Dresden und Leipzig, . . . 1848," and a review of it appeared in 'Neues Jahrbuch für Mineralogie,' Jahrg. 1848, pp. 504, 505. These pages are in the fourth of the six parts composing this Jahrgang, and assuming that the parts were published at regular intervals, this would give August 1848 for the date of publication of the review. This part contains letters of which the latest is dated 18 June, 1848, and it acknowledges the receipt of publications of which the latest seems to date from April 1848. Most of the works reviewed are of 1847, but a few appeared in the early months of 1848. One would naturally infer from this that the work of Geinitz was published not later than April or May of 1848. This agrees with a definite statement by R. Howse (Jan. 1857, p. 49) that Geinitz's 'Die Versteinerungen u. s. w.' was "published in the early

\* *Fide* R. Howse, 'Note on the Right of Priority' [1857].

part of April 1848." The trivial name "*keyserlingi*" is therefore the one to be adopted.

We have now to enquire in what genus *Cidaris keyserlingi* should be placed. That it cannot be *Eocidaris* or *Archæocidaris* (= *Echinocrinus*) has been urged above. Professors Clark and Jackson, as intimated in my opening paragraphs, would refer it to *Cidaris*, while Mr. Lambert (April 1899, p. 82) has made it the genotype of *Ectiaris*. The former course seems to me to ignore important structural differences, while the latter course lays undue stress on a very trifling feature. In the 'Triassic Echinoderms of Bakony,' I have referred *Cidaris keyserlingi* to Doederlein's genus *Miocidaris*. This genus also is regarded by Professor H. L. Clark as indistinguishable from *Cidaris*, an opinion with which I cannot agree.

### *MIOCIDARIS*, ITS SPECIES AND STRUCTURE.

Since *Miocidaris* is fully discussed in the 'Triassic Echinoderms of Bakony,' from the nomenclatorial, anatomical, and faunistic standpoints, the conclusions there reached need but a brief summary here. On the other hand it has now become necessary to give reason for the distinction of *Miocidaris* from *Cidaris*.

*Miocidaris* was established by L. Doederlein in 1887 (p. 40), and from among the species referred to it by him I have selected as genotype *Cidaris klipsteini*, interpreting that to mean *C. klipsteini* Desor 1855, non Marcou 1847. Since a new name is needed for this species, I propose *Miocidaris cassiani*, attaching thereto as lectotype the interambulacral fragment figured by Klipstein (1843) in plate xviii. fig. 15, and now in the British Museum (regd. 36512).

With Lambert (1900) I remove *Cidaris subnobilis* to *Triadocidaris*, but include in *Miocidaris* the species *Cidaris subcoronata*, which Doederlein placed in an unnamed section 5.

It is probable that various species from the older Jurassic rocks, such as *Cidaris amalthei* and *C. arietis* included by Doederlein, belong to *Miocidaris*; but I have not personally examined the type-specimens.

The interambulacra from the Wellen-dolomite of the Schwarzwald which Quenstedt (1875, pl. lxxvii. fig. 115) referred to *Cidaris grandæva* are to be placed in *Miocidaris*. So also is the specimen from Kirchberg on the Jaxt, which is the holotype of *Cidaris cœva* Quenstedt (1875, p. 160, pl. lxxvii. fig. 110); this is No. 4254 of Tübingen Geological Museum, and I owe the opportunity of examining it to the kindness of Professor Koken and Dr. F. von Huene.

Quenstedt himself, as we have already noted, associated *Miocidaris coæva* and *M. keyserlingi*.

From the Cassian and Raiblian beds of Bakony come five or six representatives of this genus, and for two of them new specific names are proposed in my memoir.

Examination of all this material has led to the following revised and extended Diagnosis of *Miocidaris*:—

A Cidarid of moderate size, with the adradial margin of the interambulacrum sharply bevelled on the inner surface, and usually, if not always, denticulate, thus flexibly imbricating over the ambulacrum. Interambulacral plates relatively few, often wide, with scrobicules circular or elliptic, distinct or confluent, with main tubercles small or of medium size, having crenelate bosses. Podial pores not yoked (?).

The differences between this diagnosis and the original one of Doederlein are explained and justified in my memoir. What we have now to consider is the inclusion of *Eotiaris*. Neither in 1899 nor in 1900 did Lambert attempt any diagnosis for his new genus, and one must assume that he adopted for it Doederlein's diagnosis of *Eocidaris* (1887), since that was based solely on the genotype of *Eotiaris*, *E. keyserlingi*. The only difference discoverable between Doederlein's diagnosis of *Eocidaris* and his diagnosis of *Miocidaris* is that the former has "Warzenhöfe elliptisch, etwas vertieft, zusammenfliessend," while the latter has "Warzenhöfe rund, schwach vertieft." Klipstein, however, said of the scrobicule in the holotype of the genotype of *Miocidaris* (his fig. 15) that it was "sehr stark vertieft." Apart from this flat contradiction, the character cannot lead to a true generic division, for the species mentioned above present every degree of variation in this respect. The scrobicules of *Miocidaris keyserlingi* are certainly elliptical (or, more correctly, "meridionally compressed"), but it has been shown above that they are not always confluent. On the other hand, later species of *Miocidaris* may have compressed and confluent scrobicules. The change from circular to compressed scrobicules is one that takes place during the growth of an individual, and a similar change may take place in racial history, as does indeed seem to be the case in *Triadocidaris*. But if so, and in so far as it is of any value, a species with compressed scrobicules cannot be regarded as the ancestor of one with circular scrobicules; therefore if *Eotiaris* has any validity it cannot be the ancestor of *Miocidaris*, as Lambert maintains. Mr. Lambert may choose which horn of the dilemma he prefers; I prefer to drop a genus based on so slight and uncertain a character.

We return now to the statements of Professor Lyman Clark (1907, p. 175), who claims *Eocidaris* Doederlein as a synonym of *Cidaris*, and says that *Miocidaris* is "too near *Cidaris* and *Dorocidaris*." In two other notes (March and July 1908) I have discussed Professor Clark's application of these generic names, and have accepted Doederlein's relegation of *Dorocidaris* to the synonymy of *Cidaris* s. str. with genotype *C. papillata*. *Cidaris* as restricted by Clark with genotype *Cidarites metularia* Lam. is the genus or subgenus for which Doederlein (Nov. 1906, p. 100) has resuscitated the name *Cidarites*, but to which he previously (1887, p. 42) applied Pomel's preferable name *Eucidaris* (1883, p. 109). It is, however, unnecessary for our present purpose to consider all the minor details of tuberculation, of radioles, and of pedicellariæ, on which the modern genera, subgenera, or sections are largely based. There are far more important differences in the structure of the test. So far as I have been able to ascertain, the sutures between the interambulacral plates in these later genera are plane vertical joints, and do not present the bevels, grooves, and ridges of *Miocidaris*. At any rate, the sutures between the interambulacra and ambulacra are vertical and notched on the vertical surface for the reception of the ambulacrals; the firmness of this union is intensified by the thickness and solidity of the united plates. In *Miocidaris*, on the other hand, as first pointed out by Doederlein, the adradial margin of the interambulacrum is bevelled on its inner surface so as to slide over the ambulacrals, and the grooves, corresponding to the notches in *Cidaris*, are on the inner face; the ambulacra also thin off to the edges, and are throughout much less solid than in later genera. It is only towards the peristome that the plates thicken, to form a perignathic girdle, and that the a radial suture gradually bends to a more vertical position. The perignathic girdle of *Miocidaris* is even then not so stout as that of *Cidaris* and *Eucidaris*, and the auricular processes with which it is provided are nothing like so large or so well developed as in the later genera. Taking the broadest construction that anyone nowadays places on *Cidaris*, it does not seem to me that it can be so extended as to include these Permian and Triassic species. And if this be true of *Cidaris* in a wide sense, it is still more true of it in the restricted senses of Clark, of Doederlein, or of Mortensen.

#### PERMOCIDARIS.

There is still one genus needing discussion, namely *Permocidaris* Lambert (1900, pp. 39, 47), since the genotype

is *Cidaris forbesiana* Koninck, which Waagen (1885, p. 819, pl. xcv. figs. 5-16) referred to *Eocidaris*, and since Lambert also included in his genus two species that have been attributed to *Eocidaris*, namely *Cidaris verneuiliana* (not *C. keyserlingi*) and possibly *C. coæva* Quenst.

Lambert's remarks may be condensed into the following diagnosis:—An Archæocidarid with irregular, usually sub-octagonal interambulacral plates, each with a well-developed tubercle, perforate, crenelate, devoid of basal terrace, with smooth scrobicule surrounded by a circle of large granules. Radioles fusiform, spinulose.

Since I have not yet seen the material described by Waagen, I shall not waste space on discussing his figures and description. It should, however, be pointed out that De Koninck (1863, p. 4) based the species on radioles only, and that, since these have never been found in actual contact with the plates, the ascription of the latter to this species remains an assumption characterized by Waagen as "highly probable." It is, of course, on the evidence of the interambulacral plates that the genus is founded, and as regards these I will merely note that in most of Waagen's specimens the complete outlines were not preserved, so that the shapes attributed to them are further assumptions. Moreover, it seems impossible to reconstruct an interambulacrum out of plates with the outlines indicated. The orientation of the plates given by Waagen, when compared with the bevelling of their margins, is found to be quite out of agreement with the bevelling in other genera of the same general character. Waagen's account of the tuberculation is also perplexing and inconsistent with his figures.

Considering the uncertainty that has so long existed with regard to the shape of the interambulacrals in *C. verneuiliana* King, it seems quite possible that *C. forbesiana* is not really so anomalous as Waagen's account would lead one to suppose. If the structure of the interambulacra agrees with that of other Archæocidaridæ (Lepidocidaridæ mihi), then the sole feature in which it can be said with certainty to differ from *Eocidaris* (s. str.), *Archæocidaris* (= *Echinocrinus*), or *Cidarotropus* is the crenelation of the parapet. If, on the other hand, the interambulacra are of Cidaroid type, then reasons for separating the genus from *Miocidaris* have yet to be supported by adequate evidence.

In the former case it will be obvious to those who have read the preceding remarks on *C. verneuiliana* King and *C. coæva* Quenst. that those species cannot be placed in *Ermocidaris*. In the latter case *C. forbesiana* may prove

congeneric with those two species, and, if so, the name *Permocidaris* will be a synonym of *Miocidaris*.

#### SUMMARY AND CONCLUSIONS.

The genotype of *Eocidaris* was not fixed by Desor (1856) when he founded the genus. Subsequent authors have removed from the genus all species referred to it by Desor except *Cidaris lævispina* Sandb. and *C. scrobiculata* Sandb., which are the only two that agree with Desor's diagnosis. But no author has yet selected a genotype. Therefore I select *C. lævispina* Sandb. as genotype.

The original specimens of *Eocidaris lævispina* are described and figured, and the original of Sandberger's pl. xxxv. fig. 2 a (1855) is selected as type (lecto-holotype). The holotype of *Cidaris scrobiculata* is also redescribed and figured, and considered congeneric with *C. lævispina*. On this evidence *Eocidaris* is provisionally maintained as an independent genus of Archæocidaridæ (=Lepidocidaridæ). No other species are placed in *Eocidaris*.

*Cidaris keyserlingi* Geinitz, which has frequently been referred to *Eocidaris*, is discussed, and fresh details of its structure are given. Numerous topotypes of *Cidaris verneuiliiana* King are described and figured, and that species is proved a synonym of *C. keyserlingi*. The evidence thus adduced shows that these fossils belong to *Miocidaris* Doederlein (1887).

*Miocidaris* is rediagnosed and *M. cassiani* nom. nov. (= *Cidaris klipsteini* Desor, non Marcou) taken as genotype. The genus is distinguished from the recent *Cidaris*.

Other species examined and referred to *Miocidaris* are *Cidaris subcoronata* Münster, *C. grandeva* Goldf. on the evidence of Quenstedt's specimens (1875), and *C. coæva* Quenst. Others are alluded to.

It follows that there is no necessity for *Eotiaris* Lambert, founded to receive *Miocidaris keyserlingi*.

It also follows that *Cidaris verneuiliiana* King and *C. coæva* Quenst. cannot belong to *Permocidaris* Lambert, a genus that rests on the inadequately described *Cidaris forbesiana* De Kon.

#### EXPLANATION OF PLATE I.

##### *Eocidaris lævispina* (Sandberger).

Fig. 1. Lecto-holotype. Interambulacral, original of Sandberger, pl. xxxv. fig. 2 a.

Fig. 2. Interambulacral, original of Sandberger, pl. xxxv. fig. 2 b.

Fig. 3. Interambulacral, original of Sandberger, pl. xxxv. fig. 2.

Fig. 4. Radiole, proximal end, original of Sandberger, pl. xxxv. fig. 2 d.

*Eocidaris scrobiculata* (Sandberger).

*Fig. 5.* Holotype. Interambulacral, original of Sandberger, pl. **xxxv.** fig. 3.

*Miocidaris keyserlingi* (Geinitz).

(a) Specimens from the Zechstein of Pössneck.

*Fig. 6.* Greater part of an interambulacrum, interior view, showing imbricate sutures, denticulation of adambulacral margin, and peristomial structures. Brit. Mus. E. 1121.

*Fig. 7.* Radiole, incomplete distally, longitudinally striate. Brit. Mus. E. 14,104.

*Fig. 8.* Interambulacral, to show nature of tuberculation. Brit. Mus. E. 1121, on another part of the rock-fragment that bears the original of fig. 6.\*

(b) Specimens from the Magnesian Limestone of Tunstall Hill :  
topotypes of *Cidaris verneuiliana* King.

*Fig. 9.* Greater part of an interambulacrum, interior view, showing denticulation of adambulacral margin and peristomial structures.

*Fig. 10.* Interambulacrals, from the adapical region of a small individual, showing slight interradiial tuberculation.

*Fig. 11.* Interambulacral from ambital region of a larger individual, showing well-marked scrobicular tubercles.

*Fig. 12.* Interambulacral from ambital region, with scrobicular tubercles not distinguished from the dense interradiial tuberculation.

*Fig. 13.* A similar interambulacral, with rather less interradiial tuberculation.

*Fig. 14.* Radiole, subcylindrical, longitudinally striate, non-muricate.

*Fig. 15.* Radiole, fusiform, muricate in longitudinal series.

*Fig. 16.* Radiole, fusiform, muricate in transverse series.

*Fig. 17.* Radiole, subfusiform, very slightly muricate.

Figures 1-5, representing *Eocidaris*, are enlarged 3 diameters. All are based on photographs, but owing to the dark colour and obscurity of the specimens the details have been emphasized.

Figures 6-17, representing *Miocidaris*, are enlarged 6 diameters.

Photographs by Mr. H. Herring. Drawings by Mr. G. T. Gwilliam and Mr. A. H. Scarle, under the direction of the author.

## XI.—On the Anatomy and Classification of the Scombroidei Fishes. By C. TATE REGAN, M.A.

Most schemes of classification of the Teleostean fishes include a group Scombroidei or Scombriformes, comprising the Scombridae and Carangidae and a varying number of other families supposed to be related to them. In Boulenger's classification the Scombriformes form a division of the Acanthopterygii, but it is admitted that no good definition



of them can be given, and, as a matter of fact, none of the characters used to separate them from the Perciformes is really distinctive.

The discovery that the Trichiurid genera *Lepidopus* and *Eupleurogrammus* do not conform to Boulenger's definition of the Acanthopterygii, as the pelvic bones are remote from the cleithra (clavicles) and only connected to them by a long ligament, has led me to look into the anatomy of the Scombriform fishes.

As a result I find that the Carangidæ, Rhachicentridæ, Coryphænidæ, Bramidæ, and Menidæ show no special affinity to the Scombridæ and may be placed with the Percoids, but the remainder of Boulenger's Scombriformes is a natural group, which still includes so great a diversity of forms as to be with difficulty definable.

It is worth notice that none of the five families mentioned above as rejected from the Scombriformes is known before the Upper Eocene, but that the true Scombroïds were abundant in the Lower Eocene (London Clay), from which forms quite as specialized as any living at the present day are known.

This early specialization of the Scombroïds makes it necessary to consider whether the indirect attachment of the pelvic bones to the cleithra in the Trichiuridæ may not be a primitive feature. That this is not the case is shown by the fact that in all the members of the group which have well-developed pelvic fins, the pelvic bones are directly attached to the cleithra—*i. e.* their anterior extremities are firmly imbedded in the ligament which connects the cleithra above the symphysis\*. In *Lepidopus* and *Eupleurogrammus* the pelvic fins are reduced to a pair of scales and the pelvis to a small spicular bone, connected by a long ligament with the symphysis; this condition may be regarded as secondary and due to the degeneration of the fins.

Consequently the Scombroïds may be regarded as an early offshoot from the Percoid stem, agreeing with the Perches in most characters, but differing in certain features of specialization.

Before proceeding to the classification of the true

\* *Epinnula*, the most generalized Trichiuroïd, is not represented in the British Museum. Dr. Th. Gill very kindly examined the specimen of *E. magistralis* in the Smithsonian Institution and wrote to me, "the pelvic bones are attenuated forwards and terminate in a ligament connecting with the 'clavicles' at their symphysis." These words describe the condition I observe in *Thyrssites*, but on dissecting away the ligament in which the pelvic bones terminate I find that the latter extend forward, enclosed in a ligamentous sheath, to between the cleithra.

Scombroids some account of five families which have hitherto been placed with them is necessary. These are:—

### 1. Carangidæ.

The more generalized members of this family (*Seriola*, *Naucrates*) have the anatomical characters of the Serranidæ, there being nothing in the structure of the cranium, vertebral column, or pectoral arch to differentiate them from the latter, whilst genera like *Scombrops* and *Pomatomus* (*Temnodon*) connect the two families. In the Carangidæ the caudal peduncle is more slender, the caudal fin more widely forked, and the hypural embraced to a greater extent by the bases of the caudal fin-rays than in the Serranidæ, but the close relationship of the two families is evident.

### 2. Rhachicentridæ.

*Rhachicentrum* has a broad depressed cranium, but the relative position of the bones is as in normal Perciformes and as in the Carangidæ—*i. e.*, the parietals and epiotics are separated by the supraoccipital, the opisthotics and exoccipitals extend forward to the prootics, the prootics give rise to an osseous roof for the myodome, alisphenoids and a basisphenoid are present, but no orbitosphenoid, the præmaxillaries are protractile and have a pair of posterior processes which slide backwards and forwards on each side of a keel on the ethmoid, and the maxillaries are expanded distally. Owing to the depressed form of the cranium the basioccipital forms the floor of the *foramen magnum*, and the exoccipitals are widely separated below; this feature has no importance, as in the Carangidæ both conditions (basioccipital entering and excluded from the *foramen magnum*) are to be met with.

The pectoral arch is exactly as in generalized Percoids. The vertebral column consists of 25 vertebræ (11+14); there are 9 pairs of ribs, all but the first of which are inserted on short parapophyses; the epipleurals are attached either to the ribs near their point of insertion or to the vertebræ just above it. The caudal fin is lunate and the rays do not embrace the hypural to a greater extent than in Perch. However much the group Perciformes may be restricted, I cannot see how this type is to be excluded from it.

### 3. Coryphænidæ.

In *Coryphæna* the relative position of the cranial bones is as described in *Rhachicentrum*.

The skull is chiefly remarkable for the high median occipital crest continued forward to above the ethmoid, its anterior portion formed by the frontals. The ethmoid is hollowed out anteriorly for the reception of the vertically placed posterior processes of the præmaxillaries. There are 30 to 33 vertebræ, the præcaudals without parapophyses, the ribs and epipleurals inserted together on the centra. The structure of the pectoral arch and of the caudal fin is as in the Carangidæ, to which family the Coryphænidæ may be related.

#### 4. Bramidæ.

The cranium of *Brama* is strikingly similar to that of *Coryphæna*. The family is distinguished from the preceding by the expanded coracoids and by the structure of the vertebral column, which comprises 42 to 47 vertebræ and has most of the ribs attached at the extremities of closed hæmal arches.

#### 5. Menidæ.

*Mene* appears to be related to *Brama*, which it resembles in the structure of the occipital crest, but from which it differs in that the epiotics meet behind the supraoccipital. The mouth is very protractile and the maxillaries are abnormal, with the inner apophyses much elongated, and moving in a pair of grooves on the anterior surface of the vomer. This recalls the condition in the *Allotriognathi*, but differs from it in that the maxillaries are non-protractile, each being attached to the well-developed maxillary process of the palatine. The vertebræ number 23 (9+14) and the anterior ones are much abbreviated; the ribs are inserted on transverse processes, except the first pair, which are sessile on the third vertebra, are much enlarged, and are modified for articulation with the inner posterior edges of the post-cleithra; the transverse processes of the fourth and fifth vertebræ are enlarged and support the first pair of ribs from behind.

None of the five families mentioned above appears to me to be related to the Scombridæ; they may all be regarded as more or less specialized Percoids. The Carangidæ, Coryphænidæ, and Bramidæ have a perch-like mouth accompanied by a widely forked caudal fin, with the hypural bone embraced to a considerable extent by the bases of the caudal fin-rays; but that this latter feature does

not really indicate relationship to the Scombridæ is shown by the fact that *Thyrsites* has the hypural exposed to the same extent as in most Perches, but is otherwise so similar to *Scomber* in its anatomy as to leave little doubt that the two genera are closely related.

Recently, in the Introduction to the "*Pisces*" volume of the 'Biologia Centrali-Americana,' I instanced three apparently natural groups, each of which included forms with the pelvic bones firmly attached to the cleithra and others with the pelvic bones remote from them; to these the Scombroids may now be added.

### Order PERCOMORPHI.

#### Suborder SCOMBROIDÆ.

Air-bladder without open duct. Maxillaries more or less firmly attached to the non-protractile præmaxillaries, which are typically produced and pointed anteriorly\*. Cranium with the orbito-rostral portion elongate and the postorbital portion abbreviate; parietals separated by the supra-occipital; no orbitosphenoid; basisphenoid present; prootics giving rise to an osseous roof for the myodome. Vertebral column of solid centra which are co-ossified with the arches. Pectoral arch attached to the cranium by a forked post-temporal; no mesocoracoid; pterygials more or less regularly hourglass-shaped, 4 in number, 3 of them attached to the scapula. Pelvic fins of a spine and 5 soft rays or variously reduced, thoracic or subthoracic in position, the pelvic bones attached to the clavicles.

#### Division I. TRICHIURIFORMES.

Caudal fin-rays not deeply forked at the base, the hypural in great part exposed. Præmaxillaries beak-like, free from the nasals; mouth toothed, with lateral cleft; strong anterior canines. Epiotics separated by the supraoccipital. Gill-membranes free from the isthmus. Pectoral fins placed low.

#### Family 1. Gempylidæ.

Body oblong or elongate, compressed; maxillary exposed; spinous dorsal longer than the soft; anal with 3 spines,

\* The very aberrant and highly specialized *Luxarus* is the only exception.

similar to the soft dorsal; each pelvic fin of a spine and 5 soft rays or reduced to a spine only; caudal fin present. Rays of the spinous dorsal equal in number to the vertebræ below them, each interneural usually attached to a neural spine; rays of soft dorsal and anal more crowded (except the isolated finlets, when present), about twice as numerous as the corresponding vertebræ; pelvic bones separate, anteriorly extending forward to the cleithra and firmly imbedded in the ligament between them. Vertebræ 31 (15 + 16) \* to 53 (28 + 25); anterior præcaudals without parapophyses, with sessile ribs; posterior præcaudals with ribs attached at the extremities of closed hæmal arches; epipleurals attached to the centra.

*Epinnula*, *Ruvettus*, *Thyrsites*, *Nealotus*, *Prometichthys*, *Gempylus*.

The Oligocene *Thyrsitocephalus* appears to belong to this family.

#### Family 2. Trichiuridæ.

Body very elongate, strongly compressed; maxillary sheathed by the præorbital; spinous dorsal, if distinct, not longer than the soft; anal with numerous short spines; pelvic fins reduced to a pair of scale-like appendages, or absent; caudal small or absent. Dorsal and anal rays corresponding to the vertebræ, each interneural or inter-hæmal attached to a neural or hæmal spine; pelvic bones, if present, united to form a slender spicular bone connected with the cleithra by a long ligament. Vertebræ numerous, 100 (43 + 57) to 159 (39 + 120) or more; ribs feeble, sessile.

*Aphanopus*, *Evoxympoton*, *Lepidopus*, *Benthodesmus*, *Eupleurogrammus*, *Trichiurus*.

*Lepidopus* is known from Oligocene deposits.

#### Division II. SCOMBRIFORMES.

Hypural nearly or quite hidden by the deeply forked bases of the caudal fin-rays. Præmaxillaries beak-like, free from the nasals, which are separated by the ethmoid; mouth toothed, with lateral cleft; no canines. Epiotics separated by the supraoccipital. Gill-membranes free from the isthmus. Pectoral fins placed high.

\* I am indebted to Dr. Gill for a radiograph of *Epinnula*, which shows the vertebræ to number 31 (15 + 16). In *Thyrsites prometheus* there are 34 vertebræ.

## Family 1. Scombridæ.

Body fusiform; spinous dorsal not longer than the soft; anal with 1 to 3 feeble spines; posterior rays of soft dorsal and anal forming separate finlets; each pelvic fin of a spine and 5 branched rays; pelvic bones extending forward to the cleithra. Vertebrae 31 to 66; anterior præcaudals without parapophyses, with sessile ribs; posterior præcaudals with ribs attached at the extremities of closed hæmal arches; epipleurals on the centra.

*Scomber*, *Thunnus*, *Acanthocybium*, *Gastrochisma*, &c., allied genera commence in the Lower Eocene.

## Division III. LUVARIFORMES.

Hypural nearly or quite hidden by the bases of the caudal fin-rays. Maxillaries broad and thin, attached to the feeble præmaxillaries, which are not produced into a beak and have short ascending processes for attachment to the ethmoid. Mouth small, anterior; teeth very feeble. Epiotics much enlarged and meeting behind the supraoccipital, which is carried forward to above the ethmoid. Gill-membranes broadly joined to the isthmus. Pectoral fins placed rather low.

## Family 1. Luvaridæ.

23 vertebrae; ribs sessile. Post-temporal fused with the supra-cleithrum. Pelvic bones united. Dorsal and anal rays flexible, non-articulated.

*Luvarus imperialis*, a large pelagic fish resembling a Tunny, is the only known species.

## Division IV. XIPHIIFORMES.

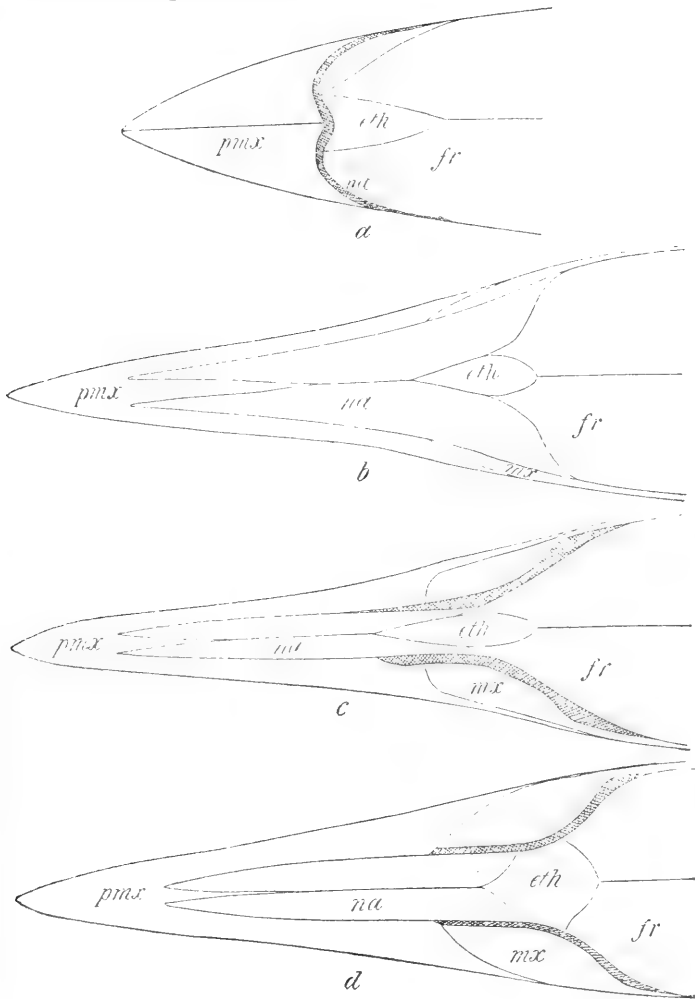
Hypural nearly or quite hidden by the bases of the caudal fin-rays\*. A long pointed rostrum, formed by the united præmaxillaries and by the nasals, the latter meeting in front of the ethmoid and then diverging and tapering forward. Mouth with lateral cleft; teeth small or absent. Epiotics separated by the supraoccipital. Gill-membranes free from the isthmus. Pectoral fins placed low.

\* Owing to the courtesy of Dr. Smith Woodward I have been able to verify this character in *Palæorhynchus* and *Blochius*.

Family 1. Palæorhynchidæ.

Vertebræ 50 to 60 in number ; pelvic fins 6-rayed. Neural and hæmal spines with thin posterior laminar expansions. Scales, if present, thin and cycloid.

*Palæorhynchus* and *Hemirhynchus* from Eocene, Oligocene, and Miocene deposits.



Diagrams showing the structure of the rostrum in *Acanthoxybium* (a), *Histiophorus* (b), *Xiphias* (c), and *Xiphiorhynchus* (d).

pmx, præmaxillary ; mx, maxillary ; na, nasal ; eth, ethmoid ; fr, frontal.

Family 2. *Histiophoridae*.

Vertebrae 24 or 25 in number; pelvic fins 1- to 3-rayed. Neural and hæmal spines expanded into strong overlapping laminæ; ribs sessile. Scales present. Rostrum rounded in transverse section; teeth present; a prædentary bone; nasals broadly attached to anterior edges of frontals; maxillary of nearly equal width throughout its length.

*Histiophorus* and *Tetrapturus*, perhaps dating back to the Eocene.

Family 3. *Blochiidae*.

24 vertebrae. Pelvic fins absent. Neural and hæmal spines not expanded. Ribs apparently sessile. Body covered with slightly imbricated, diamond-shaped, bony scutes; two longitudinal series of enlarged scutes on each side.

*Blochius longirostris*, from the Upper Eocene of Monte Bolca, attaining a length of one metre.

Family 4. *Xiphiidae*.

26 vertebrae. Pelvic fins absent. Neural and hæmal spines not expanded. Ribs inserted on transverse processes. Scales absent in the adult. Rostrum depressed; no teeth in the adult; no prædentary bone; nasals extending back on each side of the ethmoid and just reaching the frontals; maxillary formed of an expanded anterior and a rod-like posterior portion.

The adult *Xiphias gladius* differs considerably from *Blochius*, but very young specimens clearly show its relationship to the extinct genus. An example of nearly 200 mm. in the British Museum is very similar to *Blochius longirostris*, resembling it in the long slender jaws, the elongate body with the greatest depth just behind the head, and the continuous dorsal fin. The body is covered with rough, non-imbricated scales, with 4 longitudinal series of enlarged scales on each side, 2 corresponding in position to the lateral series in *Blochius* and the others running at the base of the dorsal and anal fins.

The Lower Eocene *Acestrus* may belong to the Xiphiidae.



## Family 5. Xiphiorhynchidæ.

Rostrum rounded in transverse section; teeth present; nasals widely separated from the frontals by the broad ethmoid; maxillary formed of an expanded anterior and a rod-like posterior portion.

*Xiphiorhynchus* of the Lower and Middle Eocene.

XII.—*The Classification of Teleostean Fishes.*

By C. TATE REGAN, M.A.

BEFORE proceeding to the classification of the Teleostei two questions must be discussed, viz. the rank and the limits of the group.

I have already expressed the opinion that the true Fishes are at least as distinct from the Selachians on the one hand and the Batrachians on the other as any of the vertebrate classes are from each other, and are equally entitled to rank as a class\*. The class Pisces differs from the Selachii in the presence of two external nasal openings on each side; the reduction of the interbranchial septa; the development of an air-bladder or lung; the bony exoskeleton, typically including paired nasal, frontal and parietal bones, a parasphenoid, an operculum, a series of bones, post-temporal, supra-cleithrum, cleithrum and clavicle, overlying the primary pectoral arch and connecting it with the cranium, scales and articulated fin-rays; the development of bones in or on the visceral arches, præmaxilla, maxilla, palatine, pterygoids, quadrate, dentary, &c.; the presence of supra-neural arches (well-developed in Chondrostei and Dipneusti, less evident when centra are formed). The Batrachians are separated from the Pisces especially by the presence of true internal nares and of a *fenestra ovalis*, the modification of the paired fins into pentadactyle limbs and of the hyomandibular into the stapes, and the absence of endoskeletal supports and dermal rays from the median fins.

Whilst recognizing the importance of the characters which distinguish the Pisces from the Selachii, I have hitherto been so conservative as to regard these groups as sub-classes only, using the name Teleostomi for the former. The groups which I formerly recognized as orders of the sub-class

\* Regan, Proc. Zool. Soc. 1906, p. 724, and Biol. Centr.-Am., Pisces, p. viii (1908).

Teleostomi, viz. Chondrostei, Teleostei, Crossopterygii, and Dipneusti, I now regard as sub-classes of the class Pisces. These four sub-classes may be arranged in two series: in the Actinopterygian series (Chondrostei and Teleostei) the duct of the air-bladder opens dorsally or dorso-laterally into the alimentary canal, the branchiostegals retain their primitive serial arrangement, and the supports of the paired fins are either in the form of a series of parallel pterygiophores each of which is segmented into a basal and a radial portion or are modified from this plan by a simple process of concentration and reduction; in the Crossopterygian series (Crossopterygii and Dipneusti) the opening of the pneumatic duct is ventral, the branchiostegals are replaced by a pair of gular plates, and the paired fins are more or less lobate, with their supports tending to the biserial arrangement with axial basalia.

The Teleostei are well marked off from the Chondrostei by the absence of clavicles and of pelvic radials, the reduction in number of the dorsal and anal fin-rays, so that each has its own pterygiophore, and the shortening of the upturned axis of the caudal fin, which is homocercal or abbreviate heterocercal. Thus defined they include the Holostei, a group which cannot, in my opinion, be maintained.

The ordinal names are not formed on any definite plan, but usually have some reference to the peculiarities of the group; it seems to me useful always to form subordinal names with the termination *-oidei*, and when families are arranged in divisions or superfamilies to give these groups names ending in *-formes*.

*Synopsis of the Orders and Sub-orders of the  
Sub-class Teleostei.*

- I. Splenial well developed.
- A. Vertebral centra incomplete, or with alternating pleuro- and hypo-centra in the caudal region . . . 1. *Protospondyli*.
1. Præmaxillaries meeting in the middle line; caudal fin supported by little expanded hæmal spines.
- No endochondral supraoccipital; parietals united by suture; opercular bones complete . . . . . 1 a. *Amioidei*.
- An endochondral supraoccipital; parietals united by suture; opercular bones complete . . . . . 1 b. *Dapedioidei*.
- No endochondral supraoccipital; parietals separated by a median dermal bone; sub- and inter-operculum absent . . . . . 1 c. *Pseudontoidei*.
2. Præmaxillaries separated by an ethmo-vomerine rostrum; lower lobe of caudal fin supported by a single much expanded hæmal spine . . . . . 1 d. *Pachycormoidei*

- B. Vertebral centra complete, annular or biconcave; no separate pleuro-centra and hypo-centra . . . . . 2. *Aspidorhynchii*.
- C. Vertebral centra complete, opisthocelous; no separate pleuro-centra and hypo-centra . . . . . 3. *Ginglymodi*.
- II. No splenial; an endochondral supraoccipital; vertebral centra complete.
- A. A mesocoracoid †.
1. No Weberian ossicles; maxillary entering the gape to a greater or less extent and not acting as a lever for the protraction of the præmaxillaries; mesethmoid unpaired. . . . . 4. *Isospondyli*.
- a. Frontals united by suture.
- α. Mouth not protractile.
- \* Parapophyses autogenous or parietals separated by supraoccipital.
- Parietals present . . . . . 4 a. Clupeoidei.
- Parietals absent . . . . . 4 b. Stomiatoidei.
- \*\* Parapophyses co-ossified with centra; parietals meeting, separating frontals from supraoccipital.
- Entopterygoid articulating with a lateral peg of the parasphenoid . . . . . 4 c. Osteoglossoidei.
- On each side of the skull a lateral foramen or cartilaginous area superiorly and a vesicular diverticulum of the air-bladder inferiorly . . . . . 4 d. Notopteroidei.
- On each side of the skull superiorly a lateral foramen lodging a vesicle which has lost its connection with the air-bladder . . . . . 4 e. Mormyroidei.
- β. Mouth protractile; maxillaries not articulated to the cranium . . . . . 4 f. Phractolæmoidei.
- b. Frontals united to form a single bone; gill-membranes joined to the isthmus . . . . . 4 g. Gonorhynchoidei.
- c. Frontals completely separated; gill-membranes joined to the isthmus . . . . . 4 h. Cromerioidei.
2. Weberian ossicles present. . . . . 5. *Ostariophysii*.
- Parietals distinct; pterygoids, symplectic and opercular bones all present; anterior vertebræ more or less distinct . . . . . 5 a. Cyprinoidei.
- Parietals united with supraoccipital; no metapterygoid, symplectic, or suboperculum; anterior vertebræ co-ossified . . . . . 5 b. Siluroidei.
- B. No mesocoracoid.
1. Parapophyses autogenous.
- a. Parietals united by suture; mesethmoid unpaired; physoclistic . . . . . 6. *Heteromi*.
- b. Parietals separated by the supraoccipital; paired dermal ethmoids; physostomous . . . . . 7. *Haplomi*.
- Pectoral pterygials normal. . . . . 7 a. Esocoidei.
- Pectoral pterygials represented by a cartilaginous plate . . . . . 7 b. Dallioidei.

† Absent in some Argentinidæ and Siluridæ and in the Galaxiidæ and Haplochitonidæ.

2. Parapophyses co-ossified with centra.
- a. Physostomous †; pelvic fins, if present, abdominal.
- a. Præmaxillaries nearly excluding the maxillaries from the oral border; body eel-shaped; no paired fins; vertical fins confluent ..... 8. *Symbranchii*.
- Pectoral arch attached to the skull by a forked post-temporal ..... 8a. *Symbranchoidei*.
- Pectoral arch free from the skull; no post-temporal ..... 8b. *Amphipnoidei*.
- β. Præmaxillaries absent; maxillaries articulated with the fixed ethmo-vomer; quadrate fixed; pectoral arch free from the skull; body eel-shaped.
9. *Apodes*.
- Large interbranchial slits; tongue present; opercular bones well developed ..... 9a. *Anguilloidei*.
- Small interbranchial slits; no tongue; opercular bones reduced ..... 9b. *Murænoidei*.
- γ. Præmaxillaries absent; maxillaries meeting anteriorly and suspended by the integument from a movable ethmoidal rostrum; quadrate movably articulated with the hyo-mandibular; pectoral arch far behind the skull; body eel-shaped ..... 10. *Lyomeri*.
- δ. Præmaxillaries excluding maxillaries from oral border; parapophyses short or absent; epineurals present; orbitosphenoid present and parietals united by suture or post-temporals nearly meeting above supraoccipital; an adipose fin ... 11. *Iniom*.
- ε. Præmaxillaries excluding maxillaries from oral border; all præcaudal vertebræ with strong transverse processes; no epineurals; no orbitosphenoid; parietals separated by supraoccipital; post-temporals lateral; no adipose fin ..... 12. *Microcyprini*.
- b. Physoclistic; pelvic bones not directly attached to the cleithra §; orbito-sphenoid absent or vestigial; maxillary not protractile.
- a. Lower pharyngeals completely united; fins without spines ..... 13. *Syntognathi*.
- β. Lower pharyngeals separate.
- \* On each side a dermal plate (ectocoracoid) which in the adult is united by suture to the cleithrum and co-ossified with the coracoid. 14. *Thoracostei*.
- \*\* No ectocoracoids.
- † Snout tubiform; parietals absent; pterotic extending downwards to basioccipital.
15. *Solenichthyes*.
- Mouth toothed; gills pectinate; anterior vertebræ elongate, with transverse processes on each side united to form a shelf; lower 3 pectoral pterygials enlarged .. 15a. *Aulostomoidei*.

† Some Cyprinodontidæ have recently been shown to be physoclistic.  
 § Except in the Luciocephalidæ and some Anabantidæ, which seem clearly related to forms with abdominal pelvic fins.

- Mouth toothless; gills pectinate; anterior vertebræ elongate, with separate transverse processes; pectoral pterygials short ..... 15 b. Centriscoidei.
- Mouth toothless; gills lobate; caudal vertebræ very short; pectoral arch normally attached to skull; post-temporal and supra-cleithrum similar to stellate ossifications on body ..... 15 c. Solenostomoidei.
- Mouth toothless; gills lobate; caudal vertebræ normal; post-temporal simple, suturally united to the cranium; no supra-cleithrum; cleithrum firmly attached to the transverse processes of the two anterior vertebræ; body enclosed in bony rings ..... 15 d. Syngnathoidei.
- †† Snout not tubiform; parietals present; pterotic not reaching basioccipital.
- § Body enclosed in bony rings; mouth inferior. 16. *Hypostomides*.
- §§ Body naked or scaly; skeleton well ossified; a homocercal caudal fin.
- φ No suprabranchial organ; anterior rays of dorsal and anal spinous; pelvic fins abdominal, without spines, each of 7 to 9 rays. 17. *Salmopercæ*.
- φφ No suprabranchial organ; a spinous dorsal; pelvic fins abdominal, each of a spine and 5 branched rays .... 18. *Percosoces*.
- Pectoral fin and pterygials normal ..... 18 a. Mugiloidei.
- Pectoral fin with a lower detached portion formed of free filaments; pterygials represented by a plate attached to the edge of scapula and coracoid ..... 18 b. Polynemoidei.
- φφφ A suprabranchial organ. 19. *Labyrinthici*.
- Fins without spines, the pelvics 6-rayed; suprabranchial organ not labyrinthic; air-bladder simple ..... 19 a. Ophiocephaloidei.
- Fins usually with spines, each pelvic of a spine and 5 soft rays or further reduced; suprabranchial organ labyrinthic; air-bladder bifurcated posteriorly ..... 19 b. Anabantoidei.
- §§§ Body naked or scaly; skeleton in great part cartilaginous; a homocercal caudal fin; no fin-spines.
- Pelvis represented by two separate cartilages far behind the cleithra; pectoral pterygials normal. .... 20. *Malacichthyes*.
- Pelvis unpaired, cartilaginous, articulating above with a cartilage embraced by the cleithra; pectoral pterygials represented by a cartilaginous plate ..... 21. *Chondrobrachii*.

§§§§ Body naked or scaly; skeleton well ossified; no homocercal caudal fin; opisthotic extending downwards to the basioccipital.

22. *Anacanthini*.

c. Physoclistic; pelvic bones embraced by or articulated to the coracoids; pelvic fins without spines, often with numerous rays; maxillary free, protractile. 23. *Allotriognathi*.

α. Body deep; skeleton well ossified; an occipital crest; lower pharyngeals toothed; post-temporal forked; an orbitosphenoid.

Frontals normal, in contact below with the mesethmoid and orbitosphenoid; ribs sessile; pelvic bones articulated to the greatly expanded coracoids; each pelvic fin of 15 to 17 rays ..... 23 a. *Lamproidei*.

Frontals forming the lateral walls of a chamber, the floor of which is formed by cartilage containing the mesethmoid and orbitosphenoid ossifications; ribs on parapophyses; pelvic bones not articulated to the coracoids; each pelvic fin of 8 or 9 rays ..... 23 b. *Veliferoidei*.

β. Body elongate; skeleton feebly ossified; no occipital crest; lower pharyngeals toothless; post-temporal simple.

An orbitosphenoid; epiotics meeting behind the supraoccipital; palatine and pterygoids present; neural and hæmal spines present; body ribbon-shaped ..... 23 c. *Trachypteroidei*.

No orbitosphenoid; epiotics separated by the supraoccipital; no palatine; pterygoids represented by a single small element; no neural and hæmal spines; body eel-shaped ..... 23 d. *Stylophoroidei*.

d. Physoclistic; cranium symmetrical; an orbitosphenoid or pelvic bones directly attached to the cleithra; pelvic fins usually with more than 6 rays, the first of which may be spinous; maxillary attached proximally to a process of the palatine ..... 24. *Berycomorphi*.

An orbitosphenoid ..... 24 a. *Berycoidei*.

No orbitosphenoid ..... 24 b. *Zeoidei*.

e. Physoclistic; cranium asymmetrical; pelvic bones directly attached to the cleithra; fins without spines.

25. *Heterosomata*.

f. Physoclistic; cranium symmetrical; pelvic bones directly attached to the cleithra †; each pelvic fin of a spine and 5 soft rays or still further reduced; no orbitosphenoid.

α. Post-temporal more or less distinctly forked, attached to the epiotic above and to the opisthotic or exoccipital below.

\* Spinous dorsal not forming an adhesive disc.

26. *Percomorphi*.

† Except in the Trichiuridæ and Tetragonuridæ, in which the indirect attachment is assumed to be due to degeneration.

† No bony stay for the præoperculum.

- Pelvic fins subthoracic, thoracic or jugular, each of 5 or 6 rays, the first of which is spinous; ribs, if present, normal; præmaxillaries more or less protractile; opisthotic not enlarged . . . . . 26 a. Percoidei.
- Pelvic fins subthoracic or thoracic; ribs normal; præmaxillaries not protractile, typically produced and pointed; opisthotic not enlarged . . . . . 26 b. Scombroidei.
- Pelvic fins thoracic; ribs expanded, forming a series of juxtaposed rings enclosing the air-bladder . . . . . 26 c. Kurtoidei.
- Pelvic fins thoracic; opisthotic enlarged, extending downwards to the basioccipital. 26 d. Gobioidi.
- Pelvic fins jugular or mental, each of 1 to 4 rays, the first of which may be spinous; parasphenoid sending up a wing on each side which is joined by suture to the frontals. . . . . 26 e. Blennioidei.
- †† Third suborbital produced to or towards the præoperculum § . . . . . 26 f. Scorpenoidei.
- \*\* Spinous dorsal modified into an adhesive disc placed on the head . . . . . 27. *Discocephali*.
- β. Post-temporal simple, rod-like, directed outwards, at right angles to the horizontal, backwardly directed supra-cleithrum; cranium depressed; pterygoids reduced to a single small element united to the quadrate; ribs attached at the extremities of sessile epipleurals; an adhesive ventral disc bounded posteriorly by the post-cleithra, which meet in the middle line and are attached to the pelvis. . . . . 28. *Xenopteri*.
- γ. Post-temporal, if present as a distinct element, small, simple, suturally united with the cranium; ribs absent; gill-openings reduced.
- \* Pelvic fins, if present, subthoracic or thoracic; parietals absent . . . . . 29. *Plectognathi*.
- Post-temporal distinct, suturally united with the pterotic; supra-cleithrum vertical; pectoral pterygials not enlarged . . . . . 29 a. Balistoidei.
- Post-temporal co-ossified with the pterotic; supra-cleithrum oblique or horizontal; lower three pectoral pterygials enlarged . . . . . 29 b. Tetrodontoidei.
- \*\* Pelvic fins, if present, jugular; parietals present; pectoral pterygials elongate.
30. *Pediculati*.
- Spinous dorsal normal; epiotics separated by the supraoccipital; epipleurals present; 4 or 5 pectoral pterygials . . . . . 30 a. Batrachoidei.
- Spinous dorsal, if present, modified in structure and position, the anterior rays on

§ Except in the Comephoridae, which have the skeleton feebly ossified.

the head; epiotics meeting behind the supraoccipital; no epipleurals; 2 or 3 pectoral pterygials ..... 30 b. Lophioidei.

§ No post-temporal; pectoral arch attached to the vertebral column ..... 31. *Opisthomi*.

The synopsis given above is a modification and amplification of one which formed part of a paper on teleostean classification read to the section of Systematic Zoology of the International Zoological Congress at Boston in 1907, and which will no doubt be published at some future date.

Later on I hope to give more detailed accounts of the anatomy and classification of some of the less known groups, but within the limits of the present paper only a few brief notes on some points which need elucidation are possible.

#### ISOSPONDYLI.

In some external characters *Retropinna* is intermediate between *Osmerus* and *Prototroctes*. *Retropinna*, *Salanx*, and *Microstoma* are Argentinidæ which have no mesocoracoid. The Argentinidæ, Haplochitonidæ, and Galaxiidæ are extremely similar in osteology, dentition, and in the absence of oviducts, and are undoubtedly closely related.

It is possible to maintain the order Isospondyli, with the addition of the Haplochitonidæ and Galaxiidæ, by taking into consideration the mouth-structure, the maxillary entering the gape to a greater or less extent (almost excluded in Haplochitonidæ), and the unpaired ethmoid. As thus defined, the Haplomi, Iniomi, and Microcyprini are excluded.

The cretaceous Enechodontidæ fall into the division Stomatoid-i; they agree with the Stomatidæ in the structure of the skull and of the mouth.

The Kneriidæ, known to me from external characters only, show considerable resemblance to the Gonorhynchidæ, and may pertain to this order.

#### HETEROMI.

Boulenger has pointed out that the Lipogenidæ are intermediate in fin-structure between the Halosauridæ and Notacanthidæ. These three families constitute the order Heteromi, from which I would exclude the Dereetidæ, in my opinion probably belonging to the Iniomi, and the Fierasferidæ, which are without question specialized Brotulidæ.

In skeletal characters *Halosaurus* and *Notacanthus* agree in that the orbito-rostral part of the cranium is elongate, the parietals meet, opisthotics, basisphenoid, alisphenoids, and



orbitosphenoid are absent, the parasphenoid unites with the sphenotic (post-frontal) in front of the prootic, the post-temporal is simple or ligamentous, the scapula is lamellar and imperforate, the præcaudal vertebræ have autogenous parapophyses, epineurals are present, &c.

#### HAPLOMI.

The Haplomi as now restricted comprise only the Umbridæ, Esocidæ, and Dalliidæ, a very primitive group agreeing with the Isospondyli in mouth-structure, but unique in the character of the paired ethmoids.

#### APODES.

I have defined the Apodes as lacking præmaxillaries, and I am very sceptical as to their presence in *Derichthys*. If we neglect this character, *Derichthys* is very similar to the Anguillidæ, in many of which (e. g. *Conger*) there is what may be a præmaxillary dentition distinct from that of the vomer, although there is no separate præmaxillary bone. Dr. Gill does not tell us that he dissected his specimen of *Derichthys serpentinus* in order to ascertain the limits of the præmaxillaries, and it seems not improbable that he may have inferred the presence of these bones as separate elements from the presence of a well-defined præmaxillary dentition.

The Cretaceous Anguillavidæ and Urenchelidæ have a distinct caudal fin, and small abdominal pelvic fins are present in the former.

#### LYOMERI.

The presence of parietals, the transverse processes ankylosed with the centra, the restricted gill-openings, &c. indicate the derivation of the Lyomeri from the Apodes and not from the Stomiatoids. The Synaphobranchidæ approach them in their rather broad skull, long slender maxillaries, backwardly directed suspensorium, absence of pterygo-palatine arcade, &c.

#### INIOMI.

The order Iniomi includes the Aulopidæ, Synodontidæ, Odontostomidæ, Paralepidæ, Alepidosauridæ, and Myctophidæ; probably also the Rondeletiidæ and the extinct Chirothricidæ and Dereetidæ. The name Iniomi may be retained for this group, although in *Aulopus* the forked post-temporal is firmly attached to the epiotic above and the opisthotic below; this generalized type has two supra-maxillaries and shows considerable resemblance in cranial

structure to the Elopidae; the orbitosphenoid, however, is rather anomalous; it is placed far forward and forms an interorbital septum extending from the parasphenoid to the frontals, whilst posteriorly paired inferior ridges of the frontals separate it from the alisphenoids. The protractile præmaxillaries exclude the maxillaries from the oral border, and this feature distinguishes *Aulopus* from all Isospondyli. In Iniomi other than the Aulopidae the post-temporals nearly meet in the middle line above the supraoccipital, but are attached by ligament to the epiotics, the maxillaries may become reduced and closely attached to the præmaxillaries, the orbitosphenoid tends to disappear, and the parietals may become separated by the supraoccipital (Myctophidae).

#### MICROCYPRINI.

The order Microcyprini includes the Cyprinodontidae and Amblyopsidae, usually considered to be allied to the Esocidae, which they resemble in fin-structure.

#### THORACOSTEI.

The order Thoracostei comprises the Gastrosteidae and Aulorhynchidae. Swinnerton\* has shown that the dermal plate which appears as part of the coracoid is in reality a distinct element. I cannot accept Jungersen's view that these fishes belong to the Scorpænoidei, although I readily admit that the Aulostomoids are more distinct from the Thoracostei than I recently considered them to be.

#### SOLENICHTHYES.

In a valuable memoir Jungersen† has pointed out the features which show that the Aulostomoids, Centriscoids, and Lophobranchii form a natural group, to which the ordinal name Solenichthyes, recently proposed by me for the Centriscoids only, may be applied.

#### HYPOSTOMIDES.

The Pegasidae show certain resemblances to the Scorpænoid Agonidae and Dactylopteridae, but they also exhibit some important differences from them, especially in the truly abdominal pelvic fins.

#### SALMOPERCÆ.

I am unable to find a pneumatic duct in the Percopsidae, which have hitherto been said to be physostomous. The

\* Quart. Journ. Micr. Sci. xlix. 1905, p. 363.

† Vidensk. Selsk. Skr. (7) vi. 1908, p. 41.

Aphredoderidæ are precisely similar to them in their anatomy, and these two closely related families constitute the order Salmopercæ.

#### LABYRINTHICI.

The suborder Anabantoidei comprises the Luciocephalidæ and Anabantidæ, the latter including the Osphromenidæ, which I am unable to recognize even as a distinct family, although Boulenger has widely separated them from the Anabantoids.

#### MALACICHTHYES.

The order Malacichthyes is equal to the family Icosteidae, i. e. *Icosteus* and *Acrotus*\*, of very uncertain relationships.

#### CHONDROBRACHII.

This order comprises the Ateleopidæ, a very remarkable and isolated group of fishes.

#### PERCOMORPHI.

In some members of this order the lower fork of the post-temporal is very short (e. g. Acanthuridæ), in others the upper limb may be expanded and suturally united to the skull (Agonidæ, Trigiidæ); further, the interspaces between it and the lower limb may be filled in by osseous laminæ, so that the post-temporal may form an integral part of the skull (e. g. *Callionymus*).

Of the suborders of the Percomorphi the Percoidei is by far the largest, and its classification is a matter of some difficulty. It is equivalent to Boulenger's Perciformes, after the exclusion of the Berycoids and Osphromenidæ, with the addition of the Stromateidæ, Tetragonuridæ, Carangidæ, Rhachicentridæ, Coryphænidæ, Bramidæ, Menidæ, Percophiidæ, Ammodytidæ, Trachinidæ, Champsodontidæ, Leptoscopidæ, Uranoscopidæ, Parapercidæ, Trichonotidæ, Nototheniidæ, Callionymidæ, and Agriopidæ.

Hitherto the indirect attachment of the pelvic bones to the cleithra has usually been regarded as a primitive feature, but it is difficult to see why this should always be so. It is scarcely open to question that the ligamentous connexion between the post-temporal and the epiotic in *Synodus* is derived from a direct attachment, as seen in *Aulopus*. If the pelvic fins can migrate backwards from a thoracic to a sub-abdominal position by elongation of the pelvic bones, which

\* I have examined the type of *Icichthys lockingtoni*, which is a species of *Centrolophus*.

seems to have happened in the Cirrhitiformes, why should they not do so by elongation of the ligament which binds the pelvic bones to the cleithra? In the cases of the Stromateidæ and Tetragnonuridæ and of the Gempylidæ and Trichiuridæ it is in the more specialized and degenerate forms that the pelvic bones are attached to the cleithra by a rather long ligament. In the Labyrinthici and Berycomorphi it is quite different; in each of these the forms with the pelvic bones remote from the cleithra (*Ophiocephalus*, *Polymixia*) are the more generalized, differing from the rest in that the pelvic fins are composed of articulated rays only.

The suborder Scombroidei includes the divisions Trichiuriformes, Scombriformes, Luvarifformes, and Xiphiiiformes; a more detailed account of this group is given in a separate paper.

#### XENOPTERI.

I am quite in agreement with Dr. Gill as to the ordinal distinctness of the Gobiesocidæ, and I am unable to appreciate their supposed close relationship to the Callionymidæ; the latter are not very different from the Paraperidæ and Nototheniidæ.

#### PLECTOGNATHI.

The bones named parietals in my memoir on this group may include those elements, but should preferably be termed epiotics.

#### Bibliography.

The following deal with the classification of Teleostean Fishes in general; the numerous memoirs dealing with the anatomy and classification of particular groups are not included:—

- (1) COPE. "Observations on the Systematic Relations of the Fishes," Proc. Amer. Assoc. xx. 1871, p. 317.
- (2) GÜNTHER. Introduction to the Study of Fishes (1880).
- (3) COPE. "Synopsis of the Families of Vertebrata," Amer. Nat. xxiii. 1889, p. 274.
- (4) SMITH WOODWARD. Catalogue of Fossil Fishes (1889-1901).
- (5) GILL. "Families and Subfamilies of Fishes," Mem. Ac. Washington, vi. 1893, p. 127.
- (6) GOODE and BEAN. Oceanic Ichthyology (1896).
- (7) JORDAN and EVERMANN. Fishes of North and Middle America (1896-1900).
- (8) BOULENGER. Cambridge Natural History, Fishes (1904).
- (9) JORDAN. Guide to the Study of Fishes (1905).
- (10) GREGORY. "The Orders of Teleostomous Fishes," Ann. Ac. N. York, xvii. 1907, p. 437.

## PROCEEDINGS OF LEARNED SOCIETIES.

## GEOLOGICAL SOCIETY.

November 4th, 1908.—Prof. W. J. Sollas, LL.D., Sc.D., F.R.S.,  
President, in the Chair.

The following communication was read:—

‘On the Fossil Plants of the Waldershare and Fredville Series of the Kent Coalfield.’ By E. A. Newell Arber, M.A., F.L.S., F.G.S.

At the boring at Shakespeare Cliff, Dover, Coal-Measures were reached in 1890 at a depth of 1100 feet, and subsequently penetrated to a depth of about 2270 feet. Thirteen seams of coal, varying in thickness from 1 to 4 feet, were pierced. Coal-Measures were struck at 1394 feet at the boring in Waldershare Park, and pierced for 1260 feet more. Five seams of coal, varying from 1 foot 4 inches to 5 feet 2 inches in thickness, were struck. The boring near Fredville Park reached Coal-Measures at 1363 feet, pierced three seams of coal, and was continued to a depth of 1813 feet. The specimens of plants collected from the Waldershare and Fredville borings are dealt with in detail, and compared with plants found at Dover and in other localities in Britain and abroad. The more abundant and characteristic species are common to Waldershare and Fredville, and lead to the conclusion that the beds belong to the same horizon. The majority of species tabulated are either confined to the Upper Coal-Measures and the Transition Series below, or are Middle and Lower Coal-Measure forms which are known to occur in the Transition Series. Indeed, all but two plants have been recorded from the last horizon. Thus the beds are the homotaxial equivalents of the Newcastle, Etruria, and Black-Band horizons of North Staffordshire, the Hamstead Beds below 1233 feet in South Staffordshire, the Coed-yr-allt Beds and Ruabon Marls of Denbighshire, the Ardwick Series and Beds above the Bradford Four-Foot Coal in South Lancashire, the Lower Pennant Grit of South Wales, and the New Rock and Vobster Series of Somerset. The data with regard to Dover are too scanty for certainty, but they seem to indicate approximately the same horizon as the two other Kentish localities. The majority of species are also common to the highest zone, or the ‘Charbons Gras,’ in the Pas de Calais. The flora of these rocks, and of those on the same tectonic line, belongs to the lower of the two great Continental zones of the Upper Carboniferous—the Westphalian; and the higher zone, the Stephanian, is unrepresented in the Mendip-Artois series of basins. But, as this axis is followed from east to west, it appears that continuously higher horizons are met with.

## MISCELLANEOUS.

*The Type of Cidaris.*

To the Editors of the 'Annals and Magazine of Natural History.'

GENTLEMEN,—In my reply (in the June number of the 'Annals') to Dr. Bather's (in the March 'Annals') discussion of the type of *Cidaris* I completely overlooked the really conclusive argument on the subject, to which he refers in one paragraph but fails to emphasize. Dr. Mortensen, of Copenhagen, has now called my attention to it by letter, and I beg you will allow me the space to acknowledge my surrender.

While it is true that *Echinus cidaris*, L., of 1758, is probably *Phyllacanthus baculosa* but is not certainly identifiable, there is no escape from the fact that *Echinus cidaris*, L., of 1761 ('Fauna Suecica'), is the species now universally known as *Dorocidaris papillata*. Linné's reference to Gauthieri's figures D and E, plate 108, and omission of all other references, taken in connexion with the statement that the species occurs in Norwegian seas, leaves no room for doubt on the point. Such being the case, *Dorocidaris papillata* should hereafter be known as *Cidaris cidaris* (L.), as suggested by Bather, while *abyssicola* and the other species of *Dorocidaris* become *Cidaris abyssicola*, &c. The genus now called *Cidaris* becomes *Eucidaris*, Pomel, 1883, who, however, designated no type. Döderlein in 1887 uses *Eucidaris* in Pomel's sense, and as he mentions *metularia* first, we may very conveniently consider that species the genotype. I regret that by overlooking the 'Fauna Suecica' I have needlessly prolonged an unfortunate controversy.

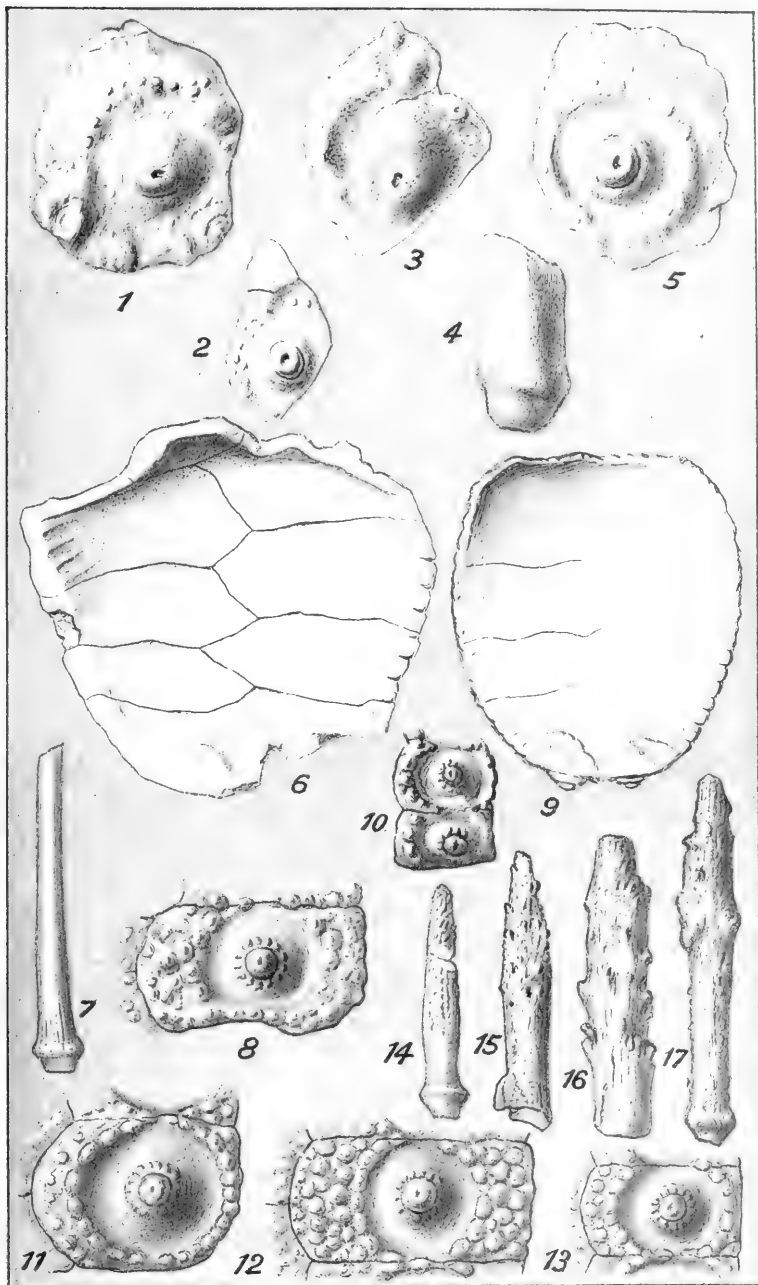
HUBERT LYMAN CLARK.

Museum of Comparative Zoology,  
Cambridge, Mass.,  
Nov. 30, 1908.

NOTE.—Since Professor Lyman Clark has most courteously transmitted this letter through me, may I express my satisfaction that at any rate four of us have come to an agreement about *Cidaris* s. str.? Further, I see no objection to the adoption of *Eucidaris*, Pomel, with genotype *E. metularia*. We may well suppose that the "trois espèces vivantes" of Pomel's list were *Cidaris metularia*, *C. tribuloides*, and *C. thouarsi*. Let us hope that Professor Döderlein will give up *Cidarites*, and return to his earlier choice—*Eucidaris*.

F. A. BATHER.

Brit. Mus. (Nat. Hist.),  
10th Dec., 1908.



London Stereoscopic Co. imp.

EOCIDARIS AND MIOCIDARIS.





# THE ANNALS

AND

## MAGAZINE OF NATURAL HISTORY.

[EIGHTH SERIES.]

No. 14. FEBRUARY 1909.

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XIII.—*New Species of Indo-Malayan and African  
Lepidoptera.* By Colonel C. SWINHÖE, M.A., F.L.S., &c.

### Family Hesperidæ.

#### *Celænorhinus zea*, nov.

♀. Uniform dark olive-brown above; palpi below, pectus, legs beneath, and segmental bands on the underside of the abdomen greyish ochreous: fore wings with a broad discal band much as in *C. dhanda*, Moore, but cut short and square on vein 2, with a small spot attached on the middle which runs below the vein, the band, which does not quite touch the costal line, white, tinged with ochreous and semihyaline; three subapical whitish dots, the middle dot inwards and attached to the upper dot, which is minute: hind wings without markings. On the underside of the fore wings the discal band is produced to the hinder angle (which it does not quite touch), the extension being caused by an adjoining large spot of the same colour as the rest of the band: hind wings without markings: antennæ broken.

Expanse of wings  $1\frac{6}{10}$  inch.

Khasia Hills; one example.

Apparently a perfectly distinct form; the band on the underside of the fore wings is very similar to the band on the underside of the fore wings of *C. affinis*, Elwes, which I also

have from the same locality, but the upperside is quite different, and the subapical dots of that species are almost linear and joined together.

*Parnara entebbea*, nov.

♂ ♀. Of a uniform very dark blackish-brown colour, very nearly pure black; fore and middle legs and hind tarsi orange-ochreous beneath: fore wings above with two discal hyaline spots, the lower the larger, slightly produced outwards at its lower end; three small subapical hyaline spots, the middle spot inwards; in the female there is an indistinct discal lower minute spot. On the underside, which is as black as the upperside, the inner marginal space of the fore wings is broadly pale, the spots are as above; no other markings above or below.

Expanse of wings  $1\frac{1}{2}$  inch.

Entebbe, Uganda; 7 ♂, 1 ♀.

There is a male from Uganda unnamed in the B. M.; in one example the middle subapical spot is absent.

*Hasora almea*, nov.

♂. Of a uniform dark olive-brown colour above; palpi on the underside with white and brown hairs, the collar below almost pure white; body and legs brown; abdomen with thin whitish segmental bands beneath: fore wings above with a rather prominent, semihyaline, white, central discal spot in the interspace between veins 3 and 4; no other markings above; the fore wings below with a broad metallic blue-green costal band from the base to one-third from the apex, the interior of the wing filled up with an acutely cut triangular dark brown space, without any pale line limiting its outer side, the discal spot smaller than it is above, and another and still smaller white spot below it and on the inner side of it: hind wings with a very thin and straight discal white line, not touching the costa and slightly thickened before the anal angle, where it is broken by the upper portion of the large black patch; a thin white anteciliar short streak running from the black patch; all the wing from the band to the base thick with metallic blue-green scales.

Expanse of wings  $1\frac{9}{10}$  inch.

Brunnei, N. Borneo; one example.

The hind wing on the underside is marked very similarly to *H. meala*, Swinhoe, but that form has no anal black patch and is of a different shape; *almea* has the shape of *chromus*.

*Hasora amboinensis*, nov.

♂ ♀. Both sexes of a uniform dark olive-brown colour above, without any markings; palpi below and pectus greyish white, thorax and abdomen below with greyish-white hairs: fore wings below with a metallic blue-green broad costal band from the base to one-third from the apex; the inner space of the wing dark brown, limited by a transverse pale shade from the costa to the middle: hind wings with a broad, white, nearly straight discal band, from the costa near the apex to the anal angle above the large black anal patch; it is nearly even for two-thirds, then narrows, and slightly enlarges again above the patch, is then broken, and has a white spot on the abdominal margin adjoining the black patch, and a short thin anteciliar white streak; the whole of the portion of the wing on the inner side of the band is metallic blue-green, and there are a few blue-green scales outside the band.

Expanse of wings  $1\frac{9}{10}$  inch.

Amboina; one pair.

A female is in the B. M. mixed up with *H. alexis*, Fabr., but its shape is quite different from that of *alexis*. Watson very properly separates *alexis* from *chromus*, Cram., and it is difficult to understand why they are mixed up together in the B. M. collection over the name *alexis* with other forms into what might be called a real "job lot," merely on account of their superficial resemblance to one another.

## Family Plutodidæ.

*Synegia secunda*, nov.

♂. Pale yellow; palpi orange above, an orange spot on the frons: fore wings with an olive-brown stripe along the costal margin, a black dot at the end of the cells of both wings; fore wings with antemedial and postmedial transverse thin bands, continued across the hind wings as subbasal and medial bands; a submarginal line, continued across the upper disc of the hind wings, where it runs into a thick nearly straight band which crosses the disc of the wing from above the anal angle to the outer margin below the apex; all the bands olive-brown, and the spaces between the bands on both wings sparsely irrorated with olive-brown atoms; black marginal dots on both wings. Underside much paler, no irrorations, but the bands more or less faintly indicated.

Expanse of wings  $1\frac{1}{10}$  inch.

Padang, Sumatra; one example.

Family **Ennomidæ**.*Hypochrosis mimaria*, nov.

♂. Shafts of the antennæ whitish, plumes black: wings above and thorax dark olive-green grey, costa of hind wings broadly pale pink: fore wings with a broad transverse greenish-black band edged with whitish, extending upwards from the hinder margin a little before the middle, expanding above its middle, with a pale excavation on its upper edge below the costa, which it does not reach; its inner edge is slightly curved inwards above its centre and the outer edge is deeply sinuous: on the hind wing there is a very large oval-shaped greenish-black patch, edged with whitish near the abdominal margin, extending from below the middle to the base, which it does not reach; both wings are irrorated with dark greenish atoms and the cilia are pinkish grey. On the underside the body, legs, and wings are bright greyish pink; the fore wings broadly pale on the hinder margin, and there are indications of a broad brownish band from the middle near the hinder margin, gradually narrowing upwards to the apex of the wing.

Expanse of wings  $1\frac{6}{10}$  inch.

Padang, Sumatra; one example.

Belongs to the *festivaria* group.

*Hypochrosis lubricata*.

*Omiza lubricata*, Warren, Nov. Zool. vi. p. 65 (1899).

*Hypochrosis hiresia*, Swinhoe, Ann. & Mag. Nat. Hist. (7) viii. p. 125 (1901).

Flores.

I overlooked Warren's description when describing this Geometer.

Family **Macariidæ**.*Calletæra distorta*, nov.

♂. Ochreous grey, uniform in coloration above; markings above much as in the common Indian *Luxiaria obliquata*, Moore; the shape of the hind wing, however, instead of being rounded, is convex below the middle, making the anal angle somewhat produced. On the underside the bands are somewhat similar, but the discal band of the hind wings is distorted, corresponding to the shape of the outer margin; the fore wings are uniformly greyish brown, with a large pale, nearly white, apical patch; the hind wings are pale greyish

ochreous, making the bands very prominent; marginal line on both wings below dark brown, with slight outer projections at the vein-ends; cilia nearly white; the second free vein of the hind wings bends downwards at its middle and terminates at the same point as vein 1 near the anal angle.

Expanse of wings  $1\frac{1}{2}$  inch.

Entebbe, Uganda; one example.

#### Genus LOXOTEPHRIA.

*Loxotephria*, Warren, Nov. Zool. xii. p. 13 (1905).

#### *Loxotephria padanga*, nov.

♂. Dark pinkish grey, the fore wings darker than the hind wings and of a red tint; both wings irrorated with white, the closeness of the irrorations making the costal and outer portions more or less smeared with white: fore wings with an indistinct, antemedial, straight, transverse line; both wings with postmedial and submarginal straight lines, the former commencing from the abdominal margin a little beyond the middle and the latter from near the anal angle, both extended to the apex of the fore wings, all the lines dark dull red and the cilia of the same colour. The underside is much paler and has a strong ochreous tinge, and is irrorated with pink, and both wings are crossed by parallel red straight lines, medial and discal, and there is some dark suffusion towards the outer margin of the fore wings and a large suffused red subapical spot.

Expanse of wings  $1\frac{1}{10}$  inch.

Padang, Sumatra; one example.

#### Family Boarmiidae.

#### *Ectropis discolor*, nov.

♂. Dull pale ochreous; palpi brown above; some brown dots on the upperside of the shafts of the antennæ; abdomen with a black tuft of rather long hairs beneath, near the base: wings rather thickly irrorated and smeared in parts with olive-brown, leaving a somewhat indistinct paler central band; four transverse olive-brown lines across both wings at equal distances apart, all sinuous and mostly outwardly dentated; a more indistinct submarginal line and black marginal spots. Underside pale, nearly whitish; costa of fore wings with blackish spots; a very broad, transverse, pale blackish-brown discal band, slightly narrowing downwards, with indications of its continuation across the hind

wings; a brown lunule at the end of each cell and black marginal spots.

Expanse of wings  $1\frac{1}{2}$  inch.

Padang, Sumatra; one example.

### Family Geometridæ.

#### *Lophochlora annuligera*, nov.

♂. Antennæ and frons orange; head, thorax, and wings above and below pale green; abdomen, thorax below, and legs ochreous white: wings thinly clothed; costal line of fore wings orange; a round white spot, each containing a black lunule, at the end of the cell of each wing; a large white spot in the disc above the middle; various other smaller white spots here and there on the outer portion of the fore wings, two on the hinder margin and one at the apex of the hind wings; cilia of both wings white, spotted with orange.

Expanse of wings  $1\frac{2}{10}$  inch.

Entebbe, Uganda; one example.

### Family Sterrhidæ.

#### *Synelis acutangulata*, nov.

♂. White, costal line of fore wings ochreous brown; a black dot at the end of the cell of the hind wings; two ochreous-grey lines across both wings, the first medial, sinuous, and indistinct, the other acutely angulated: hind wings with a similar submarginal line; both wings with black marginal dots in the interspaces. Underside pure white, without markings.

Expanse of wings  $1\frac{1}{10}$  inch.

Entebbe, Uganda; three examples.

#### *Induna pura*, nov.

♂. Upperside of the shafts of the antennæ white, lower side and pectinations ochreous grey; tarsi ochreous grey; otherwise this insect is pure white above and below, without any markings.

Expanse of wings 1 inch.

Entebbe, Uganda; three examples.

### Family Callidulidæ.

#### *Callidula nemoga*, nov.

♀. Of a uniform dark ochreous-brown colour; palpi

beneath, pectus, legs, and abdomen beneath orange: fore wings with a broad discal orange band from the middle of costa to the hinder angle, stopping short of both; on the underside this band reaches the costa and runs narrowly along it to the base; a small suffused ochreous mark at the anal angle of the hind wings.

Expanse of wings  $1\frac{4}{10}$  inch.

New Guinea, Milne Bay (type in B. M.), and one female from the same locality in my collection.

*Cleis atata*, nov.

♂ ♀. Upperside: body and wings dark blackish brown: fore wings with a large orange-ochreous patch on the outer margin above the hinder angle, with its inner side rounded: hind wings with a broad orange-ochreous marginal band, which covers half the wings; cilia of both wings black. Underside: wings black; an ochreous streak on the costa of fore wings at the base, which runs into an ochreous subcostal spot in the middle; a large ochreous patch on the outer margin above the hinder angle, with its inner edge produced into an acute angle; an ochreous spot in the male near the point of the angle, which is absent in the female, but there are two or three small ochreous marks below the subcostal spot; antennæ below marked with ochreous; palpi, body below, and legs ochreous, the legs with black stripes.

Expanse of wings, ♂  $1\frac{5}{10}$ , ♀  $1\frac{6}{10}$  inch.

Ké Island; one pair.

Somewhat like *C. aureola*, Swinhoe, from Obi, and *C. posticalis*, Guérin, from Port Praslin, but the former has an ochreous discal band on the fore wings below and the latter has the ochreous on the fore wings below in the disc away from the outer margin.

Family Limacodidæ.

*Scopelodes anthela*, nov.

♂. Antennæ, palpi, thorax, and fore wings glossy greyish brown; palpi with the brush whitish, some black hairs at the tips; abdominal half of hind wings orange-ochreous, the outer half greyish brown, paler than the fore wings; cilia of both wings whitish, no markings: abdomen orange-ochreous, with dorsal black bands on the last five segments; anal tuft black: wings below much paler than they are above, and all the veins whitish: body orange-ochreous; abdomen with a duplicate row of black spots, the space between whitish; legs greyish brown, with white hairs, the tarsi with black tips.

♀. Much paler; in some examples the fore wings are almost ochreous; in all the examples the hind wings are entirely more or less ochreous; the spots on the abdomen below are similar, but above they are more or less obsolescent.

Expanse of wings, ♂ 2, ♀  $3\frac{2}{10}$  inches.

Singapore; 10 ♂, 3 ♀ in the B. M. and in my museum (types in B. M.).

Sandakan, 1 ♂ in B. M.

Java; 1 ♀ in my coll.

### Family Sarrothripidæ.

#### *Hyblæa asava*, nov.

♂. Upperside: body and wings dark olive-brown; abdomen with indistinct whitish segmental bands: fore wing with a blackish medial thin band, straight from hinder margin to end of cell, where it is acutely angled to centre of costa, with black markings, and there are also some black markings near the apex of the wing: hind wing with three very large, almost square, orange-ochreous spots, one below the middle of the costa, another below it and a little outside of it in the disc, and the third towards the anal angle; there are also some pale ochreous hairs on the abdominal area of the wing and an ochreous mark at the base. On the underside the wings are marked in a very curious manner; the fore wing has two short yellowish-white streaks at the base, two thick ones from the costa (one central and the other outer) running halfway down the wing; the hinder margin is broadly whitish: the hind wing is all white, tinged in parts with yellow, with a blackish marginal border with brown dots above its inner side; a black streak upwards and downwards from the base; a large black ringlet from the middle of the costa, with a very small ringlet and a curled mark at its lower end: body yellow; legs yellow streaked with black.

Expanse of wings  $1\frac{1}{2}$  inch.

Mindoro, Philippines (type in B. M.).

### Family Quadridæ.

#### Genus LEISTERA, nov.

Antennæ smooth, as long as two-thirds of the costa; palpi smooth, reaching vertex of head; thorax somewhat hairy: fore wing with long flocculent hairs from median vein below, filling up the entire cell; venation of both wings as in *Catephia*: fore legs with thick rather long hairs; mid and hind legs with fans of long hairs on femora and tibia, the



former with one pair of terminal spurs, the latter with two, the outer twice as long as the inner.

Type *L. (Catephia) pulchriatrigata*, Bethune-Baker, from New Guinea (Nov. Zool. xiii. p. 253, 1906).

*Ophiusa roulera*, nov.

♂. Antennæ black; palpi, frons, head, and thorax above and below bright ochreous; abdomen and wings purplish black; fore wings with an erect white medial band, with a round small outward projection above the middle, and inwards in the middle, the lower half of the band broader than the upper; the band is not so broad as in *O. schraderei*, Felder, from Australia, and is without the two black spots that are so conspicuous in that species; a white mark on the costa outside the band and some white flecks on various parts of the wing: hind wings without markings; cilia of both wings pure white. On the underside the wings are uniformly black, cilia as above; legs ochreous; tarsi brown, with whitish rings.

Expanse of wings  $1\frac{7}{10}$  inch.

Ké Island; one example.

Can be easily distinguished from *O. schraderei*, Felder, or *O. latizona*, Butler, by its unmarked pure white cilia; in both those species the cilia are variegated with large uniform black patches.

Genus UGANA, nov.

♂. Palpi upturned, long, second and third joints of similar lengths, first about half as long as the others, all of about the same thickness, covered with short bristles, the end of third joint blunt; antennæ two-thirds the length of the costa, with short bristly bipectinations of even length almost close up to the tips, where they shorten suddenly; mid tarsi with one pair of spurs (a very long and a very short one), hind tarsi with two pairs; body slender; abdomen extending beyond the hind wings and curving upwards: fore wings with costa a little bent towards the apex, hinder margin nearly as long, slightly concave in the middle, outer margin somewhat rounded: hind wings with the outer abdominal margins rounded; veins 3 and 4, and 5, 6, and 7 from the lower and upper angles of the cell; hind wings with vein 2 from one-third before end of cell, 3, 4, and 5 from lower end, 6 and 7 from upper end.

*Ugana piana*, nov.

♂. Uniform olive-brown, paler and shaded with ochreous beneath; reniform small and pale, orbicular formed by two curved lines, which in some examples are joined at both ends; a straight black line from the abdominal margin one-third from base to one-third from apex of fore wings, where it is sharply angled inwards on to the costa, and a waved and somewhat outwardly dentated black line just outside the straight line; a blackish suffused and indistinct discal band somewhat close to the margin, which contains a row of whitish dots on the veins; the dots run across both wings, but the blackish shade is confined to the fore wings; some very minute whitish dots close to the margin; marginal line black; cilia black, with a whitish basal line. Underside with two outwardly curved brown medial lines across both wings and a pale thick discal line.

Expanse of wings 2 inches.

Entebbe, Uganda; five examples.

There are two examples in the B. M. unnamed from Uganda and Sierra Leone, Quadrifid Drawer 42.

XIV.—*The Collections of William John Burchell, D.C.L., in the Hope Department, Oxford University Museum.*

IV. *On the Lepidoptera Rhopalocera collected by W. J. Burchell in Brazil, 1825-1830.* By J. C. MOULTON, of Magdalen College, Oxford.

[Continued from p. 20.]

VI. *NYMPHALINÆ* (continued).

*Phyciodes hera*, Cram., = *ithra*, Kirby.

28. 10. 25. = 1076. Minas Geraës. (As 635.)

30. 10. 25. = 1077. „ “ (In the forest). On the N.E. side of the arraial of São João de Nêpomucéna.”

Bz. + 6. 11. 25. = 1078. “At Capitaõ Leite’s.” Minas Geraës.

6. 11. 25. 3 = 1079, 1080, 1081. Minas Geraës. “At Capitaõ Leite’s.”

Westwood's list only mentions two specimens of this date besides 1078.

Nos. 1080 and 1081 are unfortunately in a very bad state of preservation, the former being represented by a fore wing and hind wing, while only the hind wing of the latter now remains.

10. 11. 25. 2 = 1082, 1083. Minas Geraës.

10. 4. 27. = 1084. Near S. Paulo. A note dated 9. 4. 27 says that "These and the insects about this date were killed in cachaça and a little corrosive sublimate."

25. 8. 27. 2 = 1085, 1086. Ollaríá to Rio Pardo.

1086 bears Westwood's number N. 81.

Bz. + p. 26. 8. 27. = 1087. R. Pardo to Cubatáo. (As 735.)

27. 8. 27. 3 = 1088-1090. R. Pardo to Retiro.

Bz. + 27. 8. 27. = 1091.

Westwood's list adds another specimen captured on this date.

24. 10. 27. = 1092. Meiaponte to S. Joaquim (Joaq. Alves).

30. 10. 27. = 1093. Sapezal to Conceição.

5. 3. 28. = 1094. Goyaz. "Caught by the rio Vermelho, near the Carioca Aqueduct; by U[ongo]."

Bz. a. 24. 8. 28. = 1095. Retiro. "All at the rivulet near the house at Retiro."

Westwood's list (N. 81) gives an individual captured a. 24. 8. 27, which is probably a copyist's mistake for the date of 1095. He also mentions "one without a number."

*Phyciodes teletusa*, Godt.

904. I. 25. 10. 25. ♀ = 1096. Minas Geraës. "*P[apilio]*. At Discoberto, near João Pedro's house.

This specimen bears Westwood's number N. 87.

28. 10. 25. ♀ = 1097. Minas Geraës. (As 635.)

4. 11. 25. ♀ = 1098. Minas Geraës. (As 559.)

9. 3. 26. ♂ = 1099. Rio de Janeiro. This specimen bears Westwood's number "Nym. 89," and is the only one under this number.

Westwood's list (N. 87 and N. 89) agrees.

*Phyciodes sejona*, Schaus.

6. 8. 27. = 1100. "Campinas." Between Mogy Mirim and S. Paulo.

This specimen bears Westwood's number "Eryc.<sup>1a</sup> 70,"

and is given in his list of Erycinidæ. Unfortunately it is in a very bad state of preservation, so that its determination cannot be quite certain. However, there are traces of certain markings on the underside which have led to its inclusion in this series.

28. 10. 27. 2 = 1101, 1102. S. Joaquim to Sapezál.

30. 10. 27. 3 = 1103, 1104, 1105. Sapezál to Conceição.

Bz. 30. 10. 27. = 1106. Sapezál to Conceição.

25. 8. 28. = 1107. Retiro to Goyavéira. "On the road."

This specimen bears Westwood's number "Nym. 91"; his list agrees.

Professor E. B. Poulton, F.R.S., and Mr. R. Trimen, F.R.S., have very kindly examined these specimens, and they agree that they conform to Schaus's description of *P. sejona*. Unfortunately the type is in America, so that comparison has been impossible. The species is remarkably near *P. teletusa*, and, in fact, may turn out eventually to be only a more northern form of it. The whole genus is composed of such variable species that it is most desirable that breeding should be undertaken on a large scale to establish each species on a satisfactory basis.

*Phyciodes burchelli*, sp. n.

Bz. 24. 10. 27. = 1108. Meiaponte to S. Joaquim (Joaq. Alves). The type of the species.

28. 10. 27. = 1109. S. Joaquim to Sapezál.

30. 10. 27. = 1110. Sapezál to Conceição. This specimen bears Westwood's number N. 90.

25. 8. 28. 3 = 1111, 1112, 1113. Retiro to Goyavéira. "On the road."

Westwood's list (N. 90) agrees.

This species is unnamed in the British Museum, where it is placed next to *P. teletusa*; the Godman-Salvin Collection contains a long series also unnamed from Chapada and South Brazil, and a few specimens exist in the collection of Mr. H. Grose-Smith.

(1108.) *Upperside*. Ground-colour dark fuscous-brown; a wide orange-tawny band from inner margin of hind wing to near costa of fore wing, broken at apex. *Fore wing*: from inner margin an orange-tawny band, the breadth of which is a little less than half the length of the inner margin, to a little above the third median nervule, leaving externally a narrow hind-marginal border of ground-colour, in middle of which are three orange-tawny lunular markings situated respectively

between the submedian nervure and the first median nervule, between the first and second median nervules, and just above the third median nervule. The orange-tawny band is broken off about the third median nervule by a narrow streak of ground-colour running obliquely from costa to centre of hind margin and widest at costal end, leaving an apical marking of orange-tawny which runs from the subcostal nervure to the second median nervule; it is widest in centre and is roughly triangular in shape. A faint orange spot at exterior end of cell. Cilia of the ground-colour. *Hind wing*: orange-tawny band of fore wing continued across hind wing, superiorly slightly broader and occupying a good half of the hind wing, and extending to inner margin, leaving a little wider hind-marginal border of ground-colour than in the fore wing. Exterior edge of orange band is marked by a row of faint ground-colour lunular markings which merge into the hind-marginal border at second subcostal nervule; hind-marginal border itself traversed by a series of linear orange-tawny lunules, one in each internervular space, the largest being above the first subcostal nervule. Cilia as in fore wing. Hind margin crenelated.

*Underside*. Light tawny ground-colour very much paler in hind wing, with brown subapical and hind-marginal markings. *Fore wing*: tawny ground-colour slightly darker towards middle and end of cell, a little beyond which is a dark brown oblique bar from end of first subcostal nervule to hind margin at end of second median nervule; outer edge of bar straight, inner edge concave, the hind-marginal end broadening out over anal angle. External to this bar a light fulvous one, almost broken in middle, the outer edge of which is irregularly defined, and wider towards hind margin. This is succeeded by a lilac-brown apical patch, with a short oblique narrow whitish mark on the costa. A narrow lunulated brown-fulvous edging to hind margin. Central portion dull orange-fulvous, corresponding to orange-tawny band of upperside. The apical markings are variable. *Hind wing*: basal part appears slightly darker through presence of very delicate and irregular light brown transverse lines. A hind-marginal band of lilac-brown, growing lighter towards each extremity about first subcostal nervule and about first discoidal nervule. In this band a connected series of whitish lunules from costa to anal angle; on inner edge of band five small dark brown inwardly pale-margined spots, of which the two middle (between the radial and second median nervule) are largest.

Exp. al. 31-36 mm. (type 33 mm.).

Type, specimen 1108 in Hope Department, University Museum, Oxford.

*Distribution* (based on six specimens taken by Burchell and on a series in Godman-Salvin Collection). Rio Tocantins, province of Goyaz; Chapala and South Brazil. In the British Museum there are five specimens (1 ♂ from Nauta, Upper Amazons, Peru, 3 ♂ 1 ♀ from Ecuador) which are very near it, if not actually the same species.

Compared with *P. cluvia*, G. & S. (Biol. Centr.-Amer., Rhopal. pl. xxi. figs. 21, 22), on the upperside *burchelli* bears a close resemblance to it, but the tawny lunular line in the hind margin of the hind wing in *burchelli* is wanting in *cluvia*, and the hind-marginal band of fuscous brown in *cluvia* does not reach the anal angle as in *burchelli*. The undersides are remarkably different: *cluvia* has a unicolorous tawny brown hind wing, and the fore wing is of the same colour except for two orange-tawny patches.

*P. teletusa*, on the other hand, is nearly related to *burchelli* on the underside as well as the upper.

*Phyciodes* <sup>2</sup>*claudina*, Esch.

10. 1. 26. = 1114. Rio de Janeiro. (As 670.)  
 31. 1. 26. = 1115. " (As 474.)  
 1. 3. 26. = 1116. " (As 960.)  
 7. 3. 26. 2 = 1117, 1118. Rio de Janeiro. "At Catombí."  
*Bz.* + 7. 3. 26. = 1119. " "  
 10. 3. 26. 2 = 1120, 1121. " "  
 13. 3. 26. = 1122. " "  
 20. 3. 26. 2 = 1123, 1124. Rio de Janeiro. "Along the Carioca Aqueduct."  
 1123 bears Westwood's number "Nymph. 85."  
*Bz.* 20. 3. 26. = 1125. Rio de Janeiro. "Along the Carioca Aqueduct."  
 3. 4. 26. = 1126. Rio de Janeiro. "Along the Carioca Aqueduct."

Westwood's list (N. 85 and N. 86) agrees. He placed this species and the succeeding two all together under these two numbers.

*Phyciodes* *liriopæ*, Gram.

- Bz.* 343. I. [14. 10. 25.] = 1127. Minas Geraës. "P[apilio]."  
 Parahíba (on Oct. 12).  
*Bz.* 345. II. [15. 10. 25.] 2 = 1128, 1129. "P[apilio]. At the Discobérto do Antonio Velho."

- Bz. + 918. II. 25. 10. 25. 2 = 1130, 1131. Minas Geraës.  
 "P[apilio]. At Discoberto, near João Pedro's house."
- Bz. + 1005. I. 27. 10. 25. = 1132. Minas Geraës. "P[a-  
 pilio]. At San João de Nepomucéna and on the road  
 from Discoberto."
- Bz. 12. 3. 26. = 1133. Rio de Janeiro. "Aqueduct."  
 28. 10. 27. 3 = 1134, 1135, 1136. S. Joaquim to Sapezál.  
 30. 10. 27. 4 = 1137-1140. Sapezál to Conceição.
- Bz. + 30. 10. 27. = 1141.
- a. 24. 8. 28. = 1142. Retiro. "All at the rivulet near the  
 house at Retiro." (As 844.)  
 This specimen bears Westwood's number "Nym. 86."
- Bz. + 26. 5. 29. = 1143. "Silva." Between Itabóca and  
 Baião; north of the Falls of Guariba.
- p. 31. 5. 29. = 1144. Baião.
- p. 31. 5. 39. = 1145. "Sylva." This date must be a slip  
 for 31. 5. 29. Baião.
- It is, perhaps, worthy of note that "39" for "29" is the  
 only mistake of the kind so far detected among some 1200  
 specimens labelled by Burchell. A second will be found on  
 1221.
20. 9. 29. 2 = 1146, 1147. Pará. S.E. of S. Jozé.  
 Westwood's list (N. 85 and N. 86) agrees.

*Phyciodes fragilis*, Bates.

- a. 24. 8. 28. = 1148. At Retiro. "All at the rivulet near  
 the house at Retiro." (As 844.)  
 Westwood's list (N. 86) agrees, though he placed it in his  
 list of the preceding species.

*Phyciodes pedrona*, sp. n.

920. I. 25. 10. 25. = 1149. Minas Geraës. "P[apilio].  
 At Discoberto, near João Pedro's house."

The type of the species.

The specimen bears Westwood's number (N. 95); his list  
 agrees.

A single specimen exists, unnamed and without any data,  
 in the B. M. collection.

(1149.) *Upperside*. Dark fuscous-brown ground-colour  
 relieved with tawny-yellow spots, an irregular line of which  
 crosses the hind wing from costa to inner margin. *Fore*  
*wing*: from costa to inner margin a broken line of six  
 tawny-yellow spots; the first is situated on the costa about  
 the end of the second subcostal nervule, the next two between

upper radial and third median nervule; the remaining three continue the line 1 millimetre nearer the base, one spot below each median nervule, the middle one being slightly the largest: this line is succeeded externally by a similarly irregular line of five smaller spots; the first is very faint and is placed between the first and second radial nervules. Close to hind margin between third and second median nervules a tawny yellow spot. Basal portion relieved by smaller orange-tawny spots. Cilia of ground-colour. *Hind wing*: from centre of costa to a point two-thirds the length of inner margin a concave line of seven internervular tawny-yellow spots. Halfway between this and hind margin a similar row of six small dark brown inwardly tawny-margined spots—no spot on costa in this series. Not far from hind margin a row of seven almost linear tawny-yellow lunules. A few small orange-tawny spots in basal region. Cilia as in fore wing.

*Underside*. Bright tawny-yellow ground-colour, marked by dark brown patch between median nervules in fore wing. *Fore wing*: from a point on costa between first and second subcostal nervules to third median nervule a narrow pale ochreous macular stripe, continued to inner margin 1 millimetre nearer to base, broadening at inner margin towards anal angle. This stripe is succeeded by a large apical patch of slightly richer tawny yellow. Below this and between median nervules a dark fuscous-brown patch prolonged upwards by two similarly coloured spots between radial nervules, and downwards by a small spot below first median nervule. A line of three pale ochreous spots parallel to hind margin from below second radial nervule to below second median nervule; the middle one occupies centre of fuscous-brown patch. External to patch and bordering on hind margin between third and second median nervules a large pale ochreous spot. A faint hind-marginal border of dark tawny lunules. *Hind wing*: basal region pale ochreous, with irregular broken sub-basal and median indistinct yellow macular streaks. Exterior region tawny yellow, relieved by a line of small dark fulvous inwardly yellow-margined internervular spots from apex to anal angle. Hind marginal row of fulvous inwardly yellow-margined lunules. Cilia of slightly lighter ground-colour than on upperside.

Exp. al. 25 mm.

Type, specimen 1149 in Hope Department, University Museum, Oxford.

*Distribution* (based on this single specimen). The southern part of Minas Geraës, near Rio.

The upper surface of *P. pedrona* is near to that of *P. tharos*,



Drury. Compared with a single specimen in the Hope Collection from Mexico, *tharos* is 5 mm. larger in expanse of wings; the spots of the hind wing are larger, and two large spots appear in the basal region which are unrepresented in *pedrona*. The fore wing of *tharos* differs considerably in having a well-marked and regular submarginal row of six spots, while *pedrona* has a faint and irregular series of five; *tharos*, again, has a pale oblique streak beyond cell and another broken pale oblique streak from cell to inner margin, both of which are absent in *pedrona*. There are also more fulvous markings at base in *tharos*. On the underside of fore wing three fuscous-brown markings appear in *tharos*, one along the outer edge of cell, another just above anal angle, and a third in centre of inner margin, in contrast to the single submedian fuscous-brown marking in *pedrona*. The two species are, on the whole, very markedly different.

In the British Museum a single specimen of *pedrona* is placed next to *P. simois*, Hew. (Pernambuco and "Brazil"). In *simois* a larger black marking is apparent behind the lower part of the hind margin; but rows of white spots take the place of the pale yellow spots in *pedrona*, and in the fore wing of *simois* there are white and rufous spots at the apex and outer margin which are absent in *pedrona*.

*Eresia eunice*, Hew.

16. 6. 29. = 1150. Pará.

29. 7. 29. = 1151. Pará.

Specimen 1151 bears Westwood's number A. 5 and "*Eresia Esora*"; his dates agree, but he gives this species the name of *Eresia esora* and places it among his list of *Acræinæ*.

*Eresia langsdorffi*, Godt.

28. 10. 25. = 1152. Minas Geraës. (As 635.)

This specimen bears Westwood's number A. 6, and "*Eresia Langsdorffi*."

29. 10. 25. = 1153. Minas Geraës. "In the forest on the S.E. side of S. João de Nêpomucéna."

4. 11. 25. = 1154. Minas Geraës. (As 559.)

This specimen bears Westwood's number A. 6.

10. 11. 25. = 1155. Minas Geraës.

6. 12. 25. = 1156. Rio de Janeiro. On the Corcovádo Mountain. (As 667.)

8. 2. 26. = 1157. Organ Mountains. (In a ride to the Cattle Pounds and the Milho Roça.)

1. 12. 26. = 1158. Santos.

Westwood's list omits 1155 and 1156, but otherwise agrees both in dates and names, although this species is also placed, as A. 6, among the *Acræinæ*.

*Eresia perna*, Hew.

28. 10. 25. ♂ = 1159. Minas Geraës. (As 635.)

This specimen bears Westwood's number A. 7, and "*Perna*."

29. 10. 25. = 1160. Minas Geraës. In the forest on the S.E. side of S. João de Nêpomucéna.

Westwood's dates and names agree. This also appears, as A. 7, in his list of *Acræinæ*.

*Eresia clara*, Bates.

18. 12. 29. = 1161. "*Silvatica*." Pará. Rivulet above Arsenal.

This specimen bears Westwood's number (N. 88), and his list agrees.

*Euptoieta hegesia*, Cram.

26. 1. 26. 3 = 1162, 1163, 1164. Rio de Janeiro. Morro de Ladéira and Catombý. (As 672.)

28. 3. 29. = 1165. Porto Real (Nacional).

Bz. + 2 p. 28. 5. 29. 3 = 1166, 1167, 1168. A Campo Bank; between Itabóca and Baião.

2 p. 28. 5. 29. = 1169. A Campo Bank; between Itabóca and Baião.

Westwood's list (N. 63) gives one more specimen of this last date, but otherwise agrees. He named it "*Atella Hegesia*." As none of the above specimens bear Westwood's number, we may conclude that it was on the missing specimen.

*Agraulis (Dione) vanillæ*, Linn.

Bz. + 902. I. 25. 10. 25. = 1170. Minas Geraës. "*P[apilio]*". At Discoberto, near João Pedro's house."

This specimen bears Westwood's number A. 20. Given in Westwood's list.

4. 11. 25. = 1171. Minas Geraës. (As 559.)

6. 12. 25. = 1172. Rio de Janeiro. On the Corcovádo Mountain. (As 667.)

Bz. + a. 25. 2. 26. = 1173. "Frexais" on the Brazilian

label and "Frexaes" on the English label. Organ Mtns. Burchell sometimes wrote "Frexaes" for "Frechál."

*Bz.* + a. 25. 2. 26. = 1174. "Frixais" on the Brazilian label and "Frexal" on the English label. Organ Mtns. Given in Westwood's list.

a. 25. 2. 26. = 1175. "Frexaes." Organ Mtns.

p. 25. 2. 26. 4 = 1176-1179. Organ Mtns. Between Frechál and Magé. Burchell sometimes wrote "Frexaes" for "Frechál." One specimen given in Westwood's list.

*Bz.* + p. 25. 2. 26. = 1180. Between Frechál and Magé.

1. 3. 26. = 1181. (As 960.)

12. 3. 26. = 1182. Rio de Janeiro. "Aqueduct."

13. 3. 26. = 1183. Rio de Janeiro.

*Bz.* 13. 3. 26. = 1184. Rio de Janeiro.

20. 3. 26. = 1185. Rio de Janeiro. "Along the Carioca Aqueduct."

*Bz.* 27. 4. 27. = 1186. Vicinity of S. Paulo.

27. 4. 27. = 1187. Vicinity of S. Paulo.

*Bz.* 9. 6. 27. = 1188. Vicinity of S. Paulo.

19. 6. 27. = 1189. Vicinity of S. Paulo. Given in Westwood's list.

*Bz.* + 19. 7. 27. = 1190. Vicinity of S. Paulo. Given in Westwood's list.

29. 1. 29. = 1191. Porto Real (Nacionale). "Caught on the bank of the Tucantins, while measuring the baseline."

*Bz.* 29. 1. 29. = 1192. Porto Real (Nacionale). "Caught on the bank of the Tucantins, while measuring the baseline."

*Bz.* 16. 2. 29. = 1193. Porto Real (Nacionale). "Páviliones (3) caught on the flowers of a Malva in the backyard." (See 660.) Given in Westwood's list.

*Bz.* 19. 2. 29. = 1194. Porto Real (Nacionale).

19. 2. 29. = 1195.

4. 3. 29. = 1196. " "

7. 3. 29. = 1197. " "

*Bz.* 23. 3. 29. = 1198. " "

27. 3. 29. = 1199. " "

Westwood's list (A. 20) only gives six specimens in the whole of the above series. He placed it among the *Acræinæ* and named it "*Vanilla*." Probably a supplementary list exists on a small slip of paper, as in the case of *Agraulis juno*, but this has yet to be found.

*Agraulis (Dione) juno*, Cram.

*Bz.* 553. V. [19. 10. 25.] 4 = 1200-1203. Minas Geraës.  
 "Papilionida." At Discoberto, Oct. 15 and 21.

Westwood's list, in his own handwriting, gives five, indicating that one specimen has disappeared or has lost its label.  
*Bz.* + 819. I. 23. 10. 25. = 1204. Minas Geraës. "Papilio." At Discoberto, Oct. 22 and 24.

This specimen bears Westwood's number A. 22.

*Bz.* + 901. II. 25. 10. 25. 2 = 1205, 1206. Minas Geraës.  
 "P[apilio]. At Discoberto, near João Pedro's house."

30. 10. 25. = 1207. Minas Geraës. "(In the forest). On the N.E. side of the arraial of São João de Nepomucena."

4. 11. 25. 2 = 1208, 1209. Minas Geraës. (As 559.)

The list in Westwood's handwriting, which is probably perfect, gives three specimens of this date.

*Bz.* + 7. 11. 25. = 1210. Minas Geraës.

16. 2. 26. 2 = 1211, 1212. Organ Mountains.

29. 1. 27. = 1213. Vicinity of S. Paulo.

24. 10. 27. = 1214. Meiaponte to S. Joaquin (Joaq. Alves).

*Bz.* + 28. 7. 29. = 1215. Pará. "28. 7. 27" in Westwood's list.

The data of this species not only appear, as A. 22, in Westwood's *Acraënae*, but also separately on a small slip of paper. In the first of these lists, which is very incomplete and in a clerk's handwriting, he describes the species as "like *Vanilla*, but darker," while the second list, which is altogether in Westwood's writing, and probably perfect, bears the heading "Dark under winged Fritillary."

*Colænis julia*, F.

*Bz.* 144. II. [16. 8. 25.] 2 = 1216, 1217. Rio de Janeiro.  
 "Pap[ilio]. Above the Teresa Convent; and on the woody hilly [hills] along the Aqueduct."

*Bz.* 334. I. [15. 10. 25.] = 1218. Minas Geraës. "Papilio. At the Discoberto do Antonio Velho... (144.)"

This number (144) refers to specimens 1216, 1217, which Burchell thus recognized as the same species. This is given in Westwood's list.

*Bz.* 554. III. [19. 10. 25.] 3 = 1219, 1220, 1220 A. Minas Geraës. "Pap[ilio]." (As 1200.)

*Bz.* + 994. VIII. 27. 10. 25. 7 = 1221-1227. Minas Geraës. "Papilio. At San João de Nepomucena and on the road from Discoberto."

Opposite number 994 Burchell gives eight specimens dated

27. 10. 25, making no mention of specimen **1221**, labelled in England 26. 10. 25, and also bearing the Brazilian number 994. The latter date is evidently a clerical error, and is interpreted above as 27. 10. 25. Compare **1145**.

4. 11. 25. 2 = **1228, 1229**. Minas Geraës. (As **559**.)

29. 12. 25. = **1230**. Rio de Janeiro. Catombí—Barra Vermélha—and Rio Comprido.

a. 25. 2. 26. = **1231**. "Frexal." Organ Mountains. Burchell sometimes wrote "Frexal" for "Frechál."

7. 3. 26. 5 = **1232-1236**. Rio de Janeiro. "At Catombí." This date is given in Westwood's list, but only for two specimens.

No. **1234** bears Westwood's number A. 16.

Bz. + 7. 3. 26. = **1237**. Rio de Janeiro. "At Catombí."

10. 3. 26. = **1238**. "

Bz. 10. 3. 26. = **1239**. "

Bz. 12. 3. 26. = **1240**. "Aqueduct."

Mentioned in Westwood's list.

12. 3. 26. 2 = **1241, 1242**. Rio de Janeiro. "Aqueduct."

13. 3. 26. 3 = **1243, 1244, 1245**. Rio de Janeiro. One specimen mentioned in Westwood's list.

16. 3. 26. = **1246**. Rio de Janeiro. (As **647**.)

20. 3. 26. 6 = **1247-1252**. Rio de Janeiro. "Along the Carioca Aqueduct."

Bz. + 25. 8. 27. = **1253**. Ollaríá to Rio Pardo.

25. 8. 27. = **1254**.

3. 3. 28. = **1255**. Goyaz. "Caught in the town by the rio Vermelho by C[ongo]."

28. 4. 28. = **1256**. Goyaz. (As **748**.) Mentioned in Westwood's list.

Bz. + 14. 4. 29. = **1257**. Porto Real [Naçionale].

Bz. + 15. 4. 29. = **1258**. Porto Real. "

12. 8. 29. = **1259**. Pará.

Westwood's list (A. 16) only gives six specimens of this species in his list of *Acræinæ*. His description of it is thus:—" *Cethosia?* orange red with oblique brown bar in f. w." We may surmise the existence of a second list, now missing, giving the remainder of the dates, as in the case of the previous species.

### *Colænis phærusa*, Linn.

Bz. 14. 4. 27. = **1260**. In the Campo beyond Bóá Mórte. Near S. Paulo.

This specimen bears Westwood's number A. 15, and his list adds another example, captured 13. 5. 29 at Carolina,

on R. Tocantins, between Porto Real and Pará. Westwood described this as a "*Cethosia* (*Carolina*?) red buff with brown bars and white spots on margin of h. w." He placed it, as A. 15, among the *Acraënae*.

*Metamorpha dido*, Linn.

12. 3. 26. = 1261. Rio de Janeiro. "Aqueduct."  
 17. 3. 26. = 1262. Rio de Janeiro. Along the Carioca Aqueduct. (See 917.) "*Papilio*: The green species frequents the tops of trees and flies generally high above reach." [This evidently refers to this species, though the specimen bearing the date 17. 3. 26 does not bear the no. 1057. The latter, however, is borne by a specimen of *Lupilio agavus*, Drury.] Westwood's list gives one specimen bearing 1057 and two with 17. 3. 26. The former and one of the latter are now missing.  
*Bz.* 20. 3. 26. = 1263. Rio de Janeiro. "Along the Carioca Aqueduct."  
 1. 4. 26. = 1264. Rio de Janeiro. "In the valley of Catumbi."

This specimen bears Westwood's number A. 19.

- Bz.* + 1316. 17. 2. 29. = 1265. Porto Real. "Feeding on the flowers of the *Waltheria* bushes (v. H. 8632X)." (See 663.)

1316. 17. 2. 29. = 1266. As above.

Westwood made two lists of this species, in one of which he mentions only one specimen on this date, while four are recorded on the other.

2. 3. 29. = 1267. Porto Real.  
 7. 3. 29. = 1268. Porto Real. "The green papilio loses much of the beauty of its green color within a day or two after being caught." It is certain that the "green papilio" is *Metamorpha dido*, Linn., as Burchell gives the above note on a specimen dated 6. 3. 29. The specimen is now lost, but is mentioned by Westwood in his list of this species. See also 1262, where this *Papilio* is described as "the green species." The green pigment is not contained in scales, but exists between the two membranes of the wing, being almost certainly the blood or hæmolymp in a solid state, and the colour due to metachlorophyll or some other modified plant-pigment. Green markings caused in this manner are also found in *Victorina stelenes* and several true *Papilioninae* of the *sarpedon* group, also in the *Pierine*

genus *Nepheronia*, although in this case the green colour is concealed by the opaque superficial scales. The rapid change of tint noted by Burchell is clearly associated with this unusual development of pigment between the wing-membranes, and it is probably caused by desiccation.

Bz. 9. 3. 29. = 1269. Porto Real.

10. 3. 29. = 1270. Porto Real. "Lepidoptera began to appear more numerous in the end of Feby, and since the beginning of this month they appear abundant."

Westwood's list mentions another specimen captured on this date.

Bz. + 13. 3. 29. = 1271. Porto Real.

18. 3. 29. = 1272. "

Bz. + 21. 3. 29. = 1273. "

23. 3. 29. 2 = 1274, 1275. "

Bz. + 23. 3. 29. = 1276. "

Bz. + 25. 3. 29. = 1277. "

Westwood's list does not mention any individual caught on this date, but one taken 22. 3. 29,—probably an erroneous rendering of 1277.

28. 3. 29. = 1278. Porto Real.

Bz. + 28. 3. 29. = 1279. Porto Real.

22. 4. 29. 2 = 1280, 1281. "

Bz. + 22. 4. 29. = 1282. "

7. 8. 29. = 1283. Pará.

Westwood's list adds two more individuals captured at Porto Real 26. 2. 29 and 6. 3. 29. See note on 1258.

The data of this species appear, as A. 19, in Westwood's list of *Acræinæ*. Opposite the very imperfect records Westwood had written "Ceth. Dido." Another list, on a small slip of paper, is in Westwood's handwriting, and this contains all the data here recorded except those of 1261. This separate list is headed "*Dido*."

[To be continued.]

## XV.—*The Char (Salvelinus) of Great Britain.*

By C. TATE REGAN, M.A.

FOUR species of Char have hitherto been described from the lakes of Great Britain: viz. *Salvelinus killinensis*, the Haddy of Loch Killin in Inverness-shire; *S. struanensis*, the Struan

of Loch Rannoch in Perthshire; *S. willughbii*, the Windermere Char; and *S. perisii*, the Torgoch of the mountain-lakes of Carnarvonshire. In spite of much that has been written to the contrary, these four species are quite distinct, as will be seen from a comparison of the descriptions given below and from the diagnostic characters shown in the following synopsis:—

- I. Snout obtuse; lower jaw rounded anteriorly, shorter than the upper. Interorbital width 3 to  $3\frac{1}{3}$  in the length of head, considerably more than the diameter of eye; least depth of caudal peduncle  $\frac{2}{3}$  to  $\frac{1}{2}$  the length of head; 182 to 215 scales in a longitudinal series . . . . . 1. *killinensis*.  
 Interorbital width  $3\frac{2}{3}$  to 4 in the length of head, scarcely more than the diameter of eye; least depth of caudal peduncle  $\frac{1}{3}$  to  $\frac{2}{3}$  the length of head; 158 to 180 scales in a longitudinal series . . . . . 2. *struanensis*.
- II. Snout conical or subconical in the adult; lower jaw pointed anteriorly.  
 Jaws equal anteriorly ( $\sigma$   $\varphi$ ) or the lower the shorter ( $\varphi$ ); interorbital region convex . . . . . 3. *willughbii*.  
 Jaws equal anteriorly ( $\sigma$   $\varphi$ ) or the lower projecting ( $\sigma$ ); interorbital region flat . . . . . 4. *perisii*.

### 1. *Salvelinus killinensis*.

*Salmo killinensis*, Günth. Proc. Zool. Soc. 1865, p. 699, pl. xl., and Cat. Fish. vi. p. 130 (1866); Day, Fish. Britain, p. 113, pl. cxviii. fig. 1 (1884).

Depth of body about 4 in the length, length of head  $3\frac{5}{8}$  to  $4\frac{1}{4}$  ( $\sigma$ ) or  $4\frac{1}{3}$  to  $4\frac{4}{5}$  ( $\varphi$ ). Snout obtuse, with upper profile decurved, as long as or longer than eye, the diameter of which is  $4\frac{1}{2}$  to 6 in the length of head. Interorbital region more or less convex, its width 3 to  $3\frac{1}{3}$  in the length of head. Dentition moderate; lower jaw shorter than the upper; maxillary extending nearly to below the posterior margin of eye or a little beyond, its length  $2\frac{1}{4}$  to  $2\frac{1}{2}$  ( $\sigma$ ) or  $2\frac{2}{3}$  to  $2\frac{3}{4}$  ( $\varphi$ ) in the length of head; lower jaw rounded anteriorly, its length  $1\frac{1}{2}$  to  $1\frac{3}{5}$  ( $\sigma$ ) or  $1\frac{3}{5}$  to  $1\frac{3}{4}$  ( $\varphi$ ) in the length of head. 9 to 12 branchiostegals. 14 to 16 short gill-rakers on the lower part of anterior arch. 182 to 215 scales in a longitudinal series. Dorsal with 9 to 11 branched rays, its origin nearer to the tip of snout than the base of caudal, the longest ray  $\frac{3}{5}$  to  $\frac{3}{4}$  the length of head. Anal with 8 or 9 branched rays. Pectoral from  $\frac{3}{4}$  to as long as the head, extending  $\frac{5}{8}$  to  $\frac{3}{4}$  ( $\sigma$ ) or  $\frac{1}{2}$  to  $\frac{2}{3}$  ( $\varphi$ ) of the distance from its base to the base of pelvics. Least depth of caudal peduncle  $1\frac{1}{3}$  to  $1\frac{1}{2}$  in its length and  $\frac{2}{3}$  to  $\frac{1}{2}$  the length of head. Back and sides plumbeous, belly.



silvery or yellowish; small pale spots on the sides; fins dusky, the lower ones with pale anterior edges.

Loch Killin, Inverness-shire.

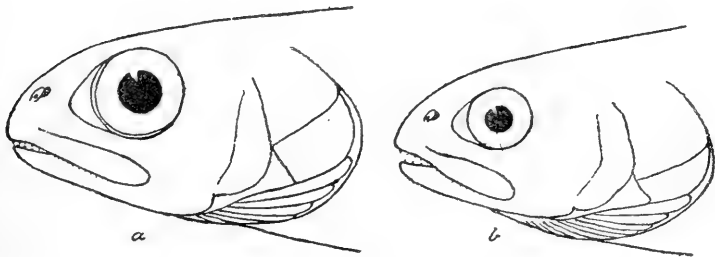
Several specimens, 200 to 350 mm. in total length, types of the species.

## 2. *Salvelinus struanensis*.

*Salmo struanensis*, Gibson-Maitland, Field, 1881, p. 516.

Depth of body 4 to 5 in the length, length of head  $3\frac{3}{4}$  to  $4\frac{1}{5}$ . Snout obtuse, with upper profile decurved, nearly as long as or a little longer than eye, the diameter of which is 4 to  $4\frac{1}{2}$  in the length of head. Interorbital region nearly flat, its width  $3\frac{2}{3}$  to 4 in the length of head. Dentition feeble or moderate; lower jaw shorter than and included within the upper; maxillary extending to below the posterior part of eye, its length  $2\frac{4}{5}$  in the length of head; lower jaw rounded anteriorly, its length  $1\frac{3}{4}$  to  $1\frac{5}{8}$  in the length of head. 10 branchiostegals. 13 or 14 short gill-rakers on the lower part of anterior arch. 158 to 180 scales in a longitudinal series.

Fig. 1.



a. *Salvelinus struanensis*. b. *S. inframundus*. ♂♂, natural size.

Dorsal with 9 branched rays, its origin nearly equidistant from the tip of snout and the base of caudal, the longest ray  $\frac{2}{3}$  to  $\frac{3}{4}$  the length of head. Anal with 8 branched rays. Pectoral  $\frac{3}{4}$  to  $\frac{7}{8}$  the length of head, extending  $\frac{2}{3}$  to  $\frac{3}{4}$  (♂) or a little less than  $\frac{2}{3}$  (♀) of the distance from its base to the base of pelvics. Least depth of caudal peduncle  $1\frac{1}{2}$  to  $1\frac{3}{4}$  in its length and  $\frac{1}{3}$  to  $\frac{2}{5}$  the length of head.

*Hab.* Loch Rannoch, Perthshire.

Four specimens, three males and a female, 175 to 210 mm. in total length, including the types of the species.

3. *Salvelinus willughbii*.

*Salmo willughbii*, Günth. Proc. Zool. Soc. 1862, p. 46, pl. v., and Cat. Fish. vi. p. 131 (1866); Day, Fish. Britain, ii. p. 113, pl. cxvii. fig. 2 (1884).

Depth of body  $3\frac{3}{4}$  to 5 in the length, length of head 4 to  $4\frac{1}{4}$  ( $\sigma$ ) or  $4\frac{1}{4}$  to  $4\frac{2}{3}$  ( $\rho$ ). Snout conical ( $\sigma$ ) or somewhat obtuse ( $\rho$ ), as long as or longer than eye, the diameter of which is  $4\frac{1}{3}$  to 6 in the length of head. Interorbital region convex, its width 3 to  $3\frac{2}{3}$  in the length of head. Dentition moderate; jaws equal anteriorly or the lower jaw a little shorter than the upper ( $\rho$ ); maxillary extending to below the posterior margin of pupil (young) or beyond the eye (adult  $\sigma$ ), its length  $2\frac{1}{2}$  to  $2\frac{5}{6}$  in the length of head; lower jaw pointed anteriorly, its length  $\frac{2}{3}$  (adult  $\sigma$ ) or less than  $\frac{2}{3}$  of the length of head. 9 to 12 branchiostegals. 11 to 16 moderately long gill-rakers on the lower part of anterior arch. 160 to 194 scales in a longitudinal series. Dorsal with 8 or 9 branched rays, its origin nearer to the tip of snout than the base of caudal, the longest ray  $\frac{1}{2}$  to  $\frac{2}{3}$  the length of head. Anal with 7 to 9 branched rays. Pectoral  $\frac{2}{3}$  to  $\frac{7}{8}$  the length of head, extending  $\frac{3}{5}$  to  $\frac{3}{4}$  ( $\sigma$ ) or  $\frac{1}{2}$  to  $\frac{2}{3}$  ( $\rho$ ) of the distance from its base to the base of pelvics. Least depth of caudal peduncle  $1\frac{1}{2}$  to 2 in its length and from  $\frac{1}{3}$  to more than  $\frac{2}{3}$  of the length of head. Greenish or bluish above, silvery or orange below; back and sides with orange spots; dorsal and caudal dusky; lower fins more or less red, the pelvics and anal with pale anterior edges.

Windermere.

Sixteen specimens, 160 to 290 mm. in total length, including the types of the species.

4. *Salvelinus perisii*.

*Salmo cambricus* (non Donovan.), Günth. Proc. Zool. Soc. 1862, p. 49, pl. vi.

*Salmo perisii*, Günth. Ann. & Mag. Nat. Hist. xv. 1865, p. 75, and Cat. Fish. vi. p. 133 (1866); Day, Fish. Britain, p. 112, pl. cxix. fig. 2 (1884).

Depth of body 4-5 in the length, length of head  $3\frac{1}{2}$ -4 ( $\sigma$ ) or  $4\frac{1}{4}$ - $4\frac{1}{2}$  ( $\rho$ ). Snout conical, pointed, as long as or longer than eye, the diameter of which is  $4\frac{1}{3}$ -5 in the length of head. Interorbital region flat, its width  $3\frac{1}{2}$ - $3\frac{3}{4}$  in length of head. Dentition rather strong; jaws equal anteriorly ( $\sigma$   $\rho$ ) or the lower projecting ( $\sigma$ ); maxillary extending nearly to below the posterior margin of eye or a little beyond, its length  $2\frac{1}{3}$ - $2\frac{2}{3}$  ( $\sigma$ ) or  $2\frac{2}{5}$ - $2\frac{2}{3}$  ( $\rho$ ) in the length of head;

lower jaw pointed anteriorly, its length  $1\frac{3}{4}$ – $1\frac{1}{2}$  ( $\sigma$ ) or  $1\frac{1}{2}$ – $1\frac{2}{3}$  ( $\text{♀}$ ) in the length of head. 10–11 branchiostegals. 13–16 slender gill-rakers on the lower part of anterior arch. 156–188 scales in a longitudinal series. Dorsal with 9 or 10 branched rays, its origin a little nearer to the tip of snout than the base of caudal, the longest ray  $\frac{2}{5}$ – $\frac{2}{3}$  the length of head. Anal with 8 or 9 branched rays. Pectoral  $\frac{3}{4}$ – $\frac{4}{5}$  the length of head, extending  $\frac{2}{3}$  to more than  $\frac{3}{4}$  ( $\sigma$ ) or  $\frac{2}{5}$  ( $\text{♀}$ ) of the distance from its base to the base of pelvics. Least depth of caudal peduncle  $1\frac{1}{2}$ –2 in its length and  $\frac{1}{3}$ – $\frac{2}{5}$  the length of head. Dark greenish above, silvery or orange below; sides with orange spots; fins more or less dusky, the lower fins tinged with orange and with pale anterior margins.

Lakes of Llanberis, Carnarvonshire, North Wales.

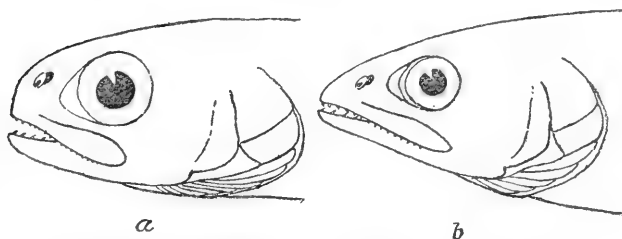
The above description is based on the types of the species, twelve examples, 180–235 mm. in total length.

The following five species of Char are so distinct from each other and from the ones described above that I have little hesitation in describing them as new.

1. *Salvelinus gracillimus*, sp. n.

Depth of body  $5\frac{1}{2}$  to  $6\frac{1}{2}$  in the length, length of head 4 to  $4\frac{1}{2}$ . Snout obtuse, as long as or a little longer than eye, the diameter of which is  $4\frac{1}{4}$  to 5 in the length of head. Inter-orbital region nearly flat, its width  $3\frac{1}{2}$  in the length of head. Dentition moderate; jaws equal anteriorly; maxillary

Fig. 2.



a. *Salvelinus gracillimus*. b. *S. lonsdalii*.  $\sigma$ s, natural size.

extending to below the posterior part of eye, its length  $2\frac{2}{3}$  to  $2\frac{5}{6}$  in the length of head; lower jaw somewhat pointed anteriorly, its length from less than  $\frac{3}{5}$  to  $\frac{2}{3}$  the length of head. 9 branchiostegals. 13 or 14 moderately elongate gill-rakers

on the lower part of anterior arch. 164 to 186 scales in a longitudinal series. Dorsal with 8 or 9 branched rays, its origin nearer to the tip of snout than the base of caudal, the longest ray about  $\frac{2}{3}$  the length of head. Anal with 7 or 8 branched rays. Pectoral  $\frac{3}{4}$  to  $\frac{7}{8}$  the length of head, extending  $\frac{3}{5}$  to  $\frac{3}{4}$  of the distance from its base to the base of pelvics. Least depth of caudal peduncle  $1\frac{2}{3}$  to  $2\frac{1}{3}$  in its length and  $\frac{1}{3}$  the length of head. Back and sides, with dorsal and caudal fins, bluish grey; belly silvery or orange; orange spots on the sides.

*Hab.* Loch of Girlsta, Tingwall, Shetlands.

Four male specimens, 150 to 200 mm. in total length, three of them recently presented by Mr. J. S. Tulloch, who tells me that Girlsta is the only char loch in the Shetlands.

## 2. *Salvelinus inframundus*, sp. n.

Depth of body  $4\frac{1}{2}$  to  $4\frac{2}{3}$  in the length, length of head  $4\frac{1}{4}$  to  $4\frac{1}{2}$ . Snout obtuse, with upper profile decurved throughout, a little longer than eye, the diameter of which is  $5\frac{1}{4}$  to  $5\frac{1}{2}$  in the length of head. Interorbital region convex, its width  $3\frac{1}{3}$  to  $3\frac{1}{2}$  in the length of head. Dentition feeble; lower jaw shorter than and included within the upper; maxillary extending nearly to below the posterior margin of eye, its length  $2\frac{3}{4}$  in the length of head; lower jaw rounded anteriorly, its length  $1\frac{3}{4}$  to  $1\frac{4}{5}$  in the length of head. 10 or 11 branchiostegals. 13 or 14 rather short gill-rakers on the lower part of anterior arch. 178 to 195 scales in a longitudinal series. Dorsal with 9 branched rays, its origin nearer to the tip of snout than the base of caudal, the longest ray  $\frac{2}{3}$  the length of head. Anal with 8 or 9 branched rays. Pectoral a little more than  $\frac{2}{3}$  the length of head, extending  $\frac{1}{2}$  of the distance from its base to the base of pelvics. Least depth of caudal peduncle 2 in its length and  $\frac{1}{3}$  to  $\frac{2}{3}$  the length of head. 59 vertebræ. Colour in spirits: brownish on back and sides, paler below; some small pale spots on the sides; dorsal and caudal fins dusky.

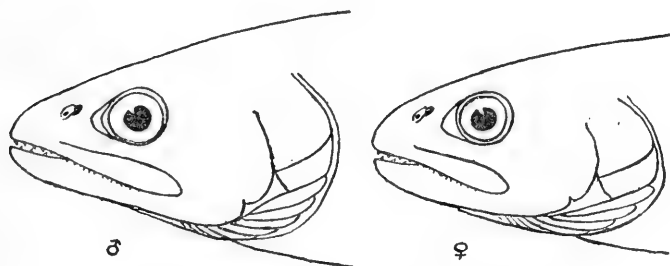
This description is based on two male specimens, 185 and 195 mm. in total length, from Hellyal Lake, Hoy Island, Orkneys, presented by Dr. Trail in 1862.

During the last few years Mr. William Cowan has made attempts to get more examples of this interesting form, but without success. I have it on his authority that char are not found in any other lakes in the Orkneys. Mr. T. Middlemore, who owns the lake, has also made unsuccessful efforts to catch some char; none have been captured since he has been the proprietor, and he believes they are extinct.

3. *Salvelinus maxillaris*, sp. n.

Depth of body  $4\frac{1}{4}$  to  $5\frac{1}{3}$  in the length, length of head  $3\frac{4}{5}$  to  $4\frac{1}{5}$  ( $\sigma$ ) or  $4\frac{1}{3}$  to  $4\frac{3}{5}$  ( $\varphi$ ). Snout subconical ( $\sigma$ ) or obtuse, with upper profile decurved ( $\varphi$ ), longer than eye, the diameter of which is  $5\frac{1}{2}$  to  $6\frac{2}{3}$  in the length of head. Interorbital region convex, its width  $3\frac{1}{3}$  to  $3\frac{2}{3}$  in the length of head. Dentition moderate; jaws equal anteriorly ( $\sigma$ ) or the lower a little shorter than the upper ( $\varphi$ ); maxillary extending to below the posterior margin of eye ( $\varphi$ ) or beyond ( $\sigma$ ), its length  $2\frac{1}{4}$  to  $2\frac{1}{2}$  ( $\sigma$ ) or  $2\frac{1}{2}$  to  $2\frac{2}{3}$  ( $\varphi$ ) in the length of head; lower jaw obtusely pointed anteriorly, its length  $\frac{2}{3}$  to more than  $\frac{3}{4}$  ( $\sigma$ ) or  $\frac{2}{3}$  or less ( $\varphi$ ) of the length of head. 10 or 11 branchiostegals. 14 or 15 rather slender gill-rakers on the lower part of anterior arch. 168 to 186 scales in a longitudinal series. Dorsal with 9 to 11 branched rays, its origin equidistant from the tip of snout and the base

Fig. 3.

*Salvelinus maxillaris*,  $\frac{3}{4}$  natural size.

of caudal or a little nearer the former, the longest ray  $\frac{1}{2}$  to  $\frac{2}{3}$  the length of head. Anal with 8 to 10 branched rays. Pectoral  $\frac{2}{3}$  to  $\frac{5}{6}$  the length of head, extending  $\frac{1}{2}$  to  $\frac{2}{3}$  ( $\sigma$ ) or  $\frac{1}{2}$  or a little less ( $\varphi$ ) of the distance from its base to the base of pelvics. Least depth of caudal peduncle  $1\frac{1}{2}$  to 2 in its length and about  $\frac{1}{3}$  the length of head. 64 vertebrae. Back and sides, with the dorsal and caudal fins, plumbeous; belly brilliant orange; small orange spots on the sides, mostly below the lateral line; pectoral greenish, with a red margin; pelvics and anal reddish, with a white anterior edge; caudal with an orange margin.

*Hab.* Loch near Ben Hope, Sutherlandshire.

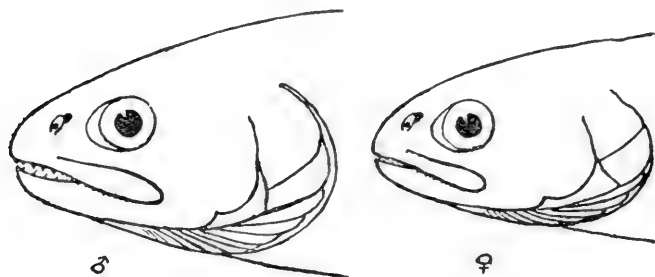
Eleven specimens, 210 to 280 mm. in total length, one

presented by Mr. R. Etheridge in 1873 and the others recently sent to me by Mr. John Murray at the request of Dr. F. Penrose.

4. *Salvelinus mallochi*, sp. n.

Depth of body  $4\frac{1}{2}$  in the length, length of head  $4\frac{1}{3}$  to  $4\frac{1}{2}$  ( $\sigma$ ) or  $4\frac{3}{5}$  to  $4\frac{4}{5}$  ( $\rho$ ). Snout obtuse, longer than eye, the diameter of which is  $5\frac{1}{2}$  to 6 in the length of head. Interorbital region convex, its width 3 to  $3\frac{2}{5}$  in the length of head. Dentition moderate; lower jaw a little shorter than the upper; maxillary extending nearly to below the posterior margin of eye or a little beyond, its length  $2\frac{2}{5}$  to  $2\frac{3}{5}$  in the length of head; lower jaw obtusely pointed anteriorly, its length  $\frac{3}{5}$  to  $\frac{2}{3}$  of the length of head. 9 to 11 branchiostegals. 13 or 14

Fig. 4.



*Salvelinus mallochi*,  $\frac{3}{4}$  natural size.

rather slender gill-rakers on the lower part of anterior arch. 188 to 200 scales in a longitudinal series. Dorsal with 10 branched rays, its origin nearer to the tip of snout than the base of caudal, the longest ray  $\frac{1}{2}$  to  $\frac{3}{5}$  the length of head. Anal with 8 or 9 branched rays. Pectoral  $\frac{2}{3}$  to  $\frac{7}{8}$  the length of head, extending  $\frac{1}{2}$  to  $\frac{3}{5}$  ( $\sigma$ ) or a little less than  $\frac{1}{2}$  ( $\rho$ ) of the distance from its base to the base of pelvics. Least depth of caudal peduncle  $1\frac{3}{4}$  to 2 in its length and  $\frac{1}{3}$  to  $\frac{2}{5}$  the length of head. Slate-coloured above, whitish tinged with orange below; numerous pale spots covering the back as well as the sides.

*Hab.* Loch Scourie, Sutherlandshire.

Four specimens, 220 to 290 mm. in total length.

I have named this species after the donor, Mr. P. D. Malloch, the well-known naturalist of Perth.

5. *Salvelinus lonsdalii*, sp. n.

Depth of body  $4\frac{1}{2}$  to 5 in the length, length of head 4 ( $\sigma$ ) or  $4\frac{1}{2}$  ( $\varphi$ ). Snout subconical, longer than eye, the diameter of which is  $4\frac{2}{3}$  to  $5\frac{1}{3}$  in the length of head. Interorbital region slightly convex, its width  $3\frac{1}{4}$  to  $3\frac{1}{2}$  in the length of head. Dentition moderate; jaws equal anteriorly; maxillary extending to below the posterior margin of pupil ( $\varphi$ ) or beyond ( $\sigma$ ), its length  $2\frac{1}{2}$  ( $\sigma$ ) or  $2\frac{2}{3}$  ( $\varphi$ ) in the length of head; lower jaw pointed anteriorly, its length more than  $\frac{2}{3}$  ( $\sigma$ ) or a little less than  $\frac{2}{3}$  ( $\varphi$ ) of the length of head. 9 to 11 branchiostegals. 13 slender gill-rakers on the lower part of anterior arch. 166 to 182 scales in a longitudinal series. Dorsal with 9 branched rays, its origin a little nearer to the tip of snout than the base of caudal, the longest ray  $\frac{2}{3}$  to  $\frac{3}{4}$  the length of head. Anal with 8 branched rays. Pectoral  $\frac{5}{6}$  to  $\frac{7}{8}$  the length of head, extending  $\frac{4}{5}$  ( $\sigma$ ) or nearly  $\frac{2}{3}$  ( $\varphi$ ) of the distance from its base to the base of pelvics. Least depth of caudal peduncle about  $1\frac{3}{4}$  in its length and about  $\frac{2}{5}$  the length of head. Bluish black above, orange below; numerous orange spots on the sides; dorsal and caudal dusky.

Haweswater.

Two specimens, 170 mm. in total length, presented by the Earl of Lonsdale, after whom I have named the species.

This species is distinguished from *S. willughbii* especially by the much longer lower jaw and bears a great resemblance to *S. perisii*, from which it differs in the smaller eye and in having the dorsal fin a little higher and the pectorals rather longer.

Day (Fish. Britain, ii. p. 116) quotes J. Davy to the effect that the Char of Haweswater is a small and slender fish compared with that of Windermere. Sir H. Davy's figures ('Salmonia,' p. 260, 1851) show well the main difference between the two forms. Mr. W. H. Parkin writes me that the Char caught in Haweswater hardly vary at all in size.

Char from other British localities in the National Collection include some forms which seem to be practically identical with one or other of the species described above, and others which may prove to be sufficiently different to be described later on as distinct species; in some cases more specimens are wanted in order to determine how far the differences observed may be constant; in other cases I have seen enough examples to determine pretty accurately the normal variation of the char in certain lochs, but these forms differ so slightly from their nearest allies that I do not venture to describe them until

I have examined specimens from intermediate localities. There are still a number of lochs in Sutherlandshire, Ross-shire, and Inverness-shire which contain Char, but from which I have not yet seen any.

In the following list of specimens I have examined I give in each case the number of branched rays in the dorsal fin (D) and in the anal fin (A), the number of scales in a longitudinal series (Sc.), of branchiostegals (B), and of gill-rakers on the lower part of the anterior arch (Gr.).

(1) *Char allied to S. killinensis.*

1. LOCH ROY, a small loch at the head of Glen Roy in Inverness-shire; a single specimen (♂), 160 mm. in total length, presented by Mr. H. Cholmøndeley Pennell in 1862. D. 7; A. 8; Sc. 160; B. 9; Gr. 15. Head perhaps a little smaller and scales larger than in the Killin Char, but, considering the variation in the number of scales in other forms, *e. g.* the Loch Loyal Char, and our ignorance of the Char of other lochs in Inverness-shire (except L. Bruiach), I cannot yet recognize this form as even a distinct race.

(2) *Char allied to S. willughbii.*

1. CONISTON LAKE; three specimens (♀) 190 to 240 mm. in total length, presented by Mr. J. W. Barratt. D. 9-10; A. 8-9; Sc. 186-198; B. 10-11; Gr. 12-13. Nearly identical with the Windermere Char.

2. CRUMMOCK WATER; four specimens (♂ ♀) 270 to 280 mm. in total length, presented by Mr. W. H. Marshall. D. 9-10; A. 8; Sc. 160-170; B. 9-12; Gr. 12-14. Practically identical with the Windermere Char.

These examples were in splendid condition, and when they arrived I drew up the following description of their coloration:—"Back and sides bluish, with silvery reflections and with numerous pink spots everywhere; faint traces of 9-12 parr-marks; lower parts red; snout, upper part of head, and sometimes the maxillary blackish; lower jaw, branchiostegals, and thorax white; cheeks and opercles silvery, with shades of green, blue, or pink; iris golden, pupil black; dorsal and caudal fins blackish, with or without pale spots at the base; pectoral dusky, tinged with red, sometimes with the upper ray whitish; pelvics and anal similar, but redder and with strongly marked white anterior edges."

3. LOCH GRANNOCH in Kirkeudbrightshire; eight specimens (♂ ♀), 160-230 mm. in total length, three presented



by Mr. Robert Service and five by Mr. G. R. Murray. D. 9-10; A. 7-8; Sc. 154-176; B. 8-11; Gr. 11-13. A race of *S. willughbii*, assuming adult characters at a smaller size.

4. LOCH DUNGEON in Kirkeudbrightshire; one specimen ( $\sigma$ ), 160 mm. in total length, received on loan from the Edinburgh Museum. D. 10; A. 8; Sc. 180; B. 10; Gr. 13. A race of *S. willughbii*; lower jaw weaker and opercular bones broader than in the Grannoch Char.

5. LOCH DOON in Ayrshire; eleven specimens ( $\sigma$  ♀), 160-180 mm. in total length, presented by Mr. R. Service. D. 8-9; A. 8-9; Sc. 146-174; B. 9-10; Gr. 12-14. A small race of *S. willughbii*, very similar to the Grannoch Char, *usually* with mouth larger, opercular bones narrower, and paired fins longer than in Windermere Char of this size.

6. LOCH BUILG in Banffshire; four specimens ( $\sigma$  ♀), 180-220 mm. in total length, presented by Messrs F. D. Godman and W. R. O. Grant. D. 9-10; A. 7-9; Sc. 160-180; B. 9-11; Gr. 14-15.

7. LOCH BRUIACH in Inverness-shire; ten specimens ( $\sigma$  ♀), 175-190 mm. in total length, presented by Lord Lovat. D. 8-10; A. 7-9; Sc. 155-178; B. 9-11; Gr. 14-16. A small race of *S. willughbii*; coloration dark; pelvic axillary scale long.

8. LOCH MORIE in Ross-shire; one specimen ( $\sigma$ ), 200 mm. in total length, presented by Mr. H. M. Warrand. D. 9; A. 8; Sc. 156; B. 10; Gr. 16. Similar to the Bruiach Char.

9. LOCH BOROLLAN in Sutherlandshire; two specimens ( $\sigma$ ), 150 and 165 mm. in total length, from Dr. F. Day's collection. D. 10; A. 8; Sc. 166-172; B. 9-10; Gr. 15.

10. LOCH LOYAL in Sutherlandshire; thirty-eight specimens ( $\sigma$  ♀), 150-200 mm. in total length, presented by Mr. John Murray. D. 8-11; A. 7-9; Sc. 126-178; B. 8-12; Gr. 11-16. A small race of *S. willughbii*, according to Mr. Murray never attaining a larger size. The range of variation in the number of scales is most remarkable.

11. LOCH BADEN in Sutherlandshire; two specimens (♀), 165 and 185 mm. in total length, presented by Mr. P. D. Malloch. D. 9-10; A. 8-9; Sc. 148-152; B. 9-10; Gr. 16-17. Head smaller than in the Loch Loyal Char.

12. LOCH CALDER in Caithness; a stuffed specimen of 230 mm., received on loan from the Edinburgh Museum. D. 9; A. 8; Sc. 166. Apparently identical with the Baden Char.

13. NORTH UIST; a single specimen ( $\sigma$ ), 260 mm. in total length, presented by Sir A. J. Campbell Orde. D. 10; A. 9; Sc. 175; B. 10; Gr. 14. A short-headed form of *S. willughbii*; silvery, back bluish.

(3) *Char allied to S. perisii.*

1. COSS-Y-GEDAWL in Merionethshire; four specimens, 125-150 mm. in total length, from Yarrell's collection. D. 9-10; A. 8-9; Sc. 144-166; B. 9-10; Gr. 14-16. Probably not distinct from the Llanberis Char.

(4) *Char allied to S. maxillaris.*

1. LOCH STACK in Sutherlandshire; two specimens ( $\rho$ ), 215 and 220 mm. in total length. D. 9; A. 8-9; Sc. 182-194; B. 9-10; Gr. 14-15. Nearly identical with the Char from Ben Hope, but paired fins a little longer than in female specimens from that locality, the pectorals extending  $\frac{3}{4}$  to  $\frac{3}{2}$  of the distance from their base to the pelvics.

XVI.—*On some new and rare Entomostraca from the Scottish Seas.* By THOMAS SCOTT, LL.D., F.L.S.

[Plates II.-IV.]

THE Entomostraca described here were obtained in collections made from time to time by the Fishery Steamer 'Goldseeker' while carrying on work in connexion with the international scheme for the investigation of the North Sea and adjacent waters, and under the directions of Professor d'Arcy W. Thompson, C.B., F.L.S., the representative for Scotland on the International Committee.

For permission to publish these notes I am indebted to Professor Thompson.

CALANOIDA.

*Xanthocalanus tenuiremis*, sp. n. ( $\sigma$ ).  
(Pl. II. figs. 1-7.)

A specimen of a male *Xanthocalanus* was obtained in a

gathering of Crustacea from 1140 metres, collected by the 'Goldseeker' at Station 53, about 70 or 80 miles north by west of the Butt of Lewis ( $55^{\circ} 36'$  N. lat.,  $7^{\circ}$  W. long.). As this specimen represents what may be either an undescribed species or the undescribed male of some species the female of which is already known, the following particulars concerning it may not be without interest.

The specimen has a general resemblance to *Xanthocalanus borealis*, G. O. Sars, and measures about 2.5 mm. in length (fig. 1).

Rostrum of moderate size and bifurcate, the segments are elongate, stout at the base, but taper towards the pointed extremities (fig. 1 a).

Antennules wanting; the antennæ, which are also slightly imperfect, resemble those of *X. borealis* (fig. 2).

Mandibles stout, with a strong masticatory part; the tooth on the inner aspect of the biting-edge is broad and massive and projects somewhat beyond the others (fig. 3); the mandible-palp, which is stout, is slightly imperfect (fig. 4).

First maxillipeds stout, each of them armed with two or three long and stout setiferous spines and a number of elongated plumose bristles, and there is also present the characteristic fascicle of sensory filaments (fig. 5).

The four pairs of swimming-feet were all more or less imperfect: fig. 6 represents what remains of the fourth pair.

The fifth pair has the left leg greatly elongated and slender, so that it is only a little shorter than the entire length of the cephalothorax. The basal joint of this leg is moderately stout and rather longer than the right leg; the next three joints are subequal and considerably longer than the basal joint, and each is more slender than the joint that precedes it; the end joint is very small and terminates in a bifurcated process, as shown in the enlarged figure (fig. 7 a). The right leg is short and rudimentary, and appears to be composed of three (or four) joints (fig. 7).

*Remarks.*—This species appears to be a true *Xanthocalanus*. The structure of the antennæ, and especially of the first maxillipeds and of the fifth pair of thoracic legs, agrees with the characters common to the species of this genus. The first maxillipeds are each furnished with a terminal fascicle of slender sensory filaments as in *X. borealis*, but with no sheaf-like bundles as in *Amallophora*; they are also armed with two strong, elongated, and more or less setiferous spines, besides a number of plumose setæ. Further, in the fifth pair of thoracic feet the right leg is very short, while the left is slender and elongated as in *X. borealis*. In the species

now described, however, the structure of the elongated left leg differs from that of any of the others known to me in the proportional lengths of the various joints and in the peculiar armature of the terminal one. The mutilated condition of the only specimen observed prevents a more detailed account being given, but the characters available are, taken together, sufficient to distinguish this form from its confreres.

*Amalophora claviger* \*, sp. n.

(Pl. III. figs. 1-11; Pl. IV. figs. 13-17.)

Cephalothorax moderately elongated; forehead rounded; rostrum bifurcate, with moderately long tapering branches; abdomen composed of five segments, caudal rami very short. Length about 4.7 mm. (Pl. III. fig. 1).

Antennules rather longer than the cephalothorax, moderately slender and composed of twenty-five joints; first and second joints somewhat dilated, the next four small, subequal, the sixth to the twelfth more or less coalescent, thirteenth and fourteenth small, the fifteenth to the nineteenth rather longer than the preceding two joints or those that follow, as in the formula, which shows approximately the proportional lengths of the various joints:—

Number of the joints	.....	1	2	3	4	5	6	7	8	9	10	11	12	
Proportional lengths of same	..	17	12	7	8	7	8	38						
		13	14	15	16	17	18	19	20	21	22	23	24	25
		9	9	14	15	16	15	15	12	9	8	11	11	6

See also the drawing (Pl. III. fig. 3).

Antennæ small, inner branch much shorter than the outer (Pl. III. fig. 4).

Mandibles small, narrow, elongated, distal end somewhat constricted, biting end obliquely truncated and armed with small denticles; mandible-palp small (Pl. III. fig. 5; Pl. IV. fig. 13).

First maxilliped small, furnished with a dense fascicle of sensory filaments and a number of setæ as shown in the drawing (Pl. III. fig. 6). Second maxillipeds also small, elongated, and sparingly setiferous (Pl. III. fig. 7).

The four pairs of swimming-feet are somewhat similar to those in *Xanthocolanus borealis*, G. O. Sars. The fifth pair has also a general resemblance to those of the same species,

\* *Claviger*, carrying a club; referring to the club-like form of the left leg of fifth pair.

but there are structural differences which at once distinguish this 'Goldseeker' Calanoid from *Amallophora typica*, T. Scott, which it somewhat resembles. The left leg of the fifth pair is elongated and slender, as in the fifth pair of *A. typica*, and the first and second joints are moderately stout, but the second joint is about one and a half times longer than the first, while the first and second are together rather less than half the entire length of the leg; the third joint is very slender and about one and a half times longer than the second; the fourth joint is scarcely half as long as the third, and becomes somewhat dilated towards the distal end; the distal half of this joint is hollow on the exterior edge and assumes a spoon-like form to receive the end joint, which is folded back upon the fourth and is greatly attenuated towards the distal extremity, and terminates in a minute hook; the end joint bears several minute setæ on its inner edge, and a small seta projects from the end of the fourth joint (Pl. IV. figs. 15-17). The right branch is very short and reaches slightly beyond the first joint of the left branch; it consists of five joints, but the three end ones are very small (Pl. IV. fig. 15).

*Hab.* 'Goldseeker' Station 53 (lat. 59° 36' N., long. 7° W.); depth 1140 metres, August 17th, 1908. A few male specimens only observed.

*Remarks.*—Though the form here described approaches somewhat closely to *Amallophora typica*, the structure of the fifth pair of thoracic legs is decidedly different; the left leg differs not only in the proportional lengths of all the joints, but also in the form and armature of the end joint.

It may be remembered that *Amallophora typica* has been relegated to the genus *Xanthocalanus* by Dr. Giesbrecht, but though it agrees with that genus in some particulars, as, for example, in the structure of the fifth pair of thoracic legs, it differs in other respects, and notably in the armature of the first maxillipeds, which possesses a character distinct from that observed in described species of that genus. In the typical *Xanthocalanus* (*X. agilis*, Giesb.) the first maxillipeds are provided with a number of slender sensory filaments, but they have no large and conspicuous sheaf-like bundle of delicate threads inextricably mixed together as in *Amallophora*. This genus I therefore retain for the two species mentioned here, viz. *Amallophora typica* and *A. claviger*.

*Neoscolecithrix kœhleri*, Canu.

1896. *Neoscolecithrix kœhleri*, Canu, Ann. Univ. Lyon, vol. xxvi. p. 426, pl. xviii. figs. 1-9.

1898. *Scolecithrix k hleri*, Giesbrecht, Das Tierreich, 6 Lief. (Copepoda) p. 46.

1905. *Oothrix bidentata*, Farran, Ann. Rep. Fish. Ireland, 1902-03, pt. ii. App. ii. (1905) p. 42, pl. x. figs. 15-18, pl. xi. figs. 1-10.

This appears to be a true deep-water species; it was moderately common in two of the 'Goldseeker' gatherings, one from 1140, the other from 1100 metres, collected in lat. 59° 36' N., long. 7° W., and lat. 59° 25' N., long. 7° 33' W., in August 1907.

Having had the privilege of examining well-developed specimens of both the male and female of this species, I am convinced that *Oothrix bidentata* is identical with *Neoscolecithrix k hleri*, and also that the species is not a true *Scolecithrix*, and that Canu's name should therefore be restored.

#### Genus PSEUDOTHARYBIS, nov.

Resembling *Tharybis*, G. O. Sars, in general appearance. Female antennules composed of twenty-four joints. Antennæ with the inner ramus considerably shorter than the outer. Mandibles with the biting edge truncated and armed with stout teeth. Maxillæ somewhat expanded, masticatory lobe broadly truncate and furnished with several setiferous spines. First maxillipeds without sensory filaments, otherwise nearly as in *Tharybis*. Second maxillipeds and swimming-feet also nearly as in that genus. Last pair of legs triarticulate, end joint with a spiniform extremity, and with two stout spines on the outer margin.

*Pseudotharybis zetlandicus*, sp. n., ♀.

(Pl. II. figs. 8-13; Pl. III. figs. 12-18.)

Body robust; forehead broadly rounded; rostrum short, bifurcated, furca short, broadly triangular, somewhat divaricated, and with a moderately wide space between them (Pl. II. fig. 9). The first cephalothoracic segment more than half the length of the cephalothorax; the lateral angles of the last segment are produced into sharp tooth-like processes, which are slightly divaricate. Abdomen short, with short furcal rami (Pl. II. fig. 8).

Length 3.8 mm.

Antennules (Pl. II. fig. 10) somewhat shorter than the cephalothorax and composed of twenty-four joints, the proportional lengths of which are nearly as in the formula:—

Number of the joints . . . . .	1	2	3	4	5	6	7	8	9	10	11		
Proportional lengths of ditto..	20	.16	.8	.8	.8	.8	.9	.13	.8	.8	.8		
	12	13	14	15	16	17	18	19	20	21	22	23	24
	10	.11	.11	.11	.10	.10	.10	.7	.7	.6	.7	.7	.3

Antennæ not very elongated, moderately stout, inner ramus considerably shorter than the outer (Pl. III. fig. 12).

The mandibles, which somewhat resemble those of the species last described, have a strongly toothed masticatory edge (Pl. II. fig. 11).

The three inner marginal lobes of the first maxillipeds are each furnished with two apical setæ, coarsely plumose and elongated, and a shorter reflexed seta; the next two lobes terminate in long slender and slightly curved spines (Pl. III. fig. 13).

The five terminal joints of the second maxillipeds are short and furnished with a number of rather slender bristles (Pl. III. fig. 14).

The swimming-feet are somewhat similar in structure to those of the species previously described. The first pair are moderately stout, but much smaller than the next pair, and the spines on the outer distal angles of the three joints of the outer ramus are not very strong (Pl. III. fig. 15). The outer ramus of the second pair is moderately elongate and broadly lamelliform; the marginal spines are strong, rather long and setiferous, but the apical spine is comparatively short and stout and coarsely serrated on the outer edge (Pl. III. fig. 16). The outer rami of the third and fourth pairs are narrower than that of the second, and the marginal spines more slender; the terminal spine is moderately stout and coarsely serrated on the outer edge, the number of teeth being about eighteen. The integument of the inner branches is covered more or less with minute denticles (Pl. III. fig. 17).

The fifth pair of feet are small and symmetrical, each consists of a single three-jointed branch; the third joint, which is rather longer than either of the other two, is produced anteriorly into a moderately long spine and is armed with two other spines, one near the proximal end of the outer margin and the others on the outer distal angle (Pl. III. fig. 18). The first and second joints are without conspicuous armature.

*Hab.* 'Goldseeker' Station 53 (lat.  $59^{\circ} 36'$  N., long.  $7^{\circ}$  W.), 1140 metres deep, collected in August 1907. One or two specimens only obtained; no male observed.

In the same gathering with the species just described were others already known to science, such as *Arietellus plumifer*, G. O. Sars, a highly coloured form with densely plumose tail-setæ; *Chirundina streetsi*, Giesbrecht, described from specimens collected off the west coast of North America in lat.  $35^{\circ}$  N., long.  $125^{\circ}$  W.; *Candacia norvegica*, Boeck; *Gaetanus latifrons*, G. O. Sars; *Megacalanus longicornis*

(G. O. Sars); *Metridia princeps*, Giesbrecht; and various others to be described later.

### Halocypridæ.

Genus EUCONCHÆCIA, G. W. Müller, 1890.

*Euconchæcia d'arcy-thompsoni*, sp. n.  
(Pl. III. fig. 19; Pl. IV. figs. 1-12.)

Shell, seen from the side, oblong; length scarcely equal to twice the width. Dorsal margin nearly straight, each valve terminating posteriorly in a small pointed process, while in front the rostral projection, which is distinctly bifid, is bounded beneath by a deep sinus, as shown in the drawing (Pl. IV. figs. 1 & 2); ventral margin nearly parallel with the dorsal and slightly but evenly rounded; posterior end sub-quadrangular; anterior end boldly curved; shell-gland near the postero-dorsal angle, as shown in the drawing (Pl. IV. fig. 2).

Length of the shell represented by the drawing about 4.7 mm.

The antennules are each provided at the apex with a dense fascicle of very slender bristles and with three (or four) setæ; two of these setæ are long and slender, but of unequal length, one being much more elongated than the other (Pl. IV. fig. 5).

Antennæ similar to those in *Euconchæcia chierchie*, G. W. Müller; the secondary branch on the right side is armed with a strong hook (Pl. IV. fig. 6), that on the left side is also provided with a hook, but it is much smaller than the other.

Mandibular foot nearly as in *Conchæcia elegans*, the masticatory part armed with several small teeth (Pl. IV. fig. 7).

First foot slender and moderately elongated, end joint very small, with one long and moderately stout seta and two other smaller ones (Pl. IV. fig. 9). Second foot considerably shorter than the first (Pl. IV. fig. 10).

Caudal lamina somewhat similar to that of *E. chierchie*, Müller, except that it is armed with eight spines; the principal spine exhibits the same number of articulations as that of the caudal lamina in the species named. Copulatory organ rather narrow and elongated (Pl. IV. figs. 11 & 12).

The female does not differ greatly from the male, except that the rostral hood-like projection at the anterior end of the shell is not bifid as in the male (Pl. IV. fig. 4) and that the accessory branch of the antenna has no hook-like appendage



(Pl. III. fig. 19). In the female dissected the ova were numerous and small. The shell in both sexes ornamented with faint delicate reticulations. The groups of glands situated near the postero-dorsal angles of each of the two valves, as indicated in the drawing (Pl. IV. fig. 2), are quite distinct.

*Hab.* 'Goldseeker' Station 53, lat. 59° 36' N., long. 7° W., 1140 metres deep, collected in August 1907. Two adult males and one female, and other two smaller specimens which appear to be young males.

*Remarks.*—The occurrence of this *Euconchæcia* at Station 53 appears to be of interest, as it differs so much in size and in other respects from *E. chierchia*, G. W. Müller, the only other species of the genus. *E. chierchia* was described from specimens collected by Dr. Chierchia off the Brazilian coast in lat. 19° S. and long. 39° W.; these specimens measured about 1.2 mm. in length\*. The same species was described and figured in the Report on collections made by John Rattray in the Gulf of Guinea, under the name of *Halocypris aculeata*; the size of the specimens from these collections was about 1 mm.† It has also been recorded from Cruz Bay by Dr. G. S. Brady, who gives the size of the male as 1.1 mm. and of the female as .85 mm.‡ The 'Goldseeker' specimens are thus about four times the size of *E. chierchia*. Moreover, in both the adult males the rostral projection of both valves of the shell is distinctly bifid, as shown in the drawing (Pl. IV. fig. 2), but in the shell of the adult female the rostral projection is not bifid. One other point of interest is the large brush of delicate filaments at the apex of the antennules in both the male and female. The brush at the apex of the antennules in *E. chierchia* is described by Dr. Brady as consisting "of about twenty setæ." In the 'Goldseeker' specimens the brush consists of several times twenty setæ. I have not counted the number of setæ, for they are so numerous, so delicate, and so crowded together, that the counting of them would be a somewhat serious task—in a small fragment broken off from one of the brushes at least forty setæ were counted.

Owing to the differences mentioned I am inclined to ascribe the 'Goldseeker' specimens to a distinct species, for which I propose the name of *Euconchæcia d'arcy-thompsoni*, after Prof. d'Arcy W. Thompson, C.B., Director of the Scottish International Investigations.

\* "Ueber Halocypriden," Zoologisch. Jahrb. Bd. v. p. 277, pl. xxviii. figs. 1-10 (1890).

† Trans. Linn. Soc. vol. vi. p. 142, figs. 5, 6, 33, 34, 38 (1894).

‡ Trans. Zool. Soc. vol. xvi. p. 190, pl. xxii. figs. 9-15 (1902).

Several other interesting Halocyprians have been obtained in collections made by the 'Goldseeker,' such as *Conchæcia elegans*, G. O. Sars, *C. borealis*, G. O. Sars, *C. obtusata*, G. O. Sars, *C. daphnoides*, Claus, *C. imbricata*, G. S. Brady, *Halocypria* (?) *globosa*, Claus, several species belonging to the Cyprinidæ, and others which will be described later.

## EXPLANATION OF THE PLATES\*.

## PLATE II.

*Xanthocalanus tenuiremis*, sp. n.

Fig. 1. Male, side view; "a," the rostrum. 2. One of the antennæ (imperfect). 3. Mandible. 4. Mandible-palp. 5. First maxilliped. 6. Fourth pair of swimming-feet (imperfect). 7. Fifth pair; "a," the extremity of long branch (greatly enlarged).

*Pseudotharybis zetlandicus*, gen. et sp. n.

Fig. 8. Female, dorsal view. 9. Rostrum. 10. One of the antennules. 11. Mandible and palp. 12. One of the maxillæ. 13. Abdomen, ventral view.

## PLATE III.

*Amalophora claviger*, sp. n.

Fig. 1. Male, side view. 2. Rostrum. 3. One of the antennules. 4. One of the antennæ. 5. Mandible-palp. 6. First maxilliped. 7. Second maxilliped. 8. Foot of first pair. 9. Foot of second pair. 10. Foot of third pair. 11. Foot of fourth pair.

*Pseudotharybis zetlandicus*, gen. et sp. n.

Fig. 12. One of the antennæ. 13. First maxilliped. 14. Second maxilliped. 15. Foot of first pair. 16. Foot of second pair. 17. Foot of fourth pair. 18. Foot of fifth pair.

*Euconchæcia d'arcy-thompsoni*, sp. n.

Fig. 19. Accessory branch of antenna, female.

## PLATE IV.

*Euconchæcia d'arcy-thompsoni*, sp. n.

Fig. 1. Shell of male, side view. 2. Shell with the valves opened out. 3. Shell of female seen from below. 4. Anterior end of opened valves of same, to show rostral projection. 5. Antennule. 6. Accessory branch of antenna, male. 7. Mandibular foot. 8. Maxilla. 9. Foot of first pair. 10. Foot of second pair. 11. Caudal lamina. 12. Copulatory organ of male.

*Amalophora claviger*, sp. n.

Fig. 13. Mandible. 14. Fifth pair of feet. 15. End joint of long branch of fifth pair (greatly enlarged). 16. Another view of the same joint. 17. Abdomen.

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\* Figures drawn with a "Zeiss" camera, and all enlarged.

XVII.—*Remarks on some new or little-known Species of Thynnidæ (Hymenoptera).* By ROWLAND E. TURNER, F.Z.S., F.E.S.

*Rhagigaster mandibularis*, Westw.

This species is quite distinct from the Victorian form of *R. unicolor*, Guér. The male may be distinguished by the tubercle on the mandibles and the absence of the lateral spines at the base of the hypopygium and the female by the much greater breadth of the head.

*Telephoromyia tridentifera*, sp. n.

♂. Mandibles tridentate, the outer tooth much the longest. Clypeus short, slightly convex, with an obliquely depressed, concave, semicircular area on the middle of the apical margin, resembling a small but deep emargination, a minute tubercle above the base of the depression. Antennæ further from each other than from the eyes, rather longer than the thorax without the median segment, the apical joints arcuate; the interantennal prominence bilobed, a delicate median carina on the front almost reaching the anterior ocellus. Pronotum narrower than the head; the mesonotum as long as broad, with two longitudinal sulci on each side, the inner one much the deepest; scutellum rounded posteriorly; median segment longer than broad, with an obscure median sulcus from the base to the apex. Punctured; most finely and closely on the head, very sparsely on the scutellum, and rather sparsely on the abdomen. First abdominal segment with a sulcus from the base to the middle, the groove between the first and second ventral segments shallow. Abdomen elongate, longer than the head, thorax, and median segment combined, narrowed at the extremities. Epipygium narrowed to the apex and almost pointed, the hypopygium projecting beyond the epipygium, narrow, the sides almost parallel, deeply triangularly emarginate at the apex.

Black; the mandibles broadly in the middle, the clypeus above the depression broadly, two spots between the antennæ, the inner margin of the eyes broadly as high as the base of the antennæ, a spot at the summit of the eyes, a spot between the posterior ocelli, a line behind the eyes connecting with a crescentic mark on the vertex, the posterior margin of the pronotum, a spot on either side of the pronotum near the middle connecting with the posterior band, an oblique mark on

each side of the prothorax, a broad vertical band strongly emarginate posteriorly on the anterior margin of the mesopleuræ, a large spot above the intermediate coxæ, a quadrate spot on the mesonotum, the tegulæ, the middle of the scutellum broadly and a spot on each of the anterior angles, the postscutellum, an oblique line on each side on the median segment, a transverse band near the apex of the five basal abdominal segments narrowly interrupted on all but the first, a large spot on each side of ventral segments 2-4, and a line on the posterior coxæ pale yellow; legs (except the coxæ) pale ferruginous; a yellow line on the anterior femora beneath. Wings hyaline, the radial cell, extending more faintly into the cubital cells, fuscous; nervures fusco-ferruginous, the stigma testaceous. Second and third cubital cells each receiving a recurrent nervure.

Length 14 mm.

*Hab.* Mendoza, Argentina; November.

Type in B.M. ex coll. Turner.

Closely resembling *T. rufipes*, Guér., in size and colour, but Guérin gives the abdomen as "simple en arrière," which could not be applied to the peculiarly shaped hypopygium of this species.

### *Spilothynnus bituberculatus*, Turn.

*Telephoromyia bituberculata*, Turn. Trans. Ent. Soc. London, p. 70 (1908), ♀.

♂. Mandibles bidentate, the outer tooth long and acute, the inner tooth short and broadly truncate. Clypeus very narrowly emarginate in the middle of the apical margin, the angles of the emargination produced into short spines; a carina from the base produced anteriorly into an acute tubercle overarchng the base of the emargination. Antennæ inserted a little further from each other than from the eyes, rather short, not longer than the thorax and median segment combined, the apical joints arcuate; the front between the antennæ bilobed, with a delicate longitudinal carina almost reaching the anterior ocellus. Head and thorax very closely punctured, the pronotum and scutellum more sparsely, the mesonotum with two longitudinal sulci on each side; median segment as long as broad, with a shallow longitudinal sulcus from the base to the middle, closely punctured. Abdomen elongate, narrow at the base, closely punctured, the segments narrowly depressed and smooth at the apex; the basal segment longer than broad at the apex, with a longitudinal sulcus from the base to beyond the middle. Hypopygium

narrow, only slightly produced beyond the epipygium, rounded at the apex with a very feeble emargination in the middle. The maxillary palpi are rather long, similar to those of *Telephoromyia*. The second recurrent nervure is received at about one-quarter from the base of the third cubital cell.

Black; the mandibles (except at the apex), the clypeus, the anterior margin of the face, a triangular spot between the eyes and the base of the antennæ, an oblique spot on each side above the base of the antennæ, a spot close to the summit of the eyes, a band behind the eyes produced more narrowly on the posterior margin of the head and broadly interrupted on the vertex, a small oblique spot on each side behind the posterior ocelli, the margins of the pronotum broadly united in the middle, with a small black spot in the middle of the anterior margin, a quadrate spot on the mesonotum, the tegulæ and a curved line above them, a spot on the propleuræ and a curved band on the mesopleuræ, a transverse band on the middle of the scutellum and a spot at each of the anterior angles, the postscutellum, a broad oblique band on each side of the median segment curved outwardly near the apex, a spot close to the apex of the median segment, a broad band on each of the five basal dorsal segments of the abdomen, narrowly interrupted in the middle on segments 2-5, a spot on the first ventral segment, an interrupted band on ventral segments 2-4 and the coxæ and femora beneath yellow; the two apical abdominal segments, the tibiæ and the tarsi ferruginous. Wings hyaline, clouded at the apex of the radial cell, nervures black, the stigma ferruginous.

Length 15 mm., exp. 25 mm.

*Hab.* Mendoza, Argentina; February.

The limits of the genera in the *Telephoromyia* group, including *Spilothynnus* and *Scotæna*, are not yet well understood, the females being very little known. The present species has the clypeus tuberculate as in *S. lætus*, but the emargination of the clypeus is much narrower. The mandibles differ in the truncation of the inner tooth from *S. lætus* and show some approach to *Tel. excisa*, Turn., but are not as broad as in that species.

*Pseudelaphroptera haarupi*, sp. n.

♀. Head twice as broad as long, convex, shining and smooth, with a few very fine scattered punctures; a short frontal sulcus; the front almost vertically depressed. Clypeus broadly and shallowly emarginate; the mandibles falcate with a small tubercle on the inner margin close to the base.

Antennæ scarcely longer than the head is broad, the scape stout and about half as long as the flagellum. Pronotum broad, nearly twice as broad as long, narrower than the head, the median line rather broadly raised, the sides subconcave, the depressions not reaching the posterior margin. Median segment and scutellum of almost equal length, combined scarcely longer than the pronotum, the whole thorax shining, with a few fine scattered punctures. Abdomen broader than the thorax and much longer than the head, thorax, and median segment combined; the first and second segments depressed on the apical portion, narrowly at the sides, much more broadly in the middle, the anterior portion smooth and shining, the depressed portion opaque and very finely shagreened; segments 3-5 smooth and shining, very narrowly and shallowly depressed on the apical margin; the ventral segments sparsely punctured with a smooth depressed space, broadest in the middle, at the apex of segments 2-4. Pygidium oblique, twice as long as broad, the sides nearly parallel, the hypopygium projecting beyond the epipygium, having an exposed surface nearly half as long as the epipygium, rounded at the apex; the epipygium truncate at the apex, with a long whitish seta on each side near the base. Tarsal ungues bidentate.

Fuscos black; the head and legs dark fusco-ferruginous; the pygidium and antennæ fusco-ferruginous; the depressed apical portion of the two basal dorsal segments and of ventral segments 2-4 pale testaceous.

Length 8-9 mm.

Described from two specimens, one of which is apparently not quite mature and has the abdomen entirely ferruginous-brown.

*Hab.* Santa Rosa, Mendoza (*A. C. Jensen-Haarup*).

This species somewhat resembles *Ornepetes albonotata*, André, in the form of the pronotum, but otherwise is nearer to *Pseudelaphroptera flavomaculata*, André, except in the longer and narrower pygidium. It may prove to be the female of *P. rollei*, Turn.

#### *Elaphroptera promissa*, sp. n.

♀. Head subrectangular, strongly rounded at the posterior angles, more than twice as broad as the pronotum, nearly half as broad again as long, thick and scarcely concave above; the eyes small and broadly ovate; the front divided by a longitudinal sulcus. Pronotum small, broader than long, scutellum small and narrow, rounded posteriorly; the median

segment as long as the pronotum, very narrow at the base, broadened and obliquely truncate posteriorly, with a small tubercle in the middle just before the base of the truncation. Head shining, very sparsely and finely punctured, the thorax opaque and more closely punctured, the pronotum not excavated. Abdomen broad, sparsely and shallowly punctured; the basal segment with a shallow transverse groove before the apex and without hairs at the base; the second segment transversely and coarsely rugose, with a deep transverse groove at the apex bordered by raised transverse carinæ. Pygidium longer than broad, finely longitudinally striated, the apex smooth and broadly rounded, the epipygium broad at the base and produced laterally into prominent angles, thence narrowed sharply. Fifth ventral segment punctured, with obscure longitudinal striæ near the apex; the first ventral segment carinate from the base, with a triangular truncation at the apex, the groove between the first and second ventral segments deeply marked.

Ferruginous brown; the thorax and median segment fuscous; the front of the head and the anterior tibiæ above ochraceous.

Length 9 mm.

Hab. Chile.

Type in B.M.

This is a true *Elaphroptera*, but differs in the much longer median segment and the absence of hair at the base of the abdomen from most of the known females. It will probably prove to be the female of *E. hyalinipennis*, Spin., but it would be unjustifiable to place it with that species until absolute certainty is attained.

#### *Ariphron excisus*, sp. n.

♀. Head large and moderately flattened, subrectangular, but strongly rounded at the posterior angles, broader than long, sparsely punctured, the vertex shining, the front subopaque and minutely punctured between the coarser punctures. The front prominent between the antennæ and bilobed, the antennæ inserted near to each other in a space strongly depressed below the front, the clypeus also depressed. Eyes very small, almost round, situated near the base of the mandibles, which are large and prominent. Pronotum coarsely punctured, much narrower than the head, the median portion longitudinally elevated and  $\Lambda$ -shaped, pointed on the anterior margin, with a large, deep, smooth excavation on each side. Scutellum very narrow; the mesopleuræ

finely and closely punctured, very prominent anteriorly, and almost toothed at the lower angle; a very deep groove between the pro- and mesopleuræ for the reception of the anterior femora. The anterior tibiæ are produced beneath into a compressed carina which is very deeply and narrowly incised before the middle. Median segment shorter than the pronotum, broadened and obliquely truncate posteriorly, closely punctured, the sides of the segment delicately aciculated. Abdomen broader than the thorax, closely punctured, with rather long greyish pubescence on the sides; the first segment narrowed and truncate at the base; the second punctured rugose, with a low transverse carina near the base and the apical margin slightly raised; the pygidium narrow and convex, with a low, median, longitudinal carina, a small elongate-ovate truncation at the apex, the carina continued on the surface of the truncation almost to the apex. All the ventral segments are rather closely punctured.

Fuscous, the legs fusco-ferruginous, the front of the head fulvous. The tarsal ungues are bluntly toothed near the base.

Length 9 mm.

*Hab.* S. Australia (?).

Type in B.M., purchased in 1867, apparently from Bake-well's collection.

I place this peculiar species in *Ariphron* with doubt. The sculpture of the abdomen is more like *Tachynomyia*, but in the excavated pronotum, the prominent mesopleuræ, and the shape of the head it is much nearer *Ariphron*. The remarkable form of the anterior tibiæ seems to be peculiar to the species, but they are not normally formed in *A. bicolor* or *A. tryphonoides*. In *tryphonoides* there is a prominent projection on the anterior tibiæ above near the base.

#### *Tachynomyia adusta*, Sm.

*Thynnus adustus*, Sm. Cat. Hym. B.M. vii. p. 43. n. 122 (1859), ♀.

*Ælurus pilosulus*, Sm. Cat. Hym. B.M. vii. p. 56. n. 10 (1859), ♂.

Several pairs taken *in copula* by Mr. G. A. Waterhouse at Killara near Sydney early in October.

#### *Tachynomyia vulpina*, Sm.

*Ælurus vulpinus*, Sm. Cat. Hym. B.M. vii. p. 54. n. 7 (1859), ♂.

In my revision of the group (Proc. Linn. Soc. N. S. W. xxxii. p. 286, 1907) I gave this as a synonym of *T. mærens*, Westw. A further examination has convinced me that the



species are quite distinct, the hypopygium of *T. vulpina* being broadly subtruncate at the apex, in addition to the difference in colour of the legs and wings; the abdomen is rather more shallowly punctured. The female described by me is that of true *mærens*.

*Tachynomyia megacephala*, sp. n.

♂. Clypeus finely and closely punctured, the apical margin broadly smooth, a carina from the base not reaching the apex, narrowly produced and truncate at the apex. Head very large, broad and massive, deeply concave beneath, with a fringe of long, curved, pale fulvous hairs on the sides; the prominence between the antennæ broadly truncate at the apex, not bilobed; the antennæ inserted farther from each other than from the eyes, the scape scarcely longer than the two basal joints of the flagellum combined. The head is shining, deeply, but not very closely, punctured; the posterior ocelli three times as far from the posterior margin of the head as from each other and more than half as far again from the eyes as from each other. Thorax closely and rather finely punctured, much more sparsely and coarsely on the disc of the mesonotum and scutellum; the pronotum narrower than the head, the anterior margin slightly raised and thickened, the scutellum strongly convex and raised above the mesonotum, rather short and broadly truncate at the apex; the mesonotum is broad, measuring nearly 3 mm. between the tegulæ. Median segment and pleuræ opaque, finely and very closely punctured, the median segment rounded, with an almost obsolete sulcus from the base. Abdomen smooth and shining, fusiform; the basal segment half as broad at the apex as long, very narrow at the base, the second segment twice as broad at the apex as the first, slightly depressed at the base, the two apical segments sparsely punctured. Hypopygium short, projecting very little beyond the epipygium, triangular, produced at the apex into a short, blunt spine, the basal angles with a small acute spine.

Black; the apex of the clypeus, a narrow line on the apex of the interantennal prominence, the anterior margin of the pronotum narrowly interrupted in the middle, the tegulæ and the postscutellum pale yellow. Wings fusco-hyaline, darkest towards the apex, the posterior wings subhyaline; nervures black. The pleuræ and median segment thinly clothed with rather long white pubescence. The tibiæ without spines on the outer margin.

Length 14 mm.

*Hab.* Cape York, Q. (Turner) ; April.

Type in B.M.

Very near *T. flavopicta*, Ritsema, the type of which came from Aru, but this is a more stoutly built insect and the wings are much darker, the head also is larger and more massive.

*Thynnus trisulcatus*, Sm.

This female, of which the male is unknown, is certainly distinct from *T. depressus*, Westw., under which name I placed it with doubt in my recent revision of the family.

*Thynnus (Zeleboria) monticolus*, sp. n.

♂. Clypeus produced and rather narrowly truncate at the apex, very finely and closely punctured, not carinated. Antennæ inserted nearer to each other than to the eyes, as long as the head, thorax, and median segment combined, the apical joints rather feebly arcuate. Front very finely rugulose, with a delicate longitudinal sulcus reaching the anterior ocellus. Head transverse, finely and closely punctured. Thorax finely punctured, the mesonotum with two longitudinal impressed lines on each side. Median segment longer than broad, delicately aciculate, with sparse cinereous pubescence on the sides. Abdomen subpetiolate, fusiform, longer than the head, thorax, and median segment combined, smooth and shining, with sparse and fine punctures. Hypopygium longer than broad, slightly narrowed to the apex, the apical margin truncate with a very short apical spine.

Black; the mandibles at the base, the anterior margin of the pronotum very narrowly and interrupted in the middle, and the middle of the postscutellum very pale yellow. Wings hyaline, nervures black. The second recurrent nervure is received at one-quarter from the base of the third cubital cell.

Length 14 mm., exp. 27 mm.

*Hab.* The Australian Alps, Victoria.

Nearest to *T. (Zeleboria) nitidulus*, Turn., from which it differs in the frontal sulcus and in the colour, especially of the legs, which are black instead of ferruginous as in the allied species.

*Thynnus (Zeleboria) lævifrons*, Sm.

*Thynnus (Agriomyia) lævifrons*, Turn. Proc. Linn. Soc. N.S.W. xxxiii. p. 166 (1908).

I placed this female in the subgenus *Agriomyia* in my revision of the family, but it is almost certainly a *Zeleboria*, probably the opposite sex of *Z. sexmaculatus*, Sm.

*Thynnus (Æolothynnus) halophilus*, sp. n.

♂. Clypeus convex, large and long, truncate at the apex, the middle sparsely punctured, the sides almost smooth, the labrum exposed. Front long and narrow, rather strongly punctured, the inner margins of the eyes almost parallel, the eyes long and narrow; the antennæ inserted much farther from each other than from the eyes and almost as far from the apex of the clypeus as from the anterior ocellus, the prominence between them not much raised, bilobed and deeply emarginate at the apex. Thorax closely and rather finely punctured, the pronotum as broad as the head, broadly emarginate anteriorly, the anterior margin raised. Mesopleuræ rather coarsely punctured; the mesonotum marked with two shallow longitudinal sulci on each side; the scutellum rather large, truncate at the apex. Median segment sparsely, but very deeply and coarsely, punctured at the base, subtruncate and rugulose posteriorly. Abdomen elongate, about as long as the head, thorax, and median segment combined, the segments constricted moderately at the base and with a raised transverse mark emarginate in the middle just before the depressed apical margin, all the segments sparsely and finely punctured. Hypopygium rather broad, tridentate at the apex, the central spine long and slender from the base, more than twice as long as the two lateral ones. The sixth ventral segment has a very short and blunt spine at each of the apical angles.

Black; the mandibles (except at the apex), the sides of the clypeus, the inner margin of the eyes broadly as high as the base of the antennæ, the margins of the pronotum, broadly interrupted in the middle of the anterior margin, the tegulæ and a curved line above them, a square spot on the posterior margin of the mesonotum, a vertical band emarginate posteriorly on the mesopleuræ below the anterior wings, a spot before the base of the intermediate coxæ, a transverse mark near the apex of the scutellum and a spot on each side at its anterior angles, the postscutellum, an oblique band on each side on the apical portion of the median segment, curved at the apex and continued on the sides of the segment, and a short transverse band on each side of abdominal segments 1-5 pale yellow; the legs pale ferruginous. Wings hyaline, nervures pale testaceous, the stigma light ferruginous.

Length 6 mm.

*Hab.* Cape York, Q. (*Turner*); April and May.

Type in B.M.

Very near *cerceroides*, Sm., but the head and clypeus are much longer and narrower than in the typical form of that insect and the thorax is much more finely punctured. It is a much smaller and less robust species, and the colour of the legs is different.

In my key to the females of *Thynnus* I have placed those of the subgenus *Æolothynnus* among those with the tarsal ungues simple; but in all except those of the *westwoodii* group there is really a minute tooth near the middle. In all the ungues are very feeble and small.

*Thynnus gravidus*, Westw.

In my revision of the Thynnidæ I suggested that this might be the female of *Oncorrhinus xanthospilus*, but on a further examination of the type at Oxford I feel little doubt that Westwood was correct in connecting it with his *T. klugii*, and that the female which I described as that of *T. klugii*, Westw., should belong to the closely allied species *T. poultoni*, Turn., which was confused both in the Oxford and British Museums with *T. klugii*. The two females agree in the structure of the hind femora, the strongly developed spur of the anterior tibiæ, the shape of the pygidium, the sculpture of the first two dorsal segments of the abdomen, and the bituberculate prominence between the antennæ. The pronotum in *T. poultoni* is, however, not concave on the sides, and I have been unable to examine the mouth-parts; the fifth ventral segment in *T. gravidus* is longitudinally striated at the apex, whereas in *T. poultoni* it is transversely striated. The difference in colour is striking, considering the close resemblance between the males.

*Thynnus bidens*, Sauss.

In my recent revision of the Thynnidæ (Proc. Linn. Soc. N.S.W. xxxiii. p. 249, 1908) I gave this as a synonym of *T. gracilis*, Westw., but the hypopygium is quite different, being shorter, without basal spines and with the sides bent upwards. *Thynnus viduus*, Sauss., is the female of this species, but is very near *T. gracilis*, ♀; the head being rather longer in *T. gracilis*.

*Thynnus pseudomelleus*, sp. n.

♂. Clypeus truncate at the apex, the angles very slightly prominent, shallowly and rather closely punctured, very narrowly truncate at the base and connected by a broad

carina with the prominence between the antennæ; the labrum scarcely visible. The antennæ inserted a little farther from each other than from the eyes, the prominence between them broadly V-shaped and divided by a longitudinal sulcus. Head closely and rather shallowly punctured, covered with rather long greyish pubescence. Thorax closely punctured, the pronotum narrowed anteriorly, the anterior margin very slightly raised, straight and narrower than the head. The disc of the mesonotum is bordered on the sides by a raised curved carina above the tegulæ, and the longitudinal sulci usually present in the family are absent. The scutellum is large, broadly rounded at the apex. Median segment obliquely truncate from a little behind the post-scutellum, rounded at the sides, closely and shallowly punctured and with rather long grey pubescence. Abdomen elongate, the segments slightly depressed at the base, shining and rather sparsely punctured; the transverse groove between the first and second ventral segments is shallow. Epipygium very coarsely punctured, without a produced dorsal plate, semicircularly depressed at the apex. Hypopygium short, produced into a stout spine projecting a little beyond the epipygium.

Black; the mandibles (except at the apex), the clypeus, the prominence between the antennæ, the margins of the eyes interrupted at the summit, continued in a narrow band on the posterior margin of the head bisinuate in the middle, the pronotum (except a small black spot on the middle of the anterior margin and a large transverse mark on each side), the mesopleuræ in front, a curved mark on the mesonotum above the tegulæ, two oblique marks uniting posteriorly on the disc of the mesonotum, the scutellum with the base rather broadly black and a narrow transverse black mark on each side near the apex, the postscutellum, a large mark trilobed posteriorly at the apex of the median segment and produced laterally on to the sides of the segment, the coxæ and femora beneath, the tegulæ, and a broad band near the apex of each abdominal segment except the seventh pale yellow; the bands are continued beneath on ventral segments 2-5. Femora and tarsi dull ferruginous, the femora very pale yellow above. Wings hyaline, tinged with yellow at the base, nervures and stigma ferruginous.

Length 19 mm.

*Hab.* Glen Innes, N.S.W. (*Froggatt*).

Type in coll. *Froggatt*.

Near *T. frenchi*, Turn., but the scutellum is shorter and differently shaped in addition to the considerable differences

in colour; the clypeus is also rather shorter and not pointed at the base as in *T. frenchi*. The markings are very similar to those of *T. melleus*, Westw., but the colour is pale yellow instead of orange.

*Thynnus atrocior*, sp. n.

♂. Clypeus coarsely punctured, some of the punctures confluent longitudinally, very prominent at the extreme base, then depressed and flattened to the apex, where it is broadly truncate, with very slightly prominent angles; the labrum projecting a little beyond the clypeus, not bilobed. Maxillæ with a fringe of very long hairs on the outer margin. Head closely and rather deeply punctured, the antennæ of equal thickness throughout, a little further from each other at the base than from the eyes, the second joint of the flagellum only two-thirds of the length of the third; the prominence between the antennæ broadly rounded at the apex and connected by a very short carina with the pointed base of the clypeus; a delicate carina from just below the anterior ocellus reaching the apex of the interantennal prominence. Thorax closely punctured, the pronotum with a transverse groove just behind the anterior margin, the anterior angles scarcely prominent; the mesonotum with the usual two longitudinal sulci on each side, the inner one much the deepest; the scutellum about two-thirds of the length of the mesonotum, convex and longitudinally subcarinate in the middle. Median segment rather finely rugose, with a longitudinal depression from the base, oblique and shining posteriorly, with a deep sulcus on each side close to the apex. Abdomen closely, but not deeply punctured; the first segment as broad at the apex as the second, the segment feebly constricted at the base, and narrowly depressed on the apical margin, the first ventral segment divided from the second by a moderately deep groove, the sixth segment with a short spine on each side at the apical angle; the dorsal plate of the epipygium flatly produced, truncate at the apex and coarsely longitudinally striated. Hypopygium prominently rounded at the basal angles, but not toothed, thence rather broadly produced and rounded at the apex, without an apical spine; transversely striated above near the base, with a longitudinal, low carina near the apex; punctured beneath, with a longitudinal carina.

Black; with close grey pubescence, longest on the sides of the head and abdomen and on the pleuræ, the spines of the tibiæ whitish, the mandibles dark fusco-ferruginous.

The flattened portion of the clypeus and the extreme apex of the median segment are without pubescence and shining, the remainder of the insect opaque. The anterior coxæ are very slightly concave beneath. Wings hyaline, nervures black.

Length 18 mm.

*Hab.* Gippsland, Victoria.

Very near *T. atrox*, Turn., from Western Australia, but the sculpture of the clypeus is different, and the spines at the basal angles of the hypopygium are not developed. The tubercle at the base of the second ventral segment, which is strongly developed in *T. atrox*, is absent in the present species.

*Thynnus multistrigatus*, sp. n.

♀. Head shining, very sparsely, but rather deeply punctured, more closely on the front between the antennæ, very slightly convex, more than half as broad again as long, and rounded at the posterior angles; the eyes oval, not touching the base of the mandibles. Thorax and median segment shining and very sparsely punctured; the pronotum as broad as the head, nearly twice as broad anteriorly as long, very slightly narrowed posteriorly, with a row of setigerous punctures on the anterior margin which is almost straight. The scutellum is narrowed and broadly rounded posteriorly; the median segment very short, obliquely truncated from just behind the scutellum; the pleuræ smooth and shining. Abdomen shining, segments 3-5 almost smooth; the first segment truncate anteriorly, the face of the truncation strongly concave, the dorsal surface rugosely punctured at the base, with a patch of long pubescence in the middle, and with three transverse carinæ near the apex, which are separated from the recurved apical margin by a rather broad transverse groove. Second segment with about twenty transverse carinæ, those near the base low and fine, very near together, those near the apex much stronger and farther apart. Pygidium truncate posteriorly, strongly constricted before the base of the truncation and transversely striated, the surface of the truncation ovate and smooth, the hypopygium not emarginate at the apex. Fifth ventral segment coarsely longitudinally striated and deeply emarginate at the apex. The basal joint of the intermediate tarsi is broad and flat, but not as strongly so as in some of the allied species. The clypeus is transverse, convex in the middle but not carinate, and closely punctured.

Black; the scutellum, a spot on each side of the first and

second abdominal segments, a band near the apex of the third and fourth, almost interrupted in the middle on the third and broadly interrupted on the fourth, the apex of the first ventral segment and a large spot on each side of segments 2-4 yellow; antennæ piceous; legs fusco-ferruginous beneath.

Length 18 mm.

*Hab.* Richmond, N.S.W. (*Froggatt*).

Type in coll. *Froggatt*.

This is the female of a species belonging to the section *Zaspilothynnus*, Ashm., but the head is not deeply grooved as in *leachiellus*, Westw., which Ashmead takes for the type of his genus. But other species in which the male does not seem to differ in structure from *leachiellus* (notably *T. vernalis*, Turn.) have the head of the female without grooves, so that I cannot regard this character as of more than specific importance.

In my key to the species of *Thynnus* (Proc. Linn. Soc. N.S.W. xxxiii. p. 84, 1908) I have placed *T. seductor*, Sm., among the species without a spine at the apical angles of the sixth ventral segment. This is an error, for the spine although short and blunt is distinctly visible. On the other hand, *T. anchorites*, Turn., has been placed, by an oversight on my part, among the species in which the spine is present, whereas there is no trace of a spine.

#### *Thynnus sabulosus*, Turn.

*Thynnus sabulosus*, Turn. Proc. Linn. Soc. N.S.W. xxxiii. p. 208 (1908), ♀.

This will probably prove to be the female of *T. zonatus*, Guér. (*nigropectus*, Sm.), which is a wide-ranging species, the localities for specimens in the British Museum being Swan River, Roeburne, N.W.A., and Alexandria, near the eastern border of the Northern Territory. Though the head of *T. sabulosus* is not deeply grooved as in most species allied to *T. dentatus*, Fab., it certainly belongs to that group.

#### *Thynnus picticollis*, Turn.

*Thynnus picticollis*, Turn. Proc. Linn. Soc. N.S.W. xxxiii. p. 216 (1908), ♀.

This belongs to the group *Zaspilothynnus*, Ashm., and may prove to be the female of *T. ochrocephalus*, Sm. The first joint of the intermediate tarsi is very strongly flattened and broadened, and the intermediate tibiæ are also broader



and stouter than in most of the allied species. The pygidium is not emarginate at the apex as it is in typical *Thynnus*, agreeing in this point with other species of the *Zaspilothynnus* group, which, when the family is more studied, may be raised to generic rank, as is done by Ashmead.

*Thynnus brisbanensis*, sp. n.

♂. Clypeus broadly truncate at the apex, the angles slightly prominent, pointed at the base and connected with the interantennal prominence by a short and narrow carina, sparsely punctured and very finely longitudinally striated; the labrum prominent. Antennæ inserted a little further from each other than from the eyes; the prominence between them broadly triangular, with a carina from the apex extending to the anterior ocellus. Front closely and finely punctured-striate, the vertex closely punctured. Pronotum broader than the head, closely punctured, with a very shallow transverse groove behind the feebly raised anterior margin. Mesonotum very closely punctured between the two longitudinal lateral sulci, the centre more sparsely punctured; scutellum large, very broadly rounded at the apex, and sparsely punctured; the postscutellum almost transverse, reaching but not projecting beyond the truncation of the median segment, which is broad and slightly oblique, not quite vertical, the surface very finely rugulose. Abdomen subconical, the first segment truncate anteriorly, slightly rounded at the anterior angles, as broad at the apex as the second segment, the whole abdomen shining and rather sparsely punctured, the segments not constricted. The dorsal plate of the epipygium is produced, longitudinally striated, and shallowly emarginate at the apex. Sixth ventral segment with a short spine on each side at the apical angles. Hypopygium with five spines, those at the basal angles blunt and not very prominent. The first ventral segment is longitudinally carinate and obliquely truncate at the apex, the groove separating it from the second segment is shallow.

Black; the mandibles (except at the apex), the clypeus, the labrum, a broadly V-shaped mark between the antennæ, the margins of the eyes narrowly interrupted at the summit, the anterior and posterior margins of the pronotum, a spot on the mesopleuræ below the anterior wings and another above the base of the intermediate coxæ, the tegulæ and a narrow oblique line behind them, a broad median mark on the posterior margin of the mesonotum, the apical half of the scutellum and a spot on each side at the anterior angles, the postscutellum, the median segment on the middle and the

sides, the coxæ beneath, the projection of the mesosternum between the intermediate coxæ, the truncation of the first abdominal segment with a longitudinal black mark in the middle and a small black spot on each near the base of the truncation, a broad band emarginate in the middle and less deeply on the sides posteriorly above the truncation and not separated from it, a broad band rather narrowly interrupted in the middle and emarginate on each side posteriorly on dorsal segments 2-6, the apex of the first ventral segment and a large spot marked with a narrow black lunule on each side of the ventral segments 2-5, largest on the second and gradually diminishing in size to the fifth, yellow. Wings hyaline, nervures black.

Length 21 mm.

*Hab.* Stradbroke Island (A. J. Turner); January.

Type in coll. Froggatt.

Allied to typical *Thynnus* by the hypopygium, but in some points nearer to Ashmead's group *Zaspilothynnus*. It is very nearly allied to *T. elgneri*, Turn., from Cape York, but in that species the hypopygium is narrower at the apex and the legs are ferruginous; it is also very much smaller than the present species. Until the female is known I think it better to connect these two species with the typical *Thynnus* group rather than with *Zaspilothynnus*, though it is quite possible that the females, when discovered, will prove to be nearer the latter.

*Thynnus ventralis*, Sm., var. *desiccatus*, var. n.

Specimens of this species received lately by the British Museum, collected by Mr. H. J. Hillier at Hermansburg, Central Australia, differ from the common form from the N.W. Coast as follows:—

♂. The yellow spots on each side of the fourth and fifth dorsal abdominal segments, which are always present in the specimens I have seen of *ventralis*, are absent in var. *desiccatus*, in which also the femora and tibiæ are ferruginous instead of yellow, and the mesopleuræ, mesonotum, metasternum, and intermediate and posterior trochanters and coxæ black instead of yellow.

♀. The variety has the clypeus black instead of yellow and the anterior margin of the pronotum is distinctly raised, which is not the case in the type of the female, the sternum and coxæ are also black in the variety, except a small yellow spot at the base of the intermediate and posterior coxæ. There are four males and two females in the Museum collection.

XVIII.—The Type of *Exocoetus exiliens* (L. Gmel.).

By ALBERT GÜNTHER, F.R.S. &c.

IN the collection of Linnean specimens of Fishes, now in the possession of the Linnean Society of London, there is a specimen of *Exocoetus*, sent by Garden to Linnæus from Carolina at an uncertain date. I have already mentioned it in my list of Linnean specimens in Proc. Linn. Soc. 1899, p. 37, no. 165; but I then failed to recognize its importance; it undoubtedly proves to be the type of (L.) Gmelin's *Exocoetus exiliens*.

It is the dried skin of a fish 6 in. long, which had been preserved in the manner of a botanical specimen; the head has been compressed and crushed; both sides of the skin are preserved, and the vertebral column shows through large vacuities in the skin; the fins are collapsed, with the exception of the pectorals, which are stretched to their full width and glued to a supporting piece of paper. The specimen is labelled by Garden, No. 25, and in Linné's handwriting *Exocoetus volans*.

It is not necessary to repeat here Gmelin's diagnosis of the fish; and I may at once proceed to supplement it as far as the dilapidated condition of the specimen will allow.

The length of the head is contained  $4\frac{5}{8}$  times in the total (without caudal); the snout seems to have been rather pointed. The pectoral fin extends nearly to the caudal, and consists of 14 rays on one side, and 15 on the other; of these the first is simple (33 mm. long), half as long as the second which is branched; however, on one side, a rudimentary ray (3 or 4 mm. long) can be made out to precede the first ray\*; none of the rays are lamellated in the basal portion as in *E. lamellifer*. The ventrals are inserted midway between the gill-opening and the root of the caudal, and reach nearly to the base of this fin. The dorsal and anal fins are collapsed, firmly adhering to the skin of the tail, so that it is difficult to

\* Lütken attached considerable taxonomic value to the presence of either one or two simple rays in front of the first branched pectoral ray. If the additional simple ray is of some length and connected with the second simple ray by an interradiation membrane, its presence, no doubt, forms a specific character. However, I find that in several species, which were supposed to have, and are generally described as having, one simple ray only, there is a rudimentary additional ray present. It is more or less covered by the skin, attached to the base of the long simple ray, with which in adult individuals it actually coalesces, thus increasing the power of resistance at the spot where it is most wanted for flying. I suppose that in young individuals this ray is much more conspicuously distinct.

count the rays, but the former seems to be formed of 12 or 13, and the latter of 9 or 10 rays. *The dorsal fin commences far in advance of the anal*, in fact, the first anal ray is opposite to the sixth of the dorsal; on the other hand, the basis of the anal extends rather more backwards than that of the dorsal. The dorsal is elevated throughout its length, some of the hinder rays reaching nearly to the caudal. The lower caudal lobe in its present dried condition is considerably longer than the head (33 mm.). The majority of the scales are lost, but there seem to have been 42 in a longitudinal series on the side of the body, and 28 between head and dorsal fin; I count 9 longitudinal series above the first anal ray.

The hinder part of the dorsal, possibly the entire fin, was black; the anal whitish, the extremity of the caudal blackish. Basis of the pectoral blackish, then follows a broad white cross-band from the lower to the upper margin; the posterior half of the fin black, with traces of a narrow white margin. Anterior half of ventrals whitish, posterior blackish. No black band across the abdomen.

The characters given above tally very well with the notes left by Gmelin, except the numbers of the fin-rays, which Gmelin states to be D. 10, A. 11. However, no great weight can be attached to this discrepancy, considering the frequent inaccuracies which we meet in this respect in Gmelin's edition, as well as the great difficulty in ascertaining the correct numbers in this particular specimen, the fins of which must have been always (since it came into Linné's possession) in the same collapsed and dried-up condition. Mr. Tate Regan assisted me in fixing the numbers by counting the swelled joints at the base of the fin-rays.

Gmelin says: "pectorales radio primo et secundo brevis"; we must therefore conclude that he saw and counted the rudimentary ray which I find on one side of the specimen, but not on the other. But this condition is very different from that obtaining in the young individuals which Lütken (Vid. Meddel. 1876, pp. 110 *et seq.*) determined as *E. exiliens*, and which have that anterior ray much more developed, nearly one half the length of the second.

Jordan and Evermann (Fish. N. Amer. p. 732) ascribe the priority of the original description and the name "*exiliens*" to P. L. S. Müller, giving 1776 as the date. This is an error. That date is the year of publication of the *first* volume of Müller's work: the description of our fish appears in the seventh volume (Supplement) dated 1789, a year later than Gmelin's edition of the 'Systema naturæ,' and published several years after Müller's death. Besides, Müller (or, after

his death, his Editor) had no specimen, and merely reproduced in a German translation the original Latin description in Gmelin's edition; this description is acknowledged by him as being taken from "Linnæus" (p. 210).

Gmelin's *E. exiliens* is at present known from the Tropical Atlantic only; in fact, from the type alone. I am unable to identify it with any of the species, as distinguished by Valenciennes, Brown Goode, Jordan and his fellow-labourers. The question whether a high dorsal fin with convex upper margin (as observed in our specimen) is invariably, or only in a part of the species of *Exocætus*, a sign of youth, has not yet been satisfactorily settled. But there remains the backward position of the anal fin: a character which precludes the idea of associating our specimen with *E. rondeletii*, *lamellifer*, or the *E. exiliens* of Jordan and Evermann. In this respect it comes nearest to *E. katoptron* (Bleek. \*), *E. robustus* (Gthr.), and *E. altipinnis* (C. V.). In fact, I should be inclined to regard the last, which was obtained in the Indian Ocean and near the Cape of Good Hope, as a synonym of *E. exiliens* (L. Gm.), if Valenciennes did not ascribe to it *twelve* rays in the anal fin. On the other hand, the figure which he gives of this fish shows *eight* or *nine* only †. Finally, the fish from Wood's Hole, which Jordan and Evermann continue to figure as late as 1905 ('Hawaii Shore-Fishes,' p. 133, fig. 45) as *Exocætus volitans*, may well prove to be a more advanced stage of growth of *Exocætus exiliens* (L. Gm.).

XIX.—*Some Mammals from N.E. Kimberley, Northern Australia.* By OLDFIELD THOMAS.

THE British Museum has acquired from Mr. J. P. Rogers a few mammals collected by him on Parry's Creek, near Wyndham, N.E. Kimberley, and these prove to be of such interest as to deserve a short account. Of the six species represented three need new names.

It is interesting to notice that there seems to be a greater

\* In Bleeker's figure of this species the ventral fins are represented much too short; they were mutilated in the single specimen which he had and which is now in the British Museum.

† I am indebted to Dr. Pellegrin, who at my request examined the types of *E. altipinnis*, for the information (received while this paper was passing through the press) that Valenciennes had correctly counted the anal rays, but that the figure was in this respect incorrect.

difference between the mammals of this district and those of the comparatively adjacent Arnhem Land, Port Essington, &c., than between the latter and Eastern Australia, more than a thousand miles distant. For example, typical *Dasyurus hallucatus* ranges from Inkerman, E. Queensland, to Port Essington, but is replaced in Kimberley by subsp. *exilis*. Again, *Chalinolobus nigrogriseus* occurs at Port Essington and at Moreton Bay, New South Wales, while we here have the new form *Ch. rogersi*. The north and south political line dividing South Australia and its Northern Territory from Western Australia would therefore seem also to form the boundary-line between the two faunas.

1. *Chalinolobus rogersi*, sp. n.

♂. No. 9. Parry's Creek. Alt. 10'. 4th September, 1908. *Type*.

A small species, black, with hoary tips to the hairs.

Most nearly allied to *Ch. nigrogriseus*, Gould, with which it shares the more normal shape of the skull as compared with the peculiarly shaped skull of *Ch. gouldi* and *morio*. Ears and tragus about as in *Ch. nigrogriseus*. Fur soft and fine; hairs of back about  $4\frac{1}{2}$  mm. in length. General colour grey (grey no. 6), resulting from the hairs being deep brownish black, with their tips (0.5 mm.) dull whitish, the whole giving a rather striking and unusual hoary appearance to the bat. Colour below similar, but the light tips are broader and more drab in tone, at least on the body. On the wing-membrane, however, which is thickly hairy outwards to a line joining the elbow and knee, the hairs are prominently whitish for their terminal halves, as are those edging the interfemoral membrane. Wing-membranes brown, a narrow whitish line edging the plagiopatagium. A well-marked postcalcareal lobe present. Tip of tail little projecting.

Skull smaller than in *Ch. nigrogriseus* and its brain-case rather more inflated. Other characters and relative size of teeth as in that species.

Dimensions of the type (the starred measurements taken in the flesh):—

Forearm 34.5 mm.

Head and body 45\*; tail 34\*; ear 6\*. Third finger, metacarpal 32, first phalanx 16; lower leg and hind foot (c. u.) 21.5.

Skull: condylo-basal length 12.2; basi-sinual length 9.9;

zygomatic breadth 8·6; mastoid breadth 7·4; palato-sinual length 4·6; front of canine to back of  $m^3$  4·5.

*Type* as above.

This well-marked little species, which I have named after its discoverer, may be readily distinguished from its only nearly ally *Ch. nigrogriseus* by its hoary colour and the smaller size of its skull.

## 2. *Mus ferculinus*, Thos.

♂. 2. Parry's Creek.

I fail to find any satisfactory means of distinction between this and the type from Barrow Island, N.W. Australia.

## 3. *Mesembriomys*\* *argurus indutus*, subsp. n.

♂. 1, 6, 8; ♀. 4. Parry's Creek; near sea-level.

Similar to typical *argurus* in all respects, except that the tail, instead of being wholly white above and below, is distinctly and sharply bicolor, dark brown along the upper surface, white on the sides and below; it is also rather more heavily pencilled.

Dimensions of the type (measured in flesh):—

Head and body 107 mm.; tail 96 (not quite perfect, another specimen 109); hind foot 22; ear 18.

Skull: greatest length 33·5; basilar length 25·7; nasals 11·6; interorbital breadth 4·8; palatilar length 15; diastema 8·6; palatal foramina 6·6; upper molar series 5·5.

*Type*. Adult male. Original number 1. Collected 13th Aug., 1908.

These specimens are the first we have had in skin of this form of *Mesembriomys*, the type and only known example of *M. argurus* being in spirit. That type was purchased from a collector who traversed Australia from north to south, and it is probable that it was obtained in the interior desert-region, which would account for its whitened tail as compared with the brown tail of this northern coast subspecies.

Mr. Rogers states that this animal has a thickened fatty tail, as also has *M. pedunculatus*, this character being rarely found among Muridæ, although in other groups it often occurs in the inhabitants of desert regions.

\* *Ammomys*, Thos. Ann. & Mag. Nat. Hist. (7) xvii. p. 84 (1906) (nec Raf.).

4. *Petrogale inornata*, Gould.

♂. 5. Parry's Creek.

This rare species has not hitherto been represented in the Museum Collection, as the type, described by Gould in 1842, was reclaimed by the collector, Mr. Bynoe, and has now disappeared.

5. *Isoodon macrurus*, Gould.

♂. 7. Parry's Creek.

6. *Dasyurus hallucatus exilis*, subsp. n.

♂. 10, 11. Parry's Creek.

A smaller paler form of *D. hallucatus*.

Size decidedly less than in true *hallucatus*. General colour above paler, owing to the ground-colour itself being paler (approaching "drab-grey"), while the white spots are not only very numerous, but are not so sharply defined, white hairs straggling over from them to the darker ground-colour. Ears, sides of neck, under surface, and upper sides of hands and feet white or whitish, instead of pale drabby. Tail thinner and less heavily pencilled than in *hallucatus*, its upper side lightly grizzled drabby for three-fourths its length, the underside and tip dark brown\*.

Skull as in true *hallucatus*, but rather smaller throughout. Teeth distinctly smaller.

Dimensions of the type (measured in flesh):—

Head and body 266 mm.; tail 219; hind foot 43; ear 35.

Skull: basal length 58; greatest breadth 39; interorbital breadth 14; palatal length 32.5; combined length of three anterior molariform teeth 11.6.

*Type.* Old male. Original number 10. Collected 8th September, 1908.

A very well-marked form which many naturalists would consider deserved specific rather than subspecific distinction. The balance of convenience, however, appears to me to be on the side of recognizing in its name that it is related to and locally representative of the species of which I call it a subspecies. A simple binomial gives no clue to its relationship.

\* In *hallucatus* the tail is grizzled drabby or grizzled buffy above and laterally for about half its length, the under surface (except the extreme base) and end being black or blackish. The description given in the Catalogue of Marsupials was based on imperfect specimens.



XX.—Notes from the Gatty Marine Laboratory, St. Andrews.  
—No. XXXI. By Prof. M'INTOSH, M.D., LL.D.,  
F.R.S., &c.

[Plates V. & VI.]

1. On a Young Stage of *Gadus luscus* with bold transverse bars of pigment.
2. On the British *Spionidæ*.
3. On the *Spionidæ* dredged by H.M.S. 'Porcupine' in 1869 and 1870.

*On a Young Stage of Gadus luscus with bold transverse bars of pigment.*

The example (Plate V. fig. 1), which measured 70 mm. in length, was thrown alive on the sand by a runlet of seawater near the Pole Rock, adjoining the West Sands, St. Andrews, on 3rd April, 1908, along with a young ling of  $7\frac{1}{2}$  inches in the boldly banded condition. The young bib had a brownish-red colour with very distinct black bars, a coloration which, like that of the young cod, may be protective amongst the seaweeds and rocks. The dorsal surface of the head is covered with dark pigment, a pale band separating this from a dark band joining the upper border of each operculum. A broad dark belt passes downward below the interval between the 1st and 2nd dorsals to the ventral border; and the abdomen in front, almost to the opercular aperture, has a considerable amount of pigment. The most perfect band is a broad one which has its anterior border at the last third of the 2nd dorsal and passes with a slight slope backward to the base of the 1st anal. Its posterior edge is a little behind a line joining the intervals between the 2nd and 3rd dorsals and the anals. The last area of dark pigment occupies the region extending behind the 3rd dorsal and the 2nd anal to the base of the caudal rays. The dorsal and ventral edges of the body have much black pigment; and an interrupted line of distinct and larger pigment-specks passes from a point a little behind the eye nearly to the end of the 3rd dorsal, and at a short distance from the dorsal edge. A similar line is visible close to the base of the 2nd anal, and it may have extended further forward in life. Besides the bars the skin is covered by a general dusting of black specks, and these extend over the chin, opercular region, the median fins, especially the 1st anal and the anterior part of the 2nd. The dorsals show fewer specks. At the base of the pectoral dorsally is a patch of black pigment, and at a somewhat higher level in

front of it is a black spot on the operculum. The number of fin-rays in the 1st anal is 31, a larger number than has been met with in any example of the young of the poor-cod (*Gadus minutus*) over an area stretching from the North of Scotland to the Thames. The 1st branchial arch bears 20 filaments and 15 gill-rakers, the former a comparatively high number, and, moreover, they are ranged along the entire length of the gill-arch, whereas in the examples from the Thames they diminish rather abruptly before reaching the ventral edge. The 2nd, 3rd, and 4th arches respectively have 15, 13, and 11 gill-rakers. In the young poor-cod \* of the same size from Aberdeen the numbers in each case were notably higher, though the long filaments at this stage had a similar shape.

*Young poor-cod same length as young bib.*

Gill-rakers.			
I.	II.	III.	IV.
27	19	16	16
19 or 20	—	17	—
24	18	14	12

The long filaments in the poor-cod of the same length are, like the example of the bib, long and slender.

In comparing the specimen from St. Andrews with examples of *Gadus luscus* of the same length from the estuary of the Thames, a noteworthy feature is the greater depth of the body and the high arch formed by its dorsal edge in the southern forms. The length of the 1st anal in the St. Andrews example is shorter than the pre-anal outline, that is, the distance from the anus the tip of the snout; whereas in the southern the pre-anal outline is shorter than the length of the base of the 1st anal fin. Again, the proportions of the 1st and 2nd anal fins in the respective examples differ, greater inequality being present in the southern forms. The two anal fins are more distinctly separated in the St. Andrews form, yet Schmidt † holds that in the bib they are practically connected and that the highest point of the 3rd dorsal and the 2nd anal lies far back, so that the anterior parts of these fins are almost parallel, a feature not evident in the St. Andrews example. The position of

\* I am indebted for a series of these to the Fishery Board for Scotland.

† Meddelsler Fra Komm. for Havundesøgelser serie Fiskerei, Bd. ii. p. 57 &c.

the anus in the latter is somewhat behind that usually seen in the adult. Further, each specimen from the Thames has a dark pigment-band, which is visible after ten years' preservation in spirit, on the free edge of the caudal rays, which also showed less of a median indentation than in the St. Andrews specimen. The barbel in the latter is also thicker and slightly shorter, whilst the eye is proportionally larger. Some of these differences may be due to the precocity of the southern examples of the same length; for in the essential structural features the specimen of 77 mm. from St. Andrews pertains to *Gadus luscus* and diverges from the poor-cod (*Gadus minutus*). Whilst young forms of the latter are not uncommon in St. Andrews Bay, in consonance with the prevalence of the adults, the bib is less common, and few or none of 70 mm. have been previously obtained. It appears to be otherwise in regard to the poor-cod in Norwegian waters; for it is stated in the 'Scandinavian Fishes' that neither adults nor fry are ever seen close inshore, nor are they taken by the seine.

Allusion has often been made to a banded stage in the life-history of the bib. Thus Dr. Günther\* mentions that the bib has cross-bands during life, and with a black axillary spot. Dr. Day † describes them as 5 or 6 broad vertical bands of rather darker colour descending from the back to the lower surface, meeting those of opposite sides. Mr. Couch ‡ and Malm § also allude to the same feature as an occasional occurrence. In the remarks on the bib and the poor-cod in 1888 || it was stated that the iridescence of the bib resembles that of the bronze-winged pigeon, the pale streaks on the sides occurring in broad blotches between the darker pigment-bands. Yet amongst many young bib captured along with young poor-cod, soles, and other forms in the nets of the shrimp-trawlers of the Thames, no banded forms were met with, and some were of the same length as the specimen here dealt with, whilst others were shorter or longer. Similar bands to those described in the examples from St. Andrews (70 mm. in length) occur in another 7½ in. long. The first is a band in front of the first dorsal fin and including its anterior third and thence to the pectoral. The second is a broad bar of dark pigment, separated from the former by a pale belt, which extended to the anterior third of the second dorsal. A broad pale band followed, and then a very well-

\* Introd. to Study of Fishes, p. 541.

† Brit. Fishes, vol. i. p. 287.

‡ Brit. Fishes, vol. iii. p. 71.

§ In the 'Scandinavian Fishes,' i. p. 493.

|| Ann. & Mag. Nat. Hist., Oct. 1888, p. 348.

marked and broad belt from the posterior third of the second dorsal sloped downward and slightly backward to the ventral border. Traces of the dark band at the base of the tail are also visible, and the dark border to the tail is evident. In this example the filaments on the first gill-arch and the gill-rakers are exactly as in the young form as regards number, though the filaments presented a distal dilatation and terminated sooner ventrally than in the younger form of 70 mm.

## 2. *On the British Spionidæ.*

The Spionidæ were included by Dr. Johnston in the Catalogue of the British Museum under the Ariciidæ, a group which comprised representatives of various families. He recognized for the first time several, e. g. *Nerine vulgaris* (= *Scolecopsis vulgaris*), besides *Nerine coniocephala* (= *Nerine foliosa*, Sars), *Spio filicornis*, O. F. M., *Spio seticornis*, O. Fabr., and *Leucodore ciliatus*, Johnst. In the 'Invertebrate Marine Fauna of Plymouth' (1904) no *Spio* is recorded, but *Scolecopsis vulgaris*, Johnst., *Nerine foliosa*, Sars, and *Nerine cirratulus*, Delle Chiaje, *Aonides oxycephala*, Sars, *Polydora ciliata*, Johnst., *P. flava*, Claparède, *P. cæca*, Ersted, and *P. hoplura*, Claparède, are entered, besides *Scolecopsis giardii*, De Quatrefages, a synonym of *Scolecopsis vulgaris*.

In *Nerine foliosa*, Sars, the head forms a somewhat blunt cone, the dorsal ridge terminating posteriorly in a rounded enlargement followed by a short tentacle. The palpi are elongate and tapering. The body is from 6 to 8 inches in length and nearly  $\frac{3}{8}$  in. broad, somewhat flattened dorsally and slightly convex ventrally, little tapered in front, but gradually diminishing posteriorly to the crenate anus, and in one a cirrus in the median ventral line and longer than the diameter of the vent occurs. The segments are about 200. In extrusion the proboscis forms a short cylinder, the free margin presenting an irregular series of frills, whilst ventrally the column is marked by longitudinal grooves. Occasionally in full protrusion two prominent lobes occur distally with a small bilobed process above and a single lobe below, whilst within the frilled margin laterally and inferiorly is a crenate brown line indicating a differentiation.

In the anterior region of the body (in spirit), where both fillets are present in the feet and where the branchiæ are large, each segment dorsally shows two transverse ridges

and a median furrow; whereas ventrally the segment is undivided, each being separated by a deep furrow at the junction in front and behind. In the next region, where branchiæ are less, the dorsum has an elevated transverse ridge with a narrow groove and a belt in front and behind. Ventrally a broad ridge with a furrow, and a narrower belt in front and behind, occurs. Still further backward, and where the branchia is represented by a rounded papilla, the dorsum shows an elevated transverse band with a more or less distinct median furrow, an enlargement in the centre of the dorsum anteriorly and one at each side, the intermediate region being marked by transverse lines. On the ventral surface a similar elevated transverse band is present, but the lateral enlargements are indistinct, and though there is an interrupted median band no median enlargement of the transverse band is visible.

The feet are furnished with branchiæ from the second backward, and they are amalgamated with the superior lamellæ from the 2nd to beyond the 50th. The inter-lamellar notch is distinct. The ventral lamella, at first prominent and rounded, becomes narrower and elongated from above downward on the appearance of the winged hooks. The latter occur in the superior division about the 70th bristled foot (Mcsnil gives the 65th). The bristles in the upper division in front form two groups, a long upper series and a shorter inferior, all curved, dappled, and finely tapered. At the foot just mentioned (70th) the branchia has lost much of its external frill, and is again separated inferiorly from the posterior fillet of the upper division of the foot, which rises into a prominent border superiorly. The anterior fillet has disappeared in both divisions, and the fillet from the second ring of the segment runs up behind the posterior fillet at its ventral edge. The bristles in the upper division remain simple, but are more slender than in front. The inferior division carries winged hooks, with the exception of a few bristles superiorly and inferiorly. The chief changes toward the posterior end are the diminution of the branchia (which at the 125th foot forms a process less than the vertical diameter of the upper fillet), the diminution in the number of the superior bristles (which are in a single fascicle), the abbreviation of the upper border of the long fillet of the ventral division, and the increase and prominence of that part of the fillet bearing the bristles and hooks. Finally, the branchia diminishes to a minute rounded papilla, the upper fillet is short and almost semi-circular, whilst a broad gap separates it from the inferior

fillet, which, though diminished, resembles that in front, viz., has a more prominent margin at the lower half.

It is strictly an inhabitant of the sand.

Part of Dr. Johnston's description of *Nerine coniocephala* would apply to *Nerine cirratulus*, Delle Chiaje, whilst his figure indicates *Nerine foliosa*.

The second British species is *Nerine cirratulus*, Delle Chiaje, which has a wide distribution on both east and west coasts and extends to the Mediterranean. The head is acutely pointed anteriorly, the central processes passing backward to end in the median tentacle. The median ridge is supported by the buccal segment on each side, so that the snout appears to be trilobed. The eyes are four and small, the anterior pair wider apart; situated in front of the occipital tentacle. The body is 6-8 inches in length, and posteriorly terminates in a crenate anus. The branchiæ commence on the second foot, and the dorsal lamella is attached to the outer edge in front. At first, *e. g.* from the 10th to the 25th foot, the lamella has two divisions, then it becomes single and hatchet-shaped and is fixed only to the base of the branchia. At the 10th foot the long, almost filiform branchia projects upward, the coil of the included vessel leaving only  $\frac{1}{6}$  of the length free. Nearly a third of the outer border is occupied by the upper flap of the division, and the free papilla at the tip projects upward in addition. The strong yet finely tapered bristles extend obliquely upward beyond the edge of the flap, and only traces of wings are present. The tips of the shorter bristles form a regular series nearer the edge of the flap, and the broader and less tapered extremities of these show indications of wings. All are minutely dotted, as mentioned by De St. Joseph. The flap of the inferior division forms an irregular semicircle, shorter from above downward than the superior, but projecting further outward. The dotted bristles also form two series, viz. a lower group with finely tapered tips and a shorter series with slightly winged tips; the upward slope of these bristles being less than in the case of the dorsal. Little change occurs at the 25th foot except the increase of the inferior lamella, the subulate condition of the branchia, and the more slender bristles. The hooks have a bold upward curve toward the end of the shaft, then the diminished tip bends backward and ends in a small, blunt fang with a spike on the crown, the whole guarded by wings. At the 70th foot bristles still occupy the upper division, so that the southern forms, from which Mesnil drew up his description,

differ considerably from the northern. The diminution of the branchia goes on posteriorly with the separation of the lamella behind the bristles. Mesnil includes under this form *Malacoceros longirostris* of De Quatrefuges, *Nerine agilis*, Verrill, and *Nerine heteropoda*, Webster.

The third species is *Scolecopsis vulgaris*, Johnston, which has a truncate head with a frontal tentacle at each side, the anterior border forming the base of a triangle, the apex of which goes to an adherent occipital tentacle. The long palpi are pale, marked externally by whitish bars with the zigzag blood-vessels. The eyes as a rule are absent in the preparations. The body is 3-4 inches long, slightly narrowed in front, and tapering posteriorly to the vent, which has 8 cirri (De St. Joseph gives 20-30 and Mesnil 16). The first foot carries a distinct though small branchia. The bristles of the upper division form a fan and are in two sections, the dorsal much longer, more slender and more finely tapered, and an inferior group of shorter bristles also with finely tapered tips. The bristles of the fan-like ventral row are similar in structure, but shorter. All lie in front of the lamellæ. At the 10th foot the inferior lamella is vertically elongated, its upper edge embracing the branchia, whilst its inferior forms a rounded lobe ventrally. The upper group of golden bristles still point dorsally, but they are shorter. The long lower bristle-row is curved backward. The lamella of the inferior division is short and hatchet-shaped. Beneath the foregoing is a small lamella, probably homologous with the papilla present in *Nerine*. No noteworthy change occurs in the 25th foot, except the increase of the ventral lamella, and the same may be said as far as the 50th. About the 50th, however, the elongation of the ventral lamella is conspicuous, and a series of long, winged hooks appear in this division. These have stout curved shafts, a strong and sharp main fang, and two well-marked spikes on the crown. Short bristles accompany the hooks, and about three are prominent ventrally. De St. Joseph found that the hooks appeared between the 30th and 52nd, whilst Mesnil gives from the 35th to the 37th. Except that a diminution in the general size of the feet occurs, the arrangement is similar at the 100th foot, but the dorsal bristles are considerably longer and more slender. The branchia remains fairly large, and the ventral hooks retain the same type as in front and are accompanied by the short bristles. In life the lamellæ of the feet as well as the branchiæ, which meet those of the opposite side in front,

are muscular, and perform various movements. Mesnil could not satisfy himself as to the identity of Johnston's *Nerine vulgaris* with De Quatrefage's *Mulacoceros vulgaris* vel *Scolecopsis girardi*. He points out that what was sent to him from Heligoland as *Nerine vulgaris*, Johnston, pertains to *Scolecopsis fuliginosa*, Claparède. Ehrenbaum, he states, considered the *Aonis wagneri* of Leuckart as identical with the supposed *Nerine vulgaris*, and Mesnil thought *Colobranchus ci/iatus*, Keferstein, a distinct form, a view not now held.

The fourth British species is *Scolecopsis fuliginosa*, Claparède, in which the head in lateral view is more pointed than in *Scolecopsis vulgaris*, and in front has a median cleft. The constriction behind the broad base of the frontal tentacles is more marked. A cream-coloured patch occurs on the prostomium, with black pigment on that region and on the dorsum as well as on each side of the mouth. The palpi have dark bands. The body is about 3 inches long, smaller, as a rule, than *Scolecopsis vulgaris*, with longer branchiæ anteriorly, and it tapers a little in front, but much more posteriorly, where it ends in a vent with 8 flattened cirri. The segments numerous—150 to 160.

The first foot carries a larger branchia than in *S. vulgaris*, and the superior lamella is narrower and the tip more acute, whilst the inferior lamella is also narrower and more prominent. The bristles are similar, but more delicate. At the 10th foot the branchia is a long, richly ciliated process, the upper lamella is hatchet-shaped, pointed and free superiorly, the inferior lamella being capstan-shaped. The long bristles at the upper edge of the dorsal tuft have narrow wings, and the shorter forms, dorsally and ventrally, are finely tapered. The branchia and superior lamella diminish before the 50th foot, about which foot three or four winged hooks appear in the ventral division. These hooks differ from those of *Scolecopsis vulgaris* in the larger angle made by the main fang with the neck, in its rather blunt tip, and in the presence of only a single spine on the crown. The ventral hooks and associated short bristles continue to the posterior end. This form is not uncommon in the south. Mesnil makes two varieties, viz. var. *microchaeta* from Naples, and *macrochaeta* from the Channel, and further two subdivisions, viz. *minor* and *major*, but such distinctions are mainly of interest in demonstrating the variability of the species.

The fifth member of the group is *Scolecopsis (Laonice)*



*cirrata*, Sars, a northern form which extends from Shetland to the S.W. of Ireland, and abroad to Greenland, Norway, and Canada. The broad anterior edge of the short head is smoothly rounded, or in some slightly bilobed. A somewhat triangular ridge, with the base in front, passes backward and ends in a point posteriorly, from the apex of which a small subulate tentacle springs. Two eyes are present, one on each side of the ridge in front of the tentacle. A lamella occurs at the base of the long tapering palpi. The body is about 1-2 inches in length, and is little tapered in front, so that it has a truncated aspect. It is rounded dorsally and deeply grooved ventrally from end to end. The first foot bears a branchia and a large hatchet-shaped lamella, with a conical end superiorly and a somewhat straight margin inferiorly. The ventral lamella is nearly as large, bluntly conical superiorly, and curving to a sharp angle inferiorly. The dorsal bristles are capillary, the long tuft being superior, the shorter inferior. The branchiæ continue of considerable size to the 25th foot, the great dorsal lamella remaining nearly as at the 10th foot and is almost reniform. The ventral lamella is slipper-shaped, the broad end being uppermost, and both are free. The winged hooks appear about this (25th) foot, have a slight dilatation of the shaft above the backward curve, then gradually diminish to the throat, from which the main fang comes off at a little more than a right angle, and a single spike occurs on the crown. Two slender capillary bristles are below the hooks. The bristles become very long and attenuate posteriorly, and wings are not evident. Not a single British example is complete, and few go beyond the 25th foot.

The British species of the genus *Spio* have hitherto been involved in considerable obscurity, for though three are described by Dr. Johnston in the Catalogue of the British Museum, it is by no means easy to identify them. Only two are entered by Malmgren as occurring in northern waters, viz. *Spio filicornis*, O. Fabr., and *Spio seticornis*, O. Fabr., both of which were known to O. Fabricius, who founded the genus for annelids with two long tentacles. Dr. Johnston in 1838 placed *Nerine* and *Leucodore* under the same head. Örsted separated the genera *Nerine* and *Spio* by the form of the dorsal lamellæ; whilst Claparède showed that this distinction was artificial. Mesnil, again, thinks that Malmgren complicated the question by reviving the generic name *Scolecopsis* and undid the advance made by Claparède, a view which cannot now be held. Yet he affirms that Malmgren

conserved the genus *Spio* without definitely defining it, and described under the name *Spio filicornis*, O. Fabr., a species which he (Mesnil) has demonstrated to be very near his *Spio martinensis*, and he doubts if Malmgren's form is that of Fabricius, though the figure pertains to the same genus. He does not accept Levinsen's inclusion of the genus *Nerine* of Johnston under *Spio*. He does not, in short, know any species falling within the description of the two species of Fabricius as entered by O. F. Müller.

For the present purposes the genus *Spio* may be characterised, after Mesnil, as having a prostomium without frontal tentacles; branchiæ from the first setigerous segment to the end; anus surrounded by cirri; always two rows of bristles in each division; and after a certain segment (8th to 15th) the posterior row is formed by winged hooks. The first species is *Spio filicornis*, O. Fabr., which has a snout somewhat like that of *Polydora* on a large scale, or akin to that of *Pygospio*, with a blunt bifid median rostrum and a bulging process of the buccal segment on each side. Two or three minute eyes occur on each side of the median ridge posteriorly. The median process passes from the tip of the snout backward to end in a conical papilla. The body is 2-3 inches in length, broad and scarcely tapered in front, but gradually diminishing to the moderately slender posterior end, which has two thicker cirri dorsally and two more slender cirri ventrally. The segments range from 60 to 80. The ligulate branchiæ occur on all the bristled segments. The superior lamella of the 10th foot is bluntly rounded dorsally and slopes obliquely to the wide notch inferiorly. The ventral lamella is more or less semicircular. The bristles of the upper division form a wide tuft; the longest superiorly, and all are curved backward and winged. The ventral bristles are somewhat shorter, but similarly tapered, and some of the lower forms present a slight dilatation in the winged region. The type of bristle rapidly changes, for at the 14th foot, or sooner, a row of hooks appears in the ventral series, with finely tapered short bristles in front, and a few winged bristles inferiorly. The upper lamella gradually diminishes, and still more the inferior, so that the setigerous process becomes prominent, and a group of bristles at the ventral edge of the inferior division becomes modified—each being curved, flattened, and furnished with a hook or a probe-tip. The winged hooks have straight shafts, which increase in bulk superiorly, then curve backward and slightly dilate before the contraction at the throat. The strong and

sharp main fang comes off nearly at a right angle and the crown has a single sharp spike. This form was dredged in 8 fathoms in Bressay Sound. Mesnil's *Spio martinensis*\*, which he hints may yet be linked on to *Spio filicornis*, O. Fabr., differs in the form of the head, since it has no fissure in front, but the author's drawings perhaps need more definition. Moreover, he mentions no occipital tentacle. The number of segments, the size, and the general structure of the tail, feet (from the 1st backward), and bristles agree, yet in the British form the latter are not punctated, a feature of moment, for only longitudinal striæ are visible even in the inferior ventral.

*Spio seticornis*, Fabr., has a head produced anteriorly into a rostrum, with two small frontal tentacles, the central region supported by the buccal segment on each side. It is about an inch in length, little tapered anteriorly, and gradually diminished posteriorly. The branchiæ commence on the first segment and apparently continue to the posterior end. They seem to be conspicuous about the middle of the body. The foot has a narrow and prominent superior lamella in front and a small conical lower lamella. The former diminishes posteriorly and the latter becomes flattened out as a narrow rim. The bristles present a long dorsal group and a shorter lower group in the superior division, and a similar short group in the ventral division anteriorly; but at the 8th bristled segment the place of the latter is taken by winged hooks, the main fang of which comes off at a large angle from the neck and is not very acutely pointed, the rounded crown bearing a single spike.

This differs from the previous form in so far as the hooks appear before the 10th bristled segment, probably at the 8th. Thus at the 5th foot the branchia is well developed, whilst the upper lamella passes outward and upward as a broad conical flap, and the bristles form a diminishing series from above downward. The inferior lamella is small, forming a short blunt cone pointing below the setigerous process. At the 10th foot the branchia is larger and apparently flattened, the upper free edge above the superior lamella is shorter. The superior lamella is small at the 25th foot, but the branchia remains large; it becomes less at the 50th foot. It is difficult to say what the *Spio seticornis*, Fabr., of Cunningham and Ramage † is. Mesnil thinks it has

\* Bullet. Sc. Fr. Belg. xxix. p. 122, pl. vii. figs. 1-20 (1896).

† Trans. Roy. Soc. Edin. vol. xxxiii. p. 640, pl. xxxvii. figs. 4, 4 A, & 4 B.

the characters of *Pygospio elegans*, but this is doubtful. Two thick anal cirri occur posteriorly.

A softened fragment from the deeper water off St. Andrews Bay appears to pertain to a distinct form which may provisionally be termed *Spio* D. It is about 2 inches in length and with subulate branchiæ from end to end. Two eyes occur anteriorly. The dorsal division of the foot has long tufts of finely tapered capillary bristles, and the ventral appear to have a similar character, though this was not observed *in situ*. Posteriorly the dorsal bristles increase much in length. Some of the tufts show also a shorter series of stronger bristles with a distinct hook at the point, and in some groups in the pulpy preparations no other form occurs. It may be that the shorter hooked forms represent the ventral series posteriorly.

A small form procured between tide-marks, St. Peter Port, Guernsey, may be related to *Spio mecznikowianus*\* of Claparède or to the *Spio atlanticus* of Langerhans †, since, so far as can be made out, the dorsal lamella does not fuse with the branchia, which seems to extend from the second segment almost to the posterior end. Claparède, however, gives his form only two anal cirri, whereas Langerhaus states that there are four, the number present in the form under consideration, and they are similar to those of *Pygospio elegans*. The head somewhat resembles that of the species just mentioned, having two rounded bosses in front, apparently better defined than in *Pygospio*. The median ridge continues backward to the first segment or a little further. On each side, about the middle of the head, is a conspicuous black eye, and a trace of a second pair a little behind. The tentacles are absent. The body is comparatively small, about half an inch in length, somewhat broad and flattened in front and then slightly tapering to the snout, more gently tapered and rounded posteriorly, the tail terminating in a minute segment with 4 somewhat short conical cirri as in *Pygospio*. In the anterior segments the dorsal lamella, as viewed from above, appears to be filiform—sloping obliquely backward behind the bristles. Winged hooks occur ventrally on the 8th foot and continue to the posterior end. The shaft of the hook dilates from the narrow proximal end nearly to the wings, curves backward below these, continues

\* Annél. Nap. p. 324, pl. xxiii. fig. 2.

† Zeitschr. f. w. Zool. Bd. xxxiv. p. 89 (1880).

of nearly the same diameter almost to the neck, which is narrowed, but not much. The main fang comes off nearly at a right angle and is short and sharp, a single spike only occurring on the crown, and thus agreeing with the form described by Langerhans. The bristles follow the typical arrangement.

A *Spio* (G) from the deeper water off St. Andrews Bay is characterized by the rounded or bluntly pointed snout, the mouth opening a short distance behind the tip. The two tentacles are of moderate length and adhere firmly to the snout. At least one eye occurs on each side at the inner base of the tentacle. The body is about half an inch in length, somewhat rapidly tapered anteriorly, and more gently posteriorly, where it ends with cirri (only one of which is present). The dorsal surface is somewhat flattened, the ventral rounded. No branchiæ are visible. The dorsal lamellæ are much developed and foliaceous in front, especially the third. Winged hooks make their appearance about the 15th bristled segment; they are slender, slightly tapered after the backward curve to the throat, have a main fang and a single spike on the crown. The dorsal lamellæ diminish greatly after the 15th segment, and in the posterior half form small conical processes behind the setigerous papilla. The ventral division in the same region is represented by the hook-papilla. The dorsal bristles are capillary, finely tapered, and curved backward. Posteriorly they greatly increase in length and are very slender.

A species swarming in sand near low-water mark, St. Andrews, and also dredged in 2 fathoms off Symbister Harbour, Shetland, has been provisionally named *Spio gattyi*\*. The head terminates anteriorly in a rounded point—the centre of a cone formed by the buccal segment. A minute black eye occurs on each side of the median ridge, which ends in an occipital papilla or tentacle posteriorly. The body is about an inch in length, proportionally short and stout, a little tapered anteriorly, and more so posteriorly, where it ends in two broadly ovate cirri. The branchiæ are conspicuous from the 1st foot to the end. The dorsal lamella of the 1st foot is elongate-ovoid, with about a third of the dorsal edge free, the rest fused to the base of the branchia, the lower margin trending gently to the body-wall. The dorsal bristles are of moderate length, curved upward and slightly

\* Named after the founder of the St. Andrews Marine Laboratory.

backward, finely tapered, the upper series long and slender. The ventral lamella is a prominent, obtusely ovate process. By-and-by the superior lamella is flattened externally and less free superiorly, and the ventral lamella assumes a rhomboidal outline—rounded at the inferior angle. The winged hooks commence in the ventral division about the 13th foot along with the delicate bristles, and they show a main fang with a spike on the crown. The lamellæ increase in size immediately before the 50th foot, the winged hooks to the number of 9 occupying nearly the entire length of the ventral lamellæ.

A small form not hitherto recorded, though it has long been known in Britain, is *Pygospio elegans*, Claparède\*, which occurs abundantly in sandy tubes in fissures of rocks and similar localities in various parts of the kingdom. The head is bluntly bifid, with a median ridge running backward to the second segment. The eyes are 2, 4, or 6, situated on the ridge or behind the middle of the ridge and between the tentacles, which are very long and attenuate. The body is very slender and elongate—of a dull yellowish colour with a tint of orange, the anterior third being reddish from the blood-vessels. The segments number from 40–60. The first twelve bristled segments are narrower than the succeeding. The branchia appears on the 13th segment, and to its outer border the somewhat crenate lamella is fused. From 19 to 25 pairs of branchiæ are largely developed, with conspicuous cilia in a row along the median anterior region, the rows of opposite sides being connected by an intermediate line of these organs. The largest branchiæ are about the posterior third of the series, and they appear to differ from the French examples, which have the branchiæ, according to Mesnil, equally developed throughout, and that, moreover, their number is usually 8, though they may reach 23. Posteriorly the body terminates in 4 small whitish conical processes which are not ciliated. Anteriorly the feet have conical dorsal lamellæ and smaller conical ventral lamellæ, but the latter soon diminish. The upper dorsal bristles are long and finely tapered, whilst the lower and shorter have broader tips with finely tapered ends. The wider ventral forms occur on the 3rd foot, as indicated by Mesnil. All the bristles are dotted and curve backward. This type of foot extends only to the 7th, for the 8th has its ventral bristles replaced by winged hooks, about 4 of which occur on each

\* Beobach. p. 37, pl. xiv. figs. 23–31 (1863).

foot. The wings are short and broad, expanded and smoothly rounded at the free end. The shaft has a forward curve distally, then it bends backward below the wings, and slightly diminishes at the throat, from which a short sharp main fang passes off at little more than a right angle, and with a single prominent spike on the crown. Posteriorly the dorsal bristles greatly increase in length and slenderness, stretching upward and outward as a hair-like tuft, whilst the superior lamella is represented by a small conical papilla above their base. The hooks occupy the same relative position, but the number is greater, viz. about 7, and a slight rim indicates the ventral lamella.

Another form very common amongst sand near low-water mark at St. Andrews is *Spiophanes bombyx*, Claparède\*. In this the head has two short frontal tentacles, from which a median elevation passes backward to end in a small conical peak or eminence. The two palpi are of moderate size, contain blood-vessels, and are frequently coiled. A small eye-speck occurs posteriorly on each side of the median ridge near the peak, and in the preparations are raised, with the ridge, above the general level. An anterior pair, a little wider apart, lies in front of them. The body is about 3 inches in length, very little tapered anteriorly, and much more so posteriorly, where it ends in a wide vent with crenate lips and two short ventral cirri. Many specimens have reproduced tails, for the species is remarkable for its fragility. The dorsum is somewhat flattened anteriorly, rounded throughout the rest of its extent, and marked ventrally by a median band, which, when it comes to the vent, splits, a limb curving upward on each side to join the dorsal band, and it may be indicating the junction of the ventral with the dorsal vessel. A median and two lateral brownish lines occur on the dorsum behind the head, but they pass only a short distance backward. The sides are vascular anteriorly, then of a pale brownish hue, thereafter orange from the colour of the gut. The ventral surface is pale, though the gut is visible.

The 1st foot has dorsally a subulate or narrow lanceolate lamella (cirrus) which has been shifted inward, so that it resembles a branchia. The dorsal bristles are very long and slender, with hair-like tips and with no evident wings. They spring from a conical setigerous process, also carried inward on the dorsum. The ventral bristles of this foot are shorter

\* Mém. Soc. Phys. et Hist. Nat. Genève, xx. p. 485, pl. xii. fig. 2.

but similarly filiform at the tip. In addition two much thicker bristles, winged at the tip, resemble modified hooks, since they end in a small claw-like tip. These hook-like bristles apparently perform a special function in the tubicolous habits of the species, just as the homologous organs of *Sclerocheilus* do. Either considerable variation occurs or Mesnil's figure of these organs is at fault, for he shows and describes them as having a simple tapering tip and winged in the ordinary way, whereas the specimens from St. Andrews have the tips specially differentiated and the wing adjusted like that of a hook.

The dorsal lamella moves gradually to the dorso-lateral region, and the foot at the 6th bristled segment presents a massive lateral enlargement. This is more clearly shown at the 10th foot, the dorsal lamella being now considerably shorter, though still subulate, and the base is broad. The dorsal bristles can be differentiated into a longer upper series and a shorter and stouter lower series, as usual in the group, and they spread in a fan-like manner in front of the dorsal lamella. The ventral lamella has been modified into a great lateral mass which passes upward to the base of the dorsal lamella. The ventral bristles are short and stout, the lower forms distinctly curved backward at the tip, which is minutely dotted or mottled as well as winged, and appears, indeed, to be the special bristle figured by Mesnil—so different from the two peculiar hook-like bristles of the ventral division of the first segment. The laterally enlarged feet seem to be most prominent from the 4th to the 14th. In its progress backward the dorsal lamella or cirrus becomes less and presents a ventral enlargement, which is very marked, for instance, at the 15th segment, the massive base being in contrast with the slender distal process. Moreover, the winged hooks appear in the ventral division of this foot as a row of four, and beneath them is a single strong curved bristle or two with the dotted or mottled tip, which points downward. The feet considerably diminish from the 20th to the 30th. Thus at the 25th the shape of the dorsal cirrus or lamella is like that of a leg of mutton, the shank formed by the tapering cirrus itself. The dorsal bristles are still arranged in a fan-like tuft, the upper being the larger, and a line of powerful cilia runs from the foot inward on the dorsum. The space between the divisions is much reduced, and below the hooks are two of the powerful, slightly curved bristles which have the dotted distal regions and sharp points. The winged hooks are proportionally small, have a slightly curved and sharp main fang, coming off nearly at a right



angle from the throat, and with a small spike on the crown. At the 30th foot at least a dozen of these organs project from the surface.

Just in front of the tail the dorsal cirrus is moderately long and subulate, and occasionally it shows a basal enlargement. The dorsal bristles project for a third of their length beyond the tip of the cirrus. The region between the divisions of the foot is convex, and below the row of 7 or 8 hooks 1 or 2 curved bristles project. The convexity of the curve is outward.

Formerly, in consonance with the Catalogue of the British Museum, it was supposed that only one species of *Polydora* occurred in British waters, but more extended examination shows that at least five species are found in our seas besides *Polydora cæca*, CErsted, entered in the fauna of Plymouth, but which has not yet been examined at St. Andrews. The genus (founded by Bosc) was first clearly described by Claparède, who, however, included it under the Ariciidæ. The first species, *Polydora ciliata*, Johnston, has the prostomium elevated and terminating anteriorly in two rounded lobes with a median notch, the ridge passing backward to the 3rd segment. Four black eyes are on the ridge, and dark pigment occurs at its sides and in the furrows of the first four segments. The body is largest in the anterior third, flattened dorsally and rounded ventrally, tapered a little anteriorly and more distinctly posteriorly, where it ends in a cup-like process with a dorsal notch. The segments are from 60-75 in number. The branchiæ commence on the 7th foot and their number ranges from 22 to 31. Thus they differ from Mesnil's form of *P. ciliata*. The first foot has a dorsal lamella but no bristles, but the latter occur throughout the rest of the body. The fifth bristled segment has large hook-like bristles, the tips are curved, more or less acute, and have a small spur on the neck. This form is very widely distributed in European waters.

The second is *Polydora flava*, Claparède, which extends from Shetland to the Channel Islands and is common in the Mediterranean. The bifid prostomium is usually longer than in *Polydora ciliata* and the divergent processes more distinct. A little pigment occurs on each side of the prostomium in front. Eyes are not visible in the preparations. The median ridge of the snout reaches the fourth bristled segment. The body is of considerable proportional size (2 inches or more in length) in contrast with *P. ciliata*, but of similar con-

formation. The terminal caudal process has an even (continuous) rim. The first foot is peculiar in having bristles in its dorsal division, which presents a rounded lamella with a setigerous process in front and a small tuft of tapering bristles slightly curved backward *in situ*. The ventral division has a similar though somewhat broader lamella, in front of which is a conspicuous group of longer upper and shorter lower bristles, the latter having distinct traces of wings. The second, third, and fourth feet have completely formed dorsal and ventral divisions. The 5th segment has minute tufts of dorsal and ventral bristles, as in other forms, besides the great hook-like bristles which have the concavity of the tips directed backward, and which are arranged in a curve. In the ordinary condition the shaft enlarges from the base upward to the middle, then slightly diminishes to the tip, which forms a lever-like hook with a concavity posteriorly and an excavation in front. The foregoing hook-like bristles are accompanied by a series of spear-shaped bristles. In the developing hook the distal curve is very marked, and a small shoulder appears at the base of the concavity in front, whilst a lateral dimple and elevation and a differentiation at the commencement of the terminal curve are evident. In frontal view, as Mesnil shows, the distal region is likewise differentiated. The winged hooks commence in the ventral division of the 7th bristled segment. Each dilates a very little above the base and has a marked forward curve throughout the greater part of its length, then bends backward and diminishes to the neck. The main fang comes off at a considerable angle to the neck and is sharp, but the spike on the crown has a small angle with the fang. The dorsal bristles become extremely slender posteriorly, though of considerable length. Moreover, bundles of bristles even more slender than the foregoing occur in each foot posteriorly and they somewhat resemble linear crystals, being perfectly straight and slightly tapered at each end. The function of these is unknown. Mesnil states they are extremely caducous, and do not occur in front of the 80th bristled segment. The bacillary pouches seem to contain only granules somewhat larger than in *Magelona*. The branchiæ commence on the 8th segment, attain their maximum a few segments behind, and then they gradually diminish, the total number being about 35-40.

A third species appears to approach the *Polydora quadri-lobata* of Jacobi\*. The head has smaller prostomial lobes

\* Anat. histolog. Untersuch. der Polydoren der Kieler Bucht. Wissenfels, 1883, p. 6, Taf. i. & ii.

than *Polydora flava* and the median ridge goes backward to the 4th segment. The snout differs from most of the other forms in its conical outline, since the peristomial supports taper anteriorly. Jacobi describes and figures four eyes on the median ridge between the tentacles, though they are frequently absent. The arrangement of the bristles in the first four segments appears to be typical, though they are somewhat shorter than in *Polydora ciliata* or in *P. flava*, and the groups in the dorsal division are clearly differentiated. The fifth foot is distinguished by the large size and conspicuous condition of the dorsal capillary bristles (Pl. V. fig. 3), for the expanded distal region is bent at an angle to the shaft, and the tapered tip is again curved; thus the aspect is that of a pointed bill-hook. The great hook-like bristles (Pl. V. fig. 2) dilate from the base upward fully two-thirds of their length, then slightly diminish to the throat, from which a short distal region comes off at considerably more than a right angle and ends in a bifid truncated tip. Six or seven occur on each side, but the tips of only four or five project from the surface. Jacobi\* describes and figures those of his *Polydora quadrilobata* as ending bluntly with a right and left spur and a thin guard or wing. The latter, however, was not visible in this example, but may have been abraded. The ventral tuft is considerably smaller than the dorsal, but the type of bristle is maintained on a diminished scale.

So far as could be ascertained in the fragmentary form, the branchiæ commence on the 7th bristled segment, and the hooks, which do not materially differ from those of *Polydora ciliata*, on the 7th segment. Jacobi represents the anal funnel as 4-lobed, but it was not present in the British specimens.

Langerhans† describes *Polydora armata*, from Madeira, as having in the 5th segment two or three large hook-like bristles with trifid tips, but his figure shows a blunt, curved tip deeply cleft and winged, the outline being very different from Jacobi's. The prostomium is bifid, and the peristomial lobes are also blunt in front. The branchiæ occur from the 7th to the 12th segment. Moreover, in the last five or six segments brownish, stiff, straight, tapering bristles are present, thus differing, he observes, from Keferstein's *P. ciliata*, with which the branchiæ agree. The anal funnel has a dorsal and a ventral hiatus. If figures can be relied on, the tips of the large bristle-like hooks of the 5th segment as well as the anal funnel differ from Jacobi's species, and

\* *Op. cit.* p. 8.

† Zeitsch. f. w. Zool. Bd. xxxiv. p. 93, Taf. iv. fig. 5.

Carazzi\* compares the former with the pedicellaria of Echinoderms.

The fourth species, viz. *Polydora carazzi*, seems to be new, the prostomium anteriorly forming a smoothly rounded process, and thus characteristically differing from any of the foregoing. This process projects very little in front of the rounded lobes of the peristomium at the sides. The median ridge is slightly contracted behind the process, and passing backward terminates at the fourth bristled segment. The mouth opens on the ventral surface as a long triangle with a prominent lip on each side. No eyes are visible in the spirit-preparations and no pigment, but it may be different in the living examples. The body, of which only the anterior 26 segments remain, tapers from the 4th segment forward, the rest having nearly the same diameter; and it is a feature that the 5th bristled segment is fully in a line with the others, its antero-posterior diameter, as usual, being greater than that of the segments adjoining. The first foot has both a dorsal and a ventral lamella, but only a tuft of ventral bristles, the tips being directed rather outward than backward, the convexity of the curve, however, being forward. They are shorter than those immediately following. The 2nd, 3rd, and 4th feet offer no feature of note. The fifth foot is unusually prominent, and bears dorsally a strong tuft of capillary bristles, the flattened, winged, and rather short tips of which curve somewhat abruptly backward. The great hook-like bristles have the points of the main fang directed backward and slightly upward, and each consists of a broad flattened shaft (Pl. V. figs. 4 & 5), which dilates from the base to the distal third, where a gentle curve backward and a little diminution towards the throat occur; but whilst the inner outline is even, the outer shows a slight projection rather below the throat, which is by no means narrow. The strong main fang comes off at a little more than a right angle, and the tip is not very acute. Moreover, the crown of the fang seems to have the upper edge flattened and prominent on each side, whilst distally a comb-like crest with a serrated edge curves from the back of the crown almost to the point of the fang, so that *uncinus crista-galli* might be an appropriate name for such a hook. Indications of striæ which slope from behind forward and upward show that this crest is an aggregate of spines. Only a few bristles occur in the ventral tuft of this segment. The 6th bristled

\* Mitt. Zool. Stat. zu Neapel, ii. Bd. p. 21.

segment has lamellæ and dorsal and ventral bristles like the 4th, and winged hooks commence on the ventral division of the 7th, where also the branchiæ originate. The winged hooks (Pl. V. fig. 6) do not offer any diagnostic feature except their small size, a single spur occurring on the crown above the great fang. In contrast with *Polydora flava*, the lamellæ of the feet generally and the bristles are shorter, whilst the hooks project similarly in both. The species seems, so far as known, to be sparingly distributed.

The *Polydora hamata* of Langerhans\* also possesses a smoothly rounded prostomium, and the sides of the peristomium form a blunt cone. The great hook-like bristles of the 5th segment, however, somewhat resemble those of *Polydora flava*, and thus differ from the foregoing. The ventral hooks, moreover, have a brown belt on the neck, and the last 30 segments, or thereabout, have hook-like bristles, after the manner of *Polydora hoplura*, whilst the anal funnel is 4-lobed—all points of divergence from the preceding form.

The fifth and last of the series is *Polydora hoplura*, Claparède, which extends from the Outer Hebrides to Plymouth, and is also found on the east coast at St. Andrews. The head is similar to that of *Polydora ciliata*, except in the absence of black pigment in the preparations. The prostomium anteriorly has a median notch and two rounded lateral regions. The arrangement and shape of the lamellæ and bristles of the first four bristled segments are like those of *P. ciliata*. The fifth segment has hook-like bristles which are distinguished at first sight from those of *P. ciliata* by the parallel arrangement of the tips *in situ*—a feature due to their more uniform diameter,—by their peculiarly curved and by no means sharp tips, and by the position and size of the lateral spur at the neck. The branchiæ and winged hooks commence on the 7th segment, the hooks having a somewhat long main fang coming off nearly at a right angle with a single spur above. The feature most diagnostic of this species, viz. the hook-like bristles of the last 15 segments, is absent in the majority of the imperfect examples, but where the caudal region is present the region occupied by the hooks seems to be distinguished by the diminution of the prominent tufts of bristles characteristic of the region in front. The strongly curved and sharp hook-like bristles

are probably connected with the special functions of the region, which may require a hook of a different type from the ordinary winged form.

Some place the next form, viz. *Magelona papillicornis*, Fritz Müller, under a special family, but for the present it may be included, as formerly, under the Spionidæ. The head (prostomium) is a large, flattened, and somewhat ovoid muscular process, with chitinous basement-tissue, marked marginally by anastomosing vessels and forming a roof to the peristomial segment beneath it. The mouth opens ventrally, and the proboscis is extruded as a pinkish mushroom-shaped organ. The tentacles are remarkably long (2-3 inches), with large adhesive papillæ on the distal two-thirds, and non-caducous. Touches of dark pigment occur as bars on them. The body is from 4-6 inches in length, apparently of two well-marked regions—the anterior short, consisting of 8 segments, and the posterior of more than 100; but the peculiar 9th segment perhaps indicates a third region. The body is somewhat quadrangular in section throughout. The first region (of 8 segments) is narrowed behind and marked by a dorsal and a ventral longitudinal band, whilst the 9th segment is remarkably narrow. The third region is anteriorly of greater diameter than the first, continues of considerable breadth for some distance, and then gradually tapers to the tail, which ends in a rounded border having the anus within it, and with a short cirrus on each side. The lateral regions of the greater part of the third division of the body are modified into processes with peculiar convoluted organs composed of the cuticle, hypoderm, and basement-tissue.

The dorsal lamellæ of the first division are scoop-shaped, and the ventral are similar though smaller. The bristles of the region are capillary. The bristles of the 9th segment are shaped like a mace with a process at the tip, and differ from all the others as do the lamellæ. The third or posterior region has on each foot a row of winged hooks dorsally and another ventrally at the edge of the quadrangular body, whilst the somewhat ovate lamellæ are between them. The species ranges from Brazil to Britain.

The interesting *Pœcilocheetus serpens* of Dr. Allen\*, from Plymouth, probably comes near *Disoma* and *Scalibregma*. The pelagic post-larval types occur frequently at St. Andrews, yet no adult has ever been found there.

\* Quart. Journ. Micr. Sc. vol. xlviii. p. 79, with plates vii.-xii.

3. On the Spionidæ dredged by H.M.S. 'Porcupine' in 1869 and 1870.

Besides the widely distributed *Scolecolepis cirrata* of Sars, east of Cape de Gatte, in 16 to 60 fathoms, a form apparently falling under the genus *Nerinides* of Mesnil, and which may be termed *N. lamellata*, was dredged in the expedition of 1870 in Tangiers Bay at a depth of 35 fathoms. Only the anterior region is present. The head (Pl. V. fig. 7) forms an even transverse margin in front, with a short blunt tentacle at each angle, and from the centre a short elevated region proceeds backward, to end in a small process which is pointed posteriorly like an adherent tentacle. Minute eyes seem to be present on each side of the latter, but the condition of the specimen renders accurate determination difficult. The whole region is thus unusually short, and the proboscis is thrust out as a short cylinder with a crenate margin. The body is flattened, slightly and abruptly tapered anteriorly, and with a median band ventrally. The segments are narrow and numerous. The 1st foot carries a subulate branchia and a large lanceolate lamella projecting freely upward nearly as far as the branchia. The dorsal bristles are very slender, long, and finely tapered, and they have the normal position characteristic of the family. The ventral division also has a lanceolate process, and the bristles are long and slender. From the form of the body the bristles and lamellæ occupy the dorso-lateral edge, so that the branchiæ, which readily fall off, pass transverse'y inward over the flattened dorsum. At the 10th foot the branchia is well developed, though still subulate, and the dorsal lamella forms a large lanceolate flap directed upward and inward. The bristles (Pl. VI. figs. 1 & 2), both dorsal and ventral, are long and slender in mass, and have a dull golden colour. The ventral lamella is now a broad, almost semicircular flap, with a tendency to a peak inferiorly. The bristles (Pl. VI. fig. 3) are in two groups, viz. finely tapered forms which stretch outward along the lamella, and a ventral series of shorter, broader bristles overlapping the former, like those seen in a *Scolecolepis* from Bressay Sound; but their tips are acute, not probe-pointed.

The branchia remains subulate at the 25th foot (Pl. VI. fig. 4) and stretches beyond the elongated upper lamella, which is acutely lanceolate superiorly, its outer edge being comparatively even till it curves inward inferiorly. The ventral lamella forms a blunt flap with the bristles in the groups formerly indicated. The branchia is still rather long

and subulate at the 50th foot, and the upper lamella is prominent and rounded inferiorly, whilst superiorly it is acutely lanceolate. The upper bristles of the dorsal series are long, slender, and finely tapered. A notch now separates the two divisions of the foot. The ventral lamella is also prominent and rounded, generally with a short peak. The modified bristles ventrally show a sharp and slightly hooked point (Pl. V. fig. 8), which under a high power is slightly dotted. No wings are visible in either dorsal or ventral bristles.

A fragmentary *Scolecopsis* (I), dredged in 35 fathoms amidst greyish sand, stones, and ooze in the 'Porcupine' Expedition of 1869, shows certain novel features. The head is short, with a slightly bilobed anterior border, which forms the base of a triangle ending in a short subulate tentacle posteriorly. No eyes are visible in the preparation. A little behind the anterior edge of the snout ventrally are two prominent rounded peristomial papillæ in front of the mouth. The fragmentary body consists of about 16 segments, at the posterior end of which new segments and a tail are developing. It is flattened dorsally and grooved in the median line ventrally, whilst the sides are flanked by an extraordinary development of dull golden bristles, which at first sight makes an approach to the condition in *Euphrosyne*. A kind of flap, vertically elongated, occurs immediately behind the snout, but it does not appear to have either bristle or branchia. The first bristled foot carries a branchia and long tufts of bristles dorsally and ventrally; but the condition of the foot negatives a minute description. The bristles are of comparatively great length and strength, are finely tapered, and conform to the usual arrangement in *Scolecopsis*, the upper of the superior division being longest and curved upward and backward. No wings are visible. The bristles of the inferior division form a dense group shorter than the superior, and they are curved backward. Focussing indicated a margin on each side of the tapered tip, but no distinct wing is visible.

The great development of the superior lamella is soon conspicuous, and at the 10th foot (Pl. VI. fig. 9) it forms a large lanceolate crest on the dorsum, the outer or inferior edge being rounded, whilst the inner is acute. The branchia appears to be subulate and to stretch inward over the dorsum, but all had disappeared during the examination of the minute specimen. The remarkably dense, strong, and boldly curved dull golden bristles curve upward and backward, and narrow



wings are evident on the lower and many others in the division. The upper, as usual, are longer and more slender, but also present indications of wings. The ventral lamella is separated from the dorsal by a notch with a papilla, and is somewhat capstan-like, only the edges slope to a low cone in the centre. Its bristles curve downward and backward, taper to a fine point, and have narrow wings. Moreover, they are all minutely dotted or dappled, and many of the upper forms show a peculiar mark just below the tip, as if a portion had been scooped out. It is possible that friction may be connected with this appearance.

The condition of the posterior region is unknown, but at the 16th foot the superior lamella is still large and lanceolate, with a rounded outer or inferior margin, and the bristles have rather increased in length. The ventral lamella, however, is smaller and of the form of a short capstan. The bristles are also longer, and a ventral group of 4 or 5 larger, longer, and boldly curved bristles is differentiated, each tapering to a fine point, and the wings are more distinct.

A form dredged in the 'Porcupine' Expedition of 1870 in 45 fathoms off Cape Sagres is distinguished both dorsally and laterally by the structure of the snout, which is shaped somewhat like that of *Staurocephalus*, and thus differs from that of *Prionospio*. It has been termed *Kinbergella plumosa*, after the distinguished Professor in Stockholm, who has done so much to advance our knowledge of the marine annelids\*.

Anteriorly, when viewed from the dorsum (Pl. V. fig. 9), two rather thick, flattened, anterior tentacles are separated by a median papilla, whilst the buccal segment gradually narrows to the base of a rounded bilobed papilla (like miniature *corpora albicantia*) on the dorsum behind. When seen from the front the anterior processes present a double foliate arrangement like the anterior end of certain mollusca, the mouth forming a median protuberance at the ventral edge. An arrangement of this kind is rare in the group. A kind of collar passes round the body at this region. The mouth opens immediately beneath the median papilla on the snout, and the lower lip, which has a slight cleft in the centre, is prominent, the aperture looking forward rather than ventrally. A projection exists on one side behind the papilla, but no palpi or tentacles are seen.

\* Since this was written Prof. Kinberg has passed away, full of years and honours. His name will long and honourably be associated with the group.

Only a fragment of the anterior region of the body is present, comprising 17 or 18 bristled segments. It tapers a little anteriorly and is somewhat flattened both dorsally and ventrally, though the first part of the ventral surface is rounded, and a streak runs along the median line. The whole anterior region diverges from that of *Prionospio*.

Behind the bilobed dorsal papilla is a segment devoid of bristles, unless it is to be regarded as only an extension of the peristomium. Anteriorly it bears the bilobed papilla and the projection on the left side. It is followed by a region provided with 6 or 7 prominent lamellæ which partly overlap the dorsum, and from the narrowness of the region in front the first two or three approach each other more closely than those which succeed.

The first foot carries a broadly lanceolate dorsal lobe and a more pointed ventral lobe, the former overlapping the lateral region of the dorsum and the latter directed obliquely upward. The bristles of the dorsal division are curved backward, taper to a fine point, and the upper series is larger, as usual in the group. The ventral bristles have a similar structure, but are shorter.

The lamellæ reach their maximum about the 4th or 5th foot, projecting above the dorsum as large broadly lanceolate flaps. Moreover, the 4th foot bears a plumose branchia (Pl. VI. figs. 6 & 7) somewhat like a sea-pen. The base is smooth or slightly crenate, then the pinnæ appear and continue to the lanceolate apex, towards which they slightly diminish in size. As mounted, the broadest part of the organ is a little below the tip. The superior lamella is almost like that in *Phyllodoce*, overhanging the 5th as a broadly lanceolate leaf, and with the row of yellow bristles in front of it. The ventral lamella is smaller and somewhat conical.

No other branchia occurred in the example, but as the specimen is fragmentary the exact distribution of these organs is unknown. The absence of the long terminal filament so characteristic of *Prionospio* is noteworthy and does not appear to be due to any injury to the organ.

At the 10th foot (Pl. VI. fig. 8) the lamella has become a narrow rim with a bluntly conical free apex, and the bristles are shorter. The ventral lamella is narrow and short, rounded superiorly and inferiorly. One of the ventral rows of bristles is much more slender than the other, with very fine capillary tips. The bristles of the stronger row are broken, so that whether these have winged hooks is uncertain;

but it is noteworthy that they and the 11th were all evenly broken about the same level.

The lamellæ become small before the 16th or 17th foot, sinking below the level of the dorsum as inconspicuous conical flaps. So far as observed, the simple dorsal bristles, which present no distinct wings, do not vary, but about the 16th foot the ventral series consists of a dense row of winged hooks with rather long shafts, which increase in diameter from below upward, bend backward, and slightly diminish to the throat (Pl. V. fig. 10), from which the sharp main fang comes off nearly at a right angle, and has three spikes on the crown above, the whole, however, quite differing from the hook of *Scolecoplepis vulgaris*. The wings are rather short and wide distally.

The specimen is a female, and large ovoid ova with the finely crenate capsule occurred as far forward as the 1st foot.

This form approaches *Prionospio* in certain respects, such as the plumose branchiæ and the massive form of the lamellæ.

The *Prionospio heterobranchia* of Percy Moore\*, from Wood's Hole, Massachusetts, bears certain resemblances in the form of the snout, but the development of the lateral processes (tentacles?) of the snout in *Kinbergella* differs materially, and the branchiæ do not seem to possess the terminal filament, whilst the pinnæ or filaments of the gill are much shorter in the new form, which is also devoid of the conspicuous eyes. Yet the prostomium in *Prionospio heterobranchia* tapers to a point posteriorly and the hooks seem to be similar. *Kinbergella* therefore finds its nearest ally in *Prionospio*.

#### EXPLANATION OF THE PLATES †.

##### PLATE V.

- Fig. 1.* Young *Gadus luscus*, 70 mm. in length. Twice the natural size.
- Fig. 2.* Strong bifid hook-like bristle of the fifth segment of *Polydora quadrilobata*, Jacobi (var. *mesnili*). × Zeiss oc. 4, obj. D.
- Fig. 3.* Dorsal bristle of same (5th) segment. × similarly.
- Figs. 4 & 5.* Different views of the hook-like bristles of the 5th segment of *Polydora corazzi*. × Zeiss oc. 4, obj. D.
- Fig. 6.* Ventral hook of the same species. × Zeiss oc. 4, obj. F.

\* Proc. Acad. Nat. Sci. Philad. 1907, p. 195, pl. xv. figs. 1-6.

† I am indebted to the Carnegie Trust for the majority of the figures in both Plates.

- Fig. 7.* Imperfect head of *Nerinides* (?) *lamellata*, with the short proboscis extended. Enlarged.  
*Fig. 8.* Ventral stiff bristles of the same. × Zeiss oc. 4, obj. D.  
*Fig. 9.* Anterior end of *Kinbergella plumosa*. Enlarged.  
*Fig. 10.* Ventral hook from the 16th foot of the same species. × Zeiss oc. 4, obj. D.

## PLATE VI.

- Fig. 1.* Dorsal bristles of the 10th foot of *Nerinides lamellata*. × Zeiss oc. 4, obj. D.  
*Fig. 2.* Winged bristle of the dorsal division of the same foot. × similarly.  
*Fig. 3.* Ventral bristles of the 10th foot. × similarly.  
*Fig. 4.* 25th foot of the same species. × similarly.  
*Fig. 5.* 50th foot of the foregoing. × similarly.  
*Figs. 6 & 7.* Different views of the 4th foot of *Kinbergella plumosa*. × 48 diam.  
*Fig. 8.* 10th foot of the foregoing form. × similarly.  
*Fig. 9.* 10th foot of *Scolecopsis* I. × about 34 diam.

XXI.—*Descriptions of Seventeen new Species and Varieties of Land and Freshwater Shells from East and West Africa and the Transvaal.* By H. B. PRESTON, F.Z.S.

## [Plate VII.]

HAVING recently had through my hands a number of land and freshwater shells from the German Cameroons, and finding among them a number of forms which seem to have hitherto escaped notice, I venture to describe them in the present paper; at the same time I take the opportunity of describing two species of *Fischeria* from Senegal, collected in that region by Colonel M. Messenger, and two species of *Achatina* from E. Africa and the Transvaal respectively, as also a variety of *Achatina variegata*, Lk., from W. Africa, which, being constant and well-marked in form, I have thought worthy of a varietal name.

*Gibbus (Edentulina) confusa*, sp. n. (Fig. 1.)

Shell ovate-elongate, rather laterally compressed, thin, white, somewhat shining, semitransparent, rimate; whorls  $5\frac{1}{2}$ , sculptured with very fine oblique transverse lines, very minutely but closely punctate throughout, the latter portion of the last whorl somewhat ascending; sutures linear; columella descending obliquely above, excavated below, outwardly

triangularly expanded, the expansion bearing a depression in the middle; parietal wall somewhat excavated in the region of the columella: peristome slightly thickened, reflexed; aperture subquadrate.

Alt. 22, diam. maj. 12 mm.

Aperture: alt. 9, diam. 5.5 mm.

*Hab.* (type specimen). Bitze, near the River Ja, Cameroons; several broken specimens also from Akok, 30-35 miles from the coast at Kribi.

Distinguished from *G. liberiana*, Lea \*, from Liberia, by its smaller size, thinner texture, and much finer transverse sculpture; moreover, the exceedingly fine punctate sculpture easily separates it from *G. liberiana*.

*Helicarion bitzeensis*, sp. n. (Figs. 2, 3.)

Shell corneous, semitransparent, dark yellowish green; spire much depressed; whorls 3, here and there showing traces of slight malleation, puckered into irregular arcuate riblets or creases, on and between which appear fine lines of growth, the last whorl subcarinate, somewhat widely expanded towards the aperture; sutures well impressed; aperture subovate, dilated above, rather laterally constricted.

Alt. 11, diam. maj. 25.5 mm.

Aperture: alt. 12, diam. 14.5 mm.

*Hab.* Bitze, near the River Ja, Cameroons (type); also a single specimen taken at Akok, 30-35 miles from the coast at Kribi.

*Helicarion umbrosolabiata*, sp. n. (Figs. 4, 5.)

Shell corneous, thin, light olive-green, somewhat inflated; whorls 3, marked with growth-lines and occasionally creased into broad riblets, the last whorl scored with very fine irregular spiral scratches; sutures impressed; peristome folded inwards so as to form a narrow thickening, dark brownish green; aperture obliquely ovate.

Alt. 15, diam. maj. 25.5 mm.

Aperture: alt. 13, diam. 14.5 mm.

*Hab.* Bitze, near the River Ja, Cameroons.

*Thapsia rosenbergi*, sp. n. (Fig. 6.)

Shell depressed, perforate, discoidal, thin, polished, horny, light reddish brown; whorls  $5\frac{1}{4}$ , sculptured with very fine, wavy, spiral striæ and transverse lines of growth; base lighter

\* Philad. Trans. vii. p. 457, pl. ii.

in colour than the rest of the shell ; sutures impressed, margined, whitish ; umbilicus narrow, deep, partly concealed by the reflexed columella ; peristome thin, acute ; aperture oblique, broadly lunate.

Alt. 6·5, diam. maj. 13·5 mm.

Aperture : alt. 5, diam. 5·5 mm.

*Hab.* Bitze, near the River Ja, Cameroons.

Type in British Museum.

A very variable species ; one specimen is of a much darker colour than the others submitted to me, and the margin of the suture, instead of being whitish, is of even a deeper shade of reddish brown than the rest of the shell ; another is somewhat larger and flatter in proportion than the type, but I am unable to separate them specifically.

*Achatina dacostana*, sp. n. (Fig. 7.)

Shell ovate, pale brownish yellow, painted with very indistinct greyish flame-markings, especially noticeable on the fourth and fifth whorls, and bearing traces of having been covered with a very thin greenish-brown periostracum ; whorls  $6\frac{1}{2}$ , flattish, the upper finely granular, the last coarsely granular above the periphery, smooth and shining below ; sutures impressed, crenulate ; aperture ovate ; peristome acute ; columella descending obliquely and spreading into a thin callus which joins the upper margin of the peristome.

Alt. 75, diam. maj. 37·5 mm.

Aperture : alt. 38, diam. 22 mm.

*Hab.* East Africa.

*Achatina subcylindrica*, sp. n. (Fig. 8.)

Shell thin, subcylindrical, pale greenish yellow ; whorls  $7\frac{1}{2}$ , regularly increasing, slightly convex, finely granular except on the lower half of the last whorl, which is smooth ; apex obtuse, somewhat flattened ; sutures well impressed, lightly crenulate ; columella descending in a curve ; peristome thin, acute ; aperture inversely auriform.

Alt. 38·5, diam. maj. 13·5 mm.

Aperture : alt. 13, diam. 7 mm.

*Hab.* Natal.

Allied to *Achatina transvaalensis*, Smith\*, but differing chiefly in its more cylindrical form, flatter whorls, and rather coarser sculpture.

\* Journ. Conch. vol. i. pp. 351-352.

*Achatina variegata*, Lk., var. *gracilis*, nov.

Shell less swollen and proportionately much narrower than is the case with the typical *A. variegata*; the whorls are also rather more convex and the painting less regular.

Alt. (about) 120, diam. maj. (about) 58 mm.

*Hab.* West Africa.

*Callistoplepa tiara*, sp. n. (Fig. 9.)

Shell oblong-ovate, thin, corneous, pale chestnut, ornamented on the upper whorls with zigzag transverse streaks of purplish brown which become thickened and deepened in colour just above the sutures, so as to appear as a supersutural row of squarish dark purple blotches, and which are continued on the body-whorl as a peripheral interrupted band; the last two whorls are also painted with irregular cream-coloured patches; whorls 6, sculptured with fine, wavy, spiral striæ crossed by irregular transverse ridges, giving to the shell a finely granular appearance; the sculpture, though continued towards the base of the shell, becomes obsolete below the periphery; sutures impressed, subcrenulate; columella straight, dark purple; peristome simple, acute; aperture elongately inversely auriform.

Alt. 49, diam. maj. 25.25 mm.

Aperture: alt. 30.75, diam. 13.5 mm.

*Hab.* Bitze, near the River Ja, Cameroons.

*Pseudachatina nodosa*, sp. n. (Fig. 10.)

Shell ovate-conic, moderately thin, painted above with broad brownish-purple transverse flame-markings, between which the pale flesh-colour of the shell is visible, covered on the lower whorls with a thin, scaly, yellowish-brown periostracum; whorls  $7\frac{1}{2}$ , the first three granulated with fine spiral striæ crossed by irregular transverse lines, the remainder irregularly coarsely nodulous, the last bearing two obsolete keels about 9 mm. apart, the lower one situated at the periphery; sutures crenulate, somewhat lightly impressed; columella obliquely curved, a thick callus, the outer margin of which is tinged with purple, joining it with the lip above; peristome expanded, scarcely reflexed, livid purple; aperture obliquely inversely auriform; interior of shell bluish white, a broad purple band appearing on the upper portion of the parietal wall.

Alt. 61, diam. maj. 29 mm.

Aperture: alt. 26, diam. 13 mm.

*Hab.* (of type). Bitze, near the River Ja, Cameroons; specimens were also collected at Akok, 30–35 miles from the coast at Kibi.

In some respects resembling *P. martensi*, d'Ailly \*; the present shell is, however, of a lighter texture, there is practically no basal zone of deeper coloration, and the peristome is always livid purple in colour, whereas M. d'Ailly makes a great point of the constant whiteness of the peristome in his species.

*Pseudachatina nodosa*, Preston, var. *eminens*, nov.  
(Fig. 11.).

Much more elongate than the typical form, the keels on the last whorl are even more obsolete, and the columella is less curved.

Alt. 89, diam. maj. 37.5 mm.

Aperture: alt. 33, diam. 17 mm.

*Hab.* Bitze, near the River Ja, Cameroons.

*Pseudotrochus batesi*, sp. n. (Fig. 12.)

Shell oblong-turrite, thin, pale flesh-coloured, transversely banded, spotted, and tessellated with chestnut-brown and creamy white, covered with a very thin pale yellowish-brown periostracum; apex flattened; whorls  $6\frac{1}{2}$ , the embryonic whorls submamillary and presenting under a lens a weathered appearance, the later whorls regularly furrowed with closely set, broad, very flat, spiral ridges, and sculptured with very fine, wavy, spiral striæ, crossed by irregular lines of growth, somewhat angled above the periphery; periphery strongly but bluntly carinate; sutures impressed, lightly crenulate, narrowly margined, whitish; base of shell convexly elongate; columella slightly excavated above, twisted at base, reddish brown and diffused into a callus, which joins the lip above and continues as a parietal callus throughout the interior of the shell; peristome angled, sharply acute; aperture nearly quadrate.

Alt. 51.5, diam. maj. 30 mm.

Aperture: alt. 21.5, diam. 13.5 mm.

*Hab.* Bitze, near the River Ja, Cameroons.

Type in British Museum.

A very remarkable shell, whose nearest ally appears to be

\* 'Bihang till Kongl. Svenska Vetenskaps-Akademiens Handlingar,' 22, Afd. 4, no. 2, 1896, pp. 95–98.



*P. lechatelieri*, Dautz.\*, from Dahomey; from this it is distinguished by its more acute spire, submamillary apex, broader base, blunter peripheral carina, coloured columella and parietal callus, flatly furrowed sculpture, and general colouring, which in *P. lechatelieri* is generally darker, especially on the base, while the chestnut bands on the spire are more pronounced, numerous, and generally confined to the lower portion of the whorls, which is not the case with *P. batesi*.

*Pseudotrochus efulenensis*, sp. n. (Fig. 13.)

Shell oblong-turrite, flesh-coloured, irregularly painted with blotches and streaks of dark brownish purple and cream-colour, base of shell painted with a broad band of blackish purple just below the periphery, which gives place to a zone of creamy flesh-colour between it and the columella; whorls 7, the embryonic whorls very flat, constricted and quite smooth, the later whorls gradually increasing, sculptured with fine, slightly wavy, spiral striæ and transverse growth-lines, the last whorl carinate at the periphery; sutures lightly impressed, subcrenulate; columella greyish brown, descending somewhat obliquely and extending into a thin, minutely granular callus which reaches the lip above; peristome slightly expanded, brownish flesh-colour; aperture subquadrate.

Alt. 63, diam. maj. 29 mm.

Aperture: alt. 28, diam. 14.5 mm.

*Hab.* Near Efulen, S. Cameroons.

Type in British Museum.

*Pseudoglessula camerunensis*, sp. n. (Fig. 14.)

Shell subulately fusiform, glossy, light brown, mottled and streaked with blotches and bands of a dark purple colour; apex slightly mammillate; whorls  $8\frac{1}{2}$ , the first two and a half spirally striate and lightly, transversely costate, presenting a punctate appearance, the remainder sculptured with fine, closely set, transverse riblets, the last whorl bearing a thread-like carina at the periphery; sutures impressed; columella whitish, excavated above, curved below, somewhat obliquely truncate, a very light callus joining it with the lip above; peristome simple, acute; aperture inversely auriform.

Alt. 30.5, diam. maj. 12 mm.

Aperture: alt. 11, diam. 5 mm.

\* Journ. de Conchyl. xl. 1892, p. 297; xli. 1893, p. 33, pl. i.

*Hab.* (of type). Akok, 30–35 miles from the coast at Kribi, Cameroons; specimens also occurred at Bitze, near the River Ja.

Allied to *P. clavata*, Gray, from which it differs by its more cylindrical form and the very fine sculpture of the embryonic whorls, which in *P. clavata* are much more coarsely costate; the last whorl and the aperture in the present species are also much longer.

*Homorus foveolatus*, sp. n. (Fig. 15.)

Shell narrowly subulate, dark brown, smooth, polished, shining; apex mammillate; whorls  $10\frac{1}{2}$ , flattish, irregularly marked with fine oblique growth-lines, the last whorl somewhat carinate at the periphery; sutures well impressed; columella descending in a curve, abruptly truncate, extending into a callus which joins the lip above; peristome simple, acute; aperture ovate.

Alt. 16·25, diam. maj. 3·5 mm.

Aperture: alt. 2, diam. 1 mm.

*Hab.* Akok, 30–35 miles from the coast at Kribi, Cameroons.

*Subulina jaensis*, sp. n. (Fig. 16.)

Shell bluntly subulate, thin, light yellowish flesh-colour, submammillate at the apex; whorls  $8\frac{1}{2}$ , rather flat, the first two and a half smooth except for a minute infrasutural plication, the last six whorls closely transversely striate; sutures subrenulate; columella curved and twisted; peristome acute; aperture elongately ovate.

Alt. 18·75, diam. maj. 4·25 mm.

Aperture: alt. 3·75, diam. 1·5 mm.

*Hab.* Bitze, near the River Ja, Cameroons.

*Fischeria messengeri*, sp. n. (Fig. 17.)

Shell thin, elongately oblong, marked faintly with concentric lines of growth, covered with a smooth pale olive-green periostracum; teeth small; posterior side very obtusely rostrate; anterior side somewhat acutely rounded; dorsal margins sloping, especially anteriorly; ventral margin rounded centrally, slightly excavated posteriorly.

Long. 15, lat. 23·5 mm.

*Hab.* Senegal River.

*Fischeria approximans*, sp. n. (Fig. 18.)

Shell thin, elongately ovate, dark olive-green painted with

rays of a darker colour and covered with a smooth periostracum; teeth small, the cardinal tooth on right valve bifid; posterior side obtusely rounded above, angled below; anterior side sharply rounded; dorsal margins very gradually sloping; ventral margin angled, somewhat produced centrally.

Long. 13, lat. 20.5 mm.

*Hab.* Podor, Senegal River.

Allied to *F. lævigata*, von Mts., but differing from that species by its angular and produced ventral margin, more sharply rounded anterior side, and more obtuse posterior side; moreover, the bifid cardinal tooth in the right valve immediately distinguishes it from *F. lævigata*.

#### EXPLANATION OF PLATE VII.

- Fig.* 1. *Gibbus (Edentulina) confusa*, sp. n.  
*Figs.* 2, 3. *Helicarion bitzeensis*, sp. n.  
*Figs.* 4, 5. — *umbrosolabiata*, sp. n.  
*Fig.* 6. *Thapsia rosenbergi*, sp. n.  
*Fig.* 7. *Achatina dacostana*, sp. n.  
*Fig.* 8. — *subcylindrica*, sp. n.  
*Fig.* 9. *Callistoptepa tiara*, sp. n.  
*Fig.* 10. *Pseudochatina nodosa*, sp. n.  
*Fig.* 11. — *nodosa*, var. *eminens*, nov.  
*Fig.* 12. *Pseudotrochus batesi*, sp. n.  
*Fig.* 13. — *efulenensis*, sp. n.  
*Fig.* 14. *Pseudoglessula camerunensis*, sp. n.  
*Fig.* 15. *Homorus foveolatus*, sp. n.  
*Fig.* 16. *Subulina jaensis*, sp. n.  
*Fig.* 17. *Fischeria messengeri*, sp. n.  
*Fig.* 18. — *approximans*, sp. n.

XXII.—*Rhynchotal Notes*.—XLVI. By W. L. DISTANT.

#### HOMOPTERA.

#### Fam. Cercopidæ.

#### *Neotropical Genera and Species.*

The Neotropical Cercopidæ are well represented in the British Museum. In addition to those described by Walker it possesses the splendid Godman Collection from Central America worked out and described by Fowler. It has also during recent years acquired a large number of species from Ecuador and Bolivia, many of which are here described. The Fry Collection, bequeathed to the British Museum by

the late Alexander Fry, also contained many South Brazilian species.

Dr. Jacobi has recently published the description of "Neue Cercopiden des Andengebietes," which comprise 41 new species and some new genera, and I have again to thank that able homopterist for letting me see cotypes of all but five of these species.

Subfam. *APHROPHORINÆ*.

Genus *AVERNUS*.

*Avernus*, Stål, Hem. Afr. iv. p. 68 (1866); id. Berl. ent. Zeitschr. x. p. 384 (1866).

Type, *A. ocelliger*, Walk.

*Avernus ocelliger*.

*Ptyelus ocelliger*, Walk. List Hom. iii. p. 708 (1851).

*Ptyelus interruptus*, Walk. loc. cit. p. 715.

*Avernus alboatra*, Stål (part.), Berl. ent. Zeitschr. x. p. 384 (1866).

*Hab.* Colombia, Venezuela, Bolivia.

Stål had treated the *Monecphora alboatra*, Walk., as a synonym of the above. This is one of the few indubitable errors made by that great Rhynchotist, as *alboatra* differs in the shape of the head and the position of the ocelli from the generic characters given by himself for *Avernus*, which he founded for their reception. *M. alboatra* cannot therefore remain the type of the genus, which was described subsequent to his visit to the British Museum.

*A. meridionalis*, Jac., is an allied species (*var.*?).

*Avernus balteatus*, sp. n.

*Ptyelus eleninus*, Bredd. MS.

Black; tegmina crossed near middle by a white fascia which narrows towards costal margin; vertex much shorter than breadth between eyes, obtusely angularly rounded in front, on central anterior area reaching apex is a slightly depressed space with raised margins, which is convex in front, truncate behind; pronotum centrally longitudinally carinate, its anterior margin somewhat strongly angularly rounded; scutellum discally angularly flattened, at base only centrally moderately foveate, both these areas centrally longitudinally incised; face without a central ridge; rostrum reaching the intermediate coxæ; posterior tibiæ with two strong spines; tegmina about two and a half times as long as broad.

Long., incl. tegm., 14 to 15 mm.

*Hab.* Ecuador; Balzapamba (Brit. Mus.).

The British Museum possesses two specimens of this species, purchased as one of "Breddin's co-types" some years ago, but I can find no trace of a corresponding description.

*Avernus affinis*, sp. n.

Allied to *A. balteatus*, Dist., but the colour pale castaneous, not black, and the legs brownish ochraceous; the tegmina in addition to the white transverse fascia possesses three white spots on the apical third—the first, largest and rounded on costal margin, the other two more ovate and placed on disk in longitudinal series before apex; head and pronotum a little narrower than in *A. balteatus*, the latter also finely granulose.

Long., incl. tegm., 14 mm.

*Hab.* Brazil (Fry. Coll., Brit. Mus.).

NEOAVERNUS, gen. nov.

Vertex about as long as breadth between eyes, somewhat broadly rounded in front; ocelli at base, close to eyes, very much nearer to eyes than to each other, the lateral and apical margins a little upwardly ridged; face without a central carination; clypeus foveately depressed on each side at base; rostrum slightly passing the intermediate coxæ; pronotum with a central longitudinal carination which is more prominent and distinct on disk, the anterior lateral margins oblique, shorter than the posterior lateral margins, which are slightly sinuate; anterior margin roundly truncate, posterior margin strongly subangularly concave in front of scutellum, which is longer than broad; posterior tibiæ with two strong spines; tegmina twice as long as broad.

Type, *N. alboater*, Walk.

Differs from *Avernus* by the larger and more rounded vertex, different position of the ocelli, and short tegmina.

*Neoavernus alboater*.

*Monecphora alboatra*, Walk. List Hom. iii. p. 682 (1851).

*Avernus alboater*, Stål (part.), Berl. ent. Zeitschr. x. p. 384 (1866).

*Hab.* Colombia (Brit. Mus.).

GENUS SPHODROSCARTA.

*Sphodroscarta*, Stål, Hem. Fabr. ii. p. 17 (1869).

Type, *S. gigas*, Fabr.

*Sphodroscarta bimaculata*, sp. n.

Black; eyes and abdominal segmental margins ochraceous; tegmina with two large white spots on inner margin, one crossing clavus a little before its apex, the other and smaller at the lower part of apical margin; wings dark fuliginous; vertex a little more than half as long as breadth between eyes, somewhat angularly produced, the lateral margins oblique, the basal margin obtusely angularly sinuate, two short carinate lines not reaching base, each situate outside the region of the ocelli; pronotum not carinate, but centrally longitudinally depressed, the anterior lateral margins very short, the posterior lateral margins about as long as the posterior margin, which is strongly angularly concave; scutellum much longer than broad, its disk centrally longitudinally depressed; posterior tibiæ with two strong spines.

Long., excl. tegm., ♀ 12 mm.; exp. tegm. 30 mm.

*Hab.* Bolivia; Yungas de la Paz.

Subfam. *CERCOPINÆ*.Genus *HYBOSCARTA*.

*Hyboscarta*, Jacobi, SB. Ges. naturf. Fr. Berlin, 1908, no. 8, p. 208.

Type, *H. rubrica*, Jacobi.

*Hyboscarta insignis*.

*Monephora insignis*, Walk. List Hom., Suppl. p. 178 (1858).

*Hab.* Amazons.

*Hyboscarta semivitrea*.

*Sphenorhina semivitrea*, Walk. List Hom., Suppl. p. 184 (1858).

*Hab.* Amazons.

*Hyboscarta tricolor*, sp. n.

Head, pronotum, scutellum, body beneath, anterior and intermediate femora (posterior legs mutilated in specimen described), and less than basal half of tegmina, sanguineous; two central spots to mesosternum, anterior and intermediate tibiæ and tarsi, black; a little more than apical half of tegmina ochraceous, subhyaline, the lateral and subapical margins of this area broadly black, extending to apex of clavus; pronotum and tegmina thickly finely punctate;

face moderately compressed, laterally strongly transversely striate, centrally longitudinally ridged.

Long.  $8\frac{1}{2}$  mm.

*Hab.* Brazil; Lages.

### Genus ISCHNORHINA.

*Ischnorhina*, Stål, Hem. Fabr. ii. p. 14 (1869).

Subgen. *Schistogonia*, Stål, *loc. cit.*

Types, *I. sanguinea*, Fabr., and *I. ephippium*, Fabr.

#### *Ischnorhina valida*, sp. n.

Head above and beneath (including face), pronotum, scutellum, and sternum sanguineous; abdomen above and beneath and the legs black; base of abdomen narrowly sanguineous; tegmina sanguineous, with a broad black fascia commencing at about one-fourth from base and extending and occupying rather more than the costal area, the apical area, and continued along the inner margin to about one-fourth from base, the sanguineous coloration thus being confined to the basal area and a medial longitudinal fascia not extending beyond apical area, the extreme costal margin for about one-fourth from base dull obscure ochraceous; wings pale shining fuliginous with the veins piceous; vertex with the central lobe narrowed and anteriorly produced; face sharply compressed, as in typical forms of *Sphenorhina*, and prominently transversely striate on each side; pronotum prominently foveately depressed on each side of anterior area, the anterior lateral margins moderately ampliate and reflexed; scutellum quadrangularly ridged, apex also ridged.

Long., excl. tegm.,  $9\frac{1}{2}$  mm.; exp. tegm. 30 mm.

*Hab.* Cayenne (Brit. Mus.).

Allied to *I. invalida*, Jacobi (a species I have not seen), from which it differs by the colour of the sternum and structural characters detailed above, which are not given by its describer in his diagnosis.

#### *Ischnorhina juno*, sp. n.

Vertex, pronotum, scutellum, face, lateral areas of pronotum, and base of abdomen sanguineous; disk of scutellum, abdomen, body beneath, and legs black; tegmina black, base of costal area and base of posterior claval area (both these markings united at base) sanguineous; wings fuliginous, the veins piceous, extreme base sanguineous; vertex about as long as breadth between eyes, the apex angularly projecting, a longitudinal impressed line in front

of each ocellus; pronotum foveately impressed on each side of anterior area, the lateral margins moderately sharply reflexed; face strongly compressed, posteriorly pointed, thence obliquely straight to clypeus, centrally longitudinally ridged; posterior tibiæ with a strong spine a little before apex; tegmina three times as long as broad.

Long., excl. tegm., 9 mm.; exp. tegm. 30 mm.

*Hab.* Peru (Coll. Dist.).

*Ischnorhina grandis.*

*Sphenorhina grandis*, Dist. Tr. Ent. Soc. Lond. 1878, p. 179; Waterh.

Aid Identif. Ins. ii. pl. 148. fig. 5 (1884).

*Tomaspis laqueus*, Bredd. Soc. entomol. xix. p. 58 (1904).

*Sphenorhina laqueus*, Bredd. Cotype purchased by Brit. Mus.

*Hab.* Colombia; Ecuador.

*Ischnorhina bogotana.*

*Sphenorhina bogotana*, Dist. Trans. Ent. Soc. Lond. 1878, p. 179;

Waterh. Aid Identif. Ins. ii. pl. 152. fig. 2 (1884).

*Hab.* Bogota.

*Ischnorhina flammans.*

*Sphenorhina flammans*, Walk. List Hom., Suppl. p. 179 (1858).

*Sphenorhina acuta*, Stål, Rio Jan. Hem. ii. p. 14 (1858); id. Öfv.

Vet.-Ak. Förh. 1862, p. 493.

*Hab.* Brazil.

*Ischnorhina rufivaria.*

*Sphenorhina rufivaria*, Walk. List Hom. iii. p. 686 (1851).

*Hab.* Brazil.

*Ischnorhina xanthomela.*

*Sphenorhina xanthomela*, Walk. List Hom., Suppl. p. 180 (1858).

*Hab.* Amazons.

GENUS TOMASPIS.

*Tomaspis*, Amy. & Serv. Hist. Hém. p. 560 (1843). Type, *T. furcata*, Germ.

*Monecphora*, Amy. & Serv. loc. cit. p. 562. Type, *M. cingulata*, Le P. & Serv.

*Sphenorhina*, Amy. & Serv. loc. cit. Type, *S. lineolatus*, Amy. & Serv.

I have previously regarded the above divisions of Amyot and Serville as generically distinct and have acted accordingly, for if we compare the types (as above) there is every reason to do so. Not only is there then found a distinct structural



difference in the face, but in the type of *Tomaspis* there is a fundamental difference in the length and structure of the tegmina. But when a large series of the species that should be arranged under these three proposed genera is examined, the differences in too many cases become evanescent and relative. Stål, who originally used them as distinct genera (Rio Jan. Hem. 1858), subsequently (Hem. Africana, 1866) treated them, with the addition of *Triecphora*, Amy. & Serv., as synonyms of *Tomaspis*, and in this generic conclusion he has been followed by Fowler and Jacobi. From this decision I only differ by not including *Triecphora*, a Palæarctic and Ethiopian genus also treated as distinct by Puton, Melichar, and other writers. From Berg (Hem. Argent., 1879) I dissent by including *Sphenorhina*, and agree with him in excluding *Triecphora*.

It is not, however, to be regarded as improbable that this large and miscellaneous genus, *Tomaspis*, as thus understood will yet be consistently divided. The differential characters given by Amyot and Serville for their three proposed genera are largely and principally confined to facial structure, and these have proved a hindrance rather than a help, by monopolising the attentions of homopterists to the neglect of other characters, many of which undoubtedly exist and will probably be used by some future analytical student.

*Tomaspis parana*, sp. n.

Head and pronotum sanguineous; basal half of head, two spots on anterior area of pronotum—connected with the anterior margin,—scutellum, abdomen above, and body beneath black; legs black or piceous; face, apex of scutellum, and lateral margins of prosternum sanguineous; tegmina sanguineous, a costal streak extending from base to apex (near base and beyond middle not reaching the costal margin), apical margin, a central longitudinal fascia, commencing near middle and extending to apex, and a claval streak black; wings fuliginous; face sanguineous, strongly, centrally, longitudinally ridged, moderately compressed, not terminating in an obtuse point; rostrum reaching the intermediate coxæ; tegmina narrow, more than three times as long as broad.

Var. *a*.—Legs dull testaceous red, apices of the femora piceous.

Long., excl. tegm., ♂ 12, ♀ 17 mm.; exp. tegm. ♂ 39, ♀ 44 mm.

*Hab.* Brazil; Parana (*E. Dukinfield Jones*, Brit. Mus.).

*Tomaspis consanguinea*, sp. n.

Allied to *T. parana*, Dist., but the tegmina comparatively shorter and broader, not quite three times longer than broad; head and pronotum sanguineous, without black markings; scutellum and legs wholly sanguineous; tegmina similarly fasciated as in *T. parana*.

Long., excl. tegm., ♀ 16 mm.; exp. tegm. 45 mm.

*Hab.* Rio Grande do Sul (Brit. Mus.).

*Tomaspis chapada*, sp. n.

Sanguineous; lateral lobes and base of head, two large spots on anterior area of the pronotum and connected with the anterior margin, scutellum, abdomen above, body beneath, and legs black; face and lateral margins of prosternum sanguineous; tegmina sanguineous, costal and apical margins (the former broad and occupying the costal area for about two-thirds its length and the latter continued to apex of clavus), a broad central somewhat short longitudinal streak between middle and apical area, and a streak at middle of upper claval margin black; wings fuliginous; tegmina barely three times as long as broad; face moderately compressed, strongly centrally ridged, terminating in an obsolete point outwardly and then subtruncately directed to clypeus; rostrum reaching the intermediate coxæ.

*Var.*—Tegmina narrowly margined with black as in typical form, but not broadened at costal area, the interior black streaks practically obsolete.

Long., excl. tegm., 12 mm.; exp. tegm. 30–35 mm.

*Hab.* Central Brazil; Chapada (*A. Robert*, Brit. Mus.).

*Tomaspis brasiliensis*, sp. n.

Body and legs black; apex of head, lateral margins and a central longitudinal fascia to pronotum, and extreme base of abdomen above sanguineous; tegmina sanguineous, costal and apical margins (the first much broadened at costal area and thus continued for about three-fourths from base, the latter continued to apex of clavus) and a broad median longitudinal fascia which occupies nearly upper half of clavus, is continued to near apex, and is fractured near claval margin, black; wings fuliginous; face black, in structure resembling that of the previously described species *T. chapada*; rostrum almost reaching the posterior coxæ; tegmina not more than three times as long as broad.

Long., excl. tegm., 13 mm.; exp. tegm. 40 mm.

*Hab.* Brazil (Fry Coll., Brit. Mus.).

*Tomaspis spectabilis*, sp. n.

Head, pronotum, and scutellum dull reddish castaneous; abdomen above, face, sternum, and legs sanguineous; abdomen beneath, spots and suffusions to sternum, longitudinal stripes to intermediate femora, posterior femora (excluding apices), tarsi (excluding extreme base), and apical joint of rostrum black; abdomen beneath with the posterior segmental margins (narrowly) and the lateral margins (somewhat broadly) sanguineous; tegmina ochraceous, narrow costal margin extending round apex to apex of clavus, centre of posterior claval margin, claval apex, and an irregular central longitudinal fascia, irregularly widened at about one-third from base and continued to near apex, black; claval suture piceous; wings dark fuliginous, their extreme bases sanguineous; vertex subangulate in front and distinctly longitudinally carinate; face moderately compressed, strongly centrally carinate and transversely striate (of the *Monecphora* form); pronotum very finely and thickly wrinkled, obscurely finely, centrally, longitudinally carinate, the carination not reaching the anterior margin, the anterior lateral margins slightly reflexed; rostrum reaching the intermediate coxæ.

Long., excl. tegm., 10 mm.; exp. tegm. 29 mm.

*Hab.* Bolivia (*J. Steinbach*, Brit. Mus.).

*Tomaspis fryi*, sp. n.

Vertex piceous, with a slightly arched transverse ochraceous fascia between the eyes; pronotum with the basal two-thirds piceous-brown, margined anteriorly with a transverse black line, in front of which the anterior area is ochraceous, as is also a lateral spot on each side behind the black line; scutellum piceous, with a pale ochraceous spot at commencement of apical area; abdomen above piceous, sanguineous at base, the connexivum ochraceous with black spots; face orange-yellow with a black basal line; body beneath and legs pale ochraceous; sternal and coxal spots, apices of femora, anterior tibiæ, bases and apices of intermediate and posterior tibiæ, the tarsi, narrow segmental margins and a longitudinal line at inner margins of connexivum, piceous or black; tegmina black; basal half of clavus, a basal linear costal spot, a longitudinal streak to corium, commencing at base above clavus and gradually narrowing to a subapical and subcostal quadrate spot, pale ochraceous; wings fuliginous; face broad and flatly rounded, of the *Monecphora* form; vertex about as long as breadth between eyes, subconically rounded in front; scutellum broadly discally

foveate (imperfectly seen in the badly pinned type); tegmina about three times as long as broad.

Long., excl. tegm.,  $8\frac{1}{2}$  mm.; exp. tegm. 24 mm.

*Hab.* Brazil (Fry Coll., Brit. Mus.).

*Tomaspis jonesi*, sp. n.

*uniformis*, Sign. MS.

Head, pronotum, and scutellum pale ochraceous; abdomen above, body beneath, and legs sanguineous; a spot near apex of scutellum, anterior and intermediate tarsi and apices of posterior tarsi, eyes, and apex of rostrum black; lateral margins of prosternum ochraceous; tegmina pale ochraceous, with a broad transverse fascia near middle and about the apical fourth black; wings pale smoky hyaline; vertex about as long as breadth between eyes; face broad, rounded, not angulate (of the *Monephora* type), centrally longitudinally ridged; rostrum reaching the intermediate coxæ; pronotum very finely transversely wrinkled; scutellum discally foveately depressed; posterior tibiæ with two spines, one near base, the other a little beyond middle.

Long., excl. tegm., 8 mm.; exp. tegm. 24 mm.

*Hab.* Brazil; Parana (*E. Dukinfield Jones*, Brit. Mus.); Rio Negro (Coll. Dist.).

Many years ago I received a specimen labelled *uniformis*, MS., from my lamented friend Dr. Signoret, and probably there is a similarly identified specimen in the Vienna Museum, in which Dr. Signoret's collection is located.

*Tomaspis saccharina*, sp. n.

*Tomaspis pictipennis*, Uhler (*nec Stål*), Proc. Zool. Soc. Lond. 1895, p. 58.

Head, pronotum, and scutellum dark bronzy; abdomen above and beneath sanguineous; face, sternum, legs, and a sublateral fascia on each side of abdomen beneath bluish black; tegmina piceous brown, with two transverse whitish fasciæ, the first broadest and slightly oblique before middle, the second narrower and nearly straight beyond middle; wings hyaline with the veins fuscous; vertex broader than long, rounded in front, centrally carinate and longitudinally depressed on each side before the eyes; face compressed, centrally longitudinally carinate, somewhat regularly rounded to clypeus (*Monephora* type); tegmina less than three times longer than broad.

Var. *a*.—A broad whitish streak in claval suture, united with the first transverse whitish fascia.

Var. *b.*—Basal third of tegmina almost totally whitish, only divided by the claval suture, which is piceous brown.

*Hab.* Trinidad (Brit. Mus.); Antilles; St. Vincent and Grenada (*Smith*, Brit. Mus.).

Reported from Trinidad as a destructive pest to the cultivation of sugar-cane.

As pointed out by Fowler, the *T. pictipennis*, Stål, is a synonym of the *M. postica*, Walk. Apart from the considerable differences in colour and pattern, *T. postica* has a less developed and more evenly rounded face than *T. saccharina*.

*Tomaspis dominicana*, sp. n.

Head, pronotum, scutellum, and abdomen above black, lateral margins and apex of scutellum and base of abdomen sanguineous; body beneath and legs black; coxal spots, sternal spots, and broad lateral margins to meso- and metasterna sanguineous; tegmina black, with five sanguineous spots, situate one near base of clavus, one above apical end of clavus, two on medial vein (one at about one-third from base, the other on apical area), and the fifth costal beyond middle; wings fuliginous; vertex almost as long as breadth between eyes, medially longitudinally carinate, between this carination and the eyes a foveate depression on each side; scutellum strongly discally foveately depressed, the margins of this foveation raised, united posteriorly and continued to apex; face rounded to clypeus (*Monecphora* type); posterior tibiæ with two strong spines, the shorter near base, the longer near middle.

Long., excl. tegm., 8 mm.; exp. tegm. 19 mm.

*Hab.* Dominica (Brit. Mus.).

Received from the Imp. Dept. Agric., West Indies.

*Tomaspis jamaicensis*, sp. n.

Head, pronotum, and scutellum black; apical area of vertex and about basal half of pronotum (not reaching the anterior lateral margins) bright ochraceous; abdomen above and beneath and legs sanguineous; head beneath and sternum black, the latter spotted and suffused with sanguineous; face bright ochraceous; tegmina pitchy black, with two large bright ochraceous spots, the first and largest extending through clavus and reaching the subcostal vein at about one-third from base, the second spot smaller, central, and subapical; wings pale fuliginous; face rounded to clypeus (*Monecphora* type); vertex scarcely as broad as breadth

between eyes, not carinate; tegmina about two and a half times as long as broad; posterior tibiæ with two strong spines, the first and shortest near base, the second and longer near middle.

Long., excl. tegm., 9 mm.; exp. tegm. 26 mm.

*Hab.* Jamaica (Brit. Mus.).

*Tomaspis multicolor*, sp. n.

Head, pronotum, and scutellum black, greyishly pilose; a spot on each lateral margin of vertex between apex and eyes and continued beneath between base of face and eyes, and lateral margins of pronotum ochraceous; basal margin of pronotum and lateral margins and apex of scutellum purplish red; body beneath black; lateral margins of prosternum, coxæ, legs, and apex of abdomen sanguineous; apices of tarsi black; tegmina stramineous; margins and apex of clavus, basal fourth of corium, a central transverse fascia broadest on costal margin and extending to apex of clavus, and apical fourth black; vertex much shorter than breadth between eyes, broadly rounded in front, distinctly centrally longitudinally carinate; face of the *Monecphora* type, somewhat broad, flattened at sides, centrally longitudinally carinate and transversely striate, gradually convexly continued to clypeus; posterior tibiæ with two prominent spines, one near base, the longer nearer apex.

Long., incl. tegm., 11 mm.

*Hab.* Central Brazil; Chapada (*A. Robert*, Brit. Mus.).

This species may be placed near *M. scita*, Walk.

*Tomaspis dissimilis*, sp. n.

Vertex dull testaceous red, eyes greyish with their posterior margins black; pronotum stramineous, a dull testaceous-red patch behind middle of anterior margin, followed by and united with a transverse black spot; scutellum piceous, its lateral margins stramineous; body beneath and legs dull ochraceous; face, disk of prosternum, anterior and intermediate femora, and abdomen above dull testaceous red; apex of rostrum, extreme apices of femora, anterior tibiæ and tarsi, bases and apices of intermediate tibiæ, the intermediate tarsi and apices of posterior tarsi, black; tegmina dark luteous, a short basal streak on costal area and an oblique basal fascia occupying nearly half of clavus stramineous; wings subhyaline, the abdominal area piceous; vertex about as long as broad between eyes, the anterior margin broadly rounded, a longitudinal impression on each

side a little before the eyes; face somewhat broad, only moderately compressed, roundly and evenly continued to clypeus (*Monecphora* type); rostrum reaching the intermediate coxæ; pronotum densely and very finely wrinkled, a distinct broad depression at the middle of the black spot; posterior tibiæ with a long spine near middle and a short spine near base.

Long., excl. tegm., 8 mm.; exp. tegm. 23 mm.

*Hab.* Colombia; R. Dagua (Brit. Mus.).

*Tomaspis astralis*, sp. n.

Head, pronotum, and scutellum bright shining olivaceous green, shortly palely pilose; abdomen above, body beneath, and legs testaceous red: head beneath, anterior and intermediate tibiæ, apices of posterior tibiæ, the tarsi, and anal segment black; tegmina black, two short basal testaceous-red streaks, one on posterior claval margin, the other above clavus, six ochraceous spots, situate one and smallest near middle of clavus, two in almost transverse series about one-third from base, and three at commencement of apical area (one on costal margin, one on inner margin, and the third on disk a little beyond the others); wings pale fuliginous; vertex about as long as breadth between eyes, somewhat angularly rounded anteriorly, strongly centrally longitudinally carinate, depressed on each lateral area, where there is a short longitudinal incised line; pronotum with a transverse cicatrice on anterior margin, from which proceeds a short central longitudinal carination not reaching middle; face a little angulate (intermediate between the *Monecphora* and *Sphenorkina* types); posterior tibiæ with two spines, a very short one near base, and a much longer one near apex.

Long., excl. tegm., 5 mm.; exp. tegm. 16 mm.

*Hab.* Bolivia; Yungas de la Paz (Brit. Mus.).

*Tomaspis funebris*, sp. n.

Vertex, pronotum, and scutellum black; lateral margins of vertex in front of eyes narrowly testaceous; abdomen above dull sanguineous, the central area and connexivum somewhat picceous; body beneath and legs black, basal margin of face testaceous; tegmina black; wings fuliginous, sanguineous at base; vertex about as long as breadth between eyes, somewhat angularly rounded in front; centrally longitudinally carinate, transversely impressed near middle and in front of this impression, the margins of the central area or lobe are also ridged; pronotum rugulosely

punctate, the anterior lateral margins distinctly reflexed; scutellum transversely striate, moderately foveately depressed on disk; face moderately compressed, slightly angulate near middle (between the *Monecphora* and *Sphenorhina* types), strongly centrally ridged, transversely coarsely striate on lateral areas; rostrum reaching the intermediate coxæ; posterior tibiæ with a strong spine beyond middle and a very short spine near base; tegmina about two and a third times as long as broad.

Long., excl. tegm., ♀ 15 mm.; exp. tegm. 38 mm.

*Hab.* Peru; Chandrayayo (Brit. Mus.).

*Tomaspis noctua*, sp. n.

Vertex, pronotum, and scutellum black; frontal margins of anterior lobe, ocelli, eyes, and anterior lateral margins of pronotum pale ochraceous; lateral margins and apex of scutellum and abdomen above reddish testaceous; body beneath and legs black; a spot on each side of base and the central ridge to face and the lateral margins of abdomen pale ochraceous; base of rostrum, apices of anterior femora beneath, obscure longitudinal streaks to femora beneath, apices of tarsi (excluding claws), and narrow posterior abdominal segmental margins reddish testaceous; tegmina black, basal third of costal margin (widened at its apex), discoidal vein for about one-third from base (where it branches, the two branches united at their ends), upper claval margin and claval vein for about two-thirds from their base, and a subcostal spot before apical area sanguineous; wings fuliginous, the veins black, the base sanguineous; face compressed, centrally ridged, scarcely pointed and moderately continuous to clypeus (intermediate between the *Monecphora* and *Sphenorhina* types); rostrum reaching the intermediate coxæ; vertex centrally ridged, somewhat angulate in front, longitudinally incised between the ocelli and eyes; pronotum rugulose and punctate, with an obscure central longitudinal carinate line which is only distinct on disk, the anterior lateral margins reflexed; scutellum longer than broad, transversely striate; tegmina about two and a half times as long as broad.

Long., excl. tegm., ♀ 14½ mm.; exp. tegm. 40 mm.

*Hab.* Amazons; Nanta (*Degand*, Brit. Mus.).

*Tomaspis combusta*, sp. n.

Vertex black, anterior half in front of eyes reddish yellow; ocelli bright yellow; pronotum black, the lateral margins



broadly reddish yellow; abdomen above and beneath reddish yellow; sternum and legs black; face, lateral margins of prosternum, anterior and intermediate femora (excluding base and apex), apices of posterior femora, and tarsal claws reddish yellow; tegmina black, basal third, costal margin (abruptly widening at about one-third from apex, continued round apex and terminating on posterior margin at apex of clavus) reddish yellow; wings pale fuliginous, extreme base black; vertex about as long as breadth between eyes, centrally longitudinally tricarinate in front of eyes, centrally carinate between the ocelli, and with an impressed line on each side of the ocelli; face strongly centrally longitudinally ridged, moderately angulated posteriorly (intermediate between the typical forms of *Monephora* and *Sphenorhina*); rostrum reaching the intermediate tibiæ; pronotum punctate and slightly rugulose, centrally longitudinally carinate, the carination not reaching base, the lateral margins strongly reflexed; tegmina not three times longer than broad, densely finely punctate, the apical area strongly reticulately veined.

Long., excl. tegm., 11–11½ mm.; exp. tegm. 32 mm.

*Hab.* Bolivia (*Steinbach*, Brit. Mus.).

To be placed near *T. cercopoides*, Walk. So far as I understand Breddin's descriptions, the *T. erigena* and *T. rodopepla* of that writer should also belong to this group.

*Tomaspis chilensis*, sp. n.

Vertex, pronotum, and scutellum piceous; broad anterior margin to vertex, broad lateral margins (which inwardly are vaguely defined and tend to produce discal suffusions) and a narrow anterior margin to pronotum ochraceous; abdomen (above and beneath) and face ochraceous; sternum and legs piceous, the femora more or less streaked with ochraceous; tegmina piceous, the basal area indefinitely ochraceous, more strongly outwardly accentuated by a transverse spot on costal area; wings pale fuliginous; vertex almost as long as breadth between eyes, centrally longitudinally carinate, and on each side of the central carination is a short curved carination from a little in front of ocelli to apex; pronotum feebly centrally carinate, obsoletely so on posterior half, the lateral margins distinctly reflexed; face compressed, centrally longitudinally strongly carinate, a little angulate posteriorly (intermediate between the *Monephora* and *Sphenorhina* types), very strongly laterally transversely striate; posterior tibiæ with two strong spines, the shorter almost at base, the longer at about one-third from apex; tegmina about two and a half times as long as broad.

Long., excl. tegm., 11 mm.; exp. tegm. 32 mm.

*Hab.* Chili.

The type of this species was given me many years ago by my late friend Stephen Barton, a coleopterist. He had received it from Edwin Reed, by whom it had been collected.

*Tomaspis fraseri*, sp. n.

Head, pronotum, scutellum, and sternum castaneous; legs and abdomen testaceous red, the latter paler above than beneath; tegmina pitchy black, suffused with sanguineous on basal area, followed by two spots in oblique series (one in and the other above clavus), a subcostal spot before apical area, and another more oblique spot parallel to it near inner margin sanguineous; wings pale fuliginous; vertex about as long as breadth between eyes, rather angularly rounded in front and centrally longitudinally carinate; pronotum wrinkled and thickly finely punctate, centrally longitudinally carinate; scutellum foveately depressed on disk, the apical area transversely wrinkled; face compressed, angulate posteriorly, strongly centrally longitudinally carinate (*Sphenorhina* type); posterior tibiæ with two spines, the shorter near base, the longer near apex; tegmina about two and a half times as long as broad.

Long., excl. tegm., 10 mm.; exp. tegm. 23 mm.

*Hab.* Ecuador; Cuença (*Fraser*, Brit. Mus.).

*Tomaspis proserpina*, sp. n.

Vertex, pronotum, scutellum, face, sternum, and legs sanguineous; abdomen and spots to mesonotum black; base of abdomen above sanguineous; posterior femora (more or less) and apices of posterior tibiæ and tarsi piceous; tegmina black, basal fourth and costal margin sanguineous, the basal red space usually but not invariably marked with a macular piceous stripe; vertex about as long as breadth between eyes, a little pointed anteriorly, foveately depressed at apex and on each side before the eyes; face moderately compressed, pointed posteriorly (*Sphenorhina* type); pronotum finely granulose, centrally ridged from anterior margin to about middle, on anterior area and on each side of the ridge distinctly foveately depressed, lateral margins oblique, sharply and distinctly reflexed; scutellum with the disk ovately foveate; posterior tibiæ with a strong spine near apex and a short spine near base; tegmina about two and a half times as long as broad.

Long., excl. tegm., 7 mm.; exp. tegm. 20 mm.

*Hab.* Bolivia; Yungas de la Paz (Brit. Mus.).

*Tomaspis hebes*, sp. n.

Vertex, pronotum, scutellum, base of abdomen, face, clypeus, and broad lateral areas to the prosternum ochraceous; abdomen above, body beneath, and legs shining black; tegmina black, the basal fifth golden yellow; wings pale fuliginous; vertex about as long as breadth between eyes, a little angularly narrowed before eyes, longitudinally impressed on each side of ocelli; face compressed, posteriorly pointed, thence oblique to clypeus, centrally longitudinally ridged; pronotum foveately depressed on each side of anterior area, the lateral margins sharply reflexed; posterior tibiae with a prominent spine a little before apex; tegmina about two and a half times as long as broad.

*Var.*—Tegmina with a golden-yellow costal spot a little beyond middle.

Long., excl. tegm.,  $8\frac{1}{2}$ –9 mm.; exp. tegm. 23–24 mm.

*Hab.* Bolivia; Yungas de la Paz (Brit. Mus.).

Allied to *T. proserpina* by the somewhat angulate vertex, which but for intermediate forms would apparently denote another genus.

*Tomaspis dimorpha*, sp. n.

♂. Vertex, pronotum, and scutellum castaneous-brown; abdomen above black, its base sanguineous; body beneath black, legs piceous; sternum and coxae more or less testaceous red; tegmina brownish ochraceous, the apical area yellowish, defined inwardly by a transverse black fascia which is continued on costal margin to apex, the pale apical area very coarsely reticulately veined, and in most of these cellules is a piceous-brown spot; wings pale ochraceous, slightly sanguineous at base.

*Var.*—♀. Vertex, pronotum, scutellum, and tegmina black, on the latter the transverse fascia defining the pale apical area is thus indistinguishable.

Face compressed, elongate, almost perpendicularly directed downward, where it terminates in a somewhat sharp point (*Sphenorhina* type), and strongly centrally longitudinally ridged; vertex about as long as breadth between eyes, with a central longitudinal carination, on each side of which is another and shorter carination not reaching base; pronotum rugulose and punctate, centrally longitudinally carinate, broadly foveately depressed on each side of anterior area, the anterior lateral margins distinctly reflexed; scutellum with the disk broadly foveately depressed; tegmina about two and one-third times as long as broad.

Long., excl. tegm., ♂ ♀ 8-9 mm.; exp. tegm. 22 mm.

*Hab.* Bolivia; Yungas de la Paz.

I possess a single specimen of each sex of this species, which vary as above. Whether this represents sexual dimorphism, as I am inclined to believe, or simple variation, can only be decided when a series of specimens are available for examination.

### *Tomaspis distinguenda.*

*Sphenorhina distinguenda*, Walk. List Hom., Suppl. p. 182 (1858).

*Tomaspis rubra*, Fowl. (nec Linn.), Biol. Centr.-Am., Rhynch. Hom. ii. p. 183, tab. xi. figs. 15 & 16 (1897): excl. syn.

Walker's type was from Venezuela; all the specimens collected by Champion were from Panama.

### *Tomaspis nigricans.*

*Tomaspis nigricans*, Amy. & Serv. Hist. Hém. p. 560 (1843).

*Sphenorhina marginata*, Walk. (nec Fabr.), List Hom. iii. p. 686 (1851).

The *Cercopis marginata*, Fabr., has been shown by Stål to be a *Gypona* (Hem. Fabr. ii. p. 85, 1869).

### *Tomaspis festa.*

*Cercopis festa*, Germ. Mag. Ent. iv. p. 40 (1821).

*Sphenorhina festa*, Stål, Rio Jan. Hem. ii. p. 14 (1858).

*Sphenorhina parallela*, Walk. List Hom. iii. p. 694 (1851).

*Tomaspis lineata*, Fowl. (part.), Biol. Centr.-Am., Rhynch. Hom. ii. p. 189 (1897).

Fowler has included the *S. parallela*, Walk., as a synonym of *S. lineata*, Walk. The two species are, however, quite distinct by markings of tegmina and shape of face, and Stål correctly pointed out the identity of the former species with *C. festa*, Germ.

### *Tomaspis stellata.*

*Sphenorhina stellata*, Walk. List Hom. iii. p. 691 (1851).

*Sphenorhina 12-punctata*, Walk. Ins. Saund., Hom. p. 90 (1858).

### *Tomaspis semifascia.*

*Monephora semifascia*, Walk. List Hom. iii. p. 679 (1851).

*Monephora demissa*, Walk. loc. cit. p. 684.

### *Tomaspis flexuosa.*

*Monephora flexuosa*, Walk. List Hom. iii. p. 677 (1851).

*Monephora viridescens*, Walk. loc. cit. p. 679.

*Monephora vacillans*, Walk. Ins. Saund., Hom. p. 86 (1858).

*Tomaspis costaricensis*.*Sphenorhina costaricensis*, Dist. Ent. Month. Mag. xvi. p. 61 (1879).*Tomaspis quatuordecim-notata*, Fowl. Biol. Centr.-Am., Rhynch. Hom. ii. p. 177, t. xi. fig. 5 (1897).*Tomaspis incompleta*.*Monecphora incompleta*, Walk. List Hom. iii. p. 684 (1851).*Sphenorhina diluta*, Walk. Ins. Saund., Hom. p. 92 (1858).

Although Walker describes the colour of *incompleta* as "pale brown, shining" and that of *diluta* as "blackish green," the colours of the two forms are practically identical, and "brown" must be substituted for "blackish green."

*Tomaspis compressa*.*Cercopis compressa*, St. Farg. & Serv. Enc. Méth. x. p. 666. 13 (1825).

Var. *a* (typical).—Pronotum sanguineous; legs black, posterior femora and bases of posterior tibiæ sanguineous. Cayenne (Brit. Mus.). Original habitat of describers.

Var. *b*.—All the femora sanguineous or ochraceous, tibiæ and tarsi black; apical margin of tegmina black, but with the apical area sometimes suffused with black. Amazons (Brit. Mus.); Ega (Coll. Dist.).

Var. *c* (Stoll, Cic. fig. 112).—Pronotum and legs black. Surinam, *vide* Stoll. This figure is said to represent a form of the species (*St. Farg. & Serv.*).

## NEOSPHENORHINA, gen. nov.

Vertex about as long as breadth between eyes, angularly narrowed anteriorly, centrally longitudinally carinate, and longitudinally ridged near the anterior margin of each eye; face very strongly compressed, almost straightly deflected downward to a point opposite base of clypeus, to which it is then truncately directed; rostrum slightly passing the intermediate coxæ; pronotum a little longer than broad, the anterior lateral margins oblique, not convexly rounded but a little concavely sinuate, longer than the posterior lateral margins, centrally finely longitudinally carinate, anterior margin truncate and not extending beyond eyes, posterior margin angularly concavely sinuate; scutellum a little longer than broad at base; abdomen above with the connexivum strongly broadly upwardly ridged; legs long and slender, posterior tibiæ with two spines, posterior tarsi long, first and third joints subequal in length; tegmina long and narrow, slightly more than three times as long as broad.

Type, *N. ocellata*, Walk.

The peculiar structure of the pronotum, with the pointed vertex and long narrow tegmina, are the salient characters of this genus.

*Neosphenorhina ocellata*.

*Sphenorhina ocellata*, Walk. List Hom. iii. p. 693 (1851).

*Hab.* Venezuela.

TOMASPISINA, gen. nov.

Vertex about as long as broad, rounded in front, transversely impressed at middle; ocelli somewhat near together at about one-third from base; pronotum about half as long as the breadth between the humeral angles, a little convexly gibbous at base and deflexed towards head, anterior lateral margins moderately ampliate and reflexed, very slightly rounded, almost straight, much shorter than posterior lateral margins, which are concavely sinuate, anterior margin straightly truncate, posterior margin profoundly sinuate before scutellum, centrally longitudinally carinate; scutellum longer than broad, the apex acuminate; face broad, deflected to an obtuse point and then truncately deflected to base of clypeus; rostrum reaching the intermediate coxæ; tegmina about two and a half times as long as broad, the whole surface, excepting central base, very robustly and prominently reticulately veined; wings ample; posterior tibiæ with a single long spine beyond middle.

Type, *T. frontalis*, Walk.

*Tomaspisina frontalis*.

*Sphenorhina frontalis*, Walk. Ins. Saund., Hom. p. 89 (1858).

*Hab.* Colombia.

NEOMONECPHORA, gen. nov.

Allied to *Makonaima*; vertex similar in structure, but the central longitudinal carination restricted to the basal half, and the lateral margins before eyes with their edges not ridged and upwardly raised, ocelli placed a little nearer base; face neither centrally ridged nor deflected to a more or less acute point, but evenly rounded to clypeus; scutellum not longer than broad and discally strongly foveately depressed; rostrum scarcely passing the anterior coxæ; abdomen above not centrally raised, but broad with a longitudinal incised

line on each lateral area, and slightly longitudinally ridged before the connexivum, which is broad and distinct; posterior femora less longly and strongly sulcate beneath, posterior tibiæ slightly not considerably longer than the femora as in *Makonaima*, and with a single spine beyond the middle; tegmina three times as long as broad, not prominently arched at base.

Type, *N. insignis*, Dist.

The large and broad vertex is the character which principally allies this genus to *Makonaima*.

*Neomonécphora insignis*, sp. n.

Vertex and pronotum brownish testaceous; scutellum, abdomen above, body beneath, and legs black; face and lateral margins of prosternum brownish testaceous; tegmina brownish ochraceous, apical half of costal area, apical margin narrowly continued to apex of clavus, and a rounded subcostal spot before middle black, posterior margin of clavus piceous brown; wings fuliginous; pronotum distinctly broadly foveately depressed on each side of anterior area, its anterior lateral margins somewhat broadly reflexed; scutellum somewhat faintly transversely striate, the disk very strongly foveately depressed; other structural characters as in generic diagnosis.

Long., excl. tegm., ♀ 15 mm.; exp. tegm. 40 mm.

*Hab.* Brazil (Fry Coll., Brit. Mus.).

MAKONAIMA, gen. nov.

Vertex as long as breadth between eyes, centrally longitudinally carinate, transversely impressed before the eyes, the lateral margins before eyes lobately convex, their edges ridged and raised upwardly, and somewhat abruptly separated from the apical margin, which is broadly transversely convex, and also distinctly separated from the lateral margins of the central area or lobe, the margins of which are ridged; ocelli placed on each side of the central carination at less than one-third from base; face somewhat globose, compressed, centrally longitudinally ridged, deflected in front to a more or less acute point, and then obliquely directed backward to the base of the clypeus, which does not quite reach the anterior coxæ; pronotum about as broad between the lateral angles as its length and that of vertex taken together, rounded and somewhat gibbous on basal area and then suddenly and obliquely deflected towards head, the anterior lateral shorter than the posterior lateral margins, the former

convex, the latter obliquely sinuate, and both ridged, the lateral angles obtusely subprominent, the anterior margin truncate, the posterior margin concavely sinuate before scutellum, which is considerably longer than broad, discally foveately depressed, strongly transversely striate, its apex long and attenuate; rostrum just or almost reaching the posterior coxæ; abdomen above centrally raised, the lateral areas deflected on each side, the connexivum broad and distinct; legs moderately long and robust, the posterior femora strongly longitudinally sulcate beneath, posterior tibiæ considerably longer than the femora and with a single long spine beyond the middle, posterior tarsi very long, third joint longest, as long or only a little shorter than first and second together; tegmina about or only a little more than twice as long as broad, costal margin arched at base and convexly deflected to apex, which is rounded, and densely, evenly, finely punctate; wings long and ample, about three-fourths the length of tegmina.

Type, *M. rivularis*, Dist.

*Makonaima rivularis*, sp. n.

Vertex dull reddish, the lateral margins before eyes bright reddish ochraceous; pronotum piceous, the lateral and posterior margins and a central longitudinal carination bright reddish ochraceous; scutellum dark purplish, its apical third bright reddish ochraceous; body beneath and legs purplish brown, the abdomen darkest; a central longitudinal fascia to face and posterior margin to metasternum bright reddish ochraceous; tegmina piceous, with small linear reddish-ochraceous spots, about seven arranged in longitudinal series beneath costal area,—two subapical, two above and beyond clavus, and a longer linear spot near middle of upper claval margin; wings dark fuliginous, their extreme bases carmine-red; pronotum finely granulose and punctate, centrally longitudinally carinate, the carination not extending to base; scutellum coarsely transversely striate, the disk broadly ovately depressed, the apex longly attenuate; scutellum reaching the posterior coxæ; tegmina strongly arched at base.

Long., excl. tegm., 17–18 mm.; exp. tegm. 48 mm.

*Hab.* Pera; Ecuador, Cuenca (Brit. Mus.).

*Makonaima circumducta*, sp. n.

Piceous; vertex with the lateral areas in front of eyes and a spot at apex, pronotum with the lateral and posterior



margins and the central longitudinal carination, apical third of scutellum, abdominal anal appendages, central longitudinal fascia and apex to face, tegmina with a small spot a little beyond base, and a fasciate looped line commencing about one-third from base below costal area, continued subapically and then backwardly above clavus to less than one-third from base, and extreme base of wings, reddish ochraceous or pale sanguineous; vertex with the central longitudinal carination very distinct; face moderately compressed, centrally longitudinally ridged, deflected in front to a more or less acute point and then obliquely directed backward to base of clypeus; rostrum reaching the posterior coxæ; pronotum finely rugulose and punctate, with a central longitudinal carination not reaching base; scutellum strongly transversely striate, the disk broadly ovately depressed; posterior tibiæ with a single long spine beyond middle; tegmina strongly arched at base.

Long., excl. tegm., 15 mm.; exp. tegm. 40 mm.

*Hab.* Bolivia, Yungas de la Paz.

#### KOROBONA, gen. nov.

Allied to *Makonaima*, from which it differs as follows:—The lateral margins before eyes are lobate and subangulate, but not convex, and are distinctly ridged and continued backwardly to base at inner margins of eyes; face subglobose, flat, not compressed, and evenly directed from base to clypeus; pronotum with the anterior lateral and posterior lateral margins about equal in length; posterior tibiæ with a moderately long spine beyond middle and a very short spine near base, posterior tarsi long and robust, the apical joint shorter than first and second joints together; tegmina short and narrow, about two and a half times as long as broad; wings small and narrow; abdomen above with a prominent basal transverse foveation on each side of apex of scutellum.

Type, *K. lineata*, Dist.

#### *Korobona lineata*, sp. n.

Black; pronotum with the lateral margins (broadly) and a central longitudinal carination, abdomen above with two central basal transverse foveations (one on each side of apex of scutellum), and a central longitudinal fascia to tegmina (neither reaching base nor apex) pale luteous; face and clypeus reddish testaceous; pronotum densely finely wrinkled and punctate, the central carination prominent, commencing at base but not reaching anterior margin, the anterior lateral

margins laminately reflexed; scutellum transversely striate and discally broadly ovately depressed, *its apex mutilated in typical specimen*; abdomen shining indigo-black, above prominently centrally ridged, and laterally obliquely deflected on each side, the connexivum broad and distinct, the margins of the latter longly pilose; legs pilose and robust; wings short, little more than half the length of tegmina, pale fuliginous, with the veins darker.

Long., excl. tegm., 16 mm.; exp. tegm. 35 mm.

*Hab.* Brazil? (Brit. Mus.).

The specimen on which this genus and species are founded is contained in the collection of the late Alexander Fry, and which was bequeathed to the British Museum. All the Rhynchota in this collection were from Brazil.

*Korobona conspicua*, sp. n.

Vertex black, the ocelli reddish; pronotum dull testaceous-red, two curved black spots near anterior margin (one on each side of the central carination) and two piceous curved fasciæ each extending from the anterior black spots parallel to the central carination, looped at base, continued along the posterior lateral margins and terminating before the humeral angles; scutellum, abdomen above, body beneath, and legs more or less black, the abdomen above shining bluish black, with the transverse basal foveations pale luteous; face, clypeus, and lateral margins of prosternum pale sanguineous, with a longitudinal fascia extending from base (where it is narrowest) beneath the costal area to near apex and attached to two fused inwardly directed spots on apical margin, and two discal longitudinal spots (one above apical half of clavus, the other above the next longitudinal vein), piceous; wings hyaline, fuliginous on basal and marginal areas, and with the veins black; pronotum finely wrinkled and obscurely punctate, with a distinct central longitudinal carination almost extending to base and apex, the anterior lateral margins slightly, the posterior lateral margins very strongly sinuate; scutellum strongly transversely striate, its disk broadly, ovately, moderately depressed; face as in generic diagnosis; rostrum passing the intermediate coxæ.

Long., excl. tegm., 21 mm.; exp. tegm. 51 mm.

*Hab.* Brazil.

I have no more precise locality for this fine species.

MAHANARVA, gen. nov.

Head robust, subtriangular, about as long as the breadth

between the eyes, the lateral and apical margins ridged and also strongly centrally longitudinally carinate, finely transversely impressed before eyes and obliquely impressed on each side of ocelli, which are placed close together at about one-fourth from base, divided by the central longitudinal ridge; face very prominent, slightly compressed, convexly deflected downwards to an obtuse point, below which it is obliquely continued to the clypeus, which reaches the anterior coxæ; rostrum about reaching the intermediate coxæ; pronotum more or less broadly obtusely ridged between the posterior angles and then deflected towards the head, centrally finely longitudinally carinate, the anterior margin straight, the anterior lateral margins oblique, the posterior lateral margins concavely obliquely sinuate, the posterior margin strongly concavely sinuate before the scutellum, which is about as long as broad at base, the apex longly attenuate; legs somewhat robust, posterior tibiæ with a prominent spine beyond middle and a smaller spine near base; tegmina a little more than twice as broad as long, their costal margins convex, their apices rounded, the veins on apical area reticulate and very prominent; posterior tarsi very long, the basal joint slightly shorter than second and third joints together.

Type, *M. indicata*, Dist.

The structure of the vertex and face is the principal characteristic of this genus; looking at the vertex from an oblique position, the base of the face is distinctly visible above.

*Mahanarva indicata*, sp. n.

Vertex, pronotum, scutellum, face, sternum, and legs very dark olivaceous; ocelli, base of rostrum, coxæ, extreme bases and apices of femora, apices of tibiæ, basal joint of posterior tarsi, and all the claws sanguineous; abdomen above very dark purplish red, beneath piceous, both surfaces more or less cretaceously tomentose; tegmina pale chocolate-brown, a narrow, obscure, paler, short longitudinal streak at base and two small sanguineous spots on apical area (one near costal the other near inner margin); wings pale fuliginous, the veins piceous, the extreme base sanguineous, outwardly suffused with black; vertex, pronotum, and scutellum thickly, finely, ochraceously pilose, vertex and pronotum thickly punctate, the latter centrally, longitudinally, finely, and somewhat obscurely carinate, with two foveate spots on each side of disk, between and a little in front of which are two contiguous, transverse, short impressions; scutellum

ovately depressed on disk and transversely striate; other structural characters as in generic diagnosis.

Long., excl. tegm., 10 mm.; exp. tegm. 23 mm.

*Hab.* Brazil (Brit. Mus.).

There is no more precise locality obtainable for this species, which was presented to the British Museum in 1868 by the late W. Wilson Saunders. It may therefore have been contained in the collections made by Bates and Wallace on the Amazons.

*Mahanarva uniformis*, sp. n.

Vertex, pronotum, scutellum, face, and body beneath picceous-black, with a slight olivaceous tint; legs picceous-brown; tegmina uniformly pale chocolate-brown, thickly, shortly, finely, palely pilose; vertex as in generic diagnosis, the ocelli ochraceous; face downwardly deflected but not terminating in such a distinctly obtuse point as in *M. indicata*; pronotum thickly, finely, transversely wrinkled, impressed as in *M. indicata*, centrally, finely, longitudinally carinate, the carination not reaching the anterior margin; scutellum ovately impressed on disk and transversely striate.

Long., incl. tegm.,  $9\frac{1}{2}$  mm.

*Hab.* Ecuador; Paramba and Cachabé (*Rosenberg*, Brit. Mus.).

Considerably smaller than *M. indicata*; face less pointed, pronotum more wrinkled and less punctate, differing also by the more uniform coloration and absence of sanguineous markings.

KANAIMA, gen. nov.

Vertex very large and broad, slightly longer than space between eyes, transversely impressed above and between the insertion of the antennæ, before this impression broadly convexly rounded, finely, centrally, longitudinally carinate, the ocelli somewhat close together, divided by the carination, and placed at less than one-third from base; face globose, oblong, its disk somewhat broadly flattened and evenly depressed to base of clypeus, transversely striate, and centrally, longitudinally, finely ridged; clypeus extending to the anterior coxæ; rostrum slightly passing the intermediate coxæ; pronotum about twice as broad as long, strongly foveately impressed on anterior disk, the anterior margin truncate, the anterior lateral margins convexly oblique, posterior margin truncate before scutellum, which is about as long as broad at base, its apical area attenuate; legs moderately robust, posterior tibiæ with two strong spines (one near base

and the larger a little beyond middle), posterior tarsi robust, first joint long (second and third joints mutilated in type); tegmina about two and a half times as long as broad, moderately narrowed towards apices, which are rounded, apical areas with the veins reticulate and prominent.

Type, *K. katzensteini*, Berg.

Allied to *Mahanarva*, vertex larger and of different shape and structure; posterior margin of pronotum truncate, &c.

*Kanaima katzensteini*.

*Tomaspis katzensteini*, Berg, Hem. Argent. p. 233 (1879).

*Hab.* Argentina.

XXIII.—*On the Characters and Affinities of "Desmalopex" and Pteralopex.* By KNUD ANDERSEN.

*The Differential Characters of "Desmalopex."*

The fruit-bat described by Temminck, fifty-six years ago, as *Pteropus leucopterus*\* has recently, by Miller, been made the type of a distinct genus, *Desmalopex* †, stated to differ from *Pteropus* by a series of cranial and dental characters. *Pteropus leucopterus* appears to be rare in collections, the only specimens recorded in literature being the type in the Leyden Museum (slightly immature) and two skins with skulls in the British Museum (adults, one of them described by Gray as "*Pteropus chinensis*" ‡). I have carefully tested all the differential characters of *Desmalopex* pointed out by Miller on these three skulls of *Desmalopex* and the whole British Museum series of skulls of *Pteropus*, representing

\* Temminck, Esq. Zool. pp. 60-61 (1853); type locality unknown, "On présume une des îles Philippines."

† Miller, 'Families and Genera of Bats,' p. 60 (29 June, 1907).

‡ Gray, 'Catalogue of Monkeys, Lemurs, and Fruit-eating Bats,' p. 111 (1870). This specimen came to the Museum from Robert Fortune, who, from the spring of 1843 to late in 1845, travelled in the northern provinces of China as a collector to the Horticultural Society of London; hence it was, very naturally, believed by Gray to be from China. But the fact was apparently overlooked that Fortune also made an excursion to Luzon (January to early in March, 1845; see his 'Three Years' Wanderings in the Northern Provinces of China,' pp. 332-345, 1847). When to this it is added that no species of *Pteropus* is known to occur in China, and that the type of *Pt. chinensis* differs in no essential characters from the type of *Pt. leucopterus*, there can be no reasonable doubt that the former was in reality obtained by Fortune during his stay in Luzon.

nearly all species known, and arrived at the conclusion that *Desmalopex* cannot be separated from *Pteropus*. It is fair to add, however, that two or three years ago, when Miller was studying the British Museum collection of bat-skulls for his revision of the genera of bats, the series of *Pteropus* skulls was much less complete than now; since then all the species of *Pteropus* have been worked out for the 'Catalogue of Chiroptera,' and the number of skulls now available for examination is more than four times as large. Miller's opportunities for verifying the supposed differential characters of *Desmalopex* were therefore much less favourable than they would be now.

The characters of *Desmalopex* given by Miller (here printed between inverted commas), and my comments thereon, are these:—

(1) "Like *Pteropus*; but skull with broader rostrum and palate."—In no small number of species of *Pteropus* (e. g. *Pt. nawaiensis*, *samoënsis*, *anctianus*, *pselaphon*\*, *tuberculatus*, *pilosus*, *insularis*, *phæocephalus*, *lombocensis*; among the larger forms *Pt. melanopogon*) the rostrum is quite as broad as or even broader than in *Pt. leucopterus*.

(2) "Orbits directed slightly more upward."—The orbits of *Pt. leucopterus* are not directed more upward than in certain other species of *Pteropus*, e. g. *Pt. vampyrus* and *giganteus* †.

\* A comparison of the measurements of *Pt. leucopterus* and *pselaphon* is perfectly fair, since the skulls of these two species are precisely of the same size (and indeed so similar also in other respects as to differ only in trivial details). Skulls measured, *Pt. leucopterus*, B.M. 62.1.14.3, and (in parentheses) *Pt. pselaphon*, B.M. 94.7.3.2: gnathion to back of zygomatic process of squamosal 54 mm. (54); zygomatic breadth 38 (37); across postero-external corners of alveoli of  $m^1$ - $m^1$  19 (19); across alveolar borders between  $p^3$  and  $p^4$  15.6 (15.8); breadth of palate between inner sides of  $m^2$ - $m^2$  12.5 (13); between postero-internal corners of  $p^4$ - $p^4$  10.8 (11.2); between  $p^3$ - $p^3$  9.8 (9.7).

† Measurements, by goniometer, of angle formed by alveolar margin (front of  $p^3$  to back of  $m^1$ ) and tangent to upper and lower edges of orbit:—*Pt. pselaphon* (B.M. 94.7.3.2) 45°, *Pteralopex atrata* (88.1.5.9; type) 32-33°, *Pt. leucopterus* (62.1.14.3) 28°, *Pt. giganteus leucocephalus* (45.1.8.274; Nepal) 27°.—Miller writes (*op. cit.* p. 61) that the orbits of *Pteralopex* are "strongly upturned," i. e. more so than in "*Desmalopex*," and lays some stress on the supposed three stages of the position of the orbits as marked by *Pteropus* (orbits less upturned), *Desmalopex* (more upturned), and *Pteralopex* (strongly upturned), this being one of his arguments for the alleged intermediate position of *Desmalopex* between *Pteropus* and *Pteralopex*. The true facts are those shown by the measurements given above and verified by an instrument still finer than a goniometer, namely, the eye, that *Pt. leucopterus* does not differ in this respect from *Pt. giganteus*, and that the orbits of *Pteralopex* are even slightly less upturned. Miller's mistake is, however, perfectly

The above are the only cranial characters of *Desmalopex* given by Miller; all the other characters (numbers 3-9, *infra*) are taken from the dentition.

(3) "Upper incisors subequal, distinctly larger than in *Pteropus*, the cross section of the crown nearly one-third that of canine, the cingulum produced into a noticeable shelf posteriorly."—In *Pt. samoënsis*, *anetianus*, *pselaphon*, *pilosus*, and *tuberculatus* the upper incisors are fully as large as, if not larger than, in *Pt. leucopterus*, and at least in the three last species the cingulum is quite or very nearly as broad as in *Pt. leucopterus*; if there is any difference in the development of the cingulum, in favour of *Pt. leucopterus*, it is certainly infinitesimal.

(4) "Lower incisors very unequal, the crown area of the outer nearly one-half that of canine, that of the inner scarcely more than one-half [probably a slip for one-fifth] as great."—In a majority of species of *Pteropus*  $i_2$  is about once and a half, twice, or twice and a half the bulk of  $i_1$ , but the contrast in size is in some species much greater,  $i_2$  being sometimes four, five, or six times as stout as  $i_1$ . In *Pt. leucopterus* the disproportion is due chiefly to an increase of  $i_2$ ; the same is the case in *Pt. samoënsis*, *anetianus*, *pilosus*, and *tuberculatus*, in which  $i_2$  is from three to four times the bulk of  $i_1$ ; in *Pt. lombocensis* (and a few other species) the increase of  $i_2$  is combined with a distinct reduction of  $i_1$ , making  $i_2$  varying from four to six times the bulk of  $i_1$ , and thus producing a disproportion even larger than in *Pt. leucopterus*.

(5) "Small upper premolar well developed, not deciduous, its diameter nearly half that of upper incisor, its crown flat."—The vanishing  $p^1$  is a trifle less reduced than usually in *Pteropus*, though the difference is exceedingly small indeed between *Pt. leucopterus* and certain specimens of *Pt. lombocensis*, in which  $p^1$  has the crown slightly but distinctly differentiated from the shaft. Whether  $p^1$  is really persistent in *Pt. leucopterus* is impossible to decide on the available material, it would require a much larger series; all that can be said is that it is present in the only three

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excusable; it really looks as if the orbits of *Pteralopex* were more directed upward than in *Pt. leucopterus*. The reason is this:—Owing to the excessively heavy canines of *Pteralopex*, the alveolar border, in the usual position of the skull (lower jaw removed, skull resting on a horizontal plane), is much more ascending in postero-anterior direction than in *Pt. leucopterus*; if, however, the two skulls are kept the one above the other, and with their alveolar borders parallel, it is very easily seen that the orbits are less upturned in *Pteralopex* than in *Pt. leucopterus*.

skulls known, one of which is, however, immature, while the teeth of the two other skulls are not much worn; on the other hand, in all the (seven) skulls I have seen of *Pt. lombocensis*  $p^1$  is present, though some of these skulls have much-worn teeth. It is quite common to find this rudimentary tooth persistent even in aged specimens of *Pteropus*.

(6) "Small lower premolar relatively larger than in *Pteropus*, but smaller than in *Pteralopex*, its outer edge raised but not distinctly cuspidate."—It is a general rule in *Pteropus* that an increase in the size of  $i_2$  is accompanied by an increase in the size of  $p_1$ ; compare, for instance, *Pt. lombocensis*, *samoënsis*, *anetianus*, *pselaphon*, *pilosus*, *tuberculatus*. *Pt. leucopterus* follows the same rule (as does also *Pteralopex*), and  $p_1$  is not relatively larger in *Pt. leucopterus* than in *Pt. lombocensis*, *samoënsis*, *anetianus*, and *pilosus*. In structure it does not differ from the typical Pteropine  $p_1$ .

(7) " $pm_3$  shows no trace of cusp on inner side."—As well known, the structure of a typical Pteropine molar is this: a longitudinal groove flanked by higher outer and lower inner ridge. But in the anterior large premolar above and below ( $p^3$  and  $p_3$ ) the outer ridge takes more the form of a high acutely pointed cusp, the inner ridge of a lower pointed cusp, and both are anteriorly closely approximated, sometimes completely fused. A fusion of the outer and inner cusps, perfectly similar to that seen in  $p_3$  of *Pt. leucopterus*, is shown by a considerable number of species of *Pteropus*, and in some species, e. g. *Pt. papuanus*, *scapulatus*, and *woodfordi*, the fusion of the cusps is decidedly more complete than in *Pt. leucopterus*.

(8) "Molars, both above and below, subquadrate in outline, the length of the crown never conspicuously greater than the width ( $m_3$  [obviously a misprint for  $m_1$ ] and  $m^1$  not elongated as in *Pteropus*)."—In species of *Pteropus* with perfectly unmodified dentition the molariform teeth, particularly  $m^1$ , are conspicuously longer than broad; in *Pt. leucopterus* they are only one-fourth or one-third longer than broad; expressed in other words, they are shorter but not narrower than usual. It is quite natural that this peculiarly shortened form of the cheek-teeth of *Pt. leucopterus* attracted the attention of Mr. Miller; it is, in fact, not precisely matched by any other *Pteropus*. But *Pt. leucopterus* is in this respect approached by *Pt. insularis*, *phæocephalus*, *macrotis*, *epularius*, *poliocephalus*, *papuanus*, and *neohibernicus*, in all of which the molariform teeth are shorter than usual. And a modification of the outline of the cheek-teeth much greater than that shown by *Pt. leucopterus* is found in *Pt. personatus*,



*scapulatus* and *woodfordi*, in which the teeth are not only much shortened but excessively narrow, as in the *Macroglossi*. It would be hopeless to "split" the genus *Pteropus* on differences in the general outline of the cheek-teeth; all modifications lead through numerous transitional stages back to the typical Pteropine molar.

(9) "Lower molars peculiar in that the ridges of  $m_1$  and  $m_2$  are each divided into two low but distinct rounded cusps. The quadritubercular form resulting from this is very noticeable in  $m_1$ , less so in  $m_2$ ."—I am probably not mistaken when I consider this to be, from Miller's point of view, the chief character of his "*Desmalopex*." It will be necessary, therefore, to make sure if *Pt. leucopterus* is not, perhaps, in this respect as in all others very closely connected with other species of the genus. In the type of "*Pteropus chinensis*" (= *leucopterus*) there is a shallow but distinct transverse depression in the outer and inner ridge of  $m_1$ , indicating a beginning subdivision of each ridge into two incompletely differentiated rounded tubercles; the depression is still shallower in the outer than in the inner ridge; in  $m_2$  it is, in both ridges, exceedingly shallow, the "quadritubercular" structure of the tooth therefore only detectable on very close examination. In the other skull of *Pteropus leucopterus* (62.1.14.3) I fail to discover the slightest trace of a depression in the outer ridge of  $m_1$ , while in the inner ridge it is present, though less distinct than in the other skull; in  $m_2$  a slight depression is present in the inner ridge and barely detectable (at least with a lens) in the outer ridge. It should be noted that in both skulls the depression is more distinct in  $m_1$  than in  $m_2$ , and more distinct in the *inner* than in the outer ridge. In all the skulls I have seen of *Pt. pselaphon* (ten) the "splitting" of the *inner* ridge of  $m_1$  is either as distinct as or (in some skulls) decidedly more distinct than in *Pt. leucopterus*, and a similar, but much stronger, splitting of the inner ridge is seen in  $p_4$ ; the inner ridge of  $m_2$  is simple, as are also the outer ridges in all teeth. On close examination of a few skulls of *Pt. samoënsis* and one of *Pt. pilosus* I find a faint depression in the inner ridge of  $p_4$ , corresponding in position to the deep groove in  $p_4$  of *Pt. pselaphon*. We have thus these four progressive stages: a majority of species of *Pteropus*, ridges of lower molariform teeth simple; *Pt. samoënsis* and *pilosus*, a slight depression in inner ridge of  $p_4$ , suggesting an initial stage towards a splitting of the ridge into two tubercles; *Pt. pselaphon*, inner ridges of  $p_4$  and  $m_1$  very distinctly subdivided into an anterior and posterior

portion; *Pt. leucopterus*, distinct depression in inner ridges of  $m_1$  and  $m_2$ , and, at least sometimes, in outer ridges of same teeth. When to this it is added that *Pt. pilosus* (Pelew Islands), which in this respect marks an intermediate stage between the typical Pteropine dentition and that of *Pt. pselaphon* (Bonin Islands), is the closest known relative of *Pt. pselaphon*, then the evidence seems to me conclusive. This more or less incomplete, or, if preferred, more or less complete, splitting of the longitudinal ridges of certain cheek-teeth may be used as a specific character (though even as such it is not of much practical use), but it is certainly not of generic importance.

*Conclusions.*—*Pt. leucopterus* accords with the typical\* species of the *Pt. pselaphon* group (*Pt. pselaphon*, *pilosus*, *tuberculatus*) in the following characters:—(1) The general shape of the skull; (2) the broad rostrum; (3) the strong supraorbital processes; (4) the heavy premaxillæ; (5) the large upper incisors; (6) the unusually broad cingulum of the upper incisors; (7) the enlargement of  $i_2$ ; (8) the heavy canines, with unusually broad cingulum, the edge of which shows a pronounced tendency to split into separate rounded tubercles; (9) the large  $p_1$ ; (10) the heavy posterior basal ledges of the molariform teeth above and below; (11) the tendency to a splitting of the ridges of some of the lower cheek-teeth; (12) the distribution of the fur (tibiæ densely clothed above); (13) the size and form of the ears; (14) the general size of the animal. The only noteworthy peculiar characters of *Pt. leucopterus* are, in fact, the shortening of the cheek-teeth (in which respect it is, however, approached by *Pt. insularis* and *phæocephalus*, both allied to *Pt. pselaphon*) and perhaps the paler colour of the fur (the three specimens known are faded). In the face of this evidence I have not the slightest hesitation in saying that *Pt. leucopterus*, far from constituting a distinct genus, is simply a Philippine representative of the *Pt. pselaphon* group. *Pt. pselaphon* inhabits the Bonin Islands, *Pt. pilosus* the Pelew Islands, the habitat of *Pt. tuberculatus* is unknown, but may, not unlikely, be the Mariannes, so that also the geography is in favour of this conclusion.

#### *The Affinities of Pteralopex.*

*Desmalopex*, Miller writes (*t. c.* p. 60), "is intermediate between *Pteropus* and *Pteralopex*, though nearer the former. In the broadened rostrum and slightly upturned orbits the skull distinctly suggests *Pteralopex*, while the same tendency

\* I consider *Pt. insularis* (Ruck atoll, Carolines) and *Pt. phæocephalus* (Mortlock, Carolines) somewhat aberrant members of the *Pt. pselaphon* group.

is shown by the form and relative size of the incisors, the well-developed small upper premolar ["upper" a slip for lower?], the squarish outline of the molars, and the extra cusps of  $m_1$  and  $m_2$ ."

In the foregoing pages I have endeavoured to show that "*Desmalopex*," i. e. *Pt. leucopterus*, cannot be separated from *Pteropus*. But I perfectly agree with Miller that *Pt. leucopterus* in certain respects distinctly foreshadows *Pteralopex*, only I must add that this is the case also with the other typical members of the *Pt. pselaphon* group, viz. *Pt. pselaphon*, *pilosus*, and *tuberculatus*, and that this group is again closely connected with the *Pt. samoënsis* group (*Pt. nawaiensis*, *samoënsis*, *anetianus*). The following review of all the essential characters of *Pteralopex* will, I think, place these suggestions as to a rather close relationship between *Pteralopex* and the *Pteropus pselaphon* group on a firmer basis:—

(1) General shape of skull Pteropine, on the whole nearest that of the short, broad-faced, heavily-built, strongly-crested skulls of *Pt. pselaphon*, *pilosus*, and *tuberculatus*.

(2) Rostrum short and very broad. In both characters rather closely approached by all species of the *Pt. pselaphon* and *samoënsis* groups, but the rostrum of *Pteralopex* is relatively broader anteriorly, no doubt owing to the excessively heavy upper canines.

(3) Premaxillæ heavy, as in all species of the *Pt. pselaphon* group.

(4) Postorbital processes of frontals strong at base, very long, quite or nearly reaching zygoma; postorbital processes of zygoma small. In all species of the *Pt. pselaphon* group the upper postorbital processes are heavy at base and very long, the lower processes small or practically undeveloped; if, as is the case generally in *Pt. leucopterus* and occasionally in *Pt. pselaphon*, the orbital ring is complete behind, it is therefore formed almost entirely by the upper processes, as in *Pteralopex*.

(5) Coronoid process of mandible high, very broad, steeply ascending (front margin almost at right angles with alveolar border), angular process unusually prominent, rami deep, gonys low (vertical extent), broad, and more steeply ascending than usual. Precisely all the same characters are found in the mandibles of *Pt. pselaphon*, *pilosus*, and *tuberculatus*; the mandible of *Pt. leucopterus* is weaker, coronoid more sloping, angular process less developed, gonys more typical Pteropine.

(6) Upper incisors very large. The nearest approximation to this in the genus *Pteropus* is found in the species of the *Pt. pselaphon* group.

(7) Cingulum of upper incisors very broad. As in *Pt. pselaphon*, *tuberculatus*, and *leucopterus*.

(8) Great enlargement of  $i_2$  combined with some reduction of  $i_1$ , making the contrast in the sizes of these two teeth greater than in any *Pteropus*. A disproportion between  $i_2$  and  $i_1$  is seen already in *Boneia*, a genus closely allied to the primitive *Rousettus*; the character is further developed in *Pteropus* (which no doubt originates from a *Rousettus*-like form), either by an increase of  $i_2$  or by this combined with a reduction of  $i_1$ ; and the reduction of  $i_1$  culminates in the complete disappearance of this tooth in *Styloctenium* and *Dobsonia* (both genera allied to *Pteropus*). This character of *Pteralopex* is therefore only an excessive development of a tendency already present in all the related genera. The numerous species of *Pteropus* show all intermediate stages, from an  $i_2$  which is only about once and a half the bulk of  $i_1$ , to an  $i_2$  about six times the size of  $i_1$ . The nearest approximation to the enormous disproportion of these teeth exhibited by *Pteralopex* is seen in the species of the *Pt. pselaphon*, *samoënsis*, and *lombocensis* groups.

(9) Upper canines peculiar in the following points:— (a) cingulum very strongly developed, its edge split into separate tubercles; the same is the case in *Pt. pselaphon*, *pilosus*, and *tuberculatus*, less distinctly in *Pt. leucopterus*; the tubercles of the cingulum in *Pt. pilosus* exactly correspond in number and position to those of *Pteralopex*, only they are slightly smaller: (b) a strong secondary cusp half-way up the hinder edge of the canine; the only species of *Pteropus* possessing a secondary cusp in the upper canines is *Pt. tuberculatus* (of the *pselaphon* group); the cusp in this species is much smaller than, but similar in position to, that of *Pteralopex*.

(10) Cingulum of lower canines broad, forming a conspicuous shelf posteriorly. As in the *Pt. pselaphon* group.

(11)  $p^3$ ,  $p^4$ , and  $m^1$  modified as follows:— (a) crown short and broad, subsquarish in outline: (b) hinder (transverse) border of teeth conspicuously raised, front border similarly raised: (c) owing to the shortening of the teeth and the sharply raised anterior and posterior borders, the usual "longitudinal ridges" of a *Pteropus* molar are become much shortened (in antero-posterior extent) so as to form two pointed cusps situated opposite each other, the one on the labial, the other on the lingual side of the tooth, a little in front of the middle. The structure of the *Pteralopex* molar is very easily derived from the molar structure of any species of *Pteropus*, but it is most likely, of course, that it has originated from a tooth in which already the posterior basal ledge (posterior

border) was more developed than usual. Such is the case in the *Pt. pselaphon* group (as well as in the related *Pt. samoënsis* group), and in *Pt. pselaphon* and allied species also the anterior border (cingulum) of  $p^3$  and  $p^4$  is distinctly raised, particularly in  $p^3$ . Of the four known typical species of the *pselaphon* group, *Pt. leucopterus* shows decidedly the nearest approximation to *Pteralopex* in the general aspect of the upper cheek-teeth; the crown is so much shortened as to be nearly subsquarish, the anterior and posterior borders of each tooth slightly but quite distinctly raised, and the "longitudinal ridges" more shortened and cusp-like than usual. The only additional modifications required to transform an upper molar of *Pt. leucopterus* into that of a *Pteralopex* is a further emphasizing of the changes which already have taken place in the passage from a typical *Pteropus* molar to that of a *Pt. leucopterus*, viz. a slight further shortening and broadening of the tooth and a much stronger development of the anterior and posterior borders. The difference in this respect between *Pt. leucopterus* and *Pteralopex* is unquestionably only one of degree.

(12)  $p_4$ ,  $m_1$ , and  $m_2$  modified as follows:—(a) crown shortened and broadened, though not quite to the same degree as in the upper teeth: (b) inner cusp unmodified (not divided), outer cusp bifid (*i. e.* the tip of the originally simple cusp divided into two cusps by a rather deep groove, which, however, is more conspicuous and goes deeper down on the inner than the outer side of the ridge): (c) posterior basal ledge very strong, peculiarly oblique, being much more developed on inner than outer side of teeth; anterior basal ledge undeveloped as in *Pteropus* generally. All characters much less developed in  $m_2$  than in  $p_4$  and  $m_1$ .—A beginning splitting of the ridges (cusps) of the lower cheek-teeth is already seen in *Pt. pselaphon* and *leucopterus* (see *suprà*). In *Pt. pselaphon* the character is even strongly pronounced in the inner ridge of  $p_4$ , very distinct also in that of  $m_1$ ; in *Pt. leucopterus* it is distinct in the inner ridges of  $m_1$  and  $m_2$ , less so, or occasionally scarcely detectable, in the outer ridges of the same teeth. The still stronger splitting of the outer ridges of  $p_4$  and  $m_1$  of *Pteralopex* is therefore only a further development of the tendency already well pronounced in *Pt. pselaphon* and *leucopterus*. But one difference should be noticed; whenever these characters and tendencies are present in the *Pt. pselaphon* group, they are either entirely restricted to the inner cusp of the lower cheek-teeth or at least more pronounced in the inner than in the outer cusp; but in *Pteralopex* the character is, so to say, shifted from the inner cusp, which is absolutely undivided, to the outer

cusps.—Viewed in profile,  $p_4$ ,  $m_1$ , and (much less so)  $m_2$  of *Pteralopex* present three cusps behind each other, viz. two higher anterior (the bifid outer cusp) and a low posterior. *This latter is not a cusp peculiar to Pteralopex*; it is homologous to the postero-external cusp arising from the posterior basal ledge in all species of *Pteropus* which have this ledge conspicuously developed.

(13) Distribution of fur (tibiæ densely clothed above). In all details perfectly as in the species of the *Pt. pselaphon* and *samoënsis* groups.

(14) Lateral membranes arising, not from the sides of the back, but from the spinal line. There is no parallel to this in any known species of *Pteropus* (but an approximation in *Pt. melanopogon*, *papuanus*, and *neohibernicus*, in which the membranes arise closer together on the spinal tract than in other *Pteropi*; the character has, however, probably no great taxonomic value, since *Pt. papuanus* and *neohibernicus* belong to a group of species very different from that of which *Pt. melanopogon* is a representative, while, on the other hand, in *Pt. aruensis* and *keyensis*, though both closely allied to *Pt. melanopogon*, the position of the membranes is perfectly normal). An exact parallel is shown by *Dobsonia*, an aberrant genus of the *Pteropus* group.

(15) Ears small, hidden in the fur, so broad above as to be semicircularly rounded off. The ears are small in all species of the *Pt. pselaphon* and *samoënsis* groups, often hidden in the fur, but in all species more or less narrowly rounded off above. In one single species of *Pteropus* (*Pt. livingstonii*) the ears are very similar in shape to those of *Pteralopex*.

(16) Colour of fur (blackish above and beneath). As in *Pt. pselaphon*.

(17) Size of animal. As an average species of the *Pt. pselaphon* and *samoënsis* groups.

*Summary*.—All the cranial and dental characters of *Pteralopex*, without any exception, point back to the species of the *Pt. pselaphon* group, much more decidedly than to any other known bats; all external characters, except the insertion of the membranes and the shape of the ears, point in the same direction. From this evidence it appears safe to assume that *Pteralopex* (Solomon Islands) is a highly specialized offshoot from that branch of *Pteropus* which in the Bonin Islands, Pelew Islands, Vanikoro (or Mariannes), and Philippines has developed into, respectively, *Pt. pselaphon*, *pilosus*, *tuberculatus*, and *leucopterus*, and in the Carolines into *Pt. insularis* and *phaeocephalus*. Also the habitat of *Pteralopex* is in favour of this conclusion.

XXIV.—*Descriptions of new Genera and Species of New-Zealand Coleoptera.* By Major T. BROWN, F.E.S.

[Continued from vol. ii. p. 422.]

## SPHÆRIDIIDÆ.

*Adolopus australis.*  
— *tibialis.*

## ALEOCHARIDÆ.

*Protopristus minutus.*

## STAPHYLINIDÆ.

*Quedius hilaris.*

## PÆDERIDÆ.

*Hyperomma tenellum.*

## OMALIIDÆ.

*Omalium flavipalpi.*  
— *planimarginatum.*  
— *setipes.*

## SILPHIDÆ.

*Choleva nemoralis.*

## TROGOSITIDÆ.

*Grynoma albosparsa.*  
*Promanus subcostatus.*

## COLYDIDÆ.

*Bitoma picicorne.*  
*Coxelus elongatus.*  
— *variegatus.*  
— *bicavus.*  
*Gathocles obliquicostatus.*  
*Protarphius tricavus.*  
— *posticalis.*  
*Symphysius serratus.*  
— *lobifer.*  
*Pycnomerus suteri.*  
— *ruficollis.*

## MYCETOPHAGIDÆ.

*Triphyllus pubescens.*

## BYRRHIDÆ.

*Pedilophorus pulcherrimus.*

## MELOLONTHIDÆ.

*Eusoma ænealis.*  
*Lewisella modesta.*  
— *capito.*  
*Odontria prælatella.*

## TELEPHORIDÆ.

*Asilis pilicornis.*  
— *sinuellus.*  
— *granipennis.*  
— *interstitialis.*  
— *apicalis.*

## MELYRIDÆ.

*Dasytes aurisetifer.*  
— *anacharis.*

## CLERIDÆ.

*Phymatophœa lugubris.*  
— *apicale.*  
*Metaxina ornata.*

## HELEIDÆ.

*Cilibe lateralis.*  
— *smithiana.*

## HELOPIDÆ.

*Adelium hudsoni.*

## MELANDRYIDÆ.

*Doxozilora punctata.*

## CEDEMERIDÆ.

*Selenopalpus rectipes.*  
*Baculipalpus maritimus.*

## Group Sphæriidiidæ.

*Adolopus australis*, sp. n.

*Compact*, convex, oblong-oval, nude, shining; head and thorax reddish brown, but not quite concolorous, the back of the former and disk of the latter being suffused with dark

fuscous, the prevailing tint of the elytra, which have rufescent margins; tibiæ fulvescent, the tarsi, palpi, and antennæ yellow, but the triarticulate club is infusate, opaque, and densely pubescent.

*Head* not very closely, very finely, yet quite definitely punctate. *Thorax* transverse, finely marginate, gently curvedly narrowed towards the slightly obtuse anterior angles, its sculpture not appreciably different from that of the head, with two small punctiform impressions near the base. *Scutellum* rather large, not quite smooth. *Elytra* finely punctured, with well-marked sutural striæ behind and several series of distinct punctures which, behind and near the sides, almost form striæ; the margins, though fine, are distinct, but not at all explanate behind as in *A. altulus*.

*Underside* subopaque, piceous, more rufescent in front; ventral segments very minutely sculptured and finely pubescent; the moderately convex subtriangular middle portion of the metasternum finely, yet evidently but not closely punctured and a little glossy, its flanks dull and closely sculptured. Posterior femora minutely, indistinctly, and irregularly strigose, with very few minute punctures; the other pairs pubescent. *Tarsi* very sparingly setose underneath, second joint of the posterior evidently longer than the exposed portion of the first. Prosternal and abdominal carinæ well developed.

*A. montanus* most nearly resembles this species, but can be easily recognized by the numerous well-developed spiniform setæ along the outer face of all the tibiæ, particularly of the intermediate pair, whereas in *A. australis* there are very few, and these not at all conspicuous.

Length  $1\frac{1}{4}$ ; breadth  $\frac{3}{4}$  line.

Invercargill. Received from Mr. A. Philpott; three specimens.

*Adolopus tibialis*, sp. n.

*Oblong-oval*, only moderately convex, slightly nitid, glabrous, nigrescent, tibiæ and elytral margins red; tarsi, palpi, and antennæ yellow; club fuscous, the head and sides of thorax obscurely rufescent.

*Head* finely but not closely punctate. *Thorax* transverse, very gradually narrowed anteriorly, finely margined, its punctuation fine, distinct, but not close. *Elytra* with sculpture similar to that of the thorax, but in addition with series of coarser punctures near the sides; none of these, however, reach the base; on the disk the serial punctures are very much finer, those near the suture becoming quite obsolete near the base; all are coarse at the apex, where the sutural row on each elytron become striate.



*Tibiæ*, anterior with one very small and two distinct setæ along the outer edge, those on the other pairs short and indistinct.

Less convex and narrower than *A. helmsi* (1833), the apex of elytra not at all castaneous, the tibiæ much less evidently or scarcely at all spinose externally. The elytral margins are not expanded as in 158 and 1690, and both of these are different otherwise.

Length  $1\frac{1}{2}$ ; breadth  $\frac{3}{4}$  line.

Otira Gorge (*Mr. J. H. Lewis*); a single specimen.

### Group Aleocharidæ.

#### PROTOFRISTUS, gen. nov.

*Body* elongate, parallel, slender, minute.

*Head* suboblong, slightly but abruptly contracted near the base, with a short neck, its whole front closely and distinctly serrate. *Eyes* small, rather flat, placed at the sides before the middle, composed apparently of two coarse facets. *Mandibles* falciform, very elongate, with a long projecting central tooth inside. *Antennæ* rather short, implanted on the forehead, nearly equally distant from the eyes and each other, 11-jointed; basal two joints stout, oblong; joints 3-6 small, moniliform; seventh and eighth also small, transverse, slightly broader than the preceding ones; ninth also transverse, rather broader than the eighth; penultimate abruptly enlarged, twice the size of the ninth; the terminal ovate, as broad as the tenth but nearly double its length; they are not perceptibly pubescent. *Maxillary palpi* as long as the basal five joints of the antennæ, penultimate joint subovate, emarginate at apex, the terminal small and transparent so as to be almost invisible. *Thorax* with acutely prominent anterior angles, its sides slightly curvate, posterior angles obtuse. *Elytra* subquadrate, very short, base and apex incurved. *Abdomen* very elongate, longer than the rest of the body, basal four segments transversely quadrate, about equal, with broad lateral margins, fifth and sixth elongate, seventh very narrow.

*Femora* stout, arched above, the posterior in the male somewhat angulate and dentate below. *Tibiæ* arcuate externally, unarmed. *Tarsi* 4-articulate, basal three joints small and conjointly not longer than the terminal one; claws divergent, simple.

*Coxæ* prominent, the anterior and intermediate contiguous, the former situated very near the hind edge of the prosternum, the posterior slightly separated.

This minute member of the Staphylinidæ seems to have

no group ready for its reception; it most nearly resembles the Pæderidæ, but its structure forbids such an association. If placed with genera having four-jointed tarsi, its other structural characters would not accord with theirs. The labial palpi and mentum are not discernible when examined with a half-inch lens in the microscope. The closely serrate front of the head resembles in miniature that of an *Ateuchus*.

*Protopristus minutus*, sp. n.

*Slender*, slightly nitid, rufo-testaceous, the palpi, antennæ, and tarsi flavescent; pubescence distinct, pale greyish yellow.

*Head* slightly convex, moderately finely but not closely punctured; just behind each antenna there is a dark, deep, but not coarse puncture. *Antennæ* apparently glabrous. *Thorax* longer than broad, rounded towards the base, its punctuation indistinct. *Elytra* shorter than thorax, base and apex incurved, somewhat rounded laterally, distinctly but not very closely punctate, the suture indistinct. *Hind body* rather finely but not closely sculptured, its apical segments paler than the others.

*Underside* pale rufo-castaneous, finely punctate and pubescent.

Length  $\frac{5}{8}$ ; breadth nearly  $\frac{1}{4}$  line.

Broken River, Canterbury.

We are indebted to Mr. J. H. Lewis for having brought this fragile creature to light.

The generic description has been drawn up from a specimen specially prepared and mounted on glass, the specific from two on cardboard. Those on cardboard could not be entirely cleared from sappy matter without destroying them.

Group Staphylinidæ.

*Quedius hilaris*, sp. n.

*Subdepressed*, elongate; head and thorax glossy æneous black, hind body violaceous black and iridescent; mandibles red; basal three joints of antennæ rufescent, the others opaque, fuscous, and densely pubescent; legs piceous, tarsi reddish.

*Antennæ* just reaching base of thorax, third joint longer and more slender than second; joints 5-10 suboblong, more slender at base than at apex, eleventh more prolonged apically at one side than the other. *Head* subrotundate, rather short and broad, with two distinct frontal punctures and four or five alongside each eye; there are also a few minute indistinct punctures, but at the sides and behind the

eyes these become quite distinct. *Clypeus* very short, infuscate. *Labrum* medially emarginate, with a membranous border beyond the setæ. *Eyes* longitudinally oval, moderately convex and occupying more than half of each side. *Thorax* as long as it is broad, rounded behind; with two punctures before the middle, one larger near each anterior angle, another close to each side near the middle, and some smaller ones at the basal margin. *Scutellum* large. *Elytra* of the same length as, but rather broader than, the thorax behind, rather closely and somewhat transversely minutely punctate-granulate and rugose, clothed, like the scutellum, for the most part with pale yellowish hairs, the suture reddish, and with three or four obscure rufo-piceous spots on each; apices oblique towards the suture. *Hind body* clothed with cinereous hairs, and here and there with small patches of yellow ones, the long setæ fuscous; it is moderately closely punctate, with stout pitchy-red styles. Male anterior *tarsi* strongly dilated.

Dr. Sharp's *Q. latifrons* differs in having a short thorax and somewhat different sculpture.

Length  $3\frac{1}{2}$ -4; breadth  $\frac{3}{4}$ - $\frac{7}{8}$  line.

Broken River. One male from J. H. Lewis and another from Mr. A. Philpott, of Invercargill.

#### Group Pæderidæ.

##### *Hyperomma tenellum*, sp. n.

*Slender*, elongate, shining, rufo-piceous; legs infuscate red, tarsi and antennæ rufo-testaceous, mandibles red.

*Head* evidently longer than broad, scarcely at all rounded, the front almost smooth, the middle also nearly smooth, there being a few fine punctures only, the base and sides with moderately coarse but not close punctures, and bearing some outstanding slender obscure greyish hairs. *Eyes* small, not convex. *Thorax* nearly twice as long as broad, obliquely narrowed near the base; on each side of the middle there is a series of distinct punctures, there are two less regular at each side, and the minute intervening punctures are almost serial. *Elytra* abbreviated, only about one-half longer than broad, shoulders rounded, apices obliquely truncate towards the suture; their punctuation like that of the thorax, at each side of the disk there is one regular series, there are very few minute punctures. *Abdomen* elongate, finely, irregularly, and rather closely punctate and pubescent, basal four segments with thick margins, the terminal with elongate appendages.

*Mandibles* very elongate and strongly curved, minutely

bidentate at base, the central tooth long and stout. *Labrum* deeply notched. *Antennæ* finely pubescent, attaining middle of thorax, basal joint hardly as long as the following two conjointly, the terminal somewhat pointed. Basal four joints of anterior *tarsi* a little dilated, the fourth rather smaller than third.

*Underside* shining brown; head with fine hairs directed forwards, penultimate ventral segment deeply emarginate.

Rather more elongate than *H. duplicatum*, much darker in colour, thorax with subparallel sides, and the median tooth of the mandibles twice as long.

♂. Length 4; breadth  $\frac{1}{2}$  line.

Timaru. One found amongst fallen leaves by Mr. Walter Lawrence Wallace.

### Group Omaliidæ.

#### *Omaliium flavipalpi*, sp. n.

*Elongate*, depressed, shining, piccous; legs and apical segment fusco-testaceous; tarsi and palpi flavescent; basal five joints of antennæ rufescent, the remaining ones fuscous and opaque.

*Head* (eyes included) rather wider than front of thorax, rather finely punctured; frontal impressions not deep, the intervening space nearly smooth, the large punctures somewhat shallow; there are also a few rugæ alongside the prominent eyes; the ocelli are reddish. *Antennæ* with the last six joints abruptly dilated and pubescent, the terminal evidently longer than tenth, basal joint nearly twice as large as the suboval second, third shorter and broader than fourth. *Thorax* transversely quadrate, finely margined, slightly and gradually narrowed towards the rectangular posterior angles, the anterior broadly rounded; it is distinctly but not coarsely or closely punctured, the discoidal impressions are well marked from the base to beyond the middle, and are divided by a smooth central line which appears cariniform, the depression at each side occupies more than half of the whole length; like the head, it is sparingly clothed with slender yellowish hairs. *Elytra* distinctly broader and nearly twice the length of thorax, apices truncate but with rounded angles; their punctuation almost serial, they bear minute, inconspicuous, greyish setæ. *Abdomen* finely sculptured, its greyish pubescence slender and depressed but quite perceptible, the basal four segments broadly margined; fifth longer and narrower than fourth, not closely united with its broad margins, almost smooth on the middle, but finely and closely transversely rugose at the sides; sixth obliquely

narrowed backwards, its extremity truncate. *Tibiæ* minutely setose.

Allied to *O. spadix*, more slender, not at all rufescent, more finely sculptured, and with shorter differently formed antennæ.

Length  $1\frac{1}{4}$ ; breadth  $\frac{3}{8}$  line

Broken River (*Mr. J. H. Lewis*); one example.

*Omalium planimarginatum*, sp. n.

*Elongate*, depressed, shining, variegate; head pitchy red, the thorax, shoulders, abdominal margins, and terminal segment castaneo-rufous, elytra piceo-fuscous, hind body castaneous; legs and palpi fulvescent, basal five joints of antennæ clear red, remaining joints nigrescent and opaque.

*Antennæ* with the thick basal joint nearly double the length of the oviform second, third evidently longer than its predecessor; joints 4 and 5 moniliform, 6-10 abruptly enlarged, laxly articulated, and transverse; eleventh quadrate, but with a narrower false terminal articulation. *Head* abruptly contracted behind, so as to form a short neck, which is minutely transversely strigose; it is as broad, including the prominent eyes, as the front of thorax, it is finely yet distinctly but not closely punctured, except on the broad frontal impressions; the ocular punctiform foveæ small; ocelli rufescent. *Thorax* transversely quadrate, with rounded anterior angles; it is nearly straight behind the middle, basal angles rectangular; its punctuation like that of the head, the discoidal and lateral impressions similar to those of *O. flavipalpi*. *Elytra* oblong, rather broader than and nearly twice as long as the thorax; suture smooth; their punctuation distinct and almost serial, but not so well marked near the subtruncate apices. *Hind body* as long as wing-cases, transversely convex; basal four segments with broad lateral margins, which, however, instead of being more or less elevated, are quite depressed, these segments more distinctly though not coarsely punctured at the sides than on the middle; on the middle of the second there are two slight rounded impressions, both of which are closely and very minutely sculptured; the fifth is narrower, but longer than the fourth; the sixth only half the breadth of the preceding one, seventh still narrower. *Tibiæ* finely setose.

The pubescence on the hind body is fine, distinct, yellowish, but slender and inconspicuous.

This species is recognizable by the flattened margins of the abdomen.

♂. Length  $1\frac{1}{2}$ ; breadth  $\frac{3}{8}$  line.

Broken River. A single individual from *Mr. J. H. Lewis*.

*Omalium setipes*, sp. n.

*Subdepressed*, slightly nitid; head and thorax red; elytra testaceous, sometimes infuscate; hind body castaneous; legs fusco-testaceous, the palpi and basal five joints of antennæ rufo-testaceous, the following joints infuscate.

*Antennæ* stout, reaching backwards to the shoulders: third joint elongate, yet distinctly shorter and more slender than first; joints 4 and 5 about equal, oviform, longer than broad; 6-11 enlarged and densely pubescent, sixth evidently longer than broad, seventh and eighth obconical, ninth and tenth subquadrate, eleventh somewhat acuminate; the fine grey pubescence on these joints seems to form an apical fringe on each. *Head* with minute coriaceous sculpture and a few fine scattered punctures; frontal foveæ distinct, the basal two subtriangular and well marked, the ocelli situated within these basal impressions; just behind the antenna there is a transverse series of fine punctures. *Thorax* transversely quadrate, anterior angles rounded, the posterior obtuse yet nearly rectangular; its surface finely, irregularly, but not closely punctured; dorsal impressions rather shallow, the space between them rather broad and nearly smooth; lateral impressions angular, very shallow, and indistinct. *Elytra* rather broader than and twice as long as the thorax, apices rounded; rather finely and regularly punctured, rather more closely near the extremity, their pubescence inconspicuous and scanty. *Hind body* apparently shorter than the elytra, which nearly conceals the basal segment; the basal four segments with broad raised margins, rather closely and distinctly punctured, the pubescence yellowish; fifth subtruncate and nearly membranous at the extremity, the second with shallow minutely sculptured foveæ on the middle. *Tibiæ* evidently setose, the intermediate subserrate.

*Underside* of a reddish-chestnut hue, finely punctate and pubescent; sixth ventral segment deeply concave. The basal joints of the front and middle *tarsi* with very long grey setæ, the terminal joint slender and evidently longer than the basal four taken together.

*O. chalmeri* in general appearance most nearly resembles this species.

♂. Length  $1\frac{1}{2}$ - $1\frac{3}{4}$ ; breadth  $\frac{1}{2}$  line.

Invercargill. Discovered by Mr. A. Philpott.

## Group Silphidæ.

*Choleva nemoralis*, sp. n.

*Convex*, broadly oval, moderately nitid, fuscous; head

ferruginous ; the palpi, tarsi, basal five or six joints of antennæ, and hind angles of thorax testaceous ; tibiæ sanguineous ; vestiture yellowish, slender but conspicuous.

*Head* finely and not closely punctured. *Eyes* prominent. *Antennæ* with infusate setæ ; basal joint longest, cylindric ; second stouter and slightly longer than third, which is slender and about equal to fourth in length ; sixth more oviform than fifth and rather shorter ; joints 7, 9, and 10 enlarged, oblong ; eighth small and oviform ; eleventh longer than tenth, its extremity pallid. *Thorax* transverse, of the same width as elytra at the base, a good deal curvedly narrowed towards the depressed anterior angles, base truncate ; its surface distantly and obsoletely punctured. *Scutellum* minute. *Elytra* regularly curvedly narrowed posteriorly, with a well-marked sutural stria on each, which, however, becomes obsolete near the apex ; their sculpture consists of transverse series of minute crenulations. *Tibiæ* straight, finely pilose, the intermediate with a few spiniform setæ.

*Underside* shining, piceo-fuscous ; epipleuræ and last two ventral segments rufescent, sparingly clothed with slender yellowish hairs, minutely and indistinctly punctured. Front and middle coxæ prominent ; the former contiguous, the latter separated by the mesosternal carina. Metasternum convex. Terminal joint of maxillary palpi elongate, tapering and acuminate.

*Male*.—Basal two joints of anterior *tarsi* dilated and emarginate at apex, third moderately expanded, fourth small ; the intermediate and posterior simple, filiform. Thorax paler.

Most nearly related to *C. monticola*, but broader, the antennæ less elongate, joints 9–11 shorter, and the transversal interstices of the elytra more shining.

♀. Length  $1\frac{3}{8}$  ; breadth nearly  $\frac{3}{4}$  line.

Broken River. One of each sex from Mr. J. H. Lewis.

### Group Trogositidæ.

#### *Grynoma albosparsa*, sp. n.

*Subdepressed*, elongate, slightly shining, black, the margins of elytra and the legs piceo-rufous.

*Head* quite a third narrower than thorax, with coarse shallow punctures, the intervals very narrow, pubescence white. *Palpi* short, black. *Antennæ* also black, slender and elongate, basal articulation thick and distinctly punctate, second subcylindrical and not so stout ; joints 3–6 slender and of about equal length, seventh shorter ; eighth and ninth equal, evidently, broader at the extremity than at the base ;

tenth elongate-oval ; they bear a few distinct dark hairs. *Thorax* strongly transverse, its sides moderately explanate and rounded ; posterior angles not sharply defined, the anterior obtuse, apex widely incurved ; its punctuation shallow, close near the sides, fine and more distant on the disk, which therefore is more shining ; the white pubescence is scanty on the middle, but thick at the sides, where there are some long outstanding hairs. *Elytra* oblong, rather wider than thorax at the base ; near each shoulder there are two very slight paler elevations ; their punctuation is coarse, not quite serial, and the intervals between them are quite as large as the punctures themselves ; the silvery pubescence has a tendency to form irregular patches, leaving equally irregular bare spots. *Legs* simple ; tarsi elongate, terminal joint as long as the basal four taken together.

Readily differentiated by the black surface and unusually elongate antennæ.

Length  $2\frac{1}{2}$  ; breadth  $1\frac{1}{8}$  line.

Broken River, Canterbury (*Mr. J. H. Lewis*) ; one.

*Promanus subcostatus*, sp. n.

*Oblong*, subdepressed, subopaque, fusco-rufous ; the antennæ, palpi, and tarsi rufo-testaceous.

*Head* closely, coarsely, and rugosely punctate. *Thorax* strongly transverse, of nearly the same width as the elytra, slightly broader at the base than it is in front, the sides moderately rounded, apex widely emarginate, base medially truncate but slightly sinuate towards the obtuse angles, with explanate margins ; the punctuation coarse, close, and rather shallow, but on the middle finer and distant. *Scutellum* with greyish pubescence. *Elytra* finely marginate, with nearly vertical sides bearing irregular series of coarse punctures ; the discoidal sculpture consists of about twelve series of coarse punctures, these series very nearly regular ; interstices narrow, nearly plane at the base, but becoming costiform beyond the middle ; the pubescence scanty, fine, and inconspicuous ; the head and thorax bear slender yellow hairs.

*Abdomen* finely and closely punctured, with fine greyish pubescence, the segments of nearly equal length. *Prosternal* process deeply grooved at each side, the middle distinctly carinate between the coxæ. *Metasternum* broadly impressed in front of the contiguous posterior coxæ. *Maxillary palpi* rather elongate, terminal joint not at all broadly securiform and with a well-marked furrow underneath extending from the extremity to the middle.

Considerably larger than *P. depressus*, with closer and coarser sculpture near the sides of the thorax, subcostate



elytral interstices, and differing also by the peculiar terminal joint of the maxillary palpi. In *P. auripilus* the pubescence is more conspicuous and the punctures on the thorax are hardly half as coarse or numerous.

Length  $4\frac{1}{4}$ ; breadth nearly 2 lines.

Southland. My specimen was found by Mr. A. Philpott.

[To be continued.]

XXV.—*A new Species of Pteropus from the Loyalty Islands.*  
By KNUD ANDERSEN.

*Pteropus auratus*, sp. n.

Allied to *Pt. vetulus* (New Caledonia), but easily distinguished by its larger ears and different colour of the fur. Forearm (type) 145.5 mm.

*Ears*.—Length from base of orifice 24.5 mm., against 20 in *Pt. vetulus*; greatest breadth 17 mm., against 12. General form of ears as in the allied species.

*Colour*.—Back golden ochraceous clouded with brownish; individual hairs vandyck-brown at base, with long golden ochraceous-buff tips. Breast and belly rich golden ochraceous, palest (golden ochraceous-buff) at base of hairs, shading to tawny on foreneck, sides of neck, and flanks, and to tawny russet faintly sprinkled with ochraceous on chin, throat, and anal region. Mantle rich golden ochraceous-buff, this colour confined to tips of hairs, middle portion of individual hairs buff, extreme base next to skin seal-brown; colour of mantle shading gradually into tawny on occiput and sides of neck. Crown buffy, slightly darkened with brownish and shading gradually into tawny on sides of head.

*Type*. ♀ ad. al. (with skull); Lifu, Loyalty Islands; collected by the Rev. S. J. Whitmee; B.M. 77. 7. 23. 1.

*Remarks*.—Though strikingly different in general aspect, the colour of this beautiful species is easily derived from that of the New Caledonian *Pt. vetulus*: the dark brown colour of the head and underparts of a *Pt. vetulus* is in *Pt. auratus* replaced by golden ochraceous or ochraceous-buff, and the dark brown of the back by mixed golden ochraceous-buff and brownish. In the single available specimen  $p^1$ ,  $m^1$ ,  $p_3$ ,  $p_4$ , and  $m_1$  are decidedly smaller than in three skulls of *Pt. vetulus*.

XXVI.—*Descriptions of Three new Freshwater Fishes from South America, presented to the British Museum by Herr J. Paul Arnold.* By C. TATE REGAN, M.A.

1. *Cichlosoma biocellatum.*

Allied to *C. coryphænoides*, Heck. Depth of body  $2\frac{1}{4}$  in the length, length of head  $2\frac{3}{4}$ . Snout a little longer than eye, the diameter of which is  $\frac{1}{4}$  in the length of head; interorbital width 3 in the length of head. Fold of the lower lip not continuous; jaws equal anteriorly; maxillary not quite reaching the vertical from anterior edge of eye; depth of præorbital nearly  $\frac{3}{4}$  the diameter of eye; cheek with 6 series of scales; 8 gill-rakers on the lower part of the anterior arch. 31 scales in a longitudinal series, 5 in a transverse series from origin of dorsal to lateral line, 4 between lateral line and sheath at base of anterior part of soft dorsal. Dorsal XIX 9; origin above opercular cleft; spines subequal from the seventh to the sixteenth, thence increasing to the last, which is  $\frac{2}{3}$  the length of head; soft fin pointed, when laid back reaching the middle of caudal. Anal VIII 8. Pectoral shorter than the head, extending to above the third anal spine. Caudal rounded. Caudal peduncle  $\frac{2}{3}$  as long as deep. Body with 8 dark cross-bars; third and fourth joined by an oblong blackish spot, edged with whitish, below the lateral line; in front of this a dark longitudinal band running forward to the eye; a blackish ocellus on the upper part of the base of the caudal fin; vertical fins with series of dark spots.

A single specimen, 80 mm. in total length, from Mañaos, Rio Negro.

*C. coryphænoides* has XVI 12-14 dorsal and VI-VII 9-11 anal rays; the spines are longer and stronger than in *C. biocellatum*, from which it also differs in coloration and in the form of the head.

2. *Otocinclus arnoldi.*

Depth of body  $4\frac{1}{2}$  in the length, length of head  $3\frac{1}{2}$ . Diameter of eye  $5\frac{1}{2}$  in the length of head, interorbital width 2; snout as long as postorbital part of head; supraoccipital without median ridge, strongly elevated posteriorly, its extremity on the level of the origin of dorsal. Scutes not carinate, 25 in a longitudinal series; abdomen with 3 longitudinal series of plates. Dorsal I 7; origin above that of the pelvics; no adipose fin. Anal I 5. Pectoral spine extending beyond

base of pelvics. Caudal emarginate. Caudal peduncle  $2\frac{2}{3}$  as long as deep. A rather broad dark longitudinal band along the middle of the side, ending at the base of the caudal; vertical fins barred with 3 to 5 series of dark spots.

A single specimen, 55 mm. in total length, from the La Plata.

Allied to *O. affinis*, Steind., which has a median ridge on the supraoccipital and the fins unspotted, and to *O. vittatus*, Regan, which has the supraoccipital less elevated, the scutes fewer, and the coloration somewhat different.

### 3. *Pœcilia heteristia*.

Depth of body about  $3\frac{1}{2}$  in the length, length of head nearly 4. Snout shorter than eye, the diameter of which is 3 in the length of head; interorbital width more than  $\frac{1}{2}$  the length of head. 27 or 28 scales in a longitudinal series. Dorsal 6-7; origin equidistant from end of snout and middle ( $\sigma$ ) or posterior part ( $\text{♀}$ ) of caudal fin; last two rays, in the male, produced into long filaments. Anal 8; origin in advance of that of the dorsal; fin pointed ( $\text{♀}$ ) or modified into an intromittent organ which is a little shorter than the head ( $\sigma$ ). Pectoral a little shorter than the head; pelvic fins longer in the male than in the female. Caudal rounded. Olivaceous; edges of scales darker; some blackish vertical streaks on the side; a vertically expanded blackish spot at the base of the caudal fin; male with a short blackish stripe near the upper edge of the caudal fin.

Two specimens, 35 mm. in total length, from Para.

## PROCEEDINGS OF LEARNED SOCIETIES.

### GEOLOGICAL SOCIETY.

December 16th, 1908.—Prof. W. J. Sollas, LL.D., Sc.D., F.R.S.,  
President, in the Chair.

The following communication was read:—

‘On the Igneous and Associated Sedimentary Rocks of the Tourmakeady District (County Mayo).’ By Charles Irving Gardiner, M.A., F.G.S., and Prof. Sidney Hugh Reynolds, M.A., F.G.S. With a Palæontological Appendix by Frederick Richard Cowper Reed, M.A., F.G.S.

The general succession of the Ordovician Rocks of the district appears to be as follows:—

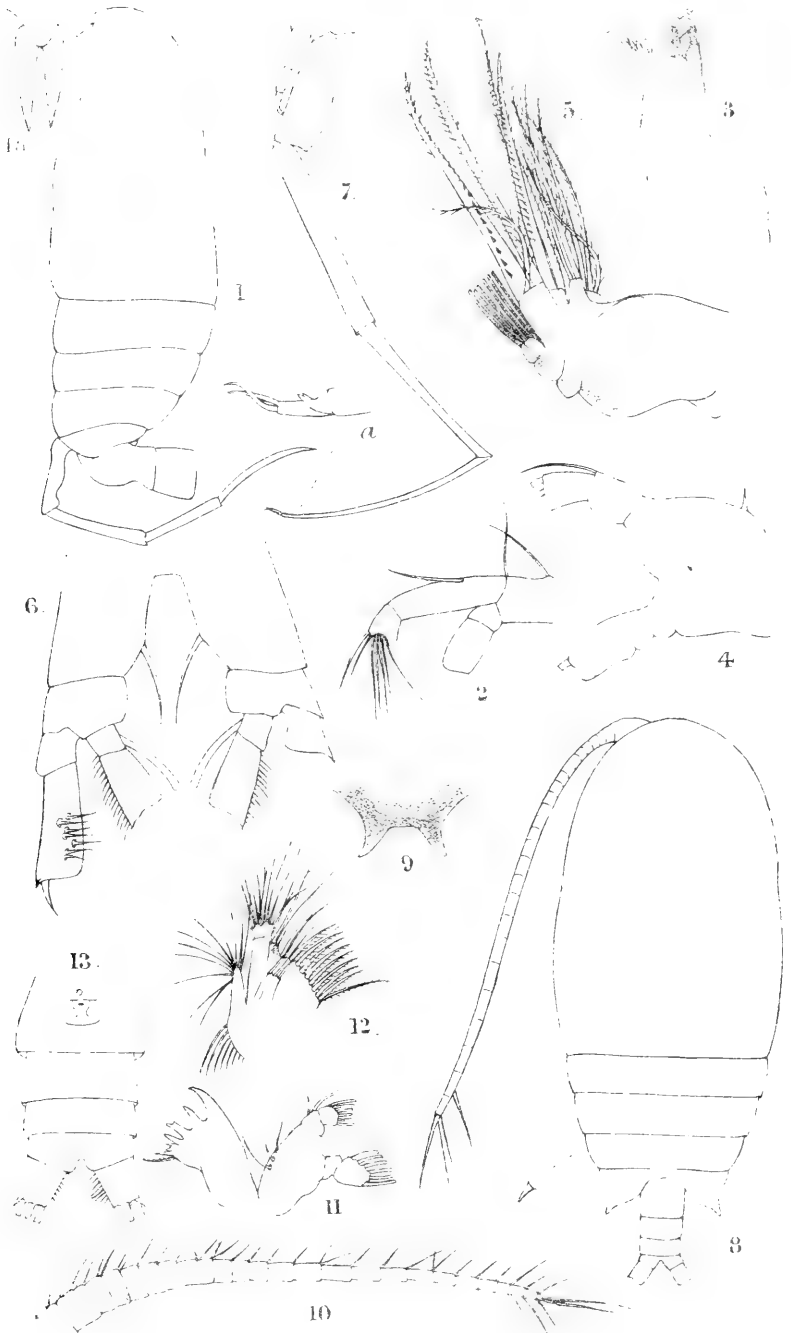
- (4) ?Bala Beds.—Coarse conglomerate and sandstone contain pebbles, mainly of granite and felsite.
- (3) Llandeilo Beds.
- (c) Shangort Beds.—Grits and tuffs, coarse and fine, the prevalent type being a calcareous gritty tuff, in which is a series of limestone-breccias, having a maximum thickness of about 40 feet and largely formed of disrupted fragments of the underlying limestone.
  - (b) Tourmakeady Beds.—Compact pink, grey, or white limestones, sometimes in beds with a maximum thickness of about 30 feet, but usually represented by blocks in the Shangort Beds.
  - (a) Red felsite or rhyolite.—A series of flows varying much in thickness.
- (2) Arenig Beds—Mount-Partry Beds.
- (d) Variable tuffs, grits, and cherts, the tuffs being seen only in the southern half of the area.
  - (c) Coarse quartzose and felspathic grits.
  - (b) Grits, graptolitic black slates, and radiolarian cherts.
  - (a) Coarse conglomerates, the pebbles of which consist almost entirely of grit.

A considerable series of graptolites, collected from the Mount-Partry Beds, has been examined by Miss G. L. Elles, D.Sc., and they prove to be of Upper Arenig age—about the zone of *Didymograptus hirundo*. The radiolaria from the same series of rocks have been studied by Dr. G. J. Hinde, F.R.S.

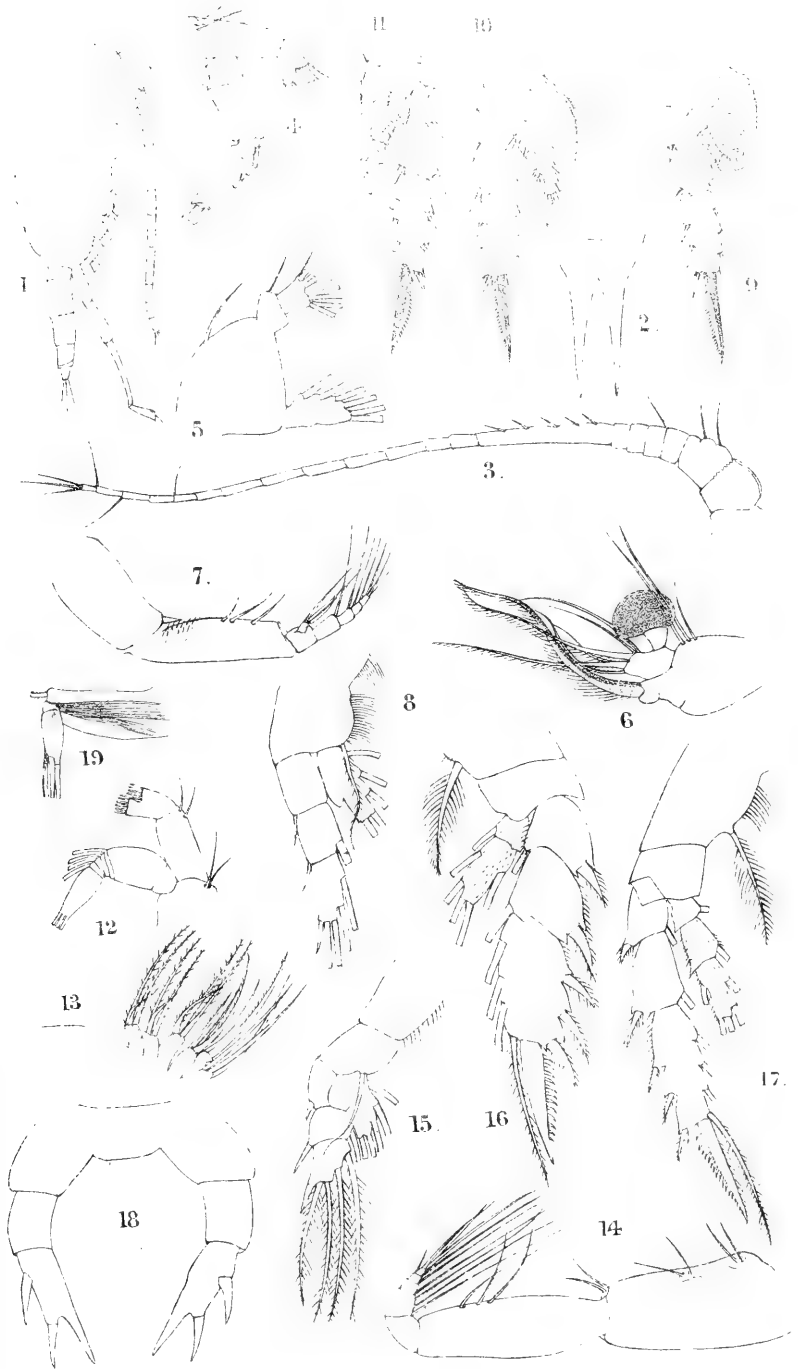
The most interesting and puzzling beds of the district are those of Llandeilo age. Although the limestones (Tourmakeady Beds) occur in the main as disrupted blocks in the gritty tuffs (Shangort Beds), the fossils indicate that there is no material difference in the age of these two deposits; and the Authors believe that, after the deposition and consolidation of the limestone, but during the prevalence of the same faunal types as those which characterize that deposit, the limestone was broken up by volcanic explosions, and its fragments, mingled with bits of felsite and other material, were deposited as the peculiar limestone-breccias. This view regarding their formation is held to afford an adequate explanation of the patchy development of these rocks.

The intrusive rocks are of considerable interest. They are, in the main, felsites with large quartz-crystals, and not infrequently contain augite. Some of them are certainly intrusive in the coarse Bala (?) conglomerate. A number of small but interesting intrusions of olivine-dolerite, hornblende-lamprophyre and fine-grained oligoclase-bearing rocks are scattered throughout the district.

The appendix embodies a critical review of the fauna of the Llandeilo Beds of the district, and a description of several new species of brachiopods and trilobites.

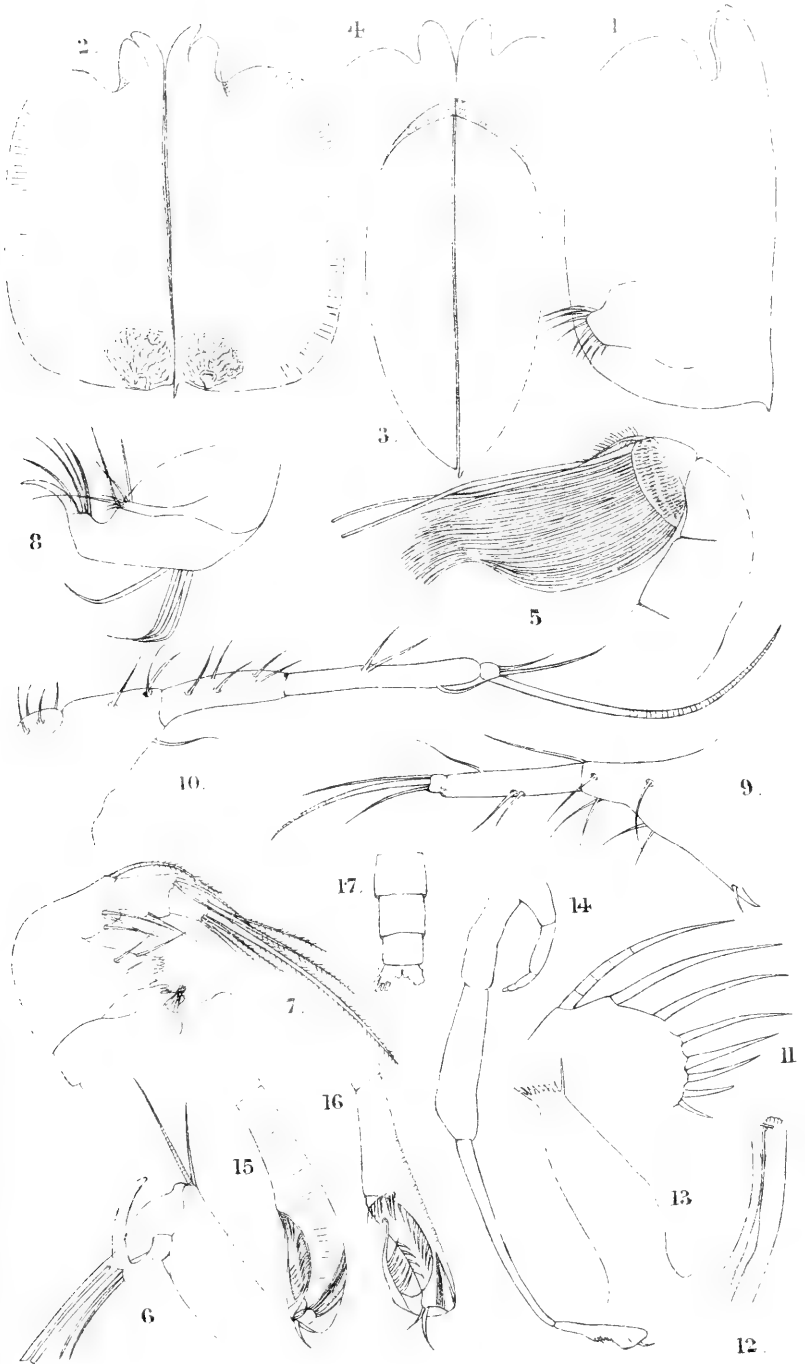


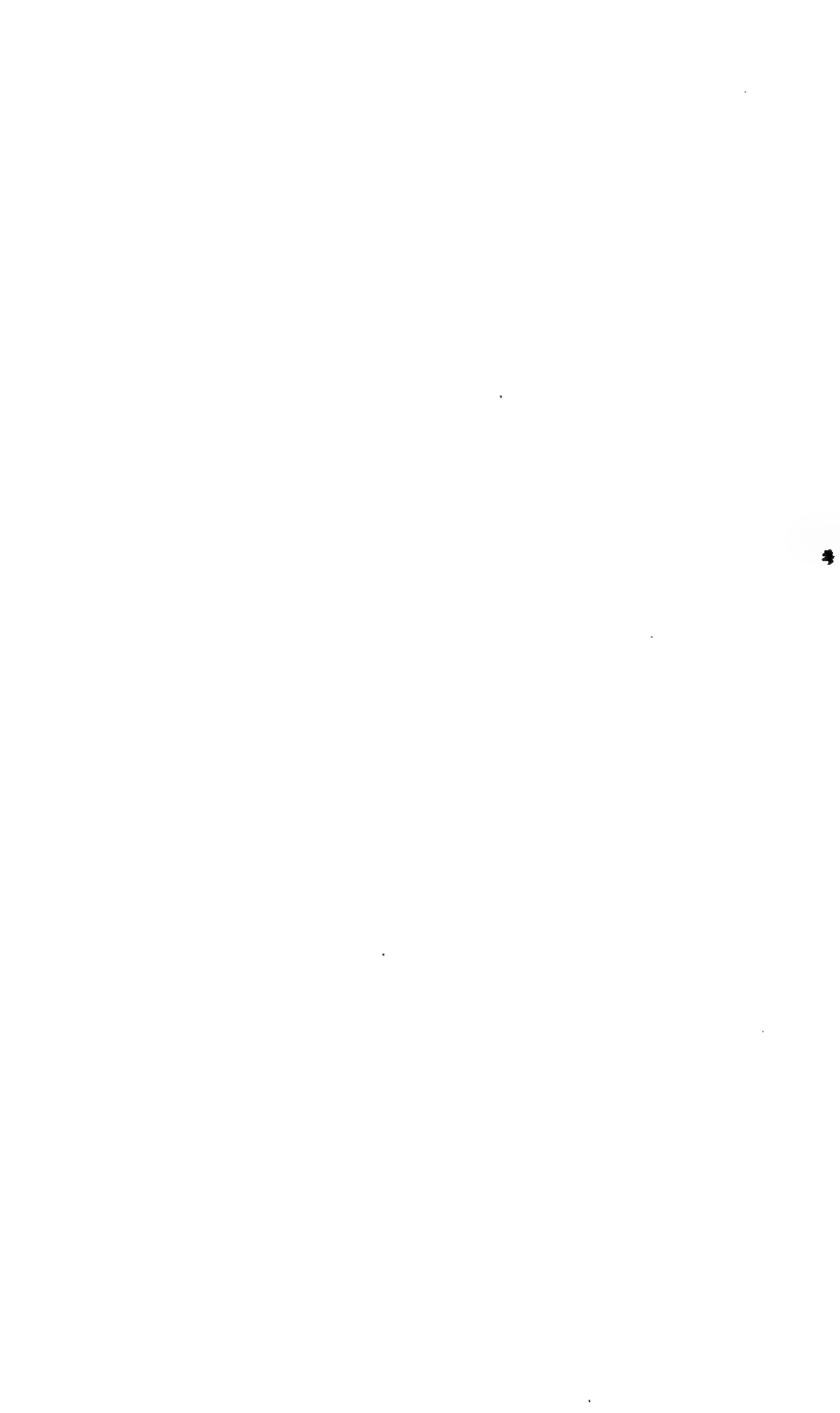


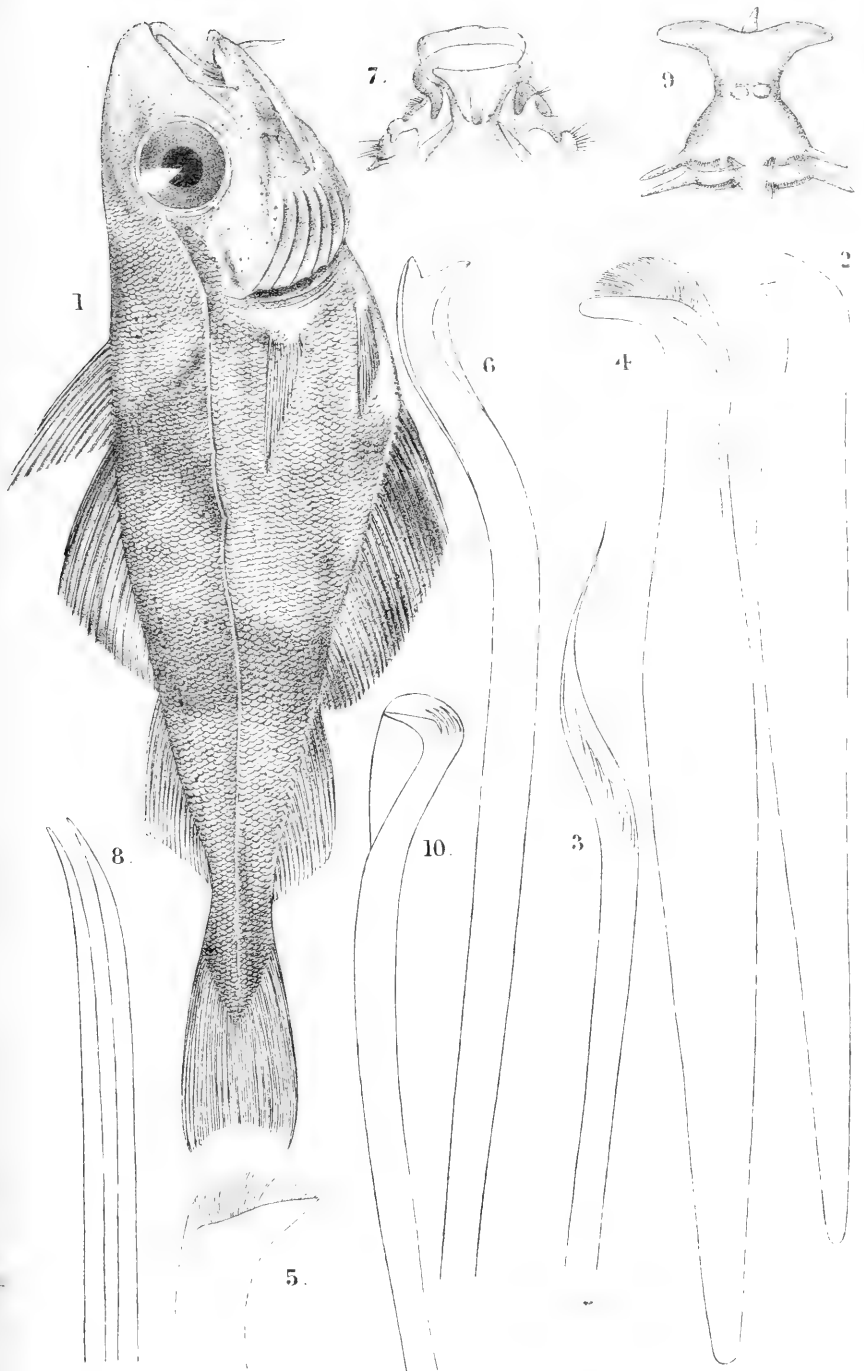










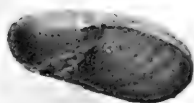








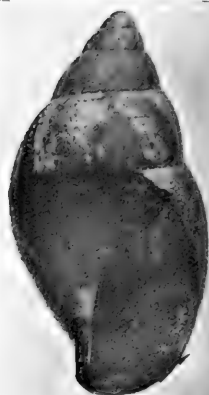




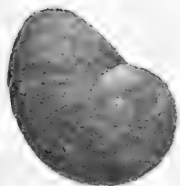
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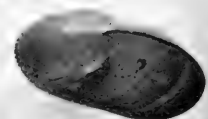
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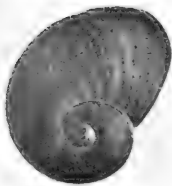
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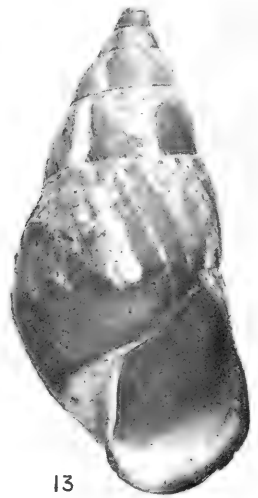




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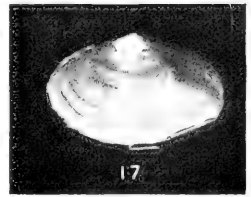
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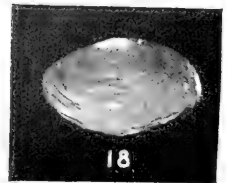
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# THE ANNALS

AND

## MAGAZINE OF NATURAL HISTORY.

[EIGHTH SERIES.]

No. 15. MARCH 1909.

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XXVII.—*Notes on Larval Trematodes* \*. By WILLIAM NICOLL, M.A., D.Sc., and WILLIAM SMALL, M.A., Gatty Marine Laboratory, University of St. Andrews.

DURING a short visit to the West of Scotland Marine Biological Station at Millport in August 1908, we had occasion to examine a few of the commoner Crustaceans and Molluscs. One object in doing so was to obtain a general idea of the larval Trematode forms to be met with in the Clyde area, and in particular to investigate the occurrence of cercariæ in the common edible and green crabs. The time at our disposal was not sufficient to permit of much material being examined, so that the number of larval forms to be described is small, but in the case of the crabs our efforts were more successful.

In addition to *Cancer pagurus* and *Carcinus mœnas*, a few specimens were examined of each of *Eupagurus bernhardus*, *Portunus depurator*, *Crangon vulgaris*, *Balanus balanoides*, *Venus cassina*, *Mytilus edulis*, *Aporrhais pes-pelecani*, *Patella vulgata*, and *Lima hians*. Only the last-mentioned harboured cercariæ. A few young fish, *e. g.* plaice, dabs, and bullheads, were also examined and in two of these encysted cercariæ were found.

\* [This work has in part been done with the aid of a Government Scientific Research Grant.—W. N.]

*Cercaria excellens*, nov.

This was found encysted in large numbers in *Carcinus mœnas*, and less frequently in *Cancer pagurus*. It is undoubtedly the larva of some species of the genus *Spelotrema*, and, as will be shown later, the adult species to which it can most probably be referred is *Sp. excellens*, Nicoll.

Three out of every four green crabs were infected; in the case of the edible crab the infection was not more than one in five. At St. Andrews we have found the infection somewhat greater; every green crab examined there contained the cercariæ in greater or less numbers, while about 25 per cent. of the edible crabs were infected. In the green crab the number of cercariæ is frequently enormous, every organ and tissue in the crab's body being riddled with cysts, so much so that sometimes one would think that the mass of cysts was actually greater than the organ in which they are contained. The chief seat of infection is the liver and next to that the gonads, but no structure is immune, except the calcareous parts. The cysts are occasionally found throughout the muscles and along the course of the nerves, blood-vessels, or alimentary canal. They may occur either singly or in clusters, bound to each other by the fibrous tissue in which they are embedded.

These observations agree with those of M'Intosh\*, who forty years ago found the crabs at St. Andrews infected to the same extent with cercariæ. Whether the cercariæ which he described then are the same as those we have met with is a matter of doubt, but this will be referred to again later.

When extricated from their fibrous investment the cysts are seen to be globular in shape. In some cases they appear to be very slightly ovoid, but this is probably due to pressure in freeing them, and usually they can be made to assume the globular shape by suitable manipulation. At first we were inclined to believe that two different kinds of cysts were present, for many were obviously, even to the naked eye, much smaller than the others. Under the microscope the difference was further accentuated by the fact that the wall of the smaller cysts was proportionately much thinner than that of the large cysts. On more exhaustive examination, however, what may be interpreted as intermediate forms were discovered, midway in size between the large and small forms. In point of numbers the large cysts far exceeded the small and intermediate-sized cysts.

In a series of measurements of about 30 cysts, two-thirds

\* Quart. J. Micr. Soc. vol. v. (1865) p. 201, pl. viii.

were found to have a diameter between .43 mm. and .49 mm. In these the thickness of the outer wall was .027-.054 mm., average .036 mm.; and the thickness of the inner wall .008-.023 mm., average .017 mm. Thus the outer wall is two or three times as thick as the inner, but in one or two cases the ratio was not more than 3 : 2. Only in a few cases was the cercaria expressed from the cyst in an undamaged condition. The approximate length of the cercaria was found to be .8-1.0 mm. In every case the oral sucker was larger than the ventral, the diameter being .066-.03 mm. for the oral and .06-.068 mm. for the ventral. In some cases the genital sucker was also measured and found to have an average diameter of .052 mm.

Of the remaining cysts a group of four measured .36-.39 mm., average .37 mm. In these the outer wall had a mean thickness of .015 mm. and the inner .006 mm. In only one case was the cercaria obtained in an undamaged state and its length was .7 mm. No difference in size could be detected between the oral and ventral suckers, each measuring .054 mm., while the genital body measured .048 mm.

A third group of five much smaller cysts measured .27-.32 mm., average .305 mm. The outer and inner walls were .011 mm. and .007 mm. thick respectively. None of the cercariæ from these were examined. From these figures there seems no reason to suppose that these groups are other than stages in the growth of the same cyst, and such being the case it is evident that the cercariæ increase considerably in size during their sojourn in the crab. The only alternative is that they represent the larvæ of three different adult species. It is unfortunate that more detailed examination of the smaller cercariæ was found impossible, as that might have been of help in deciding the matter.

A fourth variety of cyst was met with, but only on one or two occasions. It was about the same size as the foregoing, but differed in having a cell-wall composed of only one very thin (.002 mm.) layer. In none of these was the cercaria examined. They must apparently belong to a distinct species, unless, indeed, they are abnormalities. A possibility which might be suggested is that they are just some of the ordinary cysts in which the outer layer has been accidentally stripped off; but there was no evidence of this and in addition the thickness of the wall is much less than that of the inner layer even in the smallest of the cysts.

A detailed description of the anatomy of the cercaria is not necessary here, as it agrees well with that of the adult,

due allowance being made for the stage of development. The dimensions of the chief organs have already been given. The ventral sucker is situated at the beginning of the posterior third of the body length. The genital sucker lies close to its left side. The intestinal diverticula terminate at the level of the centre of the ventral sucker. The testes lie close behind that sucker, one on each side, but the yolk-glands are not visible. In most cases the ovary can be made out on the right side of the ventral sucker, and in some the vesicula seminalis in front of the sucker.

As already mentioned, this cercaria is probably the larva of a *Spelotrema* species. The only other genus which might come into question is *Levinseniella*, but the character of the genital sucker points rather to *Spelotrema*. Of the species of the latter genus the only one which can be considered is *Spel. excellens*, Nicoll, the large size of the cercaria excluding the possibility of its identification with any of the other species of the genus.

The adult *Spelotrema excellens* is found in great abundance in the herring-gull (*Larus argentatus*), both at St. Andrews and Millport. *Spelotrema simile*, Jägersk., the next largest *Spelotrema* species, is much rarer.

With regard to the cercaria described by M'Intosh \*, it is unfortunate that he gives no exact measurements either of the cysts or of the cercariæ. By measurement of his figures (pl. viii.), which are magnified 180 diameters, we find that the cyst in fig. 1 had a diameter of  $\cdot 14$  mm., and that in fig. 2,  $\cdot 17$  mm. The cercaria in fig. 5 is exactly  $\cdot 5$  mm. long. It requires but a glance at the plate to see that the cercaria in fig. 5 is much too large to have come from a cyst of the size shown in figs. 1 and 2. By the kindness of Professor M'Intosh a tube containing some of his original material from *Carcinus maenas* was placed at our disposal, but in it only one cyst was found. The diameter of this was  $\cdot 29$  mm.; the outer radially-striated wall was  $\cdot 01$  mm. thick and the inner concentrically striated  $\cdot 012$  mm. From these somewhat meagre details we are forced to the conclusion that Professor M'Intosh also had a variety of cysts under his observation, some of which correspond in size with those which we have found, but others being much smaller. The only other explanation is that some error has crept into his estimation of the magnification. It is hardly to be believed that the character of the infection of the crabs at St. Andrews has undergone a change from small cysts to large ones during the space of forty years.

\* *Loc. cit.*

A point of interest is that M'Intosh apparently met with some of the single-walled cysts already referred to, for he says (p. 202) that the wall of the cysts "consists of two layers marked by minute striæ and specks; but the outer cannot always be seen."

Reference may here be made to Miss Lebour's investigations\* of larval Trematodes in *Carcinus mænas* from the Northumberland coast. Her results appear to differ entirely from ours, for although she found the crabs fairly well infected, the cysts were of quite a different character, being single-walled and oval. The cercariæ in these cysts are apparently of the *Spelotrema* type. Their identity is doubtful, but it seems certain, at least, that they are not the same as the cercariæ we have just described. Miss Lebour, however, found a single specimen of another cyst in the crab. This was smaller than the others, spherical and double-walled. The cercaria was not examined, but from the size and character of the cyst it was presumed to be probably the same as M'Intosh had found. Whether this be the case or not it is curious that these double-walled cysts should be so rare in the Northumberland crabs in contrast to their great abundance at St. Andrews. It may possibly be regarded as an instance of the peculiar effect which local conditions may exert even on the parasitic fauna.

It may not be out of place to mention here another cercaria found by Miss Lebour † in *Balanus balanoides* and referred with much doubt to *Spelotrema excellens* as the adult. The size (1 mm.) of the cercaria is suggestive of *Spel. excellens*, but the configuration of the alimentary canal differs considerably from that in *Spel. excellens* and bears much more resemblance to that of *Levinseniella brachysoma* (Crepl.).

#### *Cercaria lima*, nov.

Five specimens of *Lima hians* were examined and in two of them a single cyst was found. In both cases it was loosely attached to the inner side of the mantle-edge, projecting into the mantle-cavity.

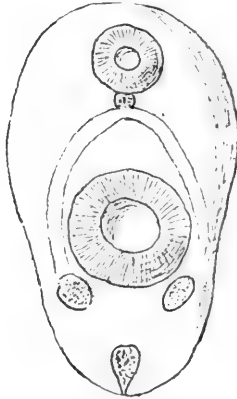
The cysts are spherical, about .3 mm. in diameter and have a thin, opaque, membranous wall. The liberated cercaria is .6 mm. long and of somewhat elongated oval outline. It is colourless and very transparent, so that little of its internal anatomy could be made out. The suckers are both globular,

\* "Trematodes of the Northumberland Coast: II," p. 10, pl. i. figs. 8, 9, in Trans. Nat. Hist. Soc. Northumberland, New Series, ii. part i.

† *Loc. cit.* pl. i. figs. 6, 7.

the oral having a diameter of  $\cdot 120$  mm. and the ventral  $\cdot 152$  mm.; the latter is situated at the beginning of the posterior third of the body. The cuticle is smooth and without spines. Just behind the ventral sucker two small oval testes are placed, one on each side, with their long axes directed obliquely outwards and forwards. The ovary could

Fig. 1.

*Cercaria lima.*

not be distinguished, being probably concealed by the ventral sucker. A short excretory vesicle lies at the posterior end of the body. There is a small pharynx contiguous with the oral sucker; two simple intestinal diverticula arise immediately behind the pharynx and appear to terminate near the testes.

This is apparently the first record of this cercaria, and no other entozoa have hitherto been described from *Lima hians*.

Even with the scanty details given above, it is not difficult to recognize in this cercaria the larva of a species belonging to one or other of the genera *Steringophorus* or *Fellodistomum*. The position of the suckers, their large size and particularly the prominence of the ventral sucker, the situation of the testes, and the smooth condition of the cuticle all support such an identification. The characters of the excretory vesicle and the alimentary system are also of importance. Moreover, these are the only two genera of British Trematodes with which the cercaria shows any affinity. More detailed differentiation seems at present out of the question. The small excretory vesicle without conspicuous lateral stems and

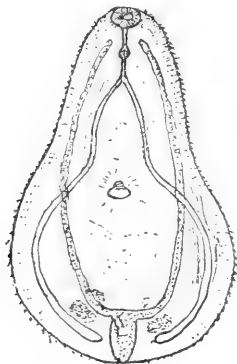


the absence of œsophagus (although this may be due to contraction) are strong evidences in favour of *Fellodistomum fellis* (Olss.) being the adult; the only contra-indication to which is the fact that *Anarrhichas lupus*, the only known host of *Fellodistomum fellis*, is not common in the neighbourhood of Millport.

*Cercaria concava*, nov.

In a young plaice (*Pleuronectes platessa*), about 4½ inches long, a small round cyst was found embedded under the skin. Its diameter was .17 mm. and it was very thin-walled, so that the cercaria was easily liberated. Its resemblance to *Cryptocotyle concava* (Crepl.) is even at first sight very striking. The shape is flattened, considerably broader towards the posterior end than towards the anterior end. The length is .48 mm. and the breadth at the widest part .22 mm. The

Fig. 2.



*Cercaria concava*.

small round oral sucker has a diameter of .06 mm., the prepharynx is .03 mm. long, the pharynx .04 mm., and the œsophagus .04 mm. The diverticula have the shape characteristic of the adult *Cryptocotyle*, bending in towards the middle line in the vicinity of the genital sucker, then curving out, and finally turning in at their termination to approach each other. The excretory vesicle is clearly seen and consists of two fairly straight lateral tubes, beginning near the prepharynx and running into a simple, rather wide terminal sac at the posterior end of the body. The genital sucker is quite distinct, situated about the middle of the body. That this structure is not a ventral sucker in the true sense

of the term is evidenced by the fact that although the aperture is sharply enough defined, the sucker itself does not have the well-marked outline usually associated with the ventral sucker. Furthermore, the vestigial ventral sucker can be made out a little in front of the genital aperture, but its aperture is concealed in the genital sucker. Traces of two small testes can be detected in front of the ends of the intestinal diverticula, but none of the other organs are visible. The cuticle, as in the adult, is set with numerous regular scale-like spines.

This larval form appears to have hitherto escaped observation. Its identification as the cercaria of *Cryptocotyle concava* (Crepl.) seems quite justifiable without further proof, for it possesses the characters of that species in a marked degree and there is no other British species with which it is likely to be confused. We have found, too, that *Phalacrocorax graculus* (the shag), which is one of the hosts of the adult parasite (so far, the only British host), feeds largely on small plaice, dabs, and flounders.

*Stephanochasmus baccatus*, Nicoll. (Cercaria.)

We have to record this larva from *Pleuronectes limanda*. Only one cyst was obtained, but no special search was made for more; its frequent occurrence in young Pleuronectids has already been fairly well established. The cyst was embedded under the skin and its wall was very thin and membranous, the thick outer covering, mentioned by Miss Lebour\*, having probably been removed in freeing the cyst from the tissues of its host. Its diameter was about  $\cdot 7$  mm., but it was more or less ovoid, according to the movements of the enclosed cercaria.

The length of the cercaria is 1.8–2.0 mm. and in structure it agrees very well with the adult *Stephanochasmus baccatus*. Anteriorly it is covered with numerous regularly arranged spines, which disappear a short distance behind the ventral sucker. The oral sucker is encircled by two rows of larger and stouter spines which are closely applied to the aperture. They number 28 in each row and are regularly and symmetrically arranged, no gap being left in either of the rows. Those of the anterior row measure  $\cdot 036$  mm. in length, in the posterior row  $\cdot 04$  mm. on an average. There is slight variation in length.

The oral sucker is terminal and measures  $\cdot 186$  mm. in diameter; the ventral sucker lies near the middle of the

\* *Op. cit.* p. 14.

body and measures  $\cdot 194$  mm. The suckers are thus nearly equal, although in the adult the ventral sucker is considerably larger than the oral sucker. The greater relative increase of the ventral sucker, however, is of almost invariable occurrence amongst Distomids.

The internal anatomy conforms very well to the *Stephanochasmus* type. The pear-shaped pharynx measures  $\cdot 14 \times \cdot 09$  mm.; the prepharynx is twice as long and the œsophagus half as long. The excretory vesicle, as commonly occurs in encysted cercariæ, is of disproportionately large size. The testes are rather near the posterior end and the ovary is a little in front of them. The cirrus-pouch is well formed and extends to midway between the ventral sucker and the ovary. The yolk-glands were not very distinct.

The identification of larval *Stephanochasmus* species would appear to rest very largely on the number and relative length of the cephalic spines. Other features which aid in identifying adult species, such as the size of the suckers, the length of the cirrus-pouch, and the extent of the yolk-glands, are of very doubtful value in the case of cercariæ. The yolk-glands are not, as a rule, conspicuous enough, while the great increase in the length of the post-acetabular relatively to the pre-acetabular region as the genital glands develop and the cercaria attains maturity renders futile any differentiation based on the comparative sizes of the suckers or the proportionate length of the cirrus-pouch. Assuming, however, that the number of cephalic spines is constant, or very nearly so, in each species, it is obvious that this would provide a fairly reliable test in diagnosing species, except such as possess a nearly equal number of spines.

Of the known species of *Stephanochasmus*, *St. cesticillus* (Molin), *St. bicoronatus* (Stoss.), *St. pristis* (Deslongch.), *St. minutus*, Lss., and *St. rhombispinosus*, Lebour, have all less than 40 cephalic spines. In *St. caducus*, Lss., there are 48, in *St. triglae*, Lebour, about 50 (?), and in *St. baccatus*, Nicoll, 56. It seems hardly likely that the cercariæ of *St. caducus* and *St. baccatus* could be confused, for not only is there a difference of 8 spines, but the anterior row contains the longer spines in *St. caducus*, while the reverse is the case in *St. baccatus*. At the same time it must not be forgotten that it is often a matter of great difficulty to determine the length of the spines accurately, for owing to the curvature of the surface on which they are set they are usually seen somewhat foreshortened, and this applies more particularly to the spines of the anterior row. Between *St. triglae* and *St. baccatus* there is greater difficulty in

deciding. In Miss Lebour's description \* of *St. triglæ* the number of spines is given as lying between 42 and 56, and the spines of the anterior row are slightly longer than those of the posterior row. From a specimen of what is apparently *St. triglæ* obtained at St. Andrews in *Cottus scorpius* we find that the number of spines is 50 and that the posterior spines are slightly longer than the anterior. In this specimen it was noticed that the spines of the posterior row had a tendency to diverge symmetrically from the middle line instead of being directed straight backwards, as is usually the case, but this may have been merely accidental. If the number 50 is confirmed for *St. triglæ* it will obviously be easier to differentiate its cercaria from that of *St. baccatus* than from that of *St. caducus*.

The occurrence of *Stephanochasmus* cercariæ encysted in various Pleuronectid fishes has already been described by Johnstone † from *Pleuronectes limanda* (recorded as *Distomum valdeinflatum*, Stoss.) and Miss Lebour ‡ from *Pl. limanda*, *Pl. microcephalus*, *Pl. cynoglossus*, and *Drepanopsetta platessoides*. As Johnstone makes no mention of the number or size of the cephalic spines it is impossible to be sure about the identity of the cercariæ which he found. In Miss Lebour's specimens the number of spines varied from 48 to 58. From these observations two alternative conclusions may be drawn, either that the number of spines may vary within such wide limits in the same species or that Miss Lebour's collection included cercariæ belonging to more than one species. The former is opposed to most observed facts; the latter seems much more likely. It is not at all improbable that the cercariæ of *St. caducus*, *St. triglæ*, and *St. baccatus* are all to be found encysted in young Pleuronectid fishes.

## XXVIII.—*New Species of Dendromus and Tatera.*

By R. C. WROUGHTON.

IN a small collection of mammals made by Dr. Jameson in the Transvaal I found some specimens of a *Dendromus* which seems to require a new name; and, further, in comparing

\* Northumberland Sea Fisheries Rept. for 1907, p. 27, pl. iii. figs. 3, 4.

† Rep. Lancashire Sea Fish. Investig. 1904, p. 98.

‡ Trans. Nat. Hist. Soc. Northumberland, New Series, ii. part i. p. 14, and Northumberland Sea Fish. Rep. for 1907, p. 28.

these specimens with those in the Natural History Museum, it became evident that two Nyasan forms also require names.

*Dendromus jamesoni*, sp. n.

A small *Dendromus* of the *pumilio* group, but with a well-marked dorsal stripe.

Fur soft and close, length 8–10 mm. on back. General colour as in *D. pumilio*, but a strongly marked, black dorsal stripe.

Dimensions of the type:—

Head and body 60 mm.; tail 78; hind foot 16; ear 13.

Skull: greatest length 20·5; basilar length 15; zygomatic breadth 11; brain-case breadth 10; nasals length 7·2; diastema 5; upper molar series 3·1.

*Hab.* Zoutpansberg, Transvaal.

*Type.* Adult female. B.M. no. 9. 1. 20. 27. Original number 135. Collected 6th July, 1907, by Dr. H. L. Jameson.

Seven specimens examined.

*Dendromus whytei*, sp. n.

A small *Dendromus* of the *pumilio* group, rather smaller and slighter than either *pumilio* or *jamesoni*, with an obsolescent dorsal stripe.

Colour above as in *pumilio* and *jamesoni*, but the dorsal stripe of the latter obsolescent or absent. Under surface white, but usually much suffused with ochraceous. Ears small.

Skull more delicately formed, narrower across the palate than in *jamesoni*.

Dimensions of the type:—

Head and body (c.) 60 mm.; tail (c.) 85; hind foot 17; ear 11.

Skull: greatest length 20; basilar length 15; zygomatic breadth 11; brain-case breadth 10·5; nasals length 8; diastema 5; upper molar series 3·1.

*Hab.* Nyasa (type from Fort Hill).

*Type.* Old male. B.M. no. 97. 10. 1. 131. Original number H. J. 117. Collected by Mr. A. Whyte, and presented to the Natural History Museum by Sir H. H. Johnston, K.C.B.

Twelve specimens examined, from Nyika Plateau, Zomba, and Mt. Malosa; in almost all there is a perceptible darkening along the mid-dorsum, but in only one is there an appreciable black stripe.

The known members of this *pumilio* group may be arranged in a key as follows:—

- A. A well-marked dorsal stripe. (Transvaal.).. *jamesoni*, sp. n.  
 B. Dorsal stripe absent or obsolescent.  
 a. Dorsal stripe obsolescent. Ear=11 mm.  
 (Nyasa.) ..... *whytei*, sp. n.  
 b. Dorsal stripe absent.  
 a<sup>1</sup>. Size smaller. Skull 18·5 mm. Ear=  
 10 mm. (Angola.) ..... *ansorgei*, Thos. & Wr.  
 b<sup>1</sup>. Size larger. Skull 20-21 mm.  
 a<sup>2</sup>. Ears large, 15 mm. Colour paler.  
 (Cape Peninsula.) ..... *pumilio*, Wagner.  
 b<sup>2</sup>. Ears smaller, 12 mm. Colour darker.  
 (Cameroons.) ..... *messorius*, Thos.

*Dendromus nyikæ*, sp. n.

A *Dendromus* of the *D. mesomelas* type, with a claw on the fifth toe. Rather smaller than that species, with a proportionally much shorter tail and smaller ears.

Size rather smaller than *D. mesomelas*. Fur rather short (9-10 mm. on back). Colour near to "fawn-colour" above, pure white below; dorsal stripe well-marked from the shoulders backwards. Hands and feet white. Ears small; tail short as compared with *Mesomelas*.

Dimensions:—

Head and body (c.) 70 mm.; tail (c.) 85; hind foot 18; ear 12.

Skull: greatest length 23; basilar length 17; zygomatic breadth 12; brain-case breadth 10·1; nasals length 8·8; diastema 5·5; upper molar series 3·6.

*Hab.* Nyika Plateau, British Central Africa.

*Type.* Adult female. B.M. no. 97. 10. 1. 123. Original number H. J. 7. Collected by Mr. A. Whyte in June 1896, and presented, with four others besides spirit-specimens, to the Natural History Museum by Sir H. H. Johnston.

The short tail, small ears, and the bluish or drab tint in its colouring suffice to distinguish this species easily from *D. mesomelas*, and, à fortiori, from *D. insignis*.

It is curious that two of the series of five specimens taken at the same time and place, and not otherwise differing in any way, have the bases of the hairs of the belly of a dark slate-colour, while in the type and the other two specimens the corresponding hairs are white to their bases.

Unfortunately no measurements were recorded by Mr. Whyte, and I have been obliged to base those given above on a spirit-specimen taken at the same time and place.

The following is a key to the known species of the *mesomelas* group. I exclude *pallidus*, Heuglin, and *mysticalis*, Heuglin, from Somaliland, about which information is not available, even as to whether they should be classed with *D. mesomelas* or *D. melanotis*.

- A. Size rather larger, hind foot=21-22 mm.; ear larger,=15 mm. Dorsal stripe very strongly marked. (British East Africa.) .. *D. insignis*, Thos.  
 B. Size smaller, hind foot 18-20 mm.  
 a. Ear larger, 15 mm.; tail longer, 100-105 mm. (Cape to Natal.)..... *D. mesomelas*, Brants.  
 b. Ear smaller, 12 mm.; tail shorter, 85-90 mm. (N. Nyasa.)..... *D. nyikæ*, sp. n.

*Tatera smithi*, sp. n.

A *Tatera* closely resembling *T. liodon* in proportions and colouring, but differing in its long posterior palatal foramina and extraordinarily broad brain-case.

Dimensions of the type:—

Head and body 155 mm.; tail 145; hind foot 34.5; ear 20.

Skull: greatest length 42 (c.); basilar length 34.5; interorbital breadth 7.4; brain-case breadth 18.6; anterior palatal foramina 8.2; posterior palatal foramina 3.6; diastema 12; upper molar series 6.8.

*Hab.* Mubende, Unyoro.

*Type.* Old female. B.M. no. 7. 10. 1. 14. Original number 34. Collected and presented to the National Collection by Mr. L. M. Seth-Smith, 23rd March, 1908. Two specimens.

*T. smithi*, while closely resembling in general facies *T. liodon* from Lake Mweru, has the long posterior palatal foramina so characteristic of the northern forms from Egypt and Somali.

XXIX.—Notes on the Forficularia.—XV. *The Esphalmeninæ*. By MALCOLM BURR, B.A., F.E.S., F.L.S., F.Z.S., &c.

IN 1901 Verhoeff (SB. Ges. naturf. Fr. no. 1, p. 7) formed the family Gonolabidæ, the essential character being the form of the prosternum, which is strongly narrowed posteriorly.

The second important feature is that the pygidium is fused with the last dorsal segment.

Now the latter character is not peculiar to this group; it marks also the following genera:—*Pyragra*, *Echinopsalis*, *Echinosoma*, *Forcipula*, *Allostethus*, *Labidura*, *Psalis*, *Labidurodes*, *Carcinophora*, *Anisolabis*, and the six genera of the Brachylabinæ referred to in these pages ('Annals,' vol. ii. p. 247, 1908). It is, in fact, the distinguishing feature of the family Labiduridæ, which includes all the genera mentioned above, and falls naturally into several subfamilies.

In an earlier note on the Gonolabidæ (Tr. Ent. Soc. London, 1904, p. 293) I have pointed out that this narrowing of the prosternum occurs in *G. peringueyi*, *G. silvestrii*, *G. lativentris*, but not in *G. kirbyi* nor in *G. javana*; consequently, by his characterization of the Gonolabidæ, Verhoeff excludes the latter species. This is unfortunate, because when I erected the genus *Gonolabis* (Ann. Soc. Ent. Belg. xlv. p. 48, 1900), I specially mentioned *G. javana* as the type of this genus.

Verhoeff was evidently unfamiliar with the literature of the subject, relying almost, if not quite, entirely on de Bormans's monograph. Consequently he falls into the curious error of quoting (l. c. p. 7) "*Gonolabis* (Burr) et mihi," and on the next page "Typus: *G. lativentris* Phil." We must now separate "*Gonolabis* Burr" from "*Gonolabis mihi*"; the former has a parallel prosternum and the type is *G. javana*, the latter has a narrow prosternum and the type is *G. lativentris*.

A new name is required for "*Gonolabis mihi*," for which I propose *Esphalmenus*\*, with *G. lativentris* as type.

The Gonolabidæ of Verhoeff, therefore, does not include the genus *Gonolabis*, and must be replaced by the name *Esphalmeninæ*, reducing the rank to that of a subfamily. There is a second genus in this subfamily, namely *Gonolabina*, Verh. Like most of that author's names, there is a lack of originality in it; this is more unfortunate since this genus really belongs to the *Esphalmeninæ*, and has no connexion with *Gonolabis*, which genus does not require a separate subfamily, but falls into the *Anisolabinæ*.

#### Subfamily *ESPHALMENINÆ*, nov.

*Gonolabidæ*, Verhoeff, SB. Ges. naturf. Fr. no. 1, p. 7 (1901); Burr, Tr. Ent. Soc. London, p. 293 (1904).

Apterous; antennæ, feet, and pygidium as in Labiduridæ generally; prosternum strongly narrowed posteriorly.

\* Past. part. Greek: σφάλλω, to make a mistake.



## Table of Genera.

1. Abdomen ♂ a basi usque ad apicem fortiter dilatatum; segmentum ultimum dorsale typicum, a pygidio verticali angulo fere acuto separatum . . . . . 1. *Espthalmenus*, nov.
- 1.1. Abdomen ♂ ♀ subparallelum, medio subdilatatum; segmentum ultimum dorsale ♂ depressum, declive, in pygidium depressum horizontaliter transiens . . . . . 2. *Gonolabina*, Verh.

## I. ESPHTHMENUS, gen. nov.

*Anisolabis*, Bormans, Ann. Soc. Ent. Belg. xxvii. ii. p. 62 (1883); id. Tierreich, Forf. p. 51 (1900); id. Ann. Mus. Civ. Gen. ii. p. 451 (1906).

*Gonolabis*, Burr, Ann. Soc. Ent. Belg. xlv. p. 48 (1900); Verhoeff, SB. Ges. naturf. Fr. p. 7 (1901); Kirby, Borelli.

Antennæ multo-segmentatæ; corpus apterum; pronotum quadratum: abdomen ♂ depressum, basi angustum, usque ad apicem fortiter dilatatum; ♀ subparallelum; segmentum ultimum dorsale ♂ latum, transversum, ♀ angustum; margine postico recto, integro, abrupte et angulatim pygidio verticali separatum: forcipis brachia ♂ valida, basi valde remota, fortiter arcuata; ♀ recta, simplicia.

Entirely apterous.

Antennæ with numerous (? 30) segments, cylindrical; third long; fourth, fifth, and sixth much shorter, the remainder gradually lengthening.

Head smooth. Pronotum rectangular.

Abdomen ♂ depressed, narrow at the base, then strongly dilated towards the apex, which is several times wider than the base; in ♀ parallel and less depressed.

Last dorsal segment very broad, posterior margin straight; in ♀ narrow and sloping.

Pygidium ♂ vertical, fused with dorsal segment, but the junction marked by a sharp angle, almost acute, as in all typical Labiduridæ: pygidium ♀ narrow.

Forceps with the branches ♂ stout, very remote at the base, triquetre, tapering and strongly arcuate. In ♀ straight, tapering, and subcontiguous.

Type of the genus: *Forficula lativentris*, Philippi, Z. Naturw. xxi. p. 47 (1863).

## Table of Species.

1. Forcipes brachia ♂ prope basin superne cristata: species africana . . . . . 1. *peringueyi*, Borm.
- 1.1. Forceps superne inermis: species Americæ meridionalis.

2. Segmentum penultimum ventrale ♂ medio triangulariter excisum ..... 2. *camposi*, Bor.  
 2.2. Segmentum penultimum ventrale integrum vel sinuato-emarginatum.  
 3. Segmentum ultimum dorsale ♂ in parte postica fortiter depressum ..... 3. *silvestrii*, Bor.  
 3.3. Segmentum ultimum dorsale ♂ postice haud depressum ..... 4. *lativentris*, Phil.

### 1. *Esphalmenus peringueyi*, Borm.

*Gonolabis peringueyi*, Borm. Ann. Mus. Civ. Gen. xx. p. 451 (1900); Burr, Tr. Ent. Soc. London, p. 293 (1904); Kirby, Cat. Orth. i. p. 16 (1904).

South Africa: Cape Colony, Caledon (Borm., coll. Brunner, and c. m.), taken by Peringuey.

De Bormans only gave a very brief description of this species, but ample for its identification. It is the only Old-World member of the genus, and the abdomen being four or five times as wide at the apex as at the base, its appearance is very distinctive; the general colour is brick-red. The dimensions are as follows:—

	♂. mm.	♀. mm.
Length of body .....	10.5-11.5	11
Breadth of pronotum .....	1.5-1.75	1.75
Breadth of base of abdomen ....	1.75-2	2
Breadth of apex of abdomen ....	3-5	3.5
Length of forceps .....	2	2.5
Breadth of forceps .....	2.5-4.75	1.5

### 2. *Esphalmenus camposi*, Borelli.

*Gonolabis camposi*, Borelli, Boll. Mus. Tor. xxii. n. 552 (1907).

Ecuador.

This species is carefully described by Borelli, who gives a figure of the characteristic form of the ventral surface of the apex of the abdomen.

It differs from its congeners in its shining black colour and less strongly dilated abdomen.

### 3. *Esphalmenus silvestrii*, Borelli.

*Gonolabis silvestrii*, Borelli, Boll. Mus. Tor. xvii. no. 418, p. 4, fig. (1902); Burr, Bull. Mus. H. N. Paris, p. 31 (1908).

*Gonolabis sylvestrii*, Kirby, Cat. Orth. i. p. 31 (1904).

Patagonia.

This species is well described and figured by Borelli.

4. *Esphalmenus lativentris*, Phil.

- Forficula lativentris*, Philippi, Zeitschr. ges. Naturw. xxi. p. 217 (1863).  
*Anisolabis lativentris*, Borm. Ann. Soc. Ent. Belg. xxvii. p. 62, pl. ii. fig. 3 (1883); id. Tierreich, Forf. p. 51 (1904).  
*Gonolabis lativentris*, Burr, Ann. Soc. Ent. Belg. xlv. p. 49 (1902); id. Tr. Ent. Soc. London, p. 293 (1904); id. Bull. Mus. H. N. Paris, p. 31 (1908); Borm. Ann. Mus. Civ. Gen. (2) xx. p. 451 (1900); Borelli, Bol. Mus. Tor. no. 451, p. 4 (1902); Verh. SB. Ges. naturf. Fr. p. 8 (1902); Kirby, Cat. Orth. i. p. 16 (1904).

Chili; Peru: Buenos Aires; Straits of Magellan.

XXX.—Notes on the Forficularia.—XVI. *On Dermaptera in the Greifswald Museum, with Synonymic Notes on some of Gerstæcker's Species.* By MALCOLM BURR, B.A., F.E.S., F.L.S., F.Z.S., &c.

As the identity of four species of Dermaptera described by Gerstæcker from West Africa has long been a puzzle, I am very glad to have the opportunity of putting all doubts at rest. Dr. Muller, Director of the Greifswald Museum, has very kindly communicated me the types of Gerstæcker, together with some material from various sources; this is worked out in the following short paper, in which the synonymy of the four doubtful species is established, as also of a species of *Proreus*.

I avail myself of the opportunity of once more expressing my gratitude to Dr. Muller.

*Apachys chartaceus*, Haan.

Soekaranda (*Dohrn*), 1 ♀.

*Diplatys* cf. *nigriceps*, Kirby.

Java orient (*Fruhstorfer*).

This specimen is undeterminable, because imperfect.

*Diplatys vosseleri*, Burr.

Nguëlo, East Africa (*Rolle*), 1 ♂.

*Cylindrogaster gracilis*, Stål.

Theresopolis (*Fruhstorfer*), 3 ♂, 1 ♀.

*Dicrana*, sp. n.

S.W. Java, Palabuan (*Fruhstorfer*), 1 ♀.

Allied to *D. horsfieldi* and *D. quadriguttata*, but differs entirely in colour.

The pronotum is tawny, with a black V, whereas it is red in *D. quadriguttata* and dark with a pale border in *D. horsfieldi*; the pronotum is dark in the latter, red in the former species, but tawny in this. In *D. horsfieldi* the elytra are yellowish; in *D. quadriguttata* black, with four reddish spots; in this species all black.

The pronotum is rectangular, the penultimate ventral segment of the ♂ has a median sulcus in *D. horsfieldi* and *D. quadriguttata*. It is not advisable to give a name and a formal description to this species without the male.

*Echinosoma wahlbergi*, Dohrn.

Nguëlo, East Africa (*Rolle*), 1 ♂.

*Pyragra brunnea*, sp. n.

Statura minore: colore rufo, pronoto, alis pedibusque fulvo-signatis; elytris fuscis.

	♂.	♀.
Long. corporis . . . . .	10 mm.	10 mm.
„ forcipis . . . . .	1.5 „	1.75 „

Size relatively small.

General colour brown.

Antennæ with about thirty segments; first not very long, stout and clavate; second short, cylindrical; third cylindrical and long, quite four times as long as broad; fourth and fifth quite short, almost globular, about as broad as long; sixth, seventh, eighth, and ninth &c. gradually lengthening, very gently clubbed at the apex, the apical ten segments slender, almost cylindrical; in colour dull brown.

Head broad, black, mouth-parts tawny; tumid and bristly.

Pronotum transverse, convex anteriorly, straight posteriorly, the angles rounded and sides gently rounded; blackish brown, with a tawny spot on each side.

Elytra dull brown, rough, clothed with short bristles.

Wings dull brown, pale yellowish along the suture.

Feet tawny, femora and tibiæ banded with fuscous.

Abdomen depressed, parallel, deep reddish brown, rugulose and bristly.

Last dorsal segment transverse in both sexes, ample, posterior margin straight; on each side there is a longitudinal ridge which runs into the posterior margin at the angles, which are rounded.

Penultimate ventral segment ♂ transverse, with a shallow, median, round emargination and each lobe broadly rounded; in ♀ not emarginate, obtuse-angular.

Forceps with the branches remote in ♂ at base, stout, triquetre, tapering arcuate, straight, contiguous, triquetre, and serrate.

Peru: Fonteboa (*Hahnel*, ♂, in Mus. Greifswald); Iguapo (♀ in c. m., et coll. Gadeau de Kerville).

This species approaches nearest to *P. paraguayensis*, Bor., but is smaller and differs in pattern. It can hardly be confused with the other species, if only on account of its much smaller size.

*Anisolabis*, ? sp. n.

Victoria (West Africa).

There are six specimens of *Anisolabis* from Victoria. I dare not offer an opinion on them; probably some at least are immature specimens of *Psalis*. One adult appears to be allied to *A. compressa*, Borelli, but is less compressed, and the antennæ and feet are somewhat differently coloured.

*Anisolabis maritima*, Borm.

N. 17, 481. Probably referable to this species.

*Brachylabis nigra*, Scudd.

Fonteboa (*Hahnel*), 1 ♀.

*Psalis cincticollis*, Gerst.

This specimen is Gerstæcker's type. It is, unfortunately, a female, but it is evidently a *Psalis*. It is larger than *P. picina*, Kirby, the other West-African species, and is probably quite distinct. In the short elytra and pronotum it approaches to *P. debilis*, Burr (East Africa); in the yellowish basal segments of the antennæ it agrees with both; in the relatively long fourth antennal segment it approaches *P. picina*. It is to be hoped that the male will be discovered soon, so that its true relations may be determined.

Long. corporis	.....	17.5 mm.
„ forcipis	.....	3 „
		18*

*Spongiphora quadrimaculata*, Stål.

Aburi, 2 ♂.

These are Gerstæcker's original specimens of *Forficula protensa*, which is consequently sunk as a synonym. There is no doubt whatever as to their identity.

*Spongiphora croceipennis*, Serv.Brazil, San Paul (*Staudinger*), 1 ♂.*Platylabia sparattoides*, Borm.Java orient. (*Fruhstorfer*), 3 ♂, 2 ♀, and nymph.*Mecomera brunnea*, Serv.Fonteboa (*Hahnel*), 1 ♂.*Chæsospania pæderina*, Gerst.Bonjongo, Aburi (*Buchh.*), 2 ♀.

These, originals of Gerstæcker, are identical with *Ch. bonjonga*, Borg, and *Ch. escalerae*, Burr, which consequently fall as synonyms.

*Sphingolabis semifulva*, Borm.Java orient. (*Fruhstorfer*), 1 ♂.? *Labia sicaria*, Burr.Java orient. (*Fruhstorfer*), 1 ♂; probably identical.*Proreus elegans*, Borm.Java orient. (*Fruhstorfer*), 1 ♂, 1 ♀.

Thanks to the kindness of Dr. Gestro, I have been able to compare these specimens with de Bormans's type, and there is no doubt as to their identity; the female is obviously identical with the specimen in the Budapest Museum described by me under the name of *Apterygida lingua* (*Termes. Füz.* xxv. p. 486, pl. xx. fig. 8, 1902), well characterized by the tongue-shaped pygidium, and the specimen doubtfully referred to as a variety of *Ch. elegans* (*l. c.* p. 485) is the male. It differs from the other species of *Proreus* in the relatively broad pronotum, agreeing thus with the *P. sobrius*, Borm., which resembles *P. elegans* in build and structure, but differs in colour and in the form of the occiput, which is tumid on

each side, whereas the whole head is smooth and globose in *P. elegans*.

*Elaunon erythrocephalus*, Oliv.

Abo: Simbareni (*Buech.*), 2 ♂, 2 ♀.

These are the original specimens of *Chelisoches pulchellus* of Gerstæcker, which must consequently be sunk as a synonym.

*Doru lineare*, Esch.

Bahia (*Fruhstorfer*), 1 ♂; Guatemala, 2 ♂, 1 ♀; Theresopolis (*Fruhstorfer*).

Var. *californica*, Dohrn.

Theresopolis (*Fruhstorfer*), 3 ♂, 1 ♀.

As the synonymic results established in the foregoing paper are rather important, it is worth while repeating them:—

*Brachylabis cincticollis*, Gerst., in Mt. Ver. Vorpomm. xiv. p. 44 (1883), is a true *Psalis*; it is allied to *Psalis pincina* of Kirby, and may prove to be identical when the male is discovered.

*Forficula protensa*, Gerst. (*l. c.* p. 45), is synonymous with *Spongiphora quadrimaculata*, Stål.

*Forficula pæderina*, Gerst. (*l. c.* p. 46), is identical with *Chaetospasia bongiana*, Borg, and *Ch. escalerae*, Burr, so that the correct name is *Chaetospasia pæderina* (Gerst.).

*Chelisoches pulchellus*, Gerst. (*l. c.* p. 42), is synonymous with *Elaunon erythrocephalus* (Oliv.).

*Apterygida lingua*, Burr (Termes. Füz. xxv. p. 486, pl. xx. fig. 8, 1902), is the female of *Proreus elegans*, Borm.

XXXI.—On Mammals collected in Turkestan by Mr. Douglas Carruthers. By OLDFIELD THOMAS.

THE British Museum has recently received a collection of mammals, obtained in different parts of Turkestan by Mr. Douglas Carruthers, one of the mammal collectors to whom the remarkable success of the recent Ruwenzori Expedition was due.

Mr. Carruthers spent the winter of 1907-8 at Samarkand and Bokhara, making collections in the three zones accessible from there—the desert, fertile, and mountain regions of Turkestan. Then in the summer he made an excursion up to the Hissar Mountains, on the south side of the Zarafshan Valley, 100 miles east of Samarkand, and afterwards to the Ak-sai Plateau, N. of Kashgar.

Although the region is fairly well known to Russian naturalists, the British Museum has hitherto been very badly off for mammals from Turkestan; and this series is therefore of much importance to us for comparison with our growing collections of Persian and N. Indian animals.

120 specimens are enumerated, belonging to 23 species, of which four have needed description as new, besides three others from adjacent parts of Central Asia, already in the Museum Collection.

1. *Nyctalus noctula*, Schr.

♂. 76, 77, 78, 79; ♀. 74, 75. Samarkand. 2000'.

2. *Pipistrellus pipistrellus lacteus*, Temm.

♂. 2, 3, 25; ♀. 1. Samarkand. 2000'.

In describing his *Pipistrellus bactrianus*\* Dr. Satunin has not shown any reason why Dobson's definite identification † of Temminck's *lacteus* with the pale-coloured E. Turkestan Pipistrelle should be ignored. Without evidence that the identification is wrong, the name should be used.

Moreover, Severtzoff's *Vesperugo akokomuli*, Temm., var. *almatensis* ‡, dating from 1876, would also appear to be the same form.

3. *Erinaceus macracanthus*, Blanf.

♀. 24. Hills south of Samarkand. 3000'.

4. *Crocidura* sp.

♂. 11, 12, 22; ♀. 19, 21. Hills south of Samarkand. 3000'.

♂. 81; ♀. 100. Samarkand. 2000'.

Allied to or identical with *C. ilensis*, Mill.

\* Mitth. Kaukas. Mus. ii. p. 85 (1905).

† Cat. Chir. B. M. p. 225 (1878).

‡ Ann. & Mag. Nat. Hist. (4) xviii. p. 42 (1876).



5. *Citellus fulvus*, Eversm.

♂. 41; ♀. 40, 65. 50 miles S.W. of Bokhara. 600'.

♂. 87; ♀. 86, 97. Samarkand. 2000'.

Both summer and winter pelages are represented in this series, but there is not the material difference between the two that occurs in the next species.

6. *Spermophilopsis leptodactylus*, Licht.

♂. 30, 92, 94; ♀. 55, 60, 63, 64. 50 miles S.W. of Bokhara. 600'.

Nos. 92 and 94, killed 20th May, are in the curious short summer pelage, though with a few hairs left of the soft winter coat.

“Shot on sand-hills.”—*D. C.*

[*Arctomys littledalei*, sp. n.]

The orange-rufous marmot of the Pamirs, hitherto erroneously termed *A. caudatus*, Jacq. Description in footnote\*.]

7. *Arctomys littledalei flavinus*, subsp. n.

♂. 117; ♀. 118. Hissar Mts., 100 miles E. of Samarkand. 10,000'.

General characters of *A. littledalei*, but the body-colour paler throughout, more yellowish, the hairs brown at base,

\* Allied to *A. caudatus*, but the back, instead of being broadly washed with black, wholly tawny or ochraceous tawny—the hairs blackish at base, their middle zone buffy or ochraceous buff, and their ends tawny, with minute and inconspicuous black tips. Under surface duller tawny. Cheeks and sides of neck little lighter than rest of body. Crown blackish, as is also a patch on the top of the nose. Hands and feet ochraceous tawny. Tail long, dull ochraceous tawny, with a prominent black end.

Skull decidedly smaller than that of the true *A. caudatus*.

Dimensions of the type (measured in skin);—

Head and body (probably stretched) 580 mm.; tail 240; hind foot 80.

Skull: upper length 95; basilar length 83; greatest breadth 61; nasals 37.5 × 17.3; length of upper tooth-series 22.

*Hab.* Alai Mts., Pamir.

*Type.* Old female. B.M. no. 92. 1. 1. 7.

The British Museum owes to Mr. St. George Littledale its first specimens of this splendid marmot, and has since received others from the St. Petersburg and Warsaw Museums. These have been hitherto considered as identical with *A. caudatus*, Jacq., but the skins of this latter received from Col. Ward and Mr. Whitehead show such constancy in their larger size and possession of a broadly black-washed back that it is evident that the Pamir species should be distinguished from them, and I have had much pleasure in naming it in honour of the well-known explorer who discovered it.

cream-buff for their middle zone, their ends tawny, without black tips. Under surface between buffy and ochraceous buff. Sides of neck and area round and over shoulders clear buffy, without tawny tips, this contrasting with the top of the neck, which is darkened by the tawny ends of the hairs. Head brown, becoming gradually tawny posteriorly. Hands and feet buff. Tail dull buffy or pinkish buff, the end scarcely darker.

Skull about as in true *A. littledalei*.

Dimensions of the type (measured in the flesh) :—

Head and body 470 mm.; tail 220; hind foot 82; ear 28.

Skull: upper length 95; basilar length 84; greatest breadth 57; length of nasals 39; length of upper tooth-row 21.

*Hab.* as above.

*Type.* Adult female. Original number 118. Collected 20th June, 1908.

This is probably the marmot called *A. caudatus* by Severtzoff. It has, of course, nothing to do with that species, from which it is even further away than *A. littledalei*, of which I provisionally make it a subspecies. It is readily distinguished from the latter by its paler ground-colour, the prominent pale areas on the sides of the neck, and by the absence of a black tip to the tail.

An imperfect skin from Suok, N.W. Mongolia, presented to the Museum by Mr. H. J. Elwes, would also appear to be referable to this form.

### 8. *Arctomys centralis*, sp. n.

*Arctomys dichrous*, Büchner, nec Anderson.

♂. 121 (immature). Ak-sai Plateau, 120 miles N. of Kashgar. 12,000'.

A small species of a colour intermediate between the brown marmots of the *himalayanus* group and the yellow ones of the *caudatus-littledalei* type. Fur of back for its basal two-fifths blackish brown, then two-fifths cream-buff, the terminal fifth dark brown. Belly strongly contrasted dark rufous.

Dimensions of the type (measured in skin) :—

Head and body (stretched) 600 mm.; tail 155.

Skull: upper length 95; condylo-basal length 96; greatest breadth 62.5; nasals 41 × 16.3; palatilar length 50; length of upper tooth-series 24.

*Hab.* Tian-shan. Type from Mt. Boro-choro.

*Type.* Old male. B.M. no. 92. 1. 1. 5. Collected 15th

July, 1889. Received in exchange from the St. Petersburg Museum.

The small red-bellied marmot of the Tian-shan was identified by Dr. Büchner as *A. dichrous*, Anderson; but a cotype of this latter in the British Museum shows that it is a wholly different animal, of a more or less chocolate-brown colour. Dr. Büchner has so fully described the present species and stated its relationship to the other Siberian forms that further detail is not now required.

It may be noted that *A. baibacinus*, Brandt, is absolutely a *nomen nudum*, whether Dr. Büchner was or was not right in separating the present animal from it.

9. *Rhombomys opimus*, Licht.

♂. 34, 54, 61; ♀. 56, 57, 59, 62, 88, 93. 50 miles S.W. of Bokhara. 600'.

10. *Meriones tamaricinus*, Pall.

♂. 5, 98, 99; ♀. 4, 95. Samarkand. 2000'.

11. *Meriones evermanni*, Bogd.

♂. 23, 67, 84, 85; ♀. 7, 68, 71. 10-20 miles S. of Samarkand. 2000'.

“In small colonies on semi-cultivated desert.”

I provisionally use the name *evermanni* for this gerbil as being undoubtedly applicable to it, but it is so closely related to the Kandahar *M. erythourus*, Gray, that its ultimate union with that species is very probable.

Gerbils of the same type are widely distributed over S.W. Asia, examples from Karyatein (Kargeten), near Damascus, being quite similar to typical Afghan specimens. Sundevall's *M. crassus* from Sinai also belongs here.

A smaller species, *M. longifrons*, Lat., occurs in S.W. Persia (Ahwaz, Busrah, &c.) and Arabia (Jedda).

12. *Meriones meridianus*, Pall.

♂. 43, 44, 45, 46, 51, 52; ♀. 48, 49, 50. 50 miles S.W. of Bokhara. 600'.

Büchner has placed Blandford's *cryptorhinus* as a synonym of *meridianus*, but specimens of it in the British Museum indicate that, while undoubtedly closely allied, it may be distinguished by its larger size.

The species described in the footnote \* was also considered by Büchner as *M. meridianus*.

13. *Mus rattus*, L.

♂. 20. Hills south of Samarkand. 4000'.

14. *Mus wagneri*, Eversm.

♂. 15, 36, 83, 96; ♀. 6, 8, 10, 13, 14, 17, 18. Samarkand and southwards. 2000-3000'.

♂. 47, 89, 90, 91; ♀. 31, 32, 33, 42-58. 30-50 miles S.W. of Bokhara. 600'.

15. *Apodemus sylvaticus arianus*, Blanf.

♂. 9; ♀. 16. Hills south of Samarkand. 3000'.

♂. 101. Samarkand. 2000'.

♂. 103, 104, 111-115. Hissar Mts., 100 miles E. of Samarkand.

16. *Cricetulus phœus*, Pall.

♂. 112. Hissar Mts., 100 miles E. of Samarkand. 9500'.

\* *Meriones büchneri*, sp. n.

Allied to *M. meridianus*, but with much shorter ears. General colour "clay-colour," but bright and glossy, instead of dull as in Ridgway, darker and richer than the sandy colour of *M. meridianus*. Under surface pure white to the roots of the hairs. Ears very short, 11 mm. instead of 15 measured from their bases and 6.7 mm. instead of 9 measured dry from the crown, their proectote bright buffy with white end. Hands and feet white; soles of the latter wholly hairy except a small spot under the calcaneum; claws white. Tail uniformly tawny ochraceous above and below, a few of the terminal hairs tipped with black.

Skull apparently quite as in *M. meridianus*, except that the bullæ are rather smaller.

Dimensions of the type:—

Head and body (in skin) 118 mm.; tail (skin) 89; hind foot (wet) 27; ear (wet) 11.

Skull: greatest length 32.2; breadth on auditory bullæ 18.

*Hab.* Deleun Mts., Dsungaria.

*Type.* Adult male. B.M. no. 92. 1.1.11. Collected by N. Przevalski, October 1874, and received in exchange from the St. Petersburg Museum.

This gerbil was referred to *M. meridianus* by Büchner, but he cannot have noticed the striking difference in the size of the ears. From "*Gerbillus*" *kozłovi*, Satunin, it differs by its white claws and untufted tail.

17. *Microtus (Micr.) ravidulus*, Mill.

♂. 123, 124; ♀. 120, 122. Ak-sai Plateau, 120 miles N.E. of Kashgar. 11,000'.

Practically topotypical of Miller's species, which was described from Ok-chi, in the valley of the Ak-sai River, at 7500'.

18. *Microtus (Pitymys) carruthersi*, sp. n.

♂. 105, 108, 109, 110; ♀. 106, 107, 116. Hissar Mts., 100 miles E. of Samarkand. 9000-10,000'.

Apparently allied to the European subgenus *Pitymys*, but with mammæ and some dental resemblances to *Phaiomys*.

Size rather large for a *Pitymys*. Fur long, very soft and fine; hairs of back about 12 mm. in length. General colour above near "broccoli-brown," but varying a good deal in the different specimens. Under surface dull whitish, the slaty bases of the hairs showing through. Ears fairly long, quite evident beyond the fur, pale brown. Hands and feet dull whitish above; claws rather longer than in ordinary *Pitymys*, but not so long as in *Phaiomys*; soles apparently with only five pads, their posterior part thickly hairy. Tail fairly long, more than twice the length of the hind foot, well but not heavily haired, brown along its middle line above and at the end, dull whitish on sides and below. Mammæ 2—2=8.

Skull lightly built, low, smooth, rounded, not ridged, its general shape not very unlike that of *M. (P.) majori*, but the brain-case is shorter and the face more developed. Nasals very broad anteriorly, tapering behind. Palatal foramina, posterior palatal region, and bullæ all about as in that species.

Tooth-pattern quite as in *Phaiomys*, as figured by Miller\*,  $m^3$  being similarly bilaterally symmetrical, though the middle section is even less constricted in the middle line. Below the anterior molar is quite like Miller's figure, except that there is usually a small extra external angle at the middle of the long anterior lobe, making five salient external angles to the tooth.

Dimensions of the type (measured in the flesh):—

Head and body 101 mm.; tail 39; hind foot 16; ear 13.

Skull: greatest length 24.5; basilar length 22; zygomatic breadth 14; nasals 6.1 × 3.6; interorbital breadth 3.7; palatilar length 13.5; diastema 8.3; palatal foramina 4.6; upper molar series (crowns) 5.7.

*Hab.* as above.

\* N. Am. Faun. no. 12, p. 57 (1896).

*Type.* Adult male. Original number 108. Collected 14th June, 1908.

I have been much puzzled as to where this peculiar little vole should be placed. It differs from all the members of *Pitymys* by its more numerous mammæ, and in this respect, as in locality and the details of the molar pattern, it shows affinity with *Phaiomys*. But there is nothing very essential in the difference of molar pattern, while the general shape of the skull, the external proportions, and the moderate claws are all so much more like *Pitymys* than *Phaiomys*, that I provisionally place it with the former, in which it is geographically a connecting-link between the European and American members.

19. *Microtus (Alticola) argurus*, sp. n.

♀. 102. Hissar Mts., 100 miles E. of Samarkand. 9500'. 14th June, 1908. *Type.*

A pale species, with an unusually long white tail.

Size about as in *M. blanfordi*, the only other long-tailed species. Fur fine and soft; hairs of back (in summer pelage) about 7-8 mm. in length. General colour above "ecru-drab"; under surface white, the slaty bases of the hairs showing through; a line of cream-buff marking the junction of the upper and lower colours on the sides. Hands and feet white. Tail unusually long, slender, thinly haired (in summer), lightly pencilled, wholly white above and below. Mammæ 2-2=8.

Skull not unlike that of *M. (A.) worthingtoni*, Miller, allowing for the fact that the type is barely adult. Bullæ rather smaller.

Teeth of the typical *Alticola* structure, but not very highly specialized, as the posterior lobe of  $m^3$  is not so long as it often is, and is also, with the rest of the teeth, thicker, its thinness being a characteristic of the most specialized forms of *Alticola*. Pattern about as in *M. blanfordi* \*.

Dimensions of the type (barely adult):—

Head and body 93 mm.; tail 50; hind foot 19; ear 15.5.

Skull: greatest length 25.4; nasals 7.2; interorbital breadth 3.9; palatilar length 12; diastema 7.4; palatal foramina 4.6; upper molar series (crowns) 5.2.

*Hab.* and *type* as above.

This striking vole is readily distinguishable by its very long tail from all the species of *Alticola* except *M. blanfordi*, which approaches it in tail-length but is very much darker

\* Figured by Blanford, J. A. S. B. l. pt. 2, pl. i. (1881).

coloured, and whose tail has a dark line along the upper surface.

The present is the most western locality at which any true *Alticola* has been found, but there is little doubt that *Chionomys*, the subgenus recently founded to contain the *Microtus nivalis* group, is the nearly allied European representative of *Alticola*.

20. *Ellobius fusciceps*, sp. n.

♂. 69, 70, 72, 80; ♀. 66, 73, 82. Samarkand. 2000'.

Black of face extended on crown. Skull short and broad.  $m^3$  complicated.

Size, as gauged by skull, scarcely larger than in *E. talpinus*. General colour above buffy, rather darker and more intense than "pinkish buff," passing gradually through dull buffy on the sides to soiled buffy whitish on the belly, the last lighter than in true *talpinus*, darker than in *rufescens*. Face blackish, the black extending further back than in other species and not entirely giving place to the dorsal colour till behind the level of the ears.

Skull comparatively short and broad, zygomata evenly and widely expanded. Muzzle short and broad, the incisors rather less projected forwards than usual, their tips about 2 mm. nearer the molars than in other specimens of the same size. Nasals not markedly narrowed behind, their posterior end just level with that of the frontal premaxillary processes. Brain-case smooth and little ridged, even in specimens with the teeth quite worn down. Lambdoidal ridges well marked, nearly evenly transverse, but slightly bowed forwards in the middle third and very much as they are in *E. tancrei*, quite different to the condition in *E. fuscicapillus*, *intermedius*, *lutescens*, and *woosnami*.

Third upper molar complex, about as in nos. 9-10 of Büchner's plate, therefore very different from the simple tooth of *E. talpinus* and *rufescens*.

Dimensions of the type (an old male), taken in the flesh:—

Head and body 106 mm.; tail 13; hind foot 21.

Skull: condylo-basal length 31; condyle to tip of incisors 32.8; zygomatic breadth 22.3; nasals  $8 \times 3.4$ ; inter-orbital breadth 5.4; palatal length 18; diastema 11; palatal foramina 3.2; upper molar series 7.3.

*Hab.* Samarkand.

*Type.* Old male. Original number 80. Collected 20th April, 1908.

Externally this *Ellobius* differs from any of the other

described forms by the greater extension backwards of the dark colour of the crown.

In the skull *E. talpinus* and *rufescens* are smaller, with much simpler  $m^3$ ; *E. tancrei* is larger, with longer muzzle and more forwardly projected incisors, as are also, with differently shaped lambdoidal ridges, *E. fuscocapillus*, *intermedius*, *lutescens*, and *woosnami*.

21. *Lepus* sp.

♂. 27, 29, 35; ♀. 26, 28, 38, 39, 53. 30 to 50 miles W. of Bokhara. 600'.

22. *Lepus* sp.

♂. 113; ♀. 114. Hissar Mts., 100 miles E. of Samarkand.

In face of the considerable number of names that have been given to Central-Asian hares, I cannot at present determine definitely the two species obtained by Mr. Carruthers. One of them is no doubt *L. lehmanni*, Sev.

23. *Ochotona rutila*, Sev.

♂. 119. Hissar Mts., 100 miles E. of Samarkand. 9500'.  
"Shot among rocks; not at all shy; was carrying a large amount of grass."—D. C.

XXXII.—Two new Bats from the Solomon Islands.

By KNUD ANDERSEN.

*Pteralopex anceps*, sp. n.

*Diagnosis*.—Dentition less specialized than in *Pt. atrata* (Guadalcanar, E. Solomon Islands); fur much longer; underside of body conspicuously paler. *Hab.* Bougainville, W. Solomon Islands.

$p^4$ .—More Pteropine in shape and structure than corresponding tooth of *Pt. atrata*. In *Pt. anceps*  $p^4$  is one-fifth longer than broad (actual measurements, antero-posterior diameter of crown 5.8 mm., transverse diameter 4.8); the anterior basal ledge is narrow, not extending on the inner side of the tooth round the base of the inner main cusp; the posterior basal ledge less heavy, particularly postero-internally, and not



extending on the inner side of the tooth; inner main cusp not essentially different from that of  $p^4$  of a *Pteropus*, *i. e.* it has preserved its character of a longitudinal ridge, is not much shortened antero-posteriorly, and, as in *Pteropus*, it constitutes the inner wall of the tooth (is not pressed inward, on the crushing surface of the tooth). In *Pt. atrata*  $p^4$  is much more conspicuously shortened, being only one-twelfth longer than broad (actual measurements from four skulls, antero-posterior diameter of crown 4.8-5.2 mm., transverse diameter 4.7-4.8); the anterior basal ledge is broad and extends, as a well-marked ledge, on the inner side of the tooth round the base of the inner main cusp, which is consequently cut off from the inner side of the tooth and practically situated on the crushing surface; posterior basal ledge heavy, particularly postero-internally, in some individuals showing a very pronounced tendency to extend forward along the inner base of the tooth, nearly meeting and uniting with the inner prolongation of the anterior ledge; inner main cusp of tooth much more shortened antero-posteriorly, *i. e.* it has entirely lost its character of a longitudinal ridge and is transformed into a conical cusp.

$p^3$  and  $m^1$ .—Differential characters of  $m^1$  much the same as those described above, under  $p^4$ .  $p^3$  is in neither species so much specialized as  $p^4$ , the differential characters therefore correspondingly less conspicuous.

$p_3$ ,  $p_4$ , and  $m_1$ .—The bifurcation of the tip of the outer cusp of  $p_4$  and  $m_1$  (one of the most peculiar characters of the genus) is much less pronounced in *Pt. anceps*; it is well marked on the inner side (crushing surface) of the cusp, but in the profile of the outer side of  $p^4$  and  $m^1$  it shows only as a slight depression in the upper margin of the cusp, whereas in *Pt. atrata* it is a deep notch.  $p_3$ ,  $p_4$ , and  $m_1$  are conspicuously less shortened, being about one-half (in *Pt. atrata* only one-fourth) longer than broad. As in the upper teeth, the inner main cusp of  $p_4$  and  $m_1$  is more ridge-like, much less cusp-like (conical), than in *Pt. atrata*. The posterior basal ledge of  $p_4$  and  $m_1$ , which in *Pt. atrata* is much more developed on the postero-internal than on the postero-external corner of the teeth, thus rendering the posterior margin of the teeth strongly oblique (particularly in  $m_1$ ), is in *Pt. anceps* smaller and more equally developed postero-externally and postero-internally, rendering the hinder margin less oblique.

*Incisors and canines*.—Upper incisors and canines, outer lower incisors, and lower canines heavier than in *Pt. atrata*; upper incisors, combined breadth, 10.8 mm. (9.7-10 in four skulls of *Pt. atrata*); upper canines, vertical extent from

alveolus 10 (8.7-9.2), greatest antero-posterior diameter of crown 6.2 (5.2-5.7).

*Fur*.—Approximate length of hairs, back 20 mm. (12-14 in *Pt. atrata*), mantle 30 (18-20), belly 21 (13-15). Tibia and metatarsus densely clothed above; thinly scattered hairs on phalanges of toes; in *Pt. atrata* the fur extends backward on proximal three-fourths of tibia, leaving distal fourth of tibia, metatarsus, and phalanges naked save for some thinly spread hairs. Furred area of back broader than in *atrata*.

*Colour*.—Blackish tinged with seal-brown; middle of breast and belly light drab with short concealed seal-brown bases to the hairs. *Pt. atrata* is practically uniform blackish above and beneath, with no trace of drab on underparts.

*Size*.—Probably as *Pt. atrata*. The type and only specimen known is slightly immature (evidently very nearly full-grown; forearm 137 mm., in four adult *Pt. atrata* 139-143.5).

*Type*. ♀ imm. (skin and skull); Bougainville, April 1904; collected by A. S. Meek; B.M. 8. 11. 16. 7.

*Remarks*.—The discovery of this species is of particular interest, not only because it is a second form of the peculiarly aberrant genus *Pteralopex*, which was hitherto known from Guadalcanar only, but also, and chiefly, because it links that genus more intimately to *Pteropus*. *Pteralopex anceps* possesses all the essential dental characters of *Pt. atrata*, some of these quite as highly developed as the eastern species (enlargement of upper incisors and canines, outer lower incisors, and  $p_1$  secondary cusp of upper canines, &c.), others decidedly less developed (anterior and posterior basal ledges of molariform teeth, splitting of outer cusp of  $p_4$  and  $m_1$ ), but at the same time it has preserved more of the dental characters of an ordinary *Pteropus* (inner ridges of upper and lower molariform teeth, less excessive shortening of these teeth). So far as the two latter categories of characters are concerned, it shows one of the stages through which the still more highly specialized *Pt. atrata* must, in all probability, have passed. Externally, in the distribution, quality, and length of the fur, as well as in the colour of the whole of the upper side, it bears a striking resemblance to *Pteropus pselaphon* (see my paper on the affinities of *Pteralopex*, Ann. & Mag. Nat. Hist., Feb. 1909, pp. 218-222).

#### *Hipposiderus demissus*, sp. n.

*Diagnosis*.—A species of the *H. diadema* group, allied to *H. oceanitis* (Guadalcanar), but much smaller, and conspicuously paler beneath. *Hab.* San Christoval, E. Solomon Islands.

*Colour*.—Exposed colour of upperside dark brown, between vandyck-brown and seal-brown, this colour confined to tips of hairs; middle portion of individual hairs light ecru-drab or whitish ecru-drab; extreme base dark brown. A distinct but not very sharply defined cream-buffy or nearly whitish stripe on each side of back along membranes. General colour of underside drab tinged with hair-brown, and conspicuously lightened with greyish white on sides of breast and belly; concealed bases of hairs nearly everywhere dark brown.—The upperside is not essentially different in colour from (only a little paler than) that of *H. oceanitis*; the colour of the underparts is very much lighter.

*Measurements*.—Two adult skins and skulls of *H. demissus* (in parentheses, for comparison, measurements of two adult specimens and skulls of *H. oceanitis*):—Forearm 64·5 and 68·5 mm. (79 and 79), third metacarpal 50·5 and 50·5 (54·5 and 56·5), fourth metacarpal 48·5 and 48·5 (54 and 56), fifth metacarpal 46 and 46·5 (51 and 52·5), lower leg 25·5 and 28·5 (35 and 36). Zygomatic breadth of skull 15·2 and 15·5 (17·3 and 17·5), mandible, condylus to front of incisors 19 and 19·5 (21·5 and 21·7), maxillary tooth-row, c-m<sup>3</sup> 10·2 and 10·2 (11·3 and 11·8), lower tooth-row, exclusive of incisors 11·5 and 11·7 (12·9 and 13·1).

*Type*. ♂ ad. (skin and skull); Yanuta, San Christoval, 28th April, 1908; collected by A. S. Meek.

*Remarks*.—The Solomon Islands are now known to be inhabited by three perfectly distinct forms of the *H. diadema* type: the very large and long-legged *H. dinops*, apparently confined to the New Georgia group; the small *H. oceanitis*, from Guadalcanar, which in many respects, even in size, is similar to *H. pullatus* (New Guinea), but considerably different in colour; and the very small, pale-bellied *H. demissus*, confined to San Christoval. The latter species is at the same time the smallest and the extreme eastern representative of the *diadema* group.—A similar, or if anything still stronger, splitting of one type of bat into different species, each confined to one island or group of islands of the Solomon Archipelago, is shown by the *Pteropus rayneri* group: *Pt. cojnatus* in San Christoval, *Pt. rayneri* in Guadalcanar, *Pt. rubianus* in the New Georgia group, *Pt. lavellanus* in Vella Lavella, and *Pt. grandis* in the Bougainville group (a sixth species, *Pt. chrysoproctus*, is found in the Moluccas). The *Pteropus hypomelanus* group is represented in the Solomon Islands by two species, one western (*Pt. colonus*, Bougainville group) and one central (*Pt. solomonis*, New Georgia group). And as pointed out above, also *Pteralopex* is differentiated into

two perfectly distinct species, one western (*anceps*, Bougainville) and one eastern (*atrata*, Guadalcanar). The faunistic areas of the Solomon Archipelago indicated by the distribution of the five species of the *Pteropus rayneri* group are very nearly the same as those recognized by ornithologists (see W. Rothschild and E. Hartert, Nov. Zool. xii. pp. 243-244, 1905).

XXXIII.—*Description of a new Cichlid Fish of the Genus Heterogramma from the La Plata.* By C. TATE REGAN, M.A.

*Heterogramma pleurotænia.*

Depth of body  $2\frac{2}{5}$  in the length, length of head  $2\frac{5}{8}$ . Snout shorter than eye, the diameter of which is 3 in the length of head; interorbital width  $3\frac{3}{4}$  in the length of head. Depth of præorbital  $\frac{1}{3}$  the diameter of eye. Maxillary extending a little beyond the vertical from anterior edge of eye; jaws equal anteriorly; fold of the lower lip continuous; cheek with 4 series of scales; no distinct gill-rakers on the lower part of the anterior arch. Scales  $23\frac{2\frac{1}{2}}{8}$ ; upper lateral line well developed on 8 or 9 scales only; lower lateral line vestigial or absent. Dorsal XVI 6; spines subequal from the fourth, the last  $\frac{2}{5}$  the length of head. Anal IV 5. Pectoral nearly as long as the head. Caudal rounded. Caudal peduncle deeper than long. A dark lateral stripe from eye to base of caudal; a broad oblique blackish bar from eye to interoperculum; caudal fin with a few transverse bars or series of spots; outer edge of pelvic fin dusky.

A single specimen, 40 mm. in total length, from the La Plata, received from Herr J. Paul Arnold.

The different coloration, somewhat deeper body, lower spines, narrower interorbital region, &c. distinguish this species from the allied *H. corumbæ* and *H. trifasciatum*. A specimen of *H. corumbæ* in the British Museum has IV 5 anal rays, and it is probable that in the species here described the normal number is III 6-7.

XXXIV.—*On the Toxic Action of the Bite of the Boomslang or South-African Tree-Snake* (*Dispholidus typus*). By F. W. FITZ-SIMONS, F.Z.S., &c., Director, Port Elizabeth Museum, Cape Colony.

THIS is the snake which recent events have made famous all over the Cape Colony. Recently one bit an assistant in our Museum with nearly deadly effect; then another in our collection of living snakes deliberately swallowed another individual of its own species, almost as big as itself. These incidents have caused heated discussions everywhere, as, in the first place, the Boomslang has been regarded as a non-venomous snake, and, secondly, it has hitherto been believed that when snakes swallow each other it is of the nature of an accident—as, for instance, when two snakes seize and attempt to swallow a frog, rat, or some other form of prey, neither caring to let go, the bigger snake naturally engulphs the smaller. In the case of the Boomslang referred to, the act was deliberate in every sense of the word.

Some live frogs were introduced into the cage containing five of these tree-snakes, one of which managed, by superior agility, to capture and swallow several of the former, much to the annoyance of one of its fellows. The latter worked itself into a state of great excitement and attacked its companion viciously, seizing it in various parts of its body. Eventually it gripped the other firmly by the neck and gradually worked its head forwards until it reached the other's jaws, whereupon it began to deliberately swallow it with a succession of spasmodic gulps, accompanied by heaving, forward movements.

After a lapse of twenty minutes it had swallowed one half of the struggling, writhing victim. I then had it removed and photographed, and, during the process, so intent was it upon the work it had in hand that the swallowing process went merrily on, and the photograph shows it in the act of raising its jaw in order to take another mouthful. Being desirous of preserving these specimens as evidence of the occurrence, I removed a little tobacco-juice with a feather from a dirty pipe and passed the feather between the jaws of the Boomslang.

Almost instantly a curious vibratory thrill passed through the snake from head to tail, the muscles relaxed, and the snake lay a lifeless mass within two minutes of the introduction of the tobacco-juice, demonstrating the rapid prussic-acid-like action of this poison upon the vital functions.

This Boomslang was of the striped, black and yellowish-green variety, measuring 4 ft. 9 inches, whilst the victim was the brown variety 3 ft. 11 inches long.

The Boomslang is placed in the British Museum Catalogue of Snakes by G. A. Boulenger in the family Colubridæ, series Opisthoglypha, subfamily Dipsadomorphinæ. The definition of the Opisthoglypha is "a division of snakes with one or more of the posterior maxillary teeth grooved," most, if not all, being regarded as poisonous to a very slight degree, paralysing their prey before deglutition.

Now this is a very important point to bear in mind, viz., one of the Opisthoglypha has been classified in many text-books of science as a non-venomous snake, or one not dangerous to man, as it is my present intention to prove the very opposite.

Sir Andrew Smith in his 'Zoology of South Africa' remarks: "As this snake, in our opinion, is not provided with a poisonous fluid to instil into wounds which these fangs may inflict, they must consequently be intended for a purpose different to those which exist in poisonous reptiles. Their use seems to offer obstacles to the retrogression (retention) of living animals, such as birds &c., while they are only partly within the mouth; and from the circumstances of these fangs being directed backward and not admitting of being raised so as to form an angle with the edge of the jaw, they are well fitted to act as powerful holders when once they penetrate the skin and soft parts of the prey which their possessors may be in the act of swallowing. Without such fangs escapes would be common; with such they are rare."

He goes on further to say: "The natives of South Africa regard the Boomslang as poisonous, but in their opinion we cannot concur, as we have not been able to discover the existence of any glands manifestly organized for the secretion of poison. The fangs are enclosed in a soft pulpy sheath, the inner surface of which is commonly coated with a thin glairy secretion. This secretion may possibly have something acrid and irritating in its qualities, which may, when it enters a wound, occasion pain and even swelling, but nothing of greater importance."

Naturally I accepted this generally current belief, and in consequence I and my assistants freely handled these snakes, taking no precautions against being bitten, deeming such to be superfluous, until, "like a bolt from the blue," Mr. James Williams, an assistant, was bitten, and came within a hair's-breadth of losing his life.

During November 1907 we had occasion to transfer our

collection of live snakes to their new apartments, and Mr. Williams was carrying a large variegated Boomslang when it suddenly buried its teeth in the muscles of his bare forearm, just below the elbow-joint. It gripped with great power and held on firmly. We disengaged its jaws, and I suggested treating the wound, but he would not hear of such a thing, and believing, as I did at the time, that it was a non-poisonous snake I did not insist. The wound smarted a little and he went on working. Within an hour a throbbing headache had manifested itself, accompanied by oozing of blood from the mucous membranes of the mouth, followed by vomiting.

Meanwhile the wound was slowly oozing blood, and the muscles in the vicinity were somewhat swollen. He was then taken to Dr. Bruce, who declared him to be suffering unmistakably from the effects of virulent poison which was seriously affecting the blood and mucous membranes. During the night Williams's condition gradually and progressively became more alarming, and he was taken to the Provincial Hospital the following day in a state of utter collapse. He steadily grew worse, and blood oozed continuously from all the mucous surfaces, viz. the mouth, nose, stomach, bladder, and bowels. Then the blood began to ooze into the tissues and caused large blackish-purple swollen patches under the skin. One eye and its surrounding tissues, both forearms for two-thirds their length, a portion of the abdomen, hip, and thigh, were all charged with extravasated blood, presenting a dreadful sight.

The venom of *Dispholidus typus* evidently contains a poison which acts upon the endothelial cells lining the capillaries. This action is particularly characteristic of the poison of the Crotalinae and is most marked after poisoning by the South American vipers of the genus *Lachesis*.

Flexner has given the name "hæmorrhagins" to the constituents of poisons possessing this action and regards them as special cytolyins for endothelial cells.

Williams rapidly grew worse after the second day in hospital, severe abdominal pains setting in and inability to retain even water in the stomach. From this time he rapidly sank, and on the evening of the third day after being bitten I went to the hospital, accompanied by Mr. William Armstrong, J.P., who took what we believed to be his dying deposition, the doctor declaring him to be in an extremely critical condition, which might result in death before the morning. He lingered on in this state, bordering between life and death, till about the sixth day, when a slow

improvement began to manifest itself, and from this time onward his condition rapidly improved, and in three weeks he was discharged from the hospital still in a weak, debilitated state, and although he gradually regained strength, he had relapses of slight bleeding from the mucous membranes of the mouth, and one eye was occasionally affected: and even three months after the accident, slight discoloration in the tissues surrounding one of his eyes showed itself for a few days. Apart from this, he has otherwise entirely recovered his health and strength, thanks to the skilful treatment in the first instance by Dr. Bruce, followed by the effective treatment whilst in hospital under the care of Drs. Pottinger and Wallace.

Some years ago a local gentleman was bitten by a Boomslang snake and died a few days later, but the general belief was, and is, that he died of blood-poisoning consequent upon pricking and irritating the wound with some foreign substance. A well-known gentleman, who saw him shortly after being bitten, says:—"I questioned him as to whether he had experienced any effects from the bite, and he certainly gave me to understand that he had not, and attributed the whole trouble to the rash use of a needle, and making too deep a puncture with it. He told me that he felt quite well as far as his health was concerned, and I was surprised to hear a few days afterwards that his death was attributed to the bite of the Boomslang; I had always been under the impression it was a case of ordinary blood-poisoning."

I have made very careful enquiry into this case, and it seems the gentleman at first showed no very apparent signs of constitutional disturbance, but subsequently symptoms set in very similar to those exhibited by Williams, viz. oozing of blood from the gums and extravasation of blood into the tissues on various parts of the body, then death. This would seem to indicate that in this case there was a smaller dose of venom discharged into the wounds than was the case with Williams, which took a longer period to manifest its effects.

I closely cross-questioned Williams, and he admitted that within half an hour of being bitten he felt a curious, restless, dizzy, and languid feeling, but refused at the time to admit it, thinking it to be due to some other cause, believing so fully that the Boomslang was perfectly harmless. However, in Williams's case the symptoms were such as to leave no possibility of a doubt that he suffered directly and unmistakably from some deadly and extremely potent venom, and local medical opinion was unanimous on this latter point.



*The Experiments.*—It now became imperative to demonstrate whether the Boomslangs were really venomous or not, as this case of Williams would not by any means be accepted by scientific men as proof positive. Naturalists and others handle these snakes and make pets of them under the belief that they are non-venomous, and, moreover, in the public interest this question had to be decided for all time, especially so as the Boomslang is one of the commonest of South African snakes.

The following are the results of the experiments:—

A large brown Boomslang was held by the neck and induced to bite the bared thighs of three fowls in quick succession. The first fowl died in 13 minutes, the second in 15 minutes, the third in 3 hours and 4 minutes.

A variegated male Boomslang bit the bared thighs of two fowls within the space of one minute. The first fowl died in 9 minutes, the second in 45 minutes.

A fowl bitten slightly lived two days and died, the wound oozing blood, and the mucous membranes of mouth being inflamed and congested.

A variegated (greenish-yellow and black) Boomslang bit a fowl on the thigh. I killed the snake and injected some of its blood into the victim. No effect. The fowl died in 12 minutes.

A brown Boomslang bit a fowl on the thigh. I killed the snake and injected contents of its gall into the fowl, which died in 11 hours.

Another fowl was bitten and injected with the serum of the blood of the snake that bit it. No effect; died in 14 minutes.

A brown Boomslang bit a duck on the thigh. Progressive exhaustion; slight oozing of blood in mouth; rapid heart's action; paralysis; death in 17 minutes.

A second duck bitten by the same snake immediately after the first one. Same symptoms; died in 35 minutes.

A variegated Boomslang bit a duck on the neck. Within three minutes it fell on its back completely paralysed; lay still for another five minutes; struggled feebly when touched. Died in 19 minutes.

A variegated female Boomslang bit a large cock fowl on the comb. Blood oozed from the cock's nostrils one minute after being bitten. It began to mope, then suddenly sprang four feet up into the air and fell a dead mass, three minutes after being bitten.

These experiments were repeated over and over again with all varieties and both sexes of Boomslangs. In all cases

death occurred within 20 minutes of the first bite; the fowls and ducks which were subjected to the second bite from the same snake usually lived from 15 minutes to two hours; not a single fowl recovered.

The fowls and ducks seemed to suffer little or no pain beyond irritation at seat of puncture for a minute or two. Within two or three minutes they showed unmistakable signs of collapse, and with a spasmodic jerk or two would suddenly expire. In some cases complete prostration would supervene five or ten minutes before death.

A few higher animals of greater vital tenacity were also experimented with, and the characteristic slow oozing of blood from the fang-punctures was noticeable, as was the case with Williams. The animals in every case gradually grew worse, and after about 12 hours were chloroformed, it being evident they were slowly sinking under the potent effects of that subtle, death-dealing venom.

Some folks will regard these experiments as cruel, but they were conducted in order that human life might be saved, for in no other way could I have rapidly and conclusively demonstrated to the public that the Boomslang is not only venomous, but exceedingly so. I can go further, and claim that the venom of the Boomslang is equal in its death-dealing power to that of the dreaded Cobra (*Naja flava*) and Ringhals (*Sepeidon haemachates*), for I forced these snakes to bite several fowls by baring the thigh and holding the snake's head close up against the flesh, when in every instance it would deliver a full and complete bite.

In all cases I made the snake give a second bite to make absolutely sure a lethal dose had been injected. The fowls all died in from five to twenty minutes—the average being fifteen minutes. In every case fowls bitten twice on the bared thigh by puff-adders (*Bitis arietans*) survived from four up to twelve hours, some recovering completely. The majority bitten by night-adders (*Causus rhombeatus*) were very sick for a couple of days, then recovered, one or two dying after twelve hours.

It will be seen by the results of the above experiments that the bite of the Boomslang destroys the life of a fowl just as rapidly as that of the Cobra, and that the venom of the puff-adder is in comparison very slow in its action and not nearly so virulent.

The reasons why the Boomslang does not always inflict a venomous bite are two. The fangs are grooved and comparatively small, and if the bite is delivered through clothing

the venom is absorbed by the material and the fangs barely scratch the flesh. Secondly, the fangs are set halfway back in the upper jaw, and are three in number on each side, exactly under the eyes, and naturally unless the Boomslang's grip be full and complete these fangs do not penetrate the flesh. During my experiments I observed that the Boomslang in every case made as good a grip as possible on the animal, then almost instantly, with a heaving, forward movement and disengagement of the teeth of the upper jaw from the victim's flesh, it would take a fresh and more secure hold, the upper jaws in which the fangs are set being capable of being pushed downwards, exposing the fangs and forcing their points forward: the jaw then closes with a snap and the snake worries the flesh, with the evident intention of forcing the venom into the punctures, as well as enlarging them for the freer ingress of the poison.

Sir Andrew Smith, the great naturalist and author, says in his 'Zoology of South Africa': "As this snake, in our opinion, is not provided with a poisonous fluid to instil into the wounds which the fangs may inflict, they must consequently be intended for a purpose different to those which exist in poisonous reptiles. We have not been able to discover any glands manifestly organised for the secretion of poison."

I was by no means inclined to accept this as final, and carefully dissected the heads of several Boomslangs, and in every case I discovered a small gland on each side of the head, lying immediately behind and above the grooved fangs, and it could be clearly seen that it had a connection with the cavity at the root of the grooved fangs and that it was the gland which secreted the sticky fluid found in the sheath enveloping the fangs.

The next move was to ascertain if the organ was really a gland capable of secreting any fluid, whether venomous or not. Dr. Robinson, of the Veterinary Institute at Grahamstown, made a microscopical examination of its structure, and reports it is undoubtedly glandular and capable of secreting. Subsequent experiments by myself bear out this statement, and, moreover, under the microscope, a sticky, colourless fluid, identical with that found in the sheath, was observed in the structure of the glands and was pressed out upon the microscopical slide with the tip of a lancet. Small pieces of these glands were cut up and inserted under the skin of rabbits, and slight pressure applied for an instant. Within 15 minutes the rabbits were dead. One was stricken with

complete paralysis within five minutes of the insertion of the fragment of gland.

These experiments conclusively prove these glands to be capable of secreting a very virulent venom, and that they are the glands which produce the glairy sticky fluid within the sheaths enveloping the fangs. These poison-glands are comparatively small, less than a sixth the size of those of a puff-adder. That they secrete a venom, potent and virulent, seems now hardly to admit of a doubt. Sir Andrew Smith claims the fangs are simply used for the retention of the prey, such as birds, which would otherwise escape. This is partly, but not wholly so. When a Boomslang seizes a live bird it grips with great tenacity. The bird struggles frantically for a minute or two and is then overcome by the potent action of the venom injected through the snake's grooved fangs. It then leisurely proceeds to swallow the birds, feathers and all.

Boomslangs are very timid creatures and will not bite unless roughly handled, or an attempt be made to seize them, hence the reason so few people are bitten by them. I have handled these snakes freely in the past, and friends have done likewise without any attempt on the part of the snake to bite. Boomslangs are essentially tree-snakes, being quite at home in the foliage of the trees, through which they can travel with great rapidity. They vary in colour, some being a bright greenish yellow, banded with black; others are vivid grass-green, banded with black; whilst others, again, are dark uniform brown above, shading into paler on the abdomen, some specimens approaching the greyish tint. The coloration of the female is not quite so brilliant as that of the male. This is particularly noticeable in the greenish-yellow and black varieties.

Boomslangs frequently descend to the ground in search of food and may often be seen basking in the sun on the bare ground in the vicinity of some thicket, into which they rapidly glide if disturbed. In captivity they become very tame and will take food from the fingers. Those in the Port Elizabeth Museum readily eat dead food—such as birds, chameleons, lizards, and frogs—whether fresh or stale.

On several occasions female Boomslangs, both Variegated and Brown, have laid batches of eggs varying in number from a dozen to twenty-three, containing a yellowish fluid, with no sign of incubation having already begun.

XXXV.—*Preliminary Note on some Fishes from the Irish Atlantic Slope.* By E. W. L. HOLT and L. W. BYRNE.

THESE fishes were collected by Messrs. Farran and Kemp in the 'Helga' in August 1908.

*Scylliorhinus indicus*, Brauer.

A young example, S. R. 593, 6/8/08, 50° 31' N., 11° 31' W., 670-770 fathoms.

We are indebted to Mr. Regan for the determination. The species is otherwise known only from the Pacific.

*Rhinochimæra atlantica*, sp. n.

An adult male, measuring 850 mm. to the origin of the dorsal lobe of the caudal, and 1165 mm. in total length, including the caudal filament. S. R. 593.

*Diagnosis.*—Adult male with the snout (measured between verticals from its tip to the origin of the vomerine dental plates) as long as the distance between the dorsal insertions of the pectoral and ventral fins and somewhat longer than the base of the second dorsal fin. Second dorsal fin with base about half as long as the distance between the gill-openings and the origin of the ventral lobe of the caudal fin. Posterior ventral claspers terminating in subconical slightly volute clubs. Vomerine dental plates deeply notched on their cutting-edges.

The above characters, especially the relative shortness of the base of the second dorsal fin, serve to distinguish adult *R. atlantica* from adults of the very closely allied *R. pacifica* (Mitsukuri). Nothing is known of the young of either species. *Harriotta raleighana*, Goode and Bean, known only from immature specimens, is stated to exhibit a progressive development of tritoral elements on the dental plates. In the absence of any evidence of the condition of the plates in young and half-grown *Rhinochimæra*, in the adults of which there are no tritors, it is unsafe to argue that *Rhinochimæra* is the adult of *Harriotta*, which in respect of other characters seems possible enough.

Messrs. Farran and Kemp have collected five egg-purses (between 550 and 720 fathoms) which appear to be identical with those obtained on the American side of the Atlantic and tentatively assigned to *Harriotta*. They closely resemble but are much smaller than the egg-purse of *R. pacifica*, which is

evidently a much larger fish than its Atlantic congener. Precisely similar differences are exhibited by the purses of *Chimara monstrosa* and its larger Pacific representative *C. phantasma*, while the same comparison may be made between a pair of purses, 128 mm. long, which we refer to *C. mirabilis* and the purses of the Pacific *C. mitsukurii*.

*Nesiarchus nasutus*, Johnson.

A specimen, 730 mm. long, S. R. 593.

Previously known from the coasts of Madeira and Portugal.

*Hoplostethus atlanticus*, Collett.

Several, of which the largest are massive individuals measuring 610 mm., S. R. 592, 6/8/08, 50° 39' N., 11° 25' W., 400–510 fathoms, and S. R. 593.

We are indebted to Mr. Regan for the determination.

Previously known from the Azores and Cape of Good Hope.

*Serrivomer beani*, Gill and Ryder.

A mangled fish, from S. R. 593, seems to be referable to this species, which has a wide distribution at suitable depths in the North Atlantic.

XXXVI.—*New African Phlebotomic Diptera in the British Museum (Natural History)*.—Part VI. By ERNEST E. AUSTEN\*.

Chironomidæ.

CERATOPOGONINÆ.

Genus CULICOIDES, Latr.†

*Culicoides grahamii*, sp. n.

♀.—Length (13 specimens), inclusive of head, 1 mm. to just over 1 mm.; length of wing 1 mm.

\* For Parts I.–V. see Ann. & Mag. Nat. Hist. ser. 8, vol. i. pp. 209–228 and 401–428, and vol. ii. pp. 94–116, 274–301, and 352–356.

† Coloured figures of the three species of this genus described below will appear shortly in an official volume, entitled 'Illustrations of African Blood-sucking Flies,' with notes by the author.

Colour of body (in dried specimens) mouse-grey\* ; wings light sepia-coloured, with three large clear spots on costal margin (distal spot close to tip of wing, above end of upper branch of fourth longitudinal vein), and two less sharply defined pale spots on hind margin, one within fork of fifth longitudinal vein, the other in anal angle ; in middle of costal margin is a conspicuous clove-brown elongate blotch, covering distal third of first longitudinal and greater part of third longitudinal veins, while on basal third of costal margin is an elongate dark blotch of less intensity ; the two distal clear spots are separated by a moderately dark quadrate blotch ; head large, prominent, not bent down beneath anterior portion of thorax ; tibiæ with a conspicuous pale band at base.

Head: palpi sepia-coloured ; first joint of antennæ dark brown, flagellum sepia-coloured, clothed with pale hairs. Thorax: dorsum clothed with scattered yellowish hairs. Abdomen clothed with brownish hair. Wings: upper portion of distal extremity, above upper branch of fourth longitudinal vein, clothed with scattered and minute black hairs ; third longitudinal vein connected with first longitudinal by a cross-vein, fourth longitudinal vein bifurcating a little before middle of wing. Halteres straw-yellow, knobs large, elliptical. Legs sepia-coloured, clothed with pale yellowish hairs, tibiæ with a narrow cream-coloured band at base, hind tibiæ also with a similar band at tip.

Ashanti, Southern Nigeria, Congo Free State, Uganda: type and three other specimens from Obuasi, Ashanti, 17. xi. 1907, " caught on the arm of a European " (Dr. W. M. Graham) ; additional material from Forcados, S. Nigeria, May 1908 (G. C. Dudgeon), Cross River, S. Nigeria, 1906 (Dr. R. W. Gray), Binza, a small village near Leopoldville, Congo Free State, 13. xii. 1903 (the late Dr. J. E. Dutton and Drs. J. L. Todd and Cuthbert Christy), and Bwamba Country, Semliki Valley, S.-W. Uganda, 2700 ft., " in forest," 1905 (M. T. Dawe).

This tiny midge, which is evidently very widely distributed in Tropical Africa, would appear to be the African representative of the equally bloodthirsty *Culicoides varius*, Winn., of Europe ; the wing-markings of the two species are identical, but *C. grahamii* can at once be distinguished by its much smaller size, paler antennæ, and much more conspicuous pale bands on the tibiæ: British specimens of *C. varius* exhibit nothing more than faint indications of pale tibial bands.

\* For names and illustrations of colours, see Ridgway, 'A Nomenclature of Colors for Naturalists' (Boston: Little, Brown, and Company, 1886).

Notes supplied by collectors show that *C. grahamii* is a troublesome pest, its bites, like those of other midges, producing irritating wheals on the skin: fuller information will be given in the author's forthcoming work on 'African Blood-sucking Flies.'

*Culicoides brucei*, sp. n.

♀.—Length (3 specimens), exclusive of head, 1 to 1.6 mm.; length of wing 1.5 mm.

*Colour of body* (in dried specimens) mouse-grey or olive-brown, with more or less distinct dark brown longitudinal markings on dorsum of thorax; head small, in dried specimens bent downwards beneath anterior portion of thorax, so as to be invisible from above; wings yellowish, semitransparent, sparsely clothed with minute brownish hairs, and spotted and blotched with dark brown and mouse-grey, branches of fourth and fifth longitudinal veins also bordered more or less with mouse-grey.

*Head*: palpi dark brown; basal joints of antennæ dark brown. *Thorax*: dorsum in some specimens in front with a median dark brown mark, and a little further back a pair of dark brown admedian stripes extending somewhat beyond middle of dorsum; behind posterior ends of admedian stripes and a little nearer middle line a pair of somewhat curved dark brown flecks may sometimes be seen. *Abdomen* clothed with brownish hair. *Wings*: darkest and most conspicuous marks are two on and adjacent to costa; of these, one consists of a narrow, elongate, clove-brown mark reaching from costa to third longitudinal vein, and extending a little way on each side of cross-vein between first and third longitudinal veins; the second is a large, oblong, dark brown mark, with its inner margin somewhat concave and its outer margin more or less convex, situate midway between former mark and tip of wing and reaching from costa to upper branch of fourth longitudinal vein; tip of wing above upper branch of fourth longitudinal vein is occupied by a mouse-grey blotch; in distal fourth of wing are two mouse-grey quadrate blotches, of which one connects the mouse-grey borders of the two branches of the fourth longitudinal vein, while the other extends from lower branch of fourth to mouse-grey border of upper branch of fifth longitudinal vein; remaining markings consist of a sharply defined, mouse-grey, oval spot in centre of cell enclosed by branches of fifth longitudinal vein; a small, mouse-grey, quadrate blotch below cross-vein



connecting first and third longitudinal veins, and between third vein and upper branch of fourth; a large, pale mouse-grey, roughly quadrate blotch in proximal third of wing, extending from costa to fourth longitudinal vein (within limits of this blotch costa and other veins passing through it are darker); a similar but narrower blotch in centre of fifth longitudinal vein, with an ill-defined extension into anal angle, and a more or less well-defined, mouse-grey, oval spot on proximal side of lower branch of fifth longitudinal vein: fourth longitudinal vein bifurcating a little before middle of wing. *Halteres* sepia-coloured, proximal two-thirds of stalks cream-buff. *Legs* sepia-coloured, clothed with brownish hair; tibiae cream-buff at extreme base.

Uganda: type and four other specimens from the vicinity of the Mianga River, July 1903, "biters" (*Colonel Sir David Bruce, C.B., R.A.M.C., F.R.S.*).

The pattern and diffuse character of the wing-markings will serve to distinguish *Culicoides brucei* without difficulty from either the foregoing or following species.

*Culicoides milnei*, sp. n.

♀.—Length (3 specimens), exclusive of head, 1.5 to 1.6 mm.; length of wing 1.6 mm.

*Colour of body* (in dried specimens) dark brown, with a median grey patch on hinder portion of dorsum of thorax; head small, in dried specimens bent downwards as in foregoing species; wings, except basal sixth, which is cream-coloured and semihyaline, sepia-coloured, strongly iridescent, and marked with sharply defined small light spots; three cream-coloured transversely elongate spots on costa, separated from each other and from base of wing by quadrate sepia-coloured blotches, somewhat darker than remainder of wing; other light spots smaller, more rounded, and milky rather than cream-coloured.

*Head*: palpi dark brown; first joint of antennæ mummy-brown, flagellum isabella-coloured, clothed with yellowish hair, last five joints darker. *Thorax*: dorsum sparsely clothed with dark brown or brownish hair. *Abdomen* clothed with brownish hair. *Wings*: costal spots as follows:—1st, starting from costa above base of third longitudinal vein, crossing first and base of third longitudinal veins, surrounding anterior transverse vein, and extending to fourth longitudinal vein; 2nd on costa at point where third longitudinal vein enters it, extending downwards to about three-fourths of distance between costa and upper

branch of fourth longitudinal vein (greater part of this spot lies beyond third vein, but it also extends into space between tips of third and first longitudinal veins); 3rd spot on costa midway between second spot and tip of wing, its lower extremity somewhat closer to upper branch of fourth longitudinal vein than is lower extremity of second spot. Remaining spots as follows:—a group of four in distal fourth of wing, consisting of a pair of spots in middle of lower branch of fourth longitudinal vein (one spot above, the other below the branch, with which they are in contact), and a second pair (in which the spots are also on either side of the lower branch of the fourth longitudinal vein, but wider apart) between former pair and margin of wing; a rounded spot on hind margin, in cell enclosed by the branches of the fifth longitudinal vein, nearer upper branch than lower; two spots below fifth longitudinal vein, one close to vein some distance before it forks, the other on or near hind margin and a little further from base of wing; near anal angle may be a trace of a third and much smaller spot; lastly, there is a somewhat elongate spot, sometimes fairly large, extending from base of lower branch of fourth to that of upper branch of fifth longitudinal vein. Third longitudinal connected with first longitudinal vein by a cross-vein; *fourth longitudinal vein bifurcating in middle of wing*; distal portion of wing sparsely clothed with minute brownish hairs. *Halteres*: knobs large, sepia-coloured; stalks and tips of knobs cream buff. *Legs* sepia-coloured, tarsi, a narrow band at base of tibiae, and tips of hind tibiae cream-buff.

East Africa Protectorate: type and two other specimens from Nairobi, 5000 ft., 4. v. 1906 (*Dr. A. D. Milne*). According to the donor this species is prevalent at Nairobi in the rainy season, when it invades bedrooms at night. Writing on Aug. 21, 1906, Dr. Milne stated that these midges abound in the grass on the Athi Plains during the wet weather, and that, so far as he was aware, there was nothing to connect them with any disease of human beings or domestic animals.

Owing to the pattern of its wing-markings, *Culicoides milnei* cannot be confused with either of the foregoing species: as affording a further means of distinction, the position of the fork of the fourth longitudinal vein may also be noted.

XXXVII.—*New Genera and Species of Blood-sucking Muscidae from the Ethiopian and Oriental Regions, in the British Museum (Natural History).* By ERNEST E. AUSTEN.

STOMOXIDINÆ.

Genus LUPEROSIA, Rond.

*Lyperosia punctigera*, sp. n.

♀.—Length (2 specimens) 3·2 to 3·25 mm.; width of head 1·2 mm.; width of front at vertex 0·4 mm.; length of wing 3·5 mm.

*Thorax greyish, with lighter median longitudinal stripe and darker markings behind suture; abdomen olive-grey\**, dorsum with a sepia-coloured elongate median spot or tapering stripe on second and following segments, second and third segments in addition each with a pair of large and conspicuous, transversely oval, clove-brown spots; wings hyaline, iridescent; legs cream-buff or buff, hind tibiæ dusky, tips of hind femora especially on inner side, hind tarsi, and last three joints of front and middle tarsi dark brown.

Head light grey, front relatively broad, sides of front (parafrontals) very conspicuous, frontal stripe clove-brown, its sides nearly parallel, though slightly outwardly convex in middle, vertical, frontal, and orbital bristles dark brown; proboscis short, horizontal portion approximately equal in length to vertical diameter of head, mummy-brown, distal portion immediately before labella dark brown; palpi not or scarcely projecting beyond proboscis, not clavate, or at least sides of distal half parallel, buff, tips brown, clothed with short black bristles, coarser, longer, and especially conspicuous at tips; antennæ dark brown, upper distal angle of second joint cinnamon-rufous, arista brown, extreme base and a band before middle pale, upper side with about six hairs. *Thorax*: humeral calli and anterior end of median stripe of a lighter grey than remainder of dorsum; in front of transverse suture an ill-defined stripe of darker grey on each side of median stripe, continued behind suture as a tapering mummy-brown stripe, which terminates at a point midway between suture and front margin of scutellum;

\* For names and illustrations of colours, see Ridgway, 'A Nomenclature of Colors for Naturalists' (Boston: Little, Brown, & Company, 1886).

between termination of mummy-brown stripe and lateral margin on each side is an elongate fusiform mummy-brown spot; pleuræ light grey; scutellum of same colour as portion of dorsum in front of it; hairs and bristles on thorax black. *Abdomen*: elongate median spot on second and third segments shaped like a truncate isosceles triangle, with base resting on front margin of segment and apex not or scarcely reaching hind margin; median spot on fourth segment narrower, in shape of a slender, tapering, longitudinal stripe, on each side of which is a roughly quadrate patch of light mummy-brown dots, which may be more or less confluent; clove-brown transversely oval spots on second and third segments not in contact with front, hind, or lateral margins; hair on abdomen uniformly dark brown. *Wings*: veins brown; first posterior cell distinctly contracted at tip; posterior transverse vein strongly bent outwards.

Uganda: two specimens (co-types) from the Nile Province, June 1906 (*the late Dr. W. A. Densham*). The collector's field-note on this species is as follows:—"These flies were noticed in great numbers in one camp only near the Nile, and were very troublesome to my boys early one sunny morning; they clustered thickly on any small sore, and quickly filled themselves; though preferring to feed in this way, they seemed also to insert the proboscis into sound skin."

The conspicuous abdominal markings described above are an unusual feature in *Lyperosia*, and will enable the present species (of which a coloured figure will appear shortly in an official publication) to be distinguished without difficulty from any of its congeners hitherto described.

#### Genus *STYGEROMYIA*, Austen.

(Ann. & Mag. Nat. Hist. ser. 7, vol. xix., May 1907, p. 445.)

#### *Stygeromyia sanguinaria*, sp. n.

♂ ♀.—Length, ♂ (1 specimen) 7 mm., ♀ (1 specimen) 6.75 mm.; width of head, ♂ 2.6 mm., ♀ 2.4 mm.; width of front at vertex, ♂ 0.5 mm., ♀ 0.6 mm.; length of wing 7 mm.

*Grey, clothed with black hairs and bristles, ♀ somewhat darker than ♂; closely resembling Stygeromyia maculosa, Austen (loc. cit. p. 447), in general appearance and also in markings of dorsum of thorax, but distinguished by abdomen being without sharply defined mummy-brown spots, not in contact with hind margins of segments, and by proboscis, except*

tip, being orange-buff or ochraceous-buff, instead of dark chestnut-brown; dorsum of abdomen with a narrow, dark brown, median, longitudinal stripe, and more or less distinct dark blotches on hind borders of second and third segments. †

*Head*: face and front yellowish silvery in ♂, darker, shimmering yellowish in ♀; in both sexes jowls yellowish grey, occiput grey; frontal stripe walnut-brown, in ♂ very narrow, about half as broad again as orbits, its sides straight and parallel, in ♀ rather less than twice as broad as orbits, widening very slightly below, its sides straight; *proboscis* slightly deeper at base in ♂, labella shining clove-brown on outer side; *palpi* buff, agreeing with generic diagnosis, clothed on outer side with black bristles; *antennæ* similar to those of *S. maculosa*, first and second joints and base of third joint on inner side below cinnamon-rufous, remainder of third joint dark brown, greyish in certain lights, arista dark brown, with 12 hairs. *Thorax*: markings on dorsum dark brown to dark cinnamon-rufous, somewhat lighter than in *S. maculosa*, but precisely similar to those in that species in general arrangement, median stripe in ♂ only visible behind transverse suture, and not reaching inner dorso-central bristles, median stripe in ♀ apparently entire, extending from front to hind margin; scutellum yellowish at tip, and also in centre of disc in case of ♂, in which it is also slightly brownish in centre of base, when viewed at a low angle from behind (scutellum of type of ♀ damaged). *Abdomen*: median dorsal stripe commencing on first segment close to hind margin, broadest on second segment, becoming successively narrower on following segments, extremely slender (linear) on fourth segment in ♂, indistinctly interrupted on hind margins of second and third segments, and not reaching hind margin of fourth segment; hind margin of first segment somewhat infuscated, at least in ♀, dark brown blotches on hind borders of second and third segments not in contact with median stripe, but situated one on either side of middle line, between median stripe and lateral margin, much more distinct and larger in ♀, in which they are roughly triangular and extend forwards beyond middle of segment, in ♂ less deep, ill-defined and dying away in front on second segment, and on third segment forming an interrupted transverse band; *skin clothing venter* bright buff-yellow, small median oval scutes grey. *Wings*: in ♂, venation and opening of first posterior cell precisely as in *S. maculosa* ♂; in ♀, bend of fourth longitudinal vein somewhat more abrupt and opening of first posterior cell slightly wider. *Halteres* cream-buff. *Legs*: in ♂, coxæ grey, trochanters

ochraceous-buff, front femora and tibiæ buff (front tarsi and remainder of legs missing in type); in ♀, coxæ and trochanters as in ♂, femora ochraceous-buff, hind femora darkish grey on outer side on rather more than distal half, tibiæ buff, middle and hind pairs more or less greyish, all tarsi dark brown; hairs and bristles black.

Congo Free State and Nyasaland Protectorate: type of ♂ from Ruwe, West Lualaba, Katanga District, Congo Free State, March 1906 (*Dr. A. Yale Massey*); type of ♀ from Monkey Bay, Lake Nyasa, Nyasaland Protectorate, 21. iv. 1908 (*Captain Hallam Hardy, R.A.M.C.*). Writing on Aug. 9, 1907, with reference to the specimen taken by him, Dr. Yale Massey remarked:—"On going over my notes I find that this fly was taken within half a mile of my house at Ruwe, in open bush and on high ground. My attention was attracted by its biting me on the hand, causing pain similar to that produced by the bite of a Tsetse: this was the only specimen seen on that occasion. The fly was caught but a few hundred yards from the cattle kraal, but I have no evidence that it bites cattle. A few days later I saw two specimens, evidently of the same fly, but failed to catch either; they were very quick in their movements; I have not met with another specimen since."

As may possibly be remembered, in default of actual observations, the blood-sucking habit of *Stygeromyia maculosa*, Austen (the type of the genus, described from a specimen from Little Aden, Arabia), was inferred "from its evident affinities and from the shape of its proboscis" (*cf. Austen, Ann. & Mag. Nat. Hist. loc. cit. p. 448*). It is therefore gratifying to find that the inference in question receives collateral support from Dr. Yale Massey's personal experience in the case of the present species.

Genus HÆMATOBIA, Rob.-Desv.

*Hematobia sanguisugens*, sp. n.

♂.—Length (6 specimens) 5·5 to 6 mm.; width of head 1·75 to 2 mm.; width of front at vertex 0·25 mm.; length of wing 5 to 5·6 mm.

*Olivaceous-grey or brownish grey, with clove-brown markings: dorsum of thorax with two pairs of clove-brown longitudinal stripes (outer stripes broader and widely interrupted at transverse suture), and a less sharply defined median stripe; dorsum of abdomen with a clove-brown median longitudinal stripe, extending from front margin of second to beyond middle*

of fourth segment, narrowly interrupted before hind margins of second and third segments, a pair of transversely elongate dusky blotches on first segment, a pair of large clove-brown spots on second segment, and a pair of similar but smaller spots on third segment; wings slightly infuscated, light sepia-coloured; legs clove-brown, bases of tibiae ochraceous-buff.

*Head*: face and sides of front bright yellowish grey, occiput dark grey, frontal stripe clove-brown, hair and bristles black; *palpi* tawny, clothed on outer side with black bristles, tips strongly spatulate (as in *H. stimulans*, Mg.), extreme tips sometimes brown; *proboscis* clove-brown; *antennæ*, including arista and its hairs, clove-brown, under side of arista usually with four hairs. *Thorax* clothed exclusively with black hairs and bristles; dorsum lighter grey on front margin and humeral calli, admedian stripes extending from front margin to about half-way between transverse suture and præscutellar groove, portion of outer stripes behind transverse suture extending somewhat further back, median stripe usually extending from front to hind margin, but its anterior extremity sometimes indistinct. *Abdomen* clothed exclusively with black hairs, median longitudinal stripe on dorsum regularly diminishing in width from front to rear, dusky blotches on first segment clove-brown, but lighter in tint than spots on the two following segments, spots on second segment triangular in shape, near but not in contact with hind margin, spots on third segment rounder, sometimes quite small. *Wings*: veins for most part dark brown, first longitudinal vein either entirely bare or at most with one or two minute black bristles near base, third longitudinal vein with three or four very minute black bristles at base. *Squamæ*: anterior squama cream-coloured, shining and iridescent, posterior squama buff. *Halteres* buff. *Legs* clothed exclusively with black hair and bristles, femora and tibiae greyish beneath.

India: type and five other specimens from Kasauli, Punjab, 1907, "on cows" (*Lieut.-Colonel F. Wyville Thomson, I.M.S.*). The donor's field-note runs:—"Caught on cattle: the flies sucked the animals, and their abdomens became distended with blood. I have never noticed them biting man."

*Hæmatobia sanguisugens* ♂ resembles the ♂ of the European *H. stimulans*, Mg., very closely, but is distinguished by its usually somewhat smaller size (*average length* of 6 ♂ ♂ 5.75 mm.), by the median dark dorsal stripe on the abdomen being practically continuous throughout its extent instead of widely interrupted before reaching the hind margins of the

second and third segments, by the fourth abdominal segment in the ♂ being always without a pair of dorsal spots, and by the first longitudinal vein being either entirely bare or having at most one or two minute bristles, instead of a row of bristles conspicuous under a strong lens when viewed at a low angle from the direction of the hind margin of the wing.

*BDELLOLARYNX* \*, gen. nov.

*Small, stoutly built, thick-set flies, closely allied to Hæmatobia, Rob.-Desv., but distinguishable as follows:—No sexual colour-dimorphism (unless it be in wings); front, facial angles, and anterior margin of buccal cavity less prominent; jowls descending considerably behind, instead of nearly horizontal, but basi-occipital region much less protuberant; bristles below facial angles small and fine, instead of relatively coarse; in ♂, front wider, with upper inner margins of eyes more nearly parallel, less approximate in middle of front; arista feathered above with considerably longer hairs, and below with about six fairly long hairs; first and third longitudinal veins entirely bare, without bristles at base.*

*Head: palpi spatulate at tips; proboscis as in Hæmatobia, slightly tapering, proximal two-thirds somewhat thickened. Thoracic bristles:—Humeral, 2. Post-humeral, 1. Notopleural, 2. Præsutural, 1. Supra-alar, 1. Intra-alar, 1. Post-alar, 2. Dorso-central, 5 (2 in front of and 3 behind suture—may be difficult to distinguish, especially in ♀). Inner dorso-central, 1 (sometimes 2 in ♂). Scutellar, 4 (1 præbasal, 1 basal, 1 discal—situated close to lateral margin, 1 apical). Mesopleural, about 10 or 12. Sternopleural, 1:1.*

*Wings: shape of first posterior cell similar to that of same cell in wing of Hæmatobia, but bend of terminal portion of fourth longitudinal vein somewhat flatter and less abrupt.*

*Bdellolarynx* is distinguished from *Hæmatobosca*, Bezzi, by the palpi being much more spatulate at the tips, by the arista having a greater number of hairs below, and, in the wing, by the shape of the first posterior cell and the course of the terminal portion of the fourth longitudinal vein (in *Hæmatobosca* the latter details are the same as in *Stygeromyia*, Austen).

Typical species, *Bdellolarynx sanguinolentus*, sp. n.

*Bdellolarynx sanguinolentus*, sp. n.

♂ ♀.—Length, ♂ (3 specimens) 4·75 to 5 mm., ♀ (4

\* ὁ βδελλο-λάρυγξ, leech-throat, a name applied to a greedy parasite.



specimens) 3·5 to 4·25 mm.; width of head, ♂ 1·8 mm., ♀ 1·4 to 1·6 mm.; width of front at vertex, ♂ 0·25 mm., ♀ 0·5 to 0·75 mm.; length of proboscis 1·4 mm.; length of wing 4 to 4·8 mm.

*Mouse-grey or slate-grey, clothed with short black hair, bristles also black; palpi buff; dorsum of thorax with a pair of extremely narrow, widely separated, parallel, longitudinal, admedian, blackish stripes, a somewhat triangular blackish mark extending backwards from inner end of each humeral callus, and an elongate blackish streak in a line with latter mark behind transverse suture (two outer marks less distinct in ♀); dorsum of abdomen with a narrow, interrupted, longitudinal, median, clove-brown stripe, and, on second and third segments, paired transverse, roughly triangular, clove-brown blotches, the pair on second segment especially large; wings hyaline or tinged with tawny olive in ♂, hyaline in ♀; femora greyish clove-brown, extreme tips ochraceous-buff, one or more pairs sometimes more or less brownish except at base, tarsi dark brown.*

*Head:* frontal margins and sides of face light grey or yellowish grey; *frontal stripe* clove-brown, in ♂ narrow, somewhat attenuate in middle, where its width is approximately equal to that of frontal margin, in ♀ broad, at least twice or rather more than twice as broad as frontal margin, with its outer edges convex; *palpi* clothed on outer side with black bristles; *proboscis* burnt umber-coloured, dark brown at tip, projecting slightly beyond palpi; *antennae*, including arista and its hairs, clove-brown, arista with a lighter band. *Thorax:* admedian stripes not diverging posteriorly, sharply defined from front margin to a point about midway between transverse suture and præscutellar furrow, after which their continuations to præscutellar furrow are broader and less clearly marked; transverse suture blackish; thoracic markings not so conspicuous in ♀ as in ♂. *Abdomen:* anterior margin of second and following segments black and shining, broader towards sides, especially conspicuous in ♀; median stripe commencing on front margin of second and extending to or not quite reaching middle of fourth segment, widely interrupted before meeting hind margins of second and third segments; dorsum of first segment in ♀ sometimes with a pair of clove-brown blotches, much smaller than those on two succeeding segments; dorsum of fourth segment in some specimens with traces of a pair of small dark spots; venter yellowish grey, median scutes clove-brown. *Squamæ* and *halteres* cream-buff. *Legs:* in one female posterior femora are

entirely ochraceous-buff, except for a brownish blotch just before distal extremity.

India and Ceylon: type of ♂ from the environs of Calcutta, India, 8. ii. 1905 (*E. Brunetti*); type of ♀ and another ♀ from Mussoorie, United Provinces, India, September 1906 (*F. M. Howlett*); additional specimens from Allahabad, United Provinces, India, 6. x. 1905 (*F. M. Howlett*); Sylhet, Assam, India, 13. iv. 1905 (*Major Hall, J.M.S.*); and Henaratgoda and Haldumulla, Ceylon, 7. ii. & 14. vi. 1892 (*Lieut.-Colonel Yerbury*).

### Genus STOMOXYs, Geoffr.

#### *Stomoxys limbata*, sp. n.

♂.—Length (3 specimens) 4·8 to 5·5 mm.; width of head 1·6 to 2 mm.; width of front at vertex 0·4 mm.; length of wing 4·6 to 5·25 mm.

*Smoke-grey*: face and sides of front bright yellowish-silvery, front narrow; dorsum of thorax with usual clove-brown longitudinal stripes, admedian stripes narrow and wide apart; dorsum of abdomen with deep clove-brown or blackish transverse band on hind border of each of first three segments; wings with a brownish tinge; femora dark clove-brown, their extreme tips and base of hind tibiæ ochraceous-buff, front and middle tibiæ and tarsi mummy-brown, hind tarsi and hind tibiæ except base sepia-coloured.

*Head*: frontal stripe clove-brown, slightly constricted in middle; occiput dark grey, latero-posterior orbits grey; palpi buff; antennæ greyish brown, tip of second and extreme base of third joint ochraceous-rufous. *Thorax*: admedian stripes on dorsum extending from front margin to a point rather less than half-way between transverse suture and præscutellar groove, outer stripes much broader and conspicuously interrupted by transverse suture; mesopleural bristles fairly stout. *Abdomen*: dark band on dorsum of second segment occupying more than half the segment, bands on first and third segments narrower; second and third segments usually with a narrow median clove-brown stripe, which on third segment may be obsolete. *Squamæ* strongly tinged with brown. *Halteres* buff.

India: Calcutta, 16. vi. 1907; additional specimens from Port Canning, Lower Bengal, 21. vii. 1907 (*Dr. N. Annandale*), and Calcutta, 20. viii. 1907, are in the collection of the Indian Museum.

What appears to be the female of this species may be characterized as follows:—

♀.—Length (3 specimens) 5·5 mm.; width of head 1·8 to 2 mm.; width of front at vertex just over 0·5 mm.; length of wing 4·75 to 5·5 mm.

*Apart from usual sexual differences agreeing essentially with ♂, except that dark markings on dorsum of thorax and abdomen are paler (olive-brown instead of clove-brown or blackish), that the wings although brownish are less noticeably infuscated, that the squamæ are paler (whitish or yellowish white), and that the front and middle tibiæ are also brighter in hue.*

*Head*: face silvery, sides of front light smoke-grey, duller than in ♂; frontal stripe clove-brown, its sides somewhat convex below middle; *palpi* and *antennæ* as in ♂. *Abdomen*: median longitudinal stripe on dorsum broader and less sharply defined than in ♂. *Legs*: tarsi and hind tibiæ except base mummy-brown.

India and Ceylon: type from Sylhet, Assam, India, 11. ii. 1905 (*Major E. A. W. Hall, I.M.S.*); a second specimen from same locality and collector, 31. i. 1905, received for determination from Indian Museum, Calcutta; a third specimen, from Peradeniya, Ceylon, 22. v. 1892 (*Lt.-Col. Yerbury*).

*Stomoxys limbata* is closely allied to *St. nigra*, Macq., but is distinguished by the front in the ♂ being somewhat narrower, with the frontal stripe slightly constricted in the middle, instead of having its sides parallel, and in the ♀ by the front and middle tibiæ being mainly ochraceous instead of for the most part clove-brown or blackish.

*Stomoxys pusilla*, sp. n.

♂.—Length (2 specimens) 4·2 to 4·5 mm.; width of head 1·4 to 1·5 mm.; width of front at vertex 0·4 mm.; length of wing 4·25 to 4·5 mm.

*Dorsum of thorax* mouse-grey or yellowish grey, with usual clove-brown longitudinal stripes; *dorsum of abdomen* olive-grey, first segment, except a small ill-defined area in centre (not reaching hind margin), second segment, either entirely or with exception of extreme front margin, and a median longitudinal stripe and fairly deep posterior transverse band on third segment clove-brown; *sides of front and sides of face*, when viewed from above, light maize-yellow; *wings* brownish; *femora* clove-brown, *front and middle tibiæ and tarsi* and extreme tips of front and middle femora buff, *hind tibiæ and tarsi* light mummy-brown, base of tibiæ paler.

*Head*: occiput grey; front fairly narrow, frontal stripe clove-brown, constricted in middle, sides of front conspicuous; *palpi* buff; *antennæ* dark brown or mummy-brown, tip of second and extreme base of third joint ochraceous rufous. *Thorax*: admedian stripes on dorsum moderately wide apart, their width about half that of outer stripes at widest portion of latter; length of admedian stripes as in foregoing species; pleuræ mouse-grey, mesopleuræ dark brown, at any rate when viewed at certain angles. *Abdomen*: median longitudinal stripe on dorsum of third segment fairly broad. *Squamæ* and *halteres* as in foregoing species.

India: type and one other specimen from Allahabad, United Provinces, October 1905 (*F. M. Howlett*).

*Stomoxys pusilla* differs from *St. limbata* in its smaller size, in the yellower colour of the sides of the front and face, in the dorsum of the second abdominal segment being entirely clove-brown or practically so, instead of having a clove-brown posterior transverse band and median longitudinal stripe, and in the pale tibiæ and tarsi of the front and middle legs.

*Stomoxys pulla*, sp. n.

♂.—Length (2 specimens) 4.2 to 4.4 mm.; width of head 1.6 to 1.8 mm.; width of front at vertex 0.4 mm.; length of wing 4.2 to 4.6 mm.

*Very dark species*: when viewed from above body appearing almost uniformly clove-brown, extreme front margin of thorax mouse-grey, with commencement of usual clove-brown longitudinal stripes; when abdomen is viewed from behind, at a very low angle, terminal segment appears olive-grey, while second and third segments may appear more or less mouse-grey, with clove-brown transverse blotches, and perhaps a trace of a narrow median longitudinal stripe; front narrow, occupied for most part by frontal stripe, sides of front not noticeable except anteriorly; wings brownish; legs clove-brown, tibiæ ochraceous-buff at extreme base, first joint of front tarsus fringed on inside with a row of hairs of equal length, claws black.

*Head*: sides of front anteriorly yellowish, face silvery, upper portion of occiput clove-brown, basi-occipital region and latero-posterior orbits grey; frontal stripe clove-brown, slightly or scarcely constricted in middle; *palpi* buff; *antennæ* uniformly clove-brown. *Thorax*: pleuræ dark grey, mesopleuræ clove-brown above; lower portion of lateral margins of scutellum, in front of apex, grey. *Abdomen*:

blackish hair on dorsum of fourth segment long and fine. *Squamæ*: thoracal squama brown. *Halteres* buff.

India: type and one other specimen from Mussoorie, United Provinces, September 1906 (*F. M. Howlett*).

This is a very distinct species, which, while resembling the foregoing in size, is at once distinguishable by the dusky coloration of the body and legs, by the sides of the front being scarcely visible except anteriorly, and by the remarkable row of hairs on the inside of the first joint of the front tarsus. Owing to the latter character *St. pulla* ♂ presents some slight approximation to the ♂ of the African *St. omega*, Newst., in which, however, the row of hairs on the inside of the front tarsus extends to the end of the second joint, while the hairs themselves are much longer and conspicuously curled.

### MUSCINÆ.

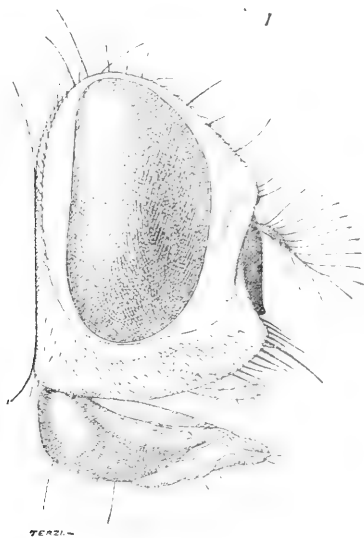
#### PHILEMATOMYIA\*, gen. nov.

*Greyish flies, not unlike Musca domestica, Linn., in general appearance, but distinguishable at once owing to the remarkable proboscis.*—Front in ♂ narrow, its width in centre being from one-eleventh to one-fifteenth of total width of head; width of front in ♀ at vertex one-third of total width of head; proximal portion of proboscis (*mentum*) a strongly swollen chitinous bulb, distal portion soft and fleshy, folded back under distal end of bulb when not in use, but when in use extended, its terminal section consisting of a "tubular extension," which is protruded from between the *labella*, and is surrounded at the distal extremity with a circlet of stout chitinous teeth; venation generally as in *Musca domestica*.

*Head*: *arista* feathered as in *Musca domestica*; *palpi* slender, cylindrical, slightly thickened at tips; *proboscis* when not in use can be entirely retracted within buccal cavity, so as to be invisible when head is viewed in profile, but, in dead specimens at any rate, more usually protrudes, projecting downwards at an angle of about 45°; the bulb is polished and bears scattered hairs. When the fleshy distal portion is reflexed beneath distal end of bulb, the extremity of the proboscis has a pointed appearance; the fleshy portion, like the bulb, bears fine hairs; when reflexed, the fleshy portion ends in the *labella*, which therefore come to lie between the pointed tip of the proboscis and the rounded base of the bulb, and, when the proboscis in this condition is

\* φιλαιμᾶτος, fond of blood, blood-thirsty; μύια, a fly.

seen in profile, look like a fleshy pad lying on the under side of the bulb just beyond the middle; when the proboscis is in use the fleshy portion is extended until it lies more or less in a line with the bulb, and the "*tubular extension*" (which, in a fly of normal size, is approximately 0.5 mm. in length) is protruded from between the inner surfaces of the labella, of which surfaces it forms a prolongation; the extension is supported internally by a pair of stout, black, chitinous rods, which are visible through the semitransparent wall, and have their proximal extremities situate between the tips of the



*Philematomyia insignis*, sp. n.

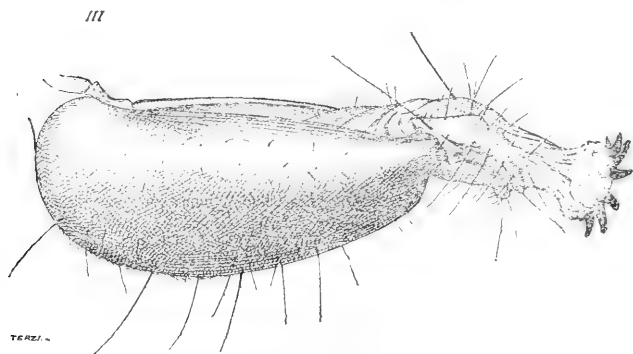
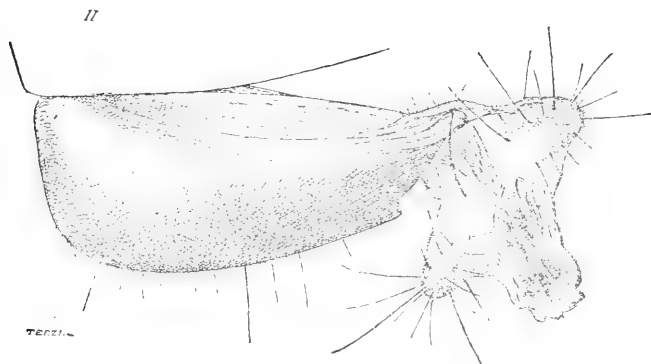
Fig. I.—Head of ♀ in profile, showing proboscis as it appears when not in use ( $\times 25$ ).

labella; the wall of the extension shows numerous parallel tracheæ; in dried specimens, at any rate, the distal extremity of the extension appears to consist of a thickened fleshy ring, armed with pale yellowish teeth in addition to the circle of stout, black, pointed, chitinous teeth, which are situate on its inner margin.

*Thoracic bristles*:—*Humeral*, 3 (in ♂ sometimes 4). *Post-humeral*, 1. *Notopleural*, 2. *Præsutural*, 1. *Supra-alar*, 2. *Intra-alar*, 1. *Post-alar*, 3. *Dorso-central*, 4 or 5 (the large and conspicuous bristles alone included—2 or 3 in

front of, 2 behind suture). *Inner dorso-central*, 1. *Scutellar*, 4 (1 præbasal, 1 basal, 1 discal, 1 apical). *Mesopleural*, normally 6 (space between uppermost two greater than that between any other two). *Sternopleural*, 1:2.

*Wings*: venation as in *Musca domestica*, Linn., except that the terminal portion of the fourth longitudinal vein, *after*



*Philæmatomyia insignis*, sp. n.

Fig. II.—Proboscis of ♀, with “tubular extension” not quite fully protruded (× about 70).

Fig. III.—Proboscis of ♂, with tubular extension fully protruded, showing circlet of stout, black, chitinous teeth (× about 70).

*the bend*, is straighter and less incurved, and that the posterior transverse vein is more sinuous; opening of first posterior cell as in *Musca domestica*.

Typical species, *Philæmatomyia insignis*, sp. n.

The genus *Philæmatomyia*, of which but a single very widely distributed species has yet been observed, consists of

blood-sucking flies, which form a remarkable connecting-link between the ordinary non-biting Muscinæ and the Stomoxydinæ. In the case of species belonging to the latter group the slender chitinized proboscis (labium) is thrust bodily into the skin of the animal or human being on which the fly is feeding, and so forms a piercing organ. In *Philæmatomyia*, however, there is no actual *piercing* organ, since the fleshy termination of the proboscis is obviously incapable of being thrust into the skin of a vertebrate, and the fly feeds by cutting through the epidermis of its victim by means of the powerful teeth at the end of the tubular extension, and then sucking up the blood in the ordinary way.

*Philæmatomyia insignis*, sp. n.

♂ ♀.—Length, ♂ (17 specimens) 3 to 5·8 mm., ♀ (25 specimens) 4 to 6·5 mm.; width of head, ♂ 1·3 to 2·2 mm., ♀ 1·4 to 2·25 mm.; width of front in centre, ♂ 0·08 to 0·2 mm., ♀ 0·6 to just over 1 mm.; length of wing, ♂ 3 to 5·5 mm., ♀ 3·2 to 5·6 mm.

*Smoke-grey to isabelline grey, or yellowish grey; dorsum of thorax with four dark longitudinal stripes, broader and clove-brown or blackish in ♂, narrower and dark grey or brownish in ♀, ♂ often with an additional, broad, median stripe, most distinct in front and behind; dorsum of abdomen with a transversely elongate dark blotch on first segment, not reaching hind margin, and a small clove-brown median triangle at base of second and third segments, in some specimens also with a similar but smaller and usually lighter mark at base of fourth segment; all hair and bristles on head, body, and legs black; palpi ochraceous-buff; wings hyaline or with a slight ochraceous tinge, veins in proximal half buff or ochraceous-buff; legs black, femora greyish pollinose.*

*Head:* posterior orbits, front, and face yellowish grey or silvery grey, occiput dark grey; *frontal stripe* clove-brown in ♂, greyish clove-brown in ♀, in ♂ extremely narrow, often reduced to a mere line above, but expanding somewhat below, in ♀ broader though still narrow, its sides nearly straight, and its width scarcely exceeding and often distinctly less than that of sides of front; upper inner margins of eyes converging slightly at vertex in ♀; *bulb of proboscis* shining clove-brown; *antennæ* dark brown, tip of second joint narrowly ferruginous, third joint greyish, arista and its hairs dark brown, tip of arista cinnamon-rufous. *Thorax:* outer dark stripes on dorsum not reaching front margin, narrowly interrupted on transverse suture, and behind scarcely ex-



tending to post-alar calli, admedian stripes extending from front margin to about one-third of distance from transverse suture to præsutural furrow, median stripe, when present, usually pointed anteriorly and not extending to front margin, but behind broad and reaching præsutural furrow; below outer dorsal stripe on each side, especially in ♂, there is often an additional dark longitudinal stripe; in ♂ specimens in certain lights a broad dark stripe can be seen running from hind margin of humeral callus, across upper portion of mesopleura, to mesopleural suture. *Abdomen*: venter grey, median scutes darker.

India, Ceylon, Sokotra, Cyprus, Senegal, and Congo Free State: types of ♂ and ♀ and four other specimens from India (*Bombay Natural History Society*); 2 ♀ ♀ from Calcutta, India, 23. vii. 1907, "on draught bullocks, burrowing into the hair" (*received from the Indian Museum, Calcutta*); 1 ♂, 1 ♀, from Mussoorie, United Provinces, India, Sept. 1906, and 1 ♀ from Allahabad, United Provinces, India, 11. x. 1905 (*F. M. Howlett*); 2 ♂ ♂, 5 ♀ ♀, from Bentota, Ceylon, 13. vi. 1891 (*Lt.-Col. Yerbury*); 1 ♂ from Dankotuwa, Ceylon, 1899 (*C. G. Rodrigo*); 2 ♂ ♂ from Hadibu Plain and Dahamis, Sokotra, 12 & 19. xii. 1898 (*W. R. O. Grant*); 3 ♂ ♂, 12 ♀ ♀, from Larnaca, Cyprus, 4. viii. 1908 (*Dr. G. A. Williamson*); 3 ♂ ♂, 1 ♀, from St. Louis, Senegal, W. Africa, 16. v. 1903, "feeding on doukeys on race-course" (*the late Dr. H. E. Dutton and Dr. J. L. Todd*); 1 ♂, 1 ♀ from the Congo Free State, 1903 (*Drs. Dutton, Todd, and Christy*). Writing from Larnaca, Cyprus, on October 23, 1908, with reference to this species, Dr. G. A. Williamson remarked:—"That this is a biting fly my ankles have on many occasions borne evidence, and I notice that horses can stand its bite very little, becoming much more restive than with the *Hippobosca* [*H. equina*, Linn.], which seems to cause them little inconvenience."

XXXVIII.—*On some new Steneosaurs from the Oxford Clay of Peterborough.* By C. W. ANDREWS, D.Sc., F.R.S. (British Museum, Natural History).

[Plates VIII. & IX.]

THE splendid collection of reptilian remains obtained by Mr. A. N. Leeds, F.G.S., from the Oxford Clay in the neighbourhood of Peterborough, includes the skeletons of

many marine crocodiles. The commonest of these are species of *Metriorhynchus*, but *Steneosaurus* and *Dacosaurus* are also represented. In the present paper it is proposed to give a brief account of the species of *Steneosaurus* included in the collection. One of these, *Steneosaurus edwardsi*, has already been described in detail by E. Deslongchamps\* from specimens from the Oxford Clay of Vaches Noires, Normandy. In addition to this, which need not be further noticed, there appear to be at least four other species, none of which seem to agree at all closely with previously described forms and they will therefore receive new names.

#### STENEOSAURUS.

This genus is here regarded as it was emended by Deslongchamps and afterwards adopted by Lydekker and others. Lydekker's definition given in the 'Catalogue of Fossil Reptiles in the British Museum,' pt. i. (1888), p. 168, is here followed, all the species described falling within it, with the possible exception of that named *S. obtusidens*, which may eventually have to be referred to a new genus.

#### *Steneosaurus leedsi*, sp. n. (Pl. VIII. fig. 1.)

Professor Bigot† has recently described a *Steneosaur* with a very long and slender snout from the Callovian of Calvados, and for it he has adopted the name *Steneosaurus roissyi*, a species originally established by E. Deslongchamps‡ on the evidence of some small fragments of a mandible from the Oxford Clay of Vaches Noires. Mr. Leeds has pointed out to me that there can be little doubt that the type specimens are portions of the jaw of a *Metriorhynchus*, so that the name is not that of *Steneosaur* at all. In the Leeds collection is a very fine skull and mandible (R. 3320), the latter closely resembling the one figured by Bigot; and these specimens I propose to make the types of a species *S. leedsi*, to which Bigot's specimen no doubt is likewise referable.

The chief peculiarities of this species are the great length and slenderness of the flattened snout. Thus the length of the skull (from the occipital condyle to the tip of the nose, allowing for 1 or 2 centimetres broken away) is 81 cm., while that of the pre-orbital region is 59.5 cm., or about  $73\frac{1}{2}$

\* Notes Paléontologiques, vol. i. (1863-69) p. 239, pl. xvii. figs. 1-3.

† "Notes sur les Reptiles Jurassiques de Normandie," Bull. Soc. géol. de Normandie, vol. xvii. (1896) p. 23, pl. ii. fig. 1.

‡ Notes Paléontologiques, vol. i. p. 252, pl. xvi. figs. 3, 4.

per cent. of the whole length. In the case of the mandible the total length is 89 cm.; that of the symphysial region is 52 cm., or about 58 per cent. In the mandible figured by Bigot the total length is 100 cm., the length of the symphysis is 55 cm. Both the proportions of the length of preorbital portion of the rostrum to the whole length of the skull and of the symphysis to the whole mandible are greater than in other species. In *S. megistorhynchus*, which seems to be the next most elongated form, the symphysial portion of the mandible is only 50 per cent. of the whole. Another characteristic of *S. leedsi* is the large number of teeth present, there being 45-46 on each side of the upper jaw and 43-44 in the lower.

In the skull the temporal fossæ are very large and are much longer than broad (length 12 cm., breadth 7.3 cm.). The orbits are rather large and are oval in outline; they look upwards and outwards, as in other members of the genus. The combined frontals terminate anteriorly in an acute angle, considerably in front of the anterior border of the orbit; their upper surface is ornamented by a few scattered pits only. The nasals extend back to about the anterior third of the orbit, but their limit in front cannot be determined with certainty. The anterior part of the snout was greatly flattened from above downward: the end, formed by the premaxillæ, is somewhat expanded. The facial processes of the premaxillæ are short and terminate in a blunt point opposite the interval between the second and third maxillary teeth. On the palate the maxillo-premaxillary suture is nearly straight and is at right angles to the long axis of the skull. The palatal surface is flat in the premaxillary region, but behind this it is concave from side to side, the alveolar border forming a somewhat sharply raised rim: the convex upper surface of the symphysial region of the mandible fits closely into the concavity of the palate. The upper teeth are 45-46 in number. The two posterior premaxillary teeth are enlarged and are separated by an interval nearly equal to the diameter of their alveoli. The maxillary teeth are nearly equal in size throughout the series; they are directed downwards and forwards. The individual teeth are slender and sharp; they are slightly compressed at the extreme tip and the enamel is marked by a series of fine longitudinal ridges. The symphysial portion of the mandible is slightly expanded anteriorly, especially between the enlarged third and fourth teeth; its upper surface in this region is nearly flat, but behind it

becomes convex from side to side, rising considerably above the alveolar borders. The ventral surface is gently convex from side to side. The splenials extend forward in the symphysis to the 24th tooth.

The dimensions of the type skull and mandibles (R. 3320) of *Steneosaurus leedsi* are:—

<i>Skull.</i>	cm.
Total length .....	81
Length in front of orbit .....	59
Width between outer angles of the quadrates ....	18
Length of temporal fossæ (inner side).....	12
Width .....	7·3
" of frontals between orbits .....	3·9
" opposite anterior border of orbit .....	10·5
" of middle of snout .....	4·3
" behind premaxillary expansion .....	2·9
" of premaxillary expansion .....	3·8
 <i>Mandible.</i>	
Total length.....	89
Length of symphyseal portion .....	52
Width at hinder end of symphysis .....	7·3
" at narrowest point behind anterior expansion	2·2

*Steneosaurus nasutus*, sp. n. (Pl. IX. fig. 1.)

The type specimen upon which this species is founded is a nearly complete but somewhat crushed skull and mandible. In some respects the skull shows an approximation to the Teleosaur type, particularly in the relative shortness of the temporal fossæ in proportion to their width, and the position of the orbits, which appear to have looked more directly forward than in the other species of the genus. The frontals between the orbits are much sculptured with a number of pits and strong rugosities; the form of their anterior end cannot be determined. The upper surface of the triangular area of the parietals at the hinder end of the sagittal crest bears sculpture like the frontals. The rostrum is very long; in front of the orbit the narrowing of the skull is rapid for a short distance, then the sides of the slender rostrum become nearly parallel, as it narrows very slightly till just behind the premaxillary expansion, which seems to have been of considerable width. The two posterior teeth in the premaxilla are enlarged and closely set together. The maxillary teeth are nearly equal in size throughout the series: they seem to have been directed forwards and downwards; their crowns are comparatively

slender, sharp-pointed, and the enamel is marked by a series of very fine longitudinal ridges with a rather stronger and more continuous ridge on the outer side.

The mandible is slender and compressed vertically. The palatal surface appears to have been somewhat convex. The ventral surface is marked by an ornamentation of irregular longitudinal ridges. There is a slight anterior expansion and the third and fourth teeth are enlarged; there are 42 teeth on either side and their structure is similar to that of the upper teeth. The splenial extends into the symphysis as far as the twenty-second tooth. The posterior (ventral) limit of the symphysis is opposite the thirty-seventh tooth.

This species approaches *S. leedsi* in the length of its snout, the preorbital portion of which is about 73 per cent. of the whole length of the skull in both species; in the next species, *S. durobrivensis*, it is only about 61 per cent. In the number of teeth it also resembles *S. leedsi* and differs from *S. durobrivensis*, in which the number is smaller. On the other hand, it is sharply distinguished from *S. leedsi* by the shorter temporal fossæ, the position of the orbits and the strong sculpturing of the frontal bones; and the first two of these characters at least separate it from *S. intermedius*, *S. edwardsi*, and *S. heberti*, from all of which it differs further in the possession of a greater number of teeth.

The dimensions of the type skull and mandible of *Steneosaurus nasutus* are:—

<i>Skull.</i>	cm.
Total length .....	100
Length in front of orbits .....	73
Width between outer angles of the quadrates ...	25
Length of temporal fossæ (inner side) .....	14
Width .....	10.5
" of frontals between the orbits .....	6
" at anterior border of orbit .....	16.5
" of middle of snout .....	6.3
" behind premaxillary expansion .....	4.2
" of premaxillary expansion .....	7.3
 <i>Mandible.</i>	
Total length .....	110
Length of symphyseal portion .....	62
Width at hinder end of symphysis .....	11.6
" immediately behind anterior expansion ..	4.2

Owing to the crushing that the specimens have undergone, many of the above measurements can be regarded as approximate only.

*Steneosaurus durobrivensis*, sp. n. (Pl. VIII. fig. 2.)

A third species of *Steneosaurus* which occurs in the Leeds Collection has a considerably shorter rostrum than those just described, but at the same time it is longer than in *S. edwardsi*, which is found in the same beds. It differs from the contemporary *S. heberti* in possessing only 33 teeth in the upper jaw instead of 39-40 as in that species, and the mandibular symphysis is relatively longer. The points of difference from *S. intermedius* are the same.

The type specimen (Leeds Coll. 18) upon which it is proposed to found this species is a beautifully preserved and nearly complete skeleton, including:—skull, mandible; 9 cervical, 14 dorsal, 2 sacral, and 39 caudal vertebræ; many ribs of both cervical and dorsal regions, several chevrons; shoulder-girdle, humeri, (?) radius and ulna; pelvic girdle and most of the bones of the hind limb; many scutes from all regions of the body. In the present paper only the skull and mandible will be briefly described, the complete account being left for the 'Descriptive Catalogue of the Marine Reptiles of the Oxford Clay' now in preparation.

In the skull the temporal fossæ are very large and about twice as long as wide. They are separated by a high and very thin sagittal crest. The orbits are relatively rather smaller than in *S. leedsi* and are more widely separated. The frontals are almost smooth; their anterior angle is a little in front of the orbit; the form of their anterior border will be best understood from the figure (Pl. VIII. fig. 2), and differs widely from that of the frontals in *S. leedsi* and *S. heberti*, but approaches that figured by Bigot in *S. intermedius*. The nasals terminate anteriorly opposite the 16th maxillary tooth, counting from before backwards. In front of the orbit the rostrum narrows rather quickly at first, then very gradually to the premaxillary region, which is only a little expanded. The suture between the premaxilla and maxilla is convex posteriorly on the upper surface, the facial processes of the premaxilla extending back to the level of the second maxillary tooth. On the palate the suture between the two bones runs forward after crossing the alveolar border, and an anterior prolongation of the maxillæ is thus interposed between the small palatal plates of the premaxillæ. The median suture between these latter is interrupted by a foramen situated at the level of the socket of the third tooth.

The upper teeth are about thirty-four in number. The premaxillæ bear four each, of which the first two are small, crowded together, and directed forward; the third and fourth are large and their alveoli separated by four or five millimetres only. Behind these there is a short, concave, edentulous space; then follows the series of 29-30 maxillary teeth, which are relatively large, and are separated by intervals less than the diameter of their alveoli. The teeth are directed downward and a little forward.

The rami of the mandible are stout; they pass into the symphyseal region by a gentle curve. The symphysis reaches back to the 25th tooth and the splenials extend forward in it to the level of the 17th tooth. Both the upper and ventral surfaces of the symphysis are nearly flat; there is a slight expansion between the enlarged third and fourth teeth; at the anterior end the line of junction of the two rami is marked by a deep median notch.

The first two lower teeth were small and directed nearly straight forward; the third and fourth are the largest in the jaw and are closely crowded together. Behind these there is a short diastema; then comes a series of about 27 teeth, a few of those in the front and close to the back being somewhat smaller than the others. They appear to have been directed upward and a little forward.

No good specimen of the teeth, either upper or lower, has been seen, all having either fallen from their sockets or been broken off short. Judging from some of the replacing germs, the crown would appear to have been blunter than those of the species described above, but much less so than is the case in the next species.

The dimensions of the skull and mandible in the type specimen of *Steneosaurus durobrivensis* are:—

<i>Skull.</i>	cm.
Total length .....	74
Length in front of orbit .....	45
Width between outer angles of quadrate .....	24*
Length of temporal fossæ (inner side) .....	18
Width .....	8·8
" of frontals between orbits .....	5·4
" of middle of snout .....	6·4
" behind premaxillary expansion .....	4·8
" of premaxillary expansion .....	5·7

---

\* Wider than in life, owing to the crushing outwards of the quadrate.

*Mandible.*

Total length .....	85
Length of symphyseal region .....	37·5
Width at hinder end of symphysis .....	10·2
„ at narrowest point behind anterior expansion.	3·8

*Steneosaurus obtusidens*, sp. n. (Pl. IX. fig. 2.)

One of the most important of the skeletons collected by Mr. Leeds is that of a very large and massively built crocodile, of which we possess the skull, mandible, numerous vertebrae and ribs, some bones of both the pectoral and pelvic girdles and of the fore and hind limbs, together with some scutes. These specimens (R. 3168) are the types of the present species.

The skull differs from that of the other *Steneosaurs* in having a thicker and more massive rostrum and teeth with thick blunt-pointed crowns. As in the last species, the temporal fossae are very large and about twice as long as broad. The orbits are large and oval. The frontals seem to have terminated anteriorly in a blunt point about on a level with the front border of the orbit; their surface is ornamented by a number of obscure ridges radiating from the centre of the united bones. The arrangement of the nasals and lacrymals cannot be made out, owing to the crushing that that region has undergone. There was a small slit-like antorbital foramen, about 7 cm. in front of the orbit. In front of the orbits the rostrum narrows very gently to a point about 16 cm. behind its anterior end, where it is only 6·2 cm. wide; the premaxillary region is expanded and the facial processes of the premaxillae terminate posteriorly in a blunt point. The nasal opening is transversely oval, the anterior border being interrupted by a prominence occurring at the point of union of the two bones. The rostrum, as a whole, is stout and its upper surface is strongly arched from side to side; the anterior end seems to have been bent a little upwards. The total number of teeth in the upper jaw cannot be made out, but it can be seen that in the premaxilla there were four, of which the two anterior are small and crowded together, so that the second is almost behind the first. The third and fourth are much enlarged.

In this skull the length of the preorbital region is about 61 per cent. of the whole; in *S. leedsi* and *S. nasutus* the proportion is about 73 per cent.; but in *S. durobrivensis* it is much the same as in the present species, which, however, differs in the more gradual narrowing of the rostrum.



The mandible is very massively constructed. The symphyseal region, which occupies about 42 per cent. of the total length, is flattened ventrally and has a considerable anterior expansion, which is greatest at the sockets of the third and fourth teeth.

The lower teeth are about 28 in number. The first two are small, then follow two large teeth closely crowded together. Behind these is a rather small tooth, and behind this point the rest increase in size till near the hinder end of the series. The most remarkable character of this dentition is that about half the mandibular teeth bite into deep pit-like sockets in the maxilla; the outer walls of these pits form slight prominences on the alveolar edges of the maxillæ. If this peculiarity of the dentition is normal it would probably justify the establishment of a new genus for the reception of this species, but there is some doubt whether it may not be the result of great pressure, which has driven the points of the lower teeth into the maxilla, while the bone was in the clay in a semi-plastic condition.

The individual teeth are thick, circular in section, and have blunt points; the enamel of the crown is raised into a number of fine longitudinal ridges of varying length; in some of the teeth two or three ridges on opposite sides are more strongly marked than the others and are continuous from base to tip of the crown.

This crocodile seems to have been a very powerfully built animal, with jaws and teeth of greater strength than in the other *Steneosaurs*. The hind limb was very long, the femur alone measuring 45 cm. in length. A detailed account of the skull and skeleton will be given in the Catalogue above referred to.

The approximate measurements of the type skull and mandible (R. 3168) of *Steneosaurus obtusidens* are:—

<i>Skull.</i>	cm.
Total length .....	116
Preorbital length .....	71
Width between outer angles of quadrates .....	37·5
Length of temporal fossæ (inner side) .....	33
Width .....	(?) 14
" of frontals between orbits .....	8·5
" of middle of snout .....	9
" at narrowest point behind premaxillary expansion .....	7·3
" of premaxillary expansion .....	9·5

*Mandible.*

Total length .....	137
Length of symphyseal region .....	58
Width at hinder end of symphysis .....	14
„ at narrowest point behind anterior expansion	6.2

## EXPLANATION OF THE PLATES.

## PLATE VIII.

- Fig. 1. Steneosaurus leedsi*, sp. n. Semi-diagrammatic figure of the upper surface of the type skull (R. 3320).  $\frac{1}{8}$  nat. size.
- Fig. 2. Steneosaurus durobriensis*, sp. n. Semi-diagrammatic figure of the upper surface of the type skull (Leeds Coll. 18).  $\frac{1}{3}$  nat. size.

## PLATE IX.

- Fig. 1. Steneosaurus nasutus*, sp. n. Upper surface of type skull (R. 3577).  $\frac{1}{7}$  nat. size.
- Fig. 2. Steneosaurus obtusidens*, sp. n. Semi-diagrammatic figure of the upper surface of the type skull (R. 3168).  $\frac{1}{7}$  nat. size.

XXXIX.—*The Genus Encrinus.* By AUSTIN HOBART CLARK, of the United States Bureau of Fisheries.

MR. F. A. BATHER in 1898 ('Natural Science,' xii. p. 245) attempted to unravel the snarl in which the generic names of the recent (and fossil) Pentacrinitidæ have become enmeshed, thanks to the nomenclatorial carelessness of certain of the writers on the subject of the Crinoidea. Passing over the fact that *Balanocrinus* is not available for any genus of Pentacrinitidæ, that *Metacrinus* was first diagnosed in 1882 (Bull. Mus. Comp. Zool. x. p. 167), and that *Isocrinus* was first proposed in 1836 (L. Agassiz, Mém. de Soc. de Sci. Nat. de Neuchâtel, i. p. 195, type *Isocrinites pendulus*, de (sic) Meyer, 1835, nomen nudum, = *Isocrinus pendulus*, von Meyer, 1837), we come to a consideration of the genus *Encrinus*. Mr. Bather ascribes *Encrinus* to Schulze, 1760; but Schulze was not binomial, as a glance at his work suffices to show; moreover, if he were, why does not Mr. Bather use his genera *Decacnimos*, *Polyactinis*, and *Triscædecacnimos* instead of the later *Antedon* and *Actinometra*?

*Encrinus* was first proposed binomially by Blumenbach in 1779 ('Handbuch der Naturgeschichte,' Göttingen, p. 435), and contained three species, all recent—(1) *asteria* (*Isis asteria*, Linnæus, 1766, based on Guettard), (2) *mylii* (a pennatulid of the genus *Umbellularia*), and (3) *boltenii* (an ascidian of the genus *Boltenia*).

In 1788 Blumenbach ('Handbuch der Naturgeschichte,' Göttingen, p. 503) again gives *Encrinus*, with the three species, (1) *asteria* (as before), (2) *radiatus* (= *Vorticella encrinus*, Linnæus), and (3) *ouifer* (= *Vorticella "ouifer,"* Linnæus). Thus the genus *Encrinus*, as understood by Blumenbach in 1779 and 1788, contained the same three species, though two of them were included under different names.

Lamarck in 1801 ('Syst. des Animaux sans vertèbres,' p. 379) appears to have been the first reviser of the genus. He included in it two species, (1) *caput-medusæ* (= *Isis asteria*, Linnæus, = *Encrinus asteria*, Blumenbach) and (2) the fossil *Encrinus liliiformis*. The latter is excluded from all claims as the type of *Encrinus* by the fact that it did not appear in the genus as originally proposed by Blumenbach. Furthermore, Lamarck removed from all consideration the second species, *mylii* or *radiatus*, by establishing for it the new genus *Umbellularia* (p. 580). According to the views of Lamarck, *asteria* was the only species of the original *Encrinus* which could be retained in that genus, as restricted by him.

In 1804 Blumenbach ('Abbildungen naturhistorische Gegenstände,' p. 60, pl. lx.) gives the name *Encrinites fossilis* to Lamarck's second species, *E. liliiformis*, and also (p. 70, pl. lxx.) gives the name *Pentacrinites fossilis* to the species subsequently called *Pentacrinus briareus* by J. S. Miller. Neither of these names can have any influence on the selection of the type of *Encrinus*, as neither species was included in the original genus.

In 1816 Lamarck repeats his original disposition of the genus *Encrinus*, and in the same year Savigny ('Mém. sur les Animaux sans vertèbres,' 2<sup>e</sup> partie, p. 140) finally removes the third species of Blumenbach's original genus, *boltenii* or *ouifer*, making it the type of his new genus *Boltenia*. This makes it clear that *asteria* alone remains as the type of *Encrinus*; summarized, the elimination is as follows:—

## ENCRINUS, Blumenbach, 1779.

- (1) *asteria*.
- (2) *mylii* (or *radiatus*) (type of *Umbellularia*, Lamarck, 1801).
- (3) *boltenii* (or *ouifer*) (type of *Boltenia*, Savigny, 1816).

It may, perhaps, be mentioned that Oken's use of *Encrinus* ('Lehrbuch der Naturgeschichte,' 1815, iii. p. 110) for Blumenbach's second species only does not enter into the question at all, for that species had, fourteen years before, become the type of Lamarck's *Umbellularia*.

Since the type of *Encrinus* is the *Isis asteria* of Linnæus, this involves considerable change in the nomenclature of the recent stalked Crinoids. The species of *Metacrinus*, *Eudoxocrinus*, and *Hypalocrinus* remain as previously understood (see Proc. Biol. Soc. Washington, xxi. pp. 151, 152); the other species of the recent Pentacrinitidæ, *asteria*, *decorus*, and *blakei*, falling into two groups which cannot be separated more than subgenerically, must be treated as follows:—

## Genus ENCRINUS, Blumenbach, 1779.

(Genotype.—*Isis asteria*, Linnæus, 1766.)

## Subgenus ENCRINUS, Blumenbach.

*Encrinus* (*Encrinus*) *asteria* (Linnæus).

## Subgenus ISOCRINUS, L. Agassiz, 1836.

(Genotype.—*Isocrinus pendulus*, von Meyer, 1837.)

*Encrinus* (*Isocrinus*) *blakei* (P. H. Carpenter).

*Encrinus* (*Isocrinus*) *decorus* (Wyville Thomson).

XL.—Note on a rare Plumularian Hydroid, *Cladocarpus formosus*. By JAMES RITCHIE, M.A., B.Sc., Natural History Department, the Royal Scottish Museum.

IN 1874 Allman described, under the name *Cladocarpus formosus*, several hydroid specimens obtained by the

'Porcupine' in the deep water to the south of the Faroe Islands\*. Four colonies of this rare and beautiful species occur amongst material collected by Dr. A. Bowman, of the North Sea International Investigations, during the autumn of 1908, and handed to me for examination through the kindness of Prof. D'Arcy W. Thompson, C.B. They were dredged in the Faroe Channel (Station 19a, lat. 60° 36' N., long. 4° 46' W.) at a depth of 1030 metres, in the immediate neighbourhood of the places from which the type specimens were obtained.

The colonies vary in height from 4 to 7.5 cm., and in general agree with Allman's description, but as regards their minute structure these additions and corrections have to be made. The colonies are fascicled for the greater part of their length, but only the anterior tube is divided into internodes, upon each of which a single hydroclade is borne. Allman's figure (pl. lxxviii. fig. 1 A) errs in indicating that the hydroclades arise from different components of the fascicle. The hydroclades are alternate and rest on short processes from the stem. The hydrothecæ are deep and cylindrical, with a straight profile, an aperture lying at right angles to the long axis of the stem and in line with a hydrocladial node, and a margin bearing an anterior prominent tooth accompanied by a smaller tooth on each side. About five indefinite sinuations also occur on each lateral margin.

Within the hydrocladial internode are several well-defined ridges, five generally springing from behind the hydrotheca, and a number, varying from two to four, from its base. One or two shorter ridges project into the proximal portion of the internode from its anterior wall. A prominent septum, perforated by a minute opening, traverses the mesial nematophore near the point where it becomes free, and from about the same level a strong anterior intrathecal ridge extends horizontally backwards almost to the posterior wall of the hydrotheca. But there is no definite relationship between the position of the intrathecal ridge and that of the nematophore septum, the former being sometimes at exactly the same level as the latter, sometimes above it or below it. The mesial nematophore reaches halfway up the hydrotheca and is free for about half its length, except on the proximal internode of each hydroclade,

\* Allman, J. G., 1874, "Report on the Hydroids collected during the Expeditions of H.M.S. 'Porcupine,'" *Trans. Zool. Soc. London*, vol. viii. p. 478.

where it is much shorter and lies altogether free from the hydrotheca. Neither it nor the supracalycine nematophores are completely tubular; their margins are serrate. Each stem-internode bears three nematophores: one posterior, in the angle between internode-process and stem; the others anterior, one beside the stem-process, the other proximal to it. The supporting tubes of the fascicle bear somewhat smaller nematophores, arranged on each tube in opposite pairs at regular intervals.

Fig. 1.

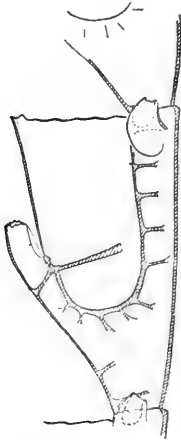
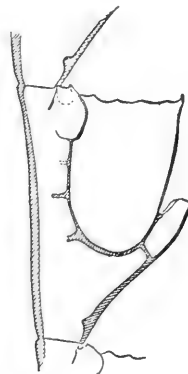


Fig. 2.

Fig. 1.—Hydrotheca of *Cladocarpus formosus*.  $\times 45$ .Fig. 2.—Hydrotheca of *Cladocarpus crenatus*, var. *allmani*.  $\times 45$ .

Viewed from the anterior the gonangia are obovate, but in lateral aspect the posterior wall is seen to be arched over the termino-lateral aperture (suggesting the overcurling tip of an oriental slipper), as in the case of *C. ventricosus* (Allman) \*.

"*Cladocarpus formosus*" of the 'Challenger' Report.—Comparison of the characters above described with those of the solitary specimen obtained by the 'Challenger'—for the opportunity of examining which I am indebted to Mr. Edgar A. Smith, I.S.O., of the British Museum—shows that Allman's identification is mistaken. For the 'Challenger' specimen differs in lacking an intrathecal ridge, in possessing

\* See Nutting, C. C., "American Hydroids: I. The Plumularidæ," Smithsonian Institution, Special Bulletin, Washington, 1900, pl. xxvi, fig. 8.

a more globular, less deep hydrotheca, with fewer and more definite marginal sinuations, in possessing two, seldom three, internodal ridges, and in having the nematophore septum much nearer the base of the hydrotheca. The serrations on the margins of the nematophores, noticed by Billard\*, are less distinct than in *C. formosus*, although, as there, the mesial nematophore on the proximal internode of each hydroclade lies below the hydrotheca and is free from it. The presence of this nematophore, the existence of which Allman denies, shows that the phylactogonium cannot be "its morphological representative." On the hydroclade-bearing tube five nematophores usually accompany each hydroclade: one posterior, in the angle between internode-process and internode; one anterior, distal to the process, and three, almost in a whorl, proximal to it.

The 'Challenger' specimen I regard as a variety of *Cladocarpus crenatus* (Fewkes) described by Fewkes, in absence of the gonosome, as *Aglaophenia crenata* †. *Cladocarpus crenatus*, var. *allmani*, nov. nom., differs from the type of the species in possessing only two instead of eight internodal ridges and in having three anterior teeth much more prominent than the lateral sinuations. The free portion of the mesial nematophore, too, is scoop-shaped, open towards the hydrotheca; but while Nutting describes that of *C. crenatus* as "tubular" ‡, one of his figures (pl. xxiii. fig. 9, uppermost hydrotheca) represents it as open on the side facing inwards. This variety was obtained by the 'Challenger' in lat. 34° 58' N., long. 139° 30' E., in the neighbourhood of Yokohama.

The following measurements indicate, in mm., the sizes of the species discussed above:—

	<i>C. formosus.</i>	<i>C. crenatus,</i> var. <i>allmani.</i>
Stem internodes, length . . . . .	0.91-0.98	Not discernible.
Hydroclade internodes, length ..	0.84	0.77
Hydrotheca, depth . . . . .	0.57	0.42-0.45
"    diameter at mouth ..	0.35	0.32
Gonotheca, length . . . . .	1.23	1.08
"    greatest diameter . . .	0.70	0.59

\* Billard, A., 1908, "Sur les Plumulariidae de la collection du 'Challenger,'" Comptes Rendus de l'Acad. des Sc., 16th Nov., 1908, p. 3.

† Fewkes, J. W., 1881, "Report of the Acalephæ, Hydroida, 'Blake' Expedition," Bull. Mus. Comp. Zool. Harvard, vol. viii. no. 7, p. 132.

‡ Nutting, C. C., *op. cit.* p. 104.

The description and figures of *Cladocarpus crenulatus*, Levinsen \*, recorded from Davis Strait, clearly indicate that that form is specifically identical with *C. formosus*, of which therefore Levinsen's name should be regarded as a synonym.

XLI.—*Diagnosis of Soletellina dautzenbergi, sp. n., from New Caledonia.* By G. B. SOWERBY, F.L.S.

Testa transverse subelongata, subæquilateralis, crassiuscula, purpurea, lineis atro-purpureis plerumque duplicatis radiata, epidermide olivacea induta; umbones minuti, fere conjuncti, vix elevati, leviter post medium locati; margo dorsalis anticus subelongatus, leviter convexus, mediocriter declivis; posticus brevior, rectiusculus, paulo declivis, rotunde angulatus; margo ventralis leviter arcuatus; latera antica rotundata, postica convexe truncata. Ligamentum crassum, breviter truncatum. Pagina interna purpurascens, atro-purpureo duplicatim radiata et postice suffusa; impressio musculari postica cordiformis; antica linguæformis; sinus pallii magnus, late ovatus. Dentes cardinales valvæ dextræ duo: valvæ sinistræ una vel tres. Margo cardinalis anticus tenuis, haud dentatus; posticus crassus, lævigatus.

Long. (umbone ad marg. ventralem) 12, lat. 19 mm.



*Soletellina dautzenbergi.*

*Hab.* New Caledonia.

I am indebted to the able and zealous conchologist Mr. Ph. Dautzenberg for information concerning this species, which I have pleasure in naming after him.

\* Levinsen, G. M. R., 1893, "Meduser, Ctenophorer og Hydroider fra Grønlands Vestkyst," Vidensk. Meddel. fra den naturh. Foren., Kjøbenhavn.



## PROCEEDINGS OF LEARNED SOCIETIES.

## GEOLOGICAL SOCIETY.

January 13th, 1909.—Prof. W. J. Sollas, LL.D., Sc.D., F.R.S.,  
President, in the Chair.

The following communication was read:—

‘On the Genus *Loxonema*, with Descriptions of New Proterozoic  
Species.’ By Mrs. Jane Longstaff (*née* Donald), F.L.S.

There is some confusion with regard to the type of the genus *Loxonema*, which has arisen from the confounding of the Silurian *Terebra* (?) *sinuosa* of Sowerby with the Devonian form which Phillips called *Loxonema sinuosum*. This matter is discussed, and the Author, following Lindström, Koken, and Perner, takes *L. sinuosum*, Sowerby as the type, in the absence of sufficient reasons to the contrary. If this be done, the other two types mentioned by Phillips cannot remain in the genus, one belonging to the genus *Macrocheilina* and the other to *Zygopleura*. This paper deals simply with Ordovician and Silurian species, therefore only a few subgenera are referred to—*Rhabdostropha*, Don., and *Stylonema*, Perner.

The diagnosis of *Loxonema* is amended, and a note given as to the true range and the geographical distribution of the genus. Descriptions are given of *Loxonema sinuosum*, Sow., of *L. intumescens*, Lindstr., and of *L. striatissimum*, Salt. MS., and six new species and one new variety are described of this genus. *Rhabdostropha pseudo-fasciatum*, Don., and *Rh. Grindrodi* and a new species of this subgenus from Stoke Wold in the Lower Ludlow Beds are next described. This is followed by a description of two new species of the subgenus *Stylonema*—one from the Chair of Kildare and the second from Mulloch Hill. In conclusion, a new species of *Hormotoma* from the Llandeilo Flags of Builth Bridge is described.

## MISCELLANEOUS.

*On the Generic Name Chærops, Rüppell.*

By J. DOUGLAS OGILBY.

*To the Editors of the Annals and Magazine of Natural History.*

GENTLEMEN,—Having been engaged lately on a revision of the bodian labrids of Queensland, the correct name of the genus commonly known as *Chærops* came duly up for consideration, with the result that I find that the two Bleekerian names *Choirodon* and

*Cossyphodes* take precedence of Rüppell's name. The latest synonymy of the genus is that given by Jordan and Snyder (Proc. U.S. Nat. Mus. xxiv. 1902, p. 614); but if Bleeker is correct, as he doubtless is, in the statements (Atlas Ichth. i. pp. xiii, 161, & 162, 1862) that the name *Choirodon* was proposed for these fishes more than sixteen years ("il y a plus de 16 ans") before the publication of the work last quoted, then the date—1856—given by Jordan and Snyder is manifestly incorrect, and should be altered to 1846, while the reference to *Cossyphodes* should be, on Bleeker's own evidence (*ibid.* p. xiii), 1849 instead of 1861. It is true that Bleeker himself asserts that *Chærops*, Rüppell, has priority over his *Cossyphodes* ("étant postérieur à celui de M. Rüppell doit aussi être supprimé"), but the facts, as we know them, fail to support this contention. It is quite possible that Bleeker was aware of Rüppell's intention to name the genus *Chærops*, and designed to adhere loyally to that name, yet, through his neglect to cancel his own *Cossyphodes*, that name was eventually issued earlier than Rüppell's; and as we are very rightly bound to accept the earliest available published name, without regard as to whether its author subsequently rejected it or not, it follows that *Cossyphodes* should be employed for this genus, since *Choirodon*, presumably from previous use, is inadmissible according to its author ("nom que ne pouvait pas être conservé"). I am, however, unable to find any record of the use of *Choirodon* as a generic name prior to its employment by Bleeker, and if others who are more happily placed than I in regard to works of reference are equally unsuccessful, that name, having precedence of date, should stand. No mention of either of the Bleekerian genera is made by Scudder (1882) or Waterhouse (1902), but the former catalogues a "*Cossyphodes*, Westwood, 1851," in Coleoptera; it will be necessary to cancel this name if it be in use, since Bleeker's employment of the term antedates Westwood's by two years.

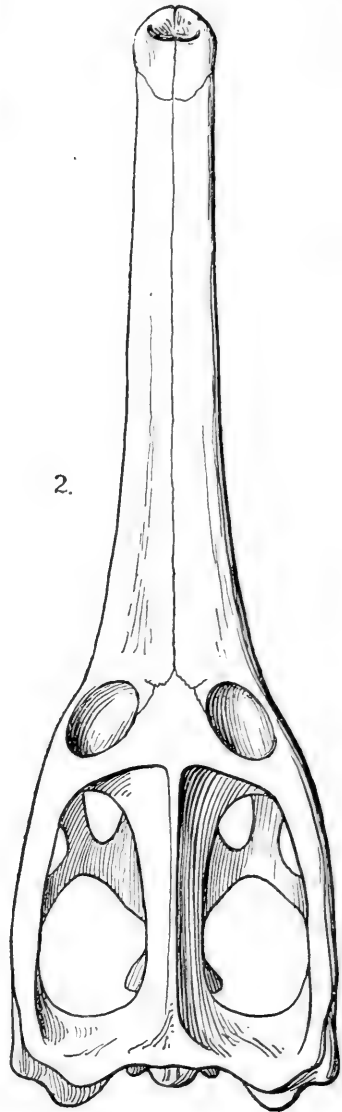
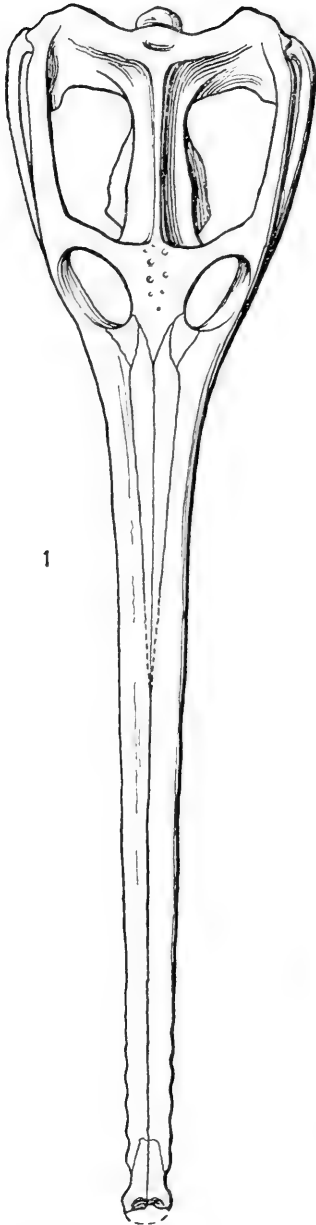
I append the synonymy of the genus so far as I am able to determine it:—

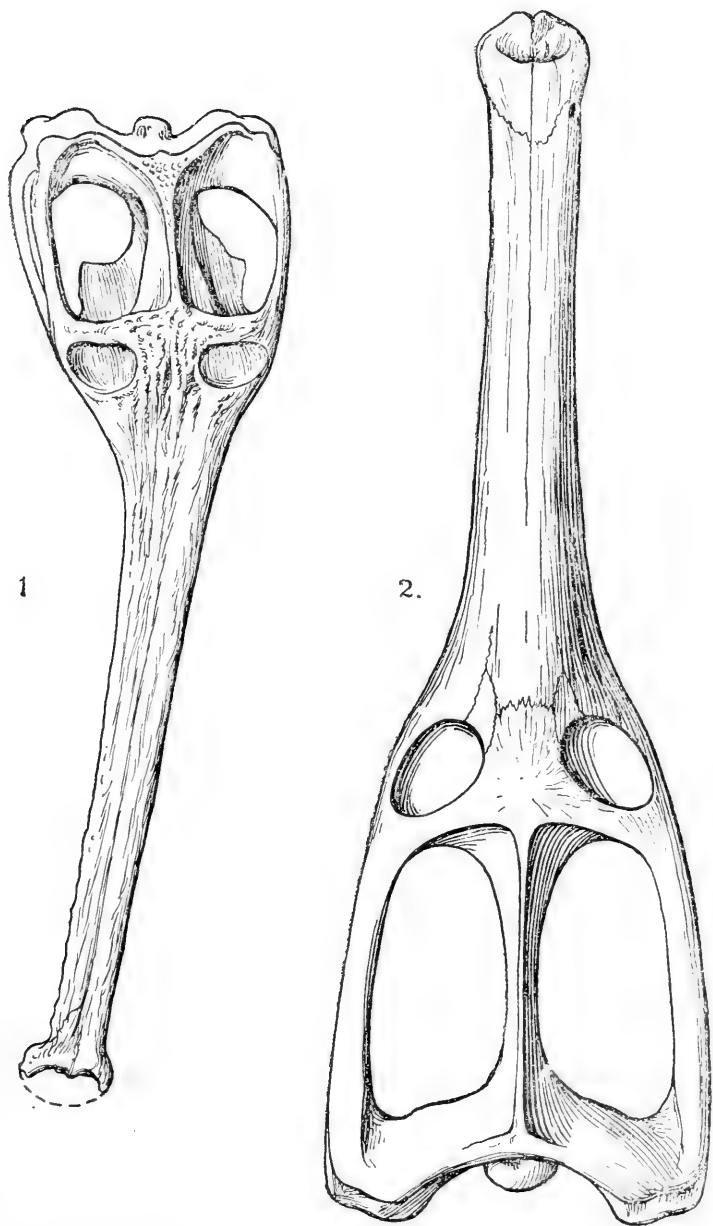
#### COSYPHODES, Bleeker.

- 1846 or earlier. *Choirodon*, Bleeker, Bijdr. Gen. Topogr. Batav. p. 513 (*macrodontus*). Name alleged to be untenable by its author.  
 1849. *Cossyphodes*, Bleeker, Verh. Batav. Gen. xxii., Gladsch. Labr. p. 10 (*macrodontus*). Substitute for *Choirodon*.  
 1852. *Chærops*, Rüppell, Verz. Mus. Senck., Fisch. p. 20 (*meleagris* = *macrodontus*).  
 1861. *Hypsigenis*, Günther, Ann. & Mag. Nat. Hist. (3) viii. p. 383 (*macrodontus*).  
 1875. *Torresia*, Castelnau, Res. Fish. Austr. p. 36 (*australis* = *cyano-stolus*).

Brisbane, August 1908.









# THE ANNALS

AND

## MAGAZINE OF NATURAL HISTORY.

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XLIII.—*Rhynchotal Notes*.—XLVII. By W. L. DISTANT.

HETEROPTERA.

Fam. *Lygæidæ*.

*Oriental Genera and Species.*

THE following newly proposed genera and a number of the new species here described will be figured in the Appendix to the Rhynchota in the 'Fauna of British India.' They all pertain to the family *Lygæidæ* as hitherto understood; but now a new departure has been advocated, and that well-known family name is by some writers threatened with suppression. As I retain the name used by all previous and nearly all recent entomologists, some remarks are necessary, especially as Bergroth, in patronising the change, has written:—"As eminent hemipterists have already decided to give up the family name *Lygæidæ* in the hitherto recognized sense, I *provisionally* accept with Breddin the name *Myodochildæ* after the oldest genus of the family (*Myodocha*, Latr.)" (Deutsch. ent. Zeitschr. 1908, p. 589). Breddin, however, is not the "eminent hemipterist" who originally advocated this idea, and Bergroth ought to have given the credit to Kirkaldy, who, however, has not been consistent with himself on the question, as he has subsequently proposed

two other new names for the same purpose. Kirkaldy's contributions to the elucidation of the question are as follows:—

*Myodochidæ* = *Lygæidæ* auctt., Kirk. Entomologist, xxxii. p. 220 (1899).

*Geocoridæ* = *Lygæidæ* auctt., Kirk. Journ. Bomb. Nat. Hist. Soc. xiv. p. 306 (1902).

*Pyrrhocoridæ* = *Lygæidæ* + *Pyrrhocoridæ* auctt., Kirk. Faun. Hawaiian. iii. pt. ii. p. 158 (1902).

We will leave these propositions by suggesting that Kirkaldy may not have yet pursued all his bibliological investigations, and that he may probably have neither said nor used the last word. Breddin, in following Kirkaldy's first lead, has not stated why he has subsequently deserted his further suggestions, while Bergroth adds no finality by stating that he "*provisionally accepts.*" The question solely and entirely depends on whether the name of a family should be founded on the name of the earliest genus contained in that family, and therefore less requires the attention of an eminent hemipterist so much as that of a good bibliographical clerk. And what good results from such a procedure? The evil is manifest in the addition to the labours and enigmas of the zoological recorder, and the consequent hindrance to the study of the family itself. To admit the principle in the Rhynchota would be to advocate a thorough confusion in the nomenclature of all branches of zoology. I have previously ventured to discuss the question in connexion with the name of the family Capsidæ (Faun. Brit. Ind., Rhynch. vol. ii. p. 413).

*Æthalotus indicatus*, sp. n.

Above black; pronotum and corium finely, thickly, obscurely pilose; lateral margins of the pronotum (not reaching basal angles) dull sanguineous; head beneath, sternum, and legs black, prosternum dull sanguineous; abdomen beneath dull yellowish white, the apical segment black; coxæ and trochanters dull ochraceous; vertex (including eyes) twice as broad as long; ocelli about twice as far removed from each other as from eyes, between the ocelli a broad longitudinal impression, the margins of which are slightly ridged; antennæ black, concolorous, second and third joints almost equally long, fourth longer than third; pronotum distinctly coarsely punctate, strongly transversely impressed, the anterior lobe thus well defined; scutellum with a strong central ridge,



membrane not passing the abdominal apex; rostrum reaching the intermediate coxæ; first joint of the posterior tarsi shorter than second and third together.

Long.  $5\frac{3}{4}$  mm.

*Hab.* Tenasserim; Myitta (*Doherty*).

Larger than *Æ. horni*, Bredd.; first joint of posterior tarsi distinctly shorter than the second and third joints together; antennæ concolorous; eyes black; prosternum sanguineous, &c.

*Lygæus simla*, sp. n.

Black; pronotum with the anterior and lateral margins (the latter not reaching basal lateral angles) and a central longitudinal fascia sanguineous; corium sanguineous, with a broad, central, obliquely transverse, black fascia, not quite reaching clavus; body beneath and legs black; lateral margins of sternum, anterior margin of prosternum, acetabulæ, and posterior segmental margins (beyond middle of abdomen widened towards lateral margins), sanguineous; antennæ robust, second joint longest, third and fourth joints about equal in length; pronotum with the anterior and lateral margins broadly and strongly ridged, the central sanguineous line marking a distinct longitudinal carination, the disk finely punctate; scutellum with a central longitudinal carination; clavus somewhat coarsely punctate; corium finely punctate; rostrum passing the intermediate, almost reaching the posterior coxæ; posterior tarsi with the first joint about as long as second and third joints together.

Long.  $9-10\frac{1}{2}$  mm.

*Hab.* Simla Hills; Matiana (*Annandale*).

*Lygæus eous*, sp. n.

Sanguineous; antennæ, eyes, a central basal spot to head (containing a small sanguineous spot at base), two large transverse spots at base and preceded by two transverse lines to pronotum, scutellum, clavus (excluding base), a large oblong spot outside clavus posteriorly connected with a costal spot beyond middle of corium, membrane, rostrum, legs, a spot on each side of prosternum, disks of meso- and metasterna, and abdomen beneath black; lateral margins of abdomen to a little beyond middle sanguineous, apex of membrane broadly hyaline; antennæ moderately robust, second and fourth joints subequal in length, each a little longer than third; head punctate; pronotum more sparingly and coarsely punctate, transversely depressed behind middle at the region of

the black basal spots, the lateral and anterior margins ridged; scutellum mutilated in type by pin; clavus coarsely, corium very finely punctate; rostrum very slightly passing the intermediate coxæ.

Long. 6 mm.

*Hab.* Calcutta.

*Aspilocoryphus? modestus*, sp. n.

Head black, with a small dull ochraceous spot at base; antennæ dull ochraceous, the basal joint a little darker, the apical joint piceous; pronotum piceous, the lateral and apical margins, the central longitudinal carination, and a transverse series of four large spots (two on each side of the central carination) dull ochraceous; scutellum piceous black, its apex dull ochraceous; corium dull ochraceous, an apical fascia to clavus, and longitudinal streaks between the veins of corium, black or piceous; membrane black, the apical margins broadly dull pale plumbeous, some of the veins greyish white; body beneath piceous black, shortly and closely ochraceously pilose; margins of the sternal segments and the legs sordidly ochraceous, femora (excluding apices) brownish; rostrum and a spot on each side of the posterior margins of the pro- and mesosterna piceous; second joint of antennæ longest, third shorter than fourth; pronotum transversely impressed before middle, distinctly, centrally, longitudinally carinate, the black or piceous anterior area with two very distinct transverse cicatrices on each side; membrane not passing abdominal apex; rostrum passing the intermediate coxæ.

Long. 4 mm.

*Hab.* Bombay (*Dixon*).

CONSIVIUS, gen. nov.

Body elongate; head subtriangular, somewhat acutely produced at apex; ocelli placed nearer eyes than to each other; antennæ with the first and fourth joints distinctly thickened; rostrum reaching or slightly passing the intermediate coxæ; pronotum moderately narrowed in front, granulose, a distinct transverse ridge near anterior margin; scutellum about as long as broad, the lateral margins (except at base) distinctly ridged, the apical margin strongly ridged, granulosely punctate; membrane considerably passing abdominal apex; lateral margins of metasternum oblique and apically acutely produced, seen above on each side of the costal margins of corium; legs somewhat slender, posterior

tarsi with the first joint distinctly longer than the second and third joints together.

Allied to *Arocatus* by the long scutellum, but differing from that genus by the structure of the scutellum and by the produced metasternal lateral angles.

*Consivius collinus*, sp. n.

Body above sanguineous; antennæ, eyes, an angular patch on each side of base of head (including the ocelli), anterior marginal area, and a transverse somewhat bimaculate spot on each side of base of pronotum, basal half of scutellum, clavus, two spots on inner margin of clavus, and a large transverse spot behind middle of corium, the apical angle of the latter, and the membrane black, apical margin of the membrane paler; body beneath sanguineous, rostrum, basal margin of head, anterior marginal areas of pro- and mesosterna, a prominent spot on the lateral areas of both meso- and metasterna, transverse fasciæ to abdominal segments (not reaching lateral margins), coxæ and legs, black; excluding membrane and including legs and antennæ greyishly pilose, the head at anterior margin very longly pilose; antennæ with the second, third, and fourth joints about subequal in length, first and fourth distinctly incrassated; pronotum somewhat coarsely granulose; scutellum coarsely granulosely punctate.

Long. 10 mm.

*Hab.* Simla Hills.

*Nysius minor*, sp. n.

Resembling *N. ceylanicus*, Motsch., but as a rule smaller in size; antennæ with the second and third joints ochraceous or brownish ochraceous, first and fourth joints more or less piceous, second and third joints of antennæ subequal in length, whereas in *N. ceylanicus* the second joint is distinctly longer than the third, and all the joints piceous in coloration.

Long. 3 mm.

*Hab.* Bengal; Pusa and Patna.

*Nysius lacustrinus*, sp. n.

Head ochraceous, the margins of the central lobe black and a black cicatral punctate fascia on each side before eyes extending from above antennæ to base; antennæ brownish ochraceous, the basal joint blackish; pronotum ochraceous, darkly punctate, and thus forming longitudinal fasciæ; scutellum piceous brown, a pale central line on apex; body

beneath and legs ochraceous ; sternum with a central greyish and a lateral plumbeous longitudinal fascia, posterior margin of metasternum greyish white, head beneath greyish ; abdomen with the base and lateral margins more or less plumbeous ; legs pale ochraceous, femora spotted with castaneous, apices of tarsi black ; rostrum black, slightly passing the posterior coxæ ; antennæ with the second joint longest, fourth joint a little longer than third ; head with the punctures coarse ; pronotum transversely impressed before anterior area, which is coarsely punctate, the other punctures also coarse ; scutellum more finely punctate, the basal area a little gibbous ; corium hyaline, with a yellowish tint, two black lines on its apical margin ; membrane hyaline, considerably passing the abdominal apex ; sternum coarsely punctate.

Long. 4 mm.

*Hab.* N.W. India ; Kumaon, Bhim Tal.

Allied to *N. dohertyi*, Dist., but differing by the larger size, differently coloured and longer antennæ, though the relative lengths of the joints are much the same, scutellum more gibbous, &c.

*Nysius melanicus*, sp. n.

Head, pronotum, and scutellum thickly piceously or blackly punctate ; antennæ black, apex of fourth joint slightly brownish ochraceous ; body beneath and legs black ; coxæ, extreme apices of the femora, tibiæ, and tarsi brownish ochraceous ; corium pale obscure luteous hyaline, the costal area clear and unspotted, the veins, and the apical margin medially interrupted, piceous or black ; second joint of antennæ distinctly longer than the third, third and fourth joints almost subequal in length ; pronotum coarsely punctate, with a somewhat obscure central longitudinal ridge ; scutellum with a longitudinal ridge commencing at about one-third from base, where it is distinctly tuberculous ; membrane hyaline, considerably passing the abdominal apex ; rostrum reaching the intermediate coxæ.

Long. 4 mm.

*Hab.* Kumaon, Bhim Tal ; Simla Hills, Theog.

*Pirkimerus nicobarensis*, sp. n.

Head, pronotum, scutellum, and body beneath piceous brown ; first, second, and third joints of antennæ, rostrum, and legs ochraceous ; fourth joint of antennæ piceous brown ; hemelytra pale umber-brown ; outer margin of clavus, an

elongate marginal spot before middle, and a marginal spot to membrane pale ochraceous ; between these spots the margin is much darker ochraceous ; second and third joints of antennæ subequal in length, each a little longer than first, fourth longest, incrassate and pilose ; pronotum strongly transversely impressed, punctate and wrinkled at anterior margin, the posterior area discally foveately depressed, anteriorly coarsely punctate, posteriorly finely transversely striate ; scutellum distinctly centrally longitudinally carinate ; membrane not quite reaching the apical abdominal segment ; posterior femora finely spined beneath, the posterior tibiæ strongly marginally setose ; basal joint of posterior tarsi much longer than the second and third joints.

Long. 5 mm.

*Hab.* Nicobar Islands ; Homfray's Sts. (*Rogers*, Brit. Mus.).

*Macropes raja*, sp. n.

Head, antennæ, pronotum, scutellum, abdomen above, body beneath, and femora black ; first and second joints of antennæ (excluding extreme apices of second joint), tibiæ, and tarsi pale ochraceous ; hemelytra milky white ; internal vein and margins of clavus, two principal veins of corium on apical half, the oblique margin separating corium from membrane, two internal curved veins and a large discal spot to membrane, piceous ; second and fourth joints of antennæ subequal in length, each a little longer than third ; pronotum with the anterior area or lobe smooth and centrally longitudinally grooved or sulcate, the posterior area or lobe coarsely punctate and depressed, with a distinct transverse ridge before basal margin, the lateral margins concave ; hemelytra reaching the anterior margin of the fifth abdominal segment ; rostrum passing the anterior coxæ.

Long. 6 mm.

*Hab.* Calcutta.

This species is allied to both *M. spinamanus*, Motsch., and *M. punctatus*, Walk., by the sulcated anterior pronotal lobe : from *M. spinamanus* it is to be separated by the longer hemelytra and the colour of the legs ; from *M. punctatus* it differs in the smaller size, the ochraceous first and second antennal joints, more distinct sulcation to pronotum, ochraceous tibiæ, &c.

*Macropes singularis*, sp. n.

Head, pronotum, scutellum, body beneath, and legs black ;

apices of femora and the whole of the tibiæ more or less castaneous; tarsi ochraceous; antennæ piceous brown, the extreme apices of the joints paler; ocelli shining carmine-red; hemelytra creamy white, costal margin of corium slightly yellowish, clavus, corium at claval margin and apical area to corium black; basal area of membrane (not reaching inner margin) and narrowly connected with a large elongate spot (which almost extends to lateral and apical margins) black; abdomen above black; second and third joints of antennæ subequal in length, fourth longer than either second or third; pronotum elongate, centrally as long as broad at base, punctate, transversely impressed behind middle and thence roundly narrowed to head, basal margin concave, a small pale impunctate spot near each basal lateral angle; scutellum punctate excepting basal area, a central longitudinal ridge extending from about middle to apex; hemelytra reaching base of apical abdominal segment; rostrum slightly passing anterior coxæ, black, with the apices of the joints a little paler.

Long.  $6\frac{1}{2}$  mm.

*Hab.* Ceylon; Pundaluoya (*Green*).

*Macropes uniformis*, sp. n.

Head, pronotum, scutellum, and sternum black; antennæ with the first, second, and third joints dull ochraceous, fourth joint black, its base ochraceous; apex of head, posterior margin of pronotum, and legs castaneous; rostrum, tibiæ, and tarsi more or less ochraceous; corium very pale stramineous; membrane very pale greyish brown; abdomen piceous brown, thickly, finely, greyishly pilose; antennæ with the third joint longer than second, fourth considerably longer than either second or third; pronotum with the anterior lobe subglobose, broad, shining, obscurely centrally longitudinally sulcate on disk, sparingly punctate, the transverse constriction about one-third from base, the basal area transversely wrinkled or striate, the anterior lobe laterally a little convexly amplified, the posterior margin concave; scutellum short, broad, centrally longitudinally ridged from about middle to apex; membrane extending to the penultimate segment of the abdomen; anterior femora strongly incrassated and shortly spined beneath.

Long. 5 mm.

*Hab.* Calcutta.

Allied to *M. subauratus*, Dist., by the uniformly coloured

corium and membrane; from that species it differs in the colour of the antennæ and legs, the broader and more globose anterior pronotal lobe, the shorter membrane, &c.

*Macropes privus*, sp. n.

Head, antennæ, eyes, pronotum, and scutellum black, moderately shining; body beneath and legs black, apices of the femora and the whole of the tibiæ pale castaneous, tarsi ochraceous; clavus and corium greyish white, the claval suture and the outer marginal area to corium (widened posteriorly) piceous; membrane black, its basal angle greyish white; antennæ with the extreme apices of the joints paler, second and third subequal in length, fourth longest, pyriform and palely pilose; pronotum considerably longer than broad, thickly punctate, the basal margin concave, two smooth cicatrices in transverse series on anterior area, and two similar but narrower cicatrices near middle; scutellum distinctly ridged, transversely at base, and centrally longitudinally, its disk finely granulose; margins of clavus, the subclaval vein to corium, and the inner half of the apical margin to corium pale yellowish; membrane smooth, shining, reaching the base of the sixth abdominal segment; connexivum and abdomen beneath very shortly but thickly ochraceously pilose, the latter with a double series of small black points on each side; rostrum shining piceous black, about reaching the anterior coxæ; anterior femora strongly incrassate, finely spined beneath.

Long.  $5\frac{1}{2}$  mm.

*Hab.* Ceylon; Peradeniya (*Green*).

Allied to *M. præcerptus*, Dist., but smaller, anterior lobe of pronotum not sulcate, colour of membrane, corium, and legs different, &c.

*Macropes thoracicus*, sp. n.

Head, pronotum, scutellum, and sternum black; basal margin of pronotum and the abdomen pale testaceous; rostrum and legs orange-yellow; corium very pale ochraceous; membrane creamy white; antennæ piceous or black, the basal joint and extreme apices of second and third joints ochraceous, second and fourth joints subequal in length, each considerably longer than third; pronotum short, a little broader than long, transverse impression about one-fourth before posterior margin, the anterior area or lobe opaque, coarsely irregularly punctate; corium shorter than

membrane, which extends to the penultimate segment of the abdomen; rostrum reaching the anterior coxæ; anterior femora moderately incrassated, obscurely spinous beneath.

Long. 5 mm.

*Hab.* Nepal.

By the uniformly coloured corium and membrane allied to *M. subauratus* and *M. uniformis*. From both it differs and is subgenerically distinct by the shorter and comparatively broader pronotum and the short posterior area or lobe, the short corium, &c.

*Ischnodemus erebus*, sp. n.

Head, pronotum, scutellum, abdomen above, and body beneath black; corium dull ochraceous, streaked longitudinally with castaneous brown; membrane (reflecting the dark abdomen beneath) black; femora black, their apices and the whole of the tibiæ and tarsi brownish ochraceous; antennæ brownish ochraceous, apical joint (excluding base) blackish, second joint slightly longer than the third, fourth joint considerably longest; vertex thickly finely granulose; pronotum coarsely punctate and granulose, finely pale pilose, more longly pilose on lateral margins, some obscure tuberculous elevations on anterior disk; scutellum granulose and punctate, palely pilose, a little depressed on disk; corium somewhat strongly palely pilose, especially on lateral margins; membrane neither reaching the abdominal apex nor covering the connexivum, which is exposed for nearly its entire length.

Long.  $2\frac{1}{2}$ –3 mm.

*Hab.* Bombay Province; Matheran, 2500 feet (Pusa Coll.).

Differing from *I. noctulus*, Dist., by its smaller size, the exposed connexivum, absence of subapical pale spot to membrane, the granulose head, pronotum, and scutellum, pale anterior tibiæ, &c. I have examined a series of this species, but, unfortunately, all the specimens were in a somewhat greasy condition, which rendered the colour-characters more or less difficult to identify, especially as regards the hemelytra.

*Ischnodemus atromaculatus*, sp. n.

Head, pronotum, and scutellum black, palely pilose; corium pale ochraceous, with the basal angle and a large spot near apex black; membrane blackish, its basal angle and a spot near the apical margins of corium pale ochraceous;



body beneath black; femora black, their apices and the whole of the tibiæ and tarsi pale ochraceous; antennæ black, second joint a little longer than third, fourth longest and thickest; vertex finely granulose, subacutely prominent anteriorly; pronotum somewhat coarsely granulose, about as long as broad at base, the lateral margins a little convexly rounded; scutellum sparingly but coarsely granulose; membrane not quite reaching abdominal apex nor covering connexivum; corium strongly palely pilose, covering or almost covering the connexivum.

Long. 2-2½ mm.

*Hab.* Bombay Province; Matheran, 2500 feet, Igatpuri, 2000 feet (Pusa Coll.).

As in the previous species, the specimens on which this is founded are in a more or less greasy condition, which renders the coloration difficult to determine. This more particularly applies to the membrane, which in some examples appears to be brownish grey, with the veins piceous.

Besides the distinct markings of the corium the species is to be recognized by the broader and comparatively shorter pronotum, with its more convexly rounded lateral margins.

#### NERTHUS, gen. nov.

Elongate; head broad, convexly narrowed in front of eyes, central lobe prominent and slightly produced; antennæ with the first joint shortest, distinctly shorter than the head, second joint a little longer than either third or fourth; rostrum just passing the posterior coxæ, first joint passing base of head, second and third subequal in length; ocelli near posterior margin, nearer to eyes than to each other; pronotum elongate, moderately laterally sinuate, transverse constriction distinct, anterior lobe convex, a little shorter than posterior lobe, which is deflected anteriorly, the posterior lateral angles rounded, their posterior margins slightly lobately produced; scutellum a little longer than broad, with a discal longitudinal carination; corium a little more than half the length of abdomen and concavely constricted at middle; membrane reaching apex of abdomen; legs moderately long, unarmed, pilose, femora moderately evenly thickened; posterior tibiæ with the basal joint a little longer than the remaining joints together; abdomen beneath with a distinct, central, longitudinal, carinate line.

Allied to *Artemidorus*, Dist., but differing by the basal joint of antennæ being shorter than the head; the much longer rostrum and the relative lengths of joints of same, the

shorter and evenly thickened posterior femora, not attenuated towards base and incrassate at apices as in *Artemidorus*.

*Nerthus dudgeoni*, sp. n.

Head, antennæ, pronotum, scutellum, abdomen above, rostrum, and body beneath black; posterior margin of pronotum, central apical longitudinal carination to scutellum, and elongate (almost connected) spots to connexivum very pale ochraceous; base of first joint of antennæ and the legs reddish yellow; apical angle of corium and the tarsi black; bases of intermediate and posterior femora stramineous; head, pronotum, and sternum thickly coarsely punctate; clavus longitudinally punctate; corium with the subclaval margin and the costal margin longitudinally punctate; body beneath (especially the abdomen) finely greyishly pilose; other structural characters as in generic diagnosis.

Long. 9 mm.

*Hab.* Kangra Valley, 4500 feet (*Dudgeon*).

*Chauliops nigrescens*, sp. n.

Head pale castaneous brown, with an obscure darker longitudinal fascia on each side between the bases of antennæ and the ocelli; antennæ pale ochraceous, the first and fourth joints brownish ochraceous; pronotum sordidly ochraceous, thickly piceously punctate, a black subanterior marginal fascia (interrupted at middle) and a pale central longitudinal line; scutellum piceous black; corium sordidly ochraceous, the clavus and apical area of corium piceous black; membrane sordidly greyish, with piceous suffusions; connexivum pale luteous, spotted with black; body beneath and legs dull black; coxæ, bases of femora, a broad central annulation to tibiæ, and the tarsi pale ochraceous; antennæ robust, second and third joints slender, second longest, fourth slightly longer than third; pronotum gibbously rounded, much as in *C. lobatula*, Bredd.; corium distinctly shorter than membrane, which very slightly extends beyond abdominal apex; abdomen beneath coarsely granulose.

Long. 3 mm.

*Hab.* N.W. India; Kumaon, Bhim Tal (Ind. Mus. and Coll. Dist.).

EPIBOMIUS, gen. nov.

Subelongate; head about as long as breadth between eyes, somewhat abruptly pointed in front, the lateral margins

between base of antennæ and apex convexly sinuate, ocelli a little in front of basal margin and on each side near eyes; antennæ moderately robust, pilose, the third and fourth joints prominently pilose; rostrum reaching the intermediate coxæ; pronotum about as long as broad at anterior margin, transversely impressed near middle, the anterior margin very slightly sinuate, lateral margins almost straightly oblique, posterior margin truncate, centrally faintly longitudinally carinate; corium considerably longer than membrane, which scarcely passes the abdominal apex, and with the basal cells distinct; femora moderately thickened.

Near *Sadoletus*, Dist.

*Epibomius pusa*, sp. n.

Head black; antennæ piceous, greyishly pilose; pronotum pale castaneous red, the anterior and posterior areas more or less black; corium black, very finely greyishly pilose, the basal and apical angles testaceous; head beneath black; sternum pale castaneous red, with its disk black; abdomen beneath and legs sordidly ochraceous, the former with its base and apex black; connexival border beneath pale luteous, with black spots; head thickly obscurely punctate; antennæ with the second joint longest, third and fourth strongly pilose, fourth joint slightly longer than third; pronotum sparingly very coarsely punctate, its lateral margins prominently pilose; corium obscurely punctate and more distinctly pilose; sternum sparingly coarsely punctate.

Long.  $3\frac{1}{2}$ –4 mm.

*Hab.* Bengal; Pusa (*Lefroy*).

*Sadoletus pallescens*, sp. n.

Head, pronotum, and scutellum dark brownish ochraceous; eyes and two large oblique spots on posterior lobe of pronotum black; corium pale ochraceous; membrane pale hyaline; antennæ, rostrum, body beneath, and legs pale ochraceous; meso- and metasterna dark brownish ochraceous, posterior lateral angles of the latter pale ochraceous; antennæ with the extreme apices of the second and third joints and the apical joint (excluding base) more or less piceous; tibiæ biannulated with pale brownish, apices of tarsi piceous, posterior femora with a fuscous spot on upper surface a little beyond middle; antennæ with the second joint slightly longer than the third, fourth joint slightly or scarcely longer than the second; posterior lobe of pronotum somewhat coarsely

punctate; scutellum finely obscurely punctate on basal, much more strongly punctate on apical area; clavus longitudinally punctate, corium linearly and more sparingly punctate.

Long. 5 mm.

*Hab.* Calcutta.

Differs from *S. validus*, Dist., by the differently coloured head and pronotum and the much less or scarcely pilose character of the same.

#### ESMUN, gen. nov.

Body oblong; head about as long as breadth between eyes, central lobe prominent and moderately projecting; ocelli near base a little nearer to eyes than to each other; rostrum reaching or just passing the anterior coxæ, first joint not reaching base of head; antennæ moderately robust, first joint scarcely reaching apex of head, fourth joint incrassated; pronotum broader than long, before middle roundly narrowed to eyes, obsolete transversely depressed near middle, posterior margin moderately concave, anterior margin nearly straight; scutellum broad and short; hemelytra shorter and narrower than the abdomen, corium shorter than membrane at its greater central length, its apical margin sinuate, membrane with distinct basal cells and scarcely passing the base of the last abdominal segment; femora moderately incrassate, posterior tarsi with the basal joint shorter than the second and third joints together.

Near *Dinomachus*, Dist.

#### *Esmun typicus*, sp. n.

Head, antennæ, rostrum, scutellum, abdomen above, and body beneath and legs black; base of fourth joint of antennæ rusty brown; eyes and apices of the tibiæ castaneous brown; tarsi pale ochraceous; corium pale stramineous, base of clavus, two very small spots at claval apex, and the apical margins of corium (broadly and irregularly) black; membrane hyaline, centrally slightly tinged with fuscous brown; antennæ with the third joint shorter than second or fourth, fourth longer than second; head granulose and punctate; pronotum coarsely punctate, two subcallosities on anterior area less punctate, the central area somewhat broadly transversely depressed; scutellum opaque; abdomen above very finely greyish pilose.

Long.  $3\frac{1}{2}$  mm.

*Hab.* Bombay (*Dixon*).

## EUHEMERUS, gen. nov.

Broad, subovate; head nearly as long as breadth between eyes; antennæ moderately robust, first joint not reaching apex of head; ocelli situate near eyes; rostrum almost reaching the intermediate coxæ, first joint almost reaching base of head; pronotum much broader than long, the anterior angles rounded, posterior margin a little concave, anterior margin slightly concave for the reception of head, near middle centrally transversely impressed; scutellum very short and broad; hemelytra a little shorter and considerably narrower than the abdomen; corium shorter than central length of membrane, its apical margin irregularly concave; membrane with distinct basal cells and not quite reaching the abdominal apex; femora moderately thickened, posterior tarsi not quite as long as the second and third joints together.

Allied to *Esmun*, Dist.

*Euhemerus latus*, sp. n.

Head, pronotum, scutellum, abdomen above, and body beneath black; antennæ, lateral margins of connexivum, rostrum, and legs castaneous brown, apices of the femora, intermediate and posterior tibiæ, and the tarsi ochraceous; corium greyish white, margins of clavus, two spots at claval apex, and the longitudinal veins to corium brownish, apical angular areas black; membrane hyaline; antennæ with the second joint longer than the third but shorter than the fourth joint; head and pronotum thickly rather coarsely punctate; scutellum opaque; connexivum and abdomen beneath thickly, shortly, greyishly pilose.

Long.  $3\frac{1}{2}$  mm.

*Hab.* Bombay (*Dixon*).

## PAMERANA, gen. nov.

Head shorter than pronotum, but longer than the anterior lobe, ocelli near base and nearer to eyes than to each other, antenniferous tubercles prominent and outwardly produced in a short spinous tubercle, the apex of the central lobe distinctly produced; antennæ with the first joint shorter than head, second joint slightly longest, third and fourth subequal in length; rostrum reaching the intermediate coxæ, first joint not reaching base of head; pronotum with a narrow anterior collar, the anterior lobe subglobose and about as long as

posterior lobe; scutellum about as long as broad; clavus and costal area of pronotum coarsely thickly punctate, the corium inwardly more finely punctate; membrane slightly passing the abdominal apex; anterior femora thickened, distinctly spined beneath, anterior tibiæ a little dilated at apex, all the tibiæ about as long as the femora, posterior tarsi with the basal joint much longer than the remaining joints together.

The spinously produced antenniferous tubercles are a prominent character in this genus, which is allied to *Pamera*.

*Pamerana cuneata*, sp. n.

Head, pronotum, scutellum, clavus, and corium dull black, head more shining black; anterior pronotal collar (interrupted at middle), two central longitudinal spots on posterior pronotal lobe, margins of clavus, subclaval veins, and a spot near inner posterior angle of corium pale castaneous brown; membrane fuscous brown, with the veins dull ochraceous; antennæ black, apical joint with a broad pale ochraceous annulation; body beneath black, rostrum and legs pale ochraceous; femora, tibiæ, and tarsi slightly piceous towards apices; pronotum thickly finely punctate; scutellum sparingly punctate, more distinctly so on lateral margins; other structural characters as in generic diagnosis.

Long. 7 mm.

*Hab.* Calcutta.

*Eucosmetus mimicus*, sp. n.

♀. Head, pronotum, scutellum, and body beneath shining black; antennæ stramineous, the apical joint (excluding base) piceous; rostrum stramineous, the basal joint black; legs stramineous, anterior femora (excluding apices) black, intermediate femora (excluding base) castaneous, posterior femora (excluding base) piceous; corium greyish white, a longitudinal streak to clavus, a streak near basal costal margin, and a broad central transverse fascia crossing apex of clavus cinnamon-brown; in this fascia beyond claval apex is a small white spot in each corium, a black transverse spot near apical angle; membrane black, narrowly white at basal outer angles, and with a white spot at apex; antennæ with the first joint reaching apex of head, second and third longest and subequal in length; posterior lobe of pronotum coarsely punctate; clavus longitudinally punctate, the transverse fascia to corium somewhat coarsely punctate; membrane very slightly passing abdominal apex; anterior tibiæ (♀) not spined.

Long. 5 mm.

*Hab.* Pegu (Coll. Dist.).

This species, apart from the generic character of the eyes, possesses a simulative appearance to *Caridops gibba*, Bergr.

#### MARAMALDUS, gen. nov.

Head long, broad and convex, constricted behind the eyes, the central lobe distinctly prominent at apex; antennæ with the first joint distinctly passing apex of head, second and third joints subequal in length, each longer than fourth; rostrum slightly passing the anterior coxæ, first joint not nearly reaching base of head; pronotum with the anterior lobe (including collar) more than twice as long as posterior lobe, with a distinct broad anterior collar, convex, narrowed anteriorly and posteriorly, smooth and shining, the collar coarsely punctate, posterior lobe coarsely punctate (except near its anterior margin), its lateral angles distinctly acutely spined; scutellum slightly longer than broad, coarsely punctate; abdomen moderately concavely constricted on basal half, its apex truncate; anterior femora strongly incrassate, strongly constricted at base and moderately narrowed at apex, spined beneath; tibiæ curved, not spined in ♀ (♂ unknown); hemelytra not reaching apex of abdomen.

Allied to *Eucosmetus*, but first joint of antennæ distinctly passing apex of head, anterior lobe of pronotum longer and with a broad anterior collar, hemelytra not reaching apex of abdomen, &c.

#### *Maramaldus admistus*, sp. n.

Head, pronotum, scutellum, and body beneath shining black; anterior collar and posterior lobe more opaque and strongly punctate; antennæ stramineous, finely pilose, apical joint (excluding base) piceous; rostrum ochraceous, the basal joint piceous; legs stramineous, anterior femora (excluding apices) shining black, anterior and intermediate femora with their apical areas piceous; connexivum spotted with stramineous; corium castaneous brown, spotted with white, the principal spots being an elongate one on both costal and claval margins, the largest near apical angle, and a small rounded spot near claval apex, clavus and anterior half of costal margin with longitudinal series of punctures, a transverse series of punctures before membranous division, which is distinctly paler; membrane piceous, with a white spot at apex; other structural characters as in generic diagnosis.

Long., ♀, 6 mm.

*Hab.* N.W. India; Kumaon.

*Agunga fulgida*, sp. n.

Head and anterior lobe of pronotum shining black, posterior pronotal lobe brownish ochraceous, thickly darkly punctate, the lateral margins (narrower on anterior lobe) stramineous, the posterior lateral angular margins black; scutellum black; corium pale ochraceous, with two short, black, costal, marginal lines (one near middle, the other on apical area), clavus and posterior disk blackly punctate, an obscure greyish-white spot at each interior angle; membrane yellowish white, with the veins darker; body beneath black, lateral margins of sternum ochraceous, but anteriorly and posteriorly castaneous; legs ochraceous, anterior femora (excluding apices) and a subapical annulation to intermediate and posterior femora black or piceous; antennæ with the first and second joints stramineous, base of second joint black, third black, fourth ochraceous, with its base black, second, third, and fourth subequal in length; head and anterior lobe of pronotum thickly finely punctate, the latter strongly convexly raised and anteriorly deflexed, posterior pronotal lobe more sparingly and coarsely punctate; scutellum coarsely punctate.

Long.  $2\frac{1}{2}$  mm.

*Hab.* Calcutta.

Differing principally from *A. crassa*, Dist., by the shining head and pronotum, which is opaque in *crassa*; anterior pronotal lobe more gibbous and only slightly longer than posterior lobe, in *crassa* the pronotum is wholly black, in *fulgida* the anterior lobe is only black, head more vertically depressed, &c.

*Diniella bengalensis*, sp. n.

Head, pronotum, and scutellum shining black; pronotum with the basal margin (very narrowly) and the posterior lateral angles ochraceous; antennæ and corium ochraceous, the latter with a transverse castaneous fascia crossing from costa to inner angle, and then broadly continued on inner half of apical margin; membrane pale hyaline; body beneath black; legs and rostrum ochraceous; antennæ robust, first joint shorter than second, second and third subequal in length, each a little shorter than fourth; head sparsely finely punctate; pronotum more coarsely punctate, with indications of an obscure transverse impression; clavus finely sparingly longitudinally punctate, corium at claval suture with two longitudinal rows of coarse punctures, disk of corium more



sparingly and irregularly punctate; first joint of rostrum thickened and passing base of head.

Long. 3 mm.

Hab. Bengal.

Allied to *D. nitida*, Reut., from Madagascar and the Seychelles.

#### TEUTATES, gen. nov.

Head about as long as breadth between the outer expanse of eyes, broadly obtusely produced before insertion of antennæ, the margins of the central lobe prominent, eyes not quite reaching the anterior angles of the pronotum; antennæ with the first joint not reaching apex of head, second joint about one and a half times the length of the first (remaining joints mutilated in type); rostrum reaching the apex of the anterior coxæ, first joint not extending to base of head, second and third joints subequal in length; pronotum a little more than half the length at base, the lateral margins rounded anteriorly and narrowly dilated, anterior area with two small central tubercles, four longitudinal carinate lines, of which the central two are less developed and do not reach the base, posterior margin truncate, the anterior margin very slightly sinuate; scutellum a little shorter than broad at base, the lateral margins slightly sinuate, the disk foveate and punctate; margins of the corium slightly rounded; membrane not passing the apex of the abdomen, the veins simple; legs of moderate length; anterior femora not spined beneath.

I place this genus near *Arrianus*, Dist.

#### *Teutates sculpturatus*, sp. n.

Above dull ochraceous, eyes and margins of the central lobe to head piceous; pronotal tubercles brownish ochraceous; body beneath paler than above, the anterior acetabulæ darkly margined, a broad castaneous longitudinal fascia on each lateral abdominal area; pronotum thickly and more darkly punctate, the lateral margins paler and almost impunctate; scutellum darkly coarsely punctate, the margins of the foveate area raised and almost impunctate; corium semihyaline, coarsely punctate, the clavus longitudinally punctate; sternum punctate, other characters as in generic diagnosis.

Long. 3 mm.

Hab. Calcutta.

*Aphanus dudgeoni*, sp. n.

Head pale dull castaneous, with irregular black lines; antennæ ochraceous, basal joint much mottled with black, apices of second and third joints and fourth joint (excluding base) piceous; pronotum ochraceous, thickly brownly punctate, the disk of the anterior area and the lateral margins much more sparsely punctate; scutellum ochraceous, thickly brownly punctate, the extreme apex pale ochraceous; tegmina brownish, thickly punctate, the lateral margin ochraceous, sparsely blackly punctate, the apical angle and a spot before it blackish, some obscure basal suffusions and two small spots about middle of apical area, pale ochraceous; membrane brownish ochraceous, with darker mottlings, the basal area black traversed by the paler veins, a small pale ochraceous spot behind apical angle of corium; head beneath, rostrum, sternum, and legs ochraceous, apices of tibiæ piceous, excluding head darkly punctate, central area of meso- and metasterna black; abdomen beneath somewhat testaceous; basal joint of antennæ moderately thickened, with prominent spinous hairs, fourth joint a little longer than third or second; rostrum slightly passing anterior coxæ; pronotum strongly transversely impressed near middle, the lateral margins laminate, anterior femora shortly spinous beneath, but with a longer spine before apex; intermediate and posterior tibiæ prominently spinulose.

Long.  $7\frac{1}{2}$  mm.

*Hab.* Kangra Valley, 4500 feet (June, *G. C. Dudgeon*); Purneah District (*Paiva*, Ind. Mus.).

This species was taken by the same collector at the same locality and at the same time of the year as the species described by Kirkaldy as *A. kangricus*. It cannot, however, be reconciled with Kirkaldy's description, from which it seems abundantly distinct.

*Aphanus ornatulus*, sp. n.

Reddish ochraceous; pronotum and scutellum thickly darkly punctate, lateral margins of the pronotum pale ochraceous, with scattered black punctures; head piceous brown, with a small central ochraceous spot at base; antennæ brownish ochraceous, the basal joint, apices of second and third joints, and the fourth joint (excluding base) piceous; corium with the lateral margins narrowly pale ochraceous and containing a costal series of dark punctures, on apical area three large black spots, one on lateral margin before apex

which is narrowly united to a similar spot near apex of clavus and inner angle of membrane, the third spot occupying apical angle of corium; membrane black; sternum and legs blackly punctate, apices of femora and tibiæ narrowly blackish; antennæ with the first joint thickest and shorter than head, second a little longer than the third and slightly longer than the fourth joint; pronotum transversely impressed near middle, before which it is moderately convexly raised, clavus and corium thickly somewhat finely punctate; membrane reaching apex of abdomen; rostrum about or almost reaching the intermediate coxæ, the area of the sternum between the coxæ black; tarsi very pale ochraceous, with their apices black.

Long. 8 mm.

*Hab.* Nepal Terai.

*Aphanus bengalensis*, sp. n.

Head reddish ochraceous; antennæ brownish ochraceous, basal joint, apices of second and third joints, and fourth joint (excluding base) piceous; pronotum ochraceous, thickly blackly punctate, the lateral margins paler and longitudinally coarsely blackly punctate; scutellum ochraceous, darkly punctate (somewhat mutilated in type); clavus and corium pale ochraceous, thickly blackly punctate, the lateral margins pale and sparingly coarsely blackly punctate; a somewhat large greyish-white spot on apical margin at each side of basal angle of membrane, the apical angle of corium piceous; membrane pale brownish, the upper margins paler, and with a small but very pale spot near apical angle of corium; prosternum ochraceous, blackly punctate; meso- and metasterna piceous, the latter with two marginal lines and the posterior margin ochraceous and blackly punctate; abdomen beneath piceous; legs orange-yellow, sparingly, finely, blackly punctate, apices of the tibiæ black; first joint of antennæ thickest and shorter than head, second and fourth subequal in length, each a little longer than third joint; pronotum transversely impressed near middle, before which it is slightly convex; rostrum slightly passing the anterior coxæ; anterior femora shortly spined beneath; membrane very slightly passing the abdominal apex.

Long.  $6\frac{1}{2}$  mm.

*Hab.* Bengal, Pusa (*Lefroy*).

Allied to *A. sparsus*, Dist.

*Aphanus suratensis*, sp. n.

Head, pronotum, and scutellum black; lateral pronotal margins (not quite reaching base) ochraceous, two central spots on basal area of pronotum reddish ochraceous; extreme apex of scutellum ochraceous; tegmina black, corium with the outer claval margin (more or less), the costal margin for about two-thirds from base with an inner elongate spot near its base, and a large round spot near the apical margin ochraceous; membrane pale fuliginous, subhyaline; body beneath black, lateral margins of sternum ochraceous, lateral margin of abdomen pale brownish; rostrum ochraceous, the basal joint black; legs ochraceous, anterior femora (excluding base), apical halves of intermediate and posterior femora, and extreme apices of tibiæ black; second joint of antennæ longer than third (fourth mutilated in type); pronotum transversely constricted near middle, behind the constriction thickly punctate, the lateral margins laminate and impunctate; scutellum obscurely finely punctate; clavus thickly coarsely punctate; corium (excluding costal margin) thickly punctate; anterior femora spined beneath; intermediate and posterior tibiæ spinulose.

Long. 8 mm.

*Hab.* Bombay Prov.; Surat.

## UZZA, gen. nov.

Head (including eyes) slightly wider than anterior margin of pronotum, ocelli close to basal margin, almost equally removed from eyes as from each other; antennæ long, basal joint longer than first joint of rostrum; first, second, and third joints almost subequal in length, each a little longer than fourth; rostrum about reaching the anterior coxæ, first joint about or almost reaching base of head; pronotum as long as broad at base, transversely constricted a little behind middle, before which it is subglobose, the lateral margins moderately dilately ampliate, the basal margin concavely sinuate; scutellum longer than broad; lateral margins of corium concavely sinuate; membrane reaching or slightly passing the abdominal apex; legs long, anterior femora thickened, obtusely spined beneath, and armed with a strong spine before apex, posterior legs very long, posterior tibiæ much longer than the femora and about as long as head, pronotum, and scutellum together, posterior tarsi with the first joint about twice as long as the other two joints together.

Allied to *Dieuches*, from which it differs by having the

basal joint of the antennæ longer than the first joint of the rostrum; by the length of the posterior legs allied to *Pæantius*.

*Uzza karenia*, sp. n.

Head black; antennæ piceous, base of fourth joint pale luteous; pronotum with the anterior lobe black, the posterior lobe piceous, with a central longitudinal ochraceous line, the lateral margins (not reaching base) pale ochraceous; scutellum black, the extreme apex ochraceous; corium dark castaneous, the basal third, two marginal spots beyond middle, and the apical angles pale ochraceous, a small spot on each side of claval apex pale testaceous; membrane black, with a subcentral, waved, transverse, greyish fascia; body beneath black; rostrum and legs piceous, bases of intermediate and posterior tibiæ pale ochraceous; structural characters as in generic diagnosis.

Long. 6 mm.

*Hab.* Burma; Karennee.

*Naudarensia manipurensis*, sp. n.

Head, pronotum, and scutellum piceous; pronotum with the middle of the lateral margins distinctly paler, antennæ with the first and second joints brownish ochraceous, apex of second joint, third (excluding base) and fourth joint piceous; corium brownish ochraceous, thickly darkly punctate, a small black spot near middle of costal margin, and a transverse linear pale spot before apex; membrane fuliginous, the basal margin pale; body beneath, rostrum, and legs black or piceous; bases of intermediate and posterior femora pale ochraceous, tibiæ (excluding apices) brownish ochraceous; first joint of antennæ scarcely reaching apex of head and finely spinulose, second joint a little longer than third; pronotum about as long as broad at base, transversely compressed near middle, before which it is finely and behind which more coarsely punctate; scutellum somewhat finely punctate; clavus longitudinally punctate, corium somewhat coarsely punctate except on costal margin, membrane reaching apex of abdomen; rostrum almost reaching the intermediate coxæ; anterior femora incrassate and shortly spinous beneath; posterior tarsi with the basal joint about twice as long as the other two joints together.

Long. 6 mm.

*Hab.* Manipur.

The membrane reaching the abdominal apex in this species will require a corresponding modification in the generic diagnosis.

NEOLETHÆUS, gen. nov.

Head about as long as broad (including eyes), central lobe a little prominent at apex, ocelli near base, much closer to eyes than to each other; antennæ with the first joint moderately thickened, not quite as long as head, second and third joints slender, second longer than third; rostrum reaching the intermediate coxæ, first joint reaching base of head; pronotum subquadrate, slightly transversely impressed before middle, much more coarsely punctate behind the impression than before it, and containing a central longitudinal carinate line, the anterior margin truncate, more sparsely punctate, and extending on each side a little beyond eyes, the lateral margins almost obliquely straight, the anterior angles rounded, basal margin truncate, the basal lateral angles longitudinally ridged; scutellum triangular, about as long as broad, discally depressed; membrane slightly passing abdominal apex, venation generally as in *Lethæus*; femora incrassate, the intermediate less and the posterior femora a little more so, the anterior femora shortly spined beneath, the intermediate and posterior femora somewhat spinously hirsute, tibiæ spinulose, posterior tarsi with the basal joint twice as long as the remaining joints together.

*Neolethæus typicus*, sp. n.

Black; two small spots to clavus, two on corium (one near middle, the other near apical margin), second and third joints of antennæ, rostrum (excluding basal joint), tibiæ, and tarsi more or less ochraceous; basal joints of antennæ and rostrum, femora, and apices of tibiæ and tarsal joints castaneous brown; head (excluding central lobe) punctate; pronotum before the faint transverse impression finely, behind it coarsely punctate; scutellum foveately impressed and somewhat sparingly punctate, the lateral marginal areas more thickly and coarsely punctate; corium thickly and finely punctate, the veins prominent, clavus with two longitudinal series of punctures; membrane brownish ochraceous.

Long.  $9\frac{1}{2}$  mm.

*Hab.* Burma; Palon.

## USILANUS, gen. nov.

Head somewhat long, subtriangular, about or almost as long as the anterior lobe of the pronotum, the central lobe distinctly produced and projecting in front, ocelli near base, much nearer to eyes than to each other; antennæ with the first joint moderately thickened, shorter than head but passing its apex, second, third, and fourth joints almost subequal in length; rostrum reaching the intermediate coxæ, first joint slightly passing the base of head, second not reaching the base of prosternum; pronotum shorter than breadth at base, the lateral margins obliquely rounded, transversely impressed behind middle, the anterior margin scarcely or only slightly broader than the eyes, the anterior lobe subglobose, the basal area or posterior lobe coarsely punctate, faintly, centrally, longitudinally ridged, and here the lateral margins are a little laminate, posterior margin distinctly concave before scutellum, the anterior margin truncate; scutellum triangular, slightly longer than broad at base; clavus longitudinally punctate, corium with the subcostal vein distinctly curved; membrane slightly passing the abdominal apex, with four longitudinal veins, the two inner strongly curved towards base and reaching basal margin, the two outer not reaching basal margin; anterior femora incrassate and somewhat continuously but irregularly spined beneath, anterior tibiæ a little curved, somewhat flattened and also shortly spined beneath on their apical halves, intermediate and posterior legs moderately slender, the tibiæ setose, first joint of the posterior tarsi about one and a half times as long as the remaining joints together.

Allied to the genus *Eremocoris*.

*Usilanus burmanicus*, sp. n.

Body above black, lateral margins of the corium narrowly ochraceous; antennæ piceous, about its basal half pale ochraceous; head beneath and sternum black, abdomen piceous; rostrum pale ochraceous, the basal joint black; legs pale ochraceous, the anterior femora, apices of intermediate and posterior femora, apices of all the tibiæ, and apices of the anterior tarsal joints black; head somewhat coarsely punctate on basal area; pronotum finely and sparsely punctate on the smooth anterior subconvex lobe, more coarsely so near the anterior margin, posterior lobe thickly coarsely punctate; scutellum finely punctate, the apical area with an obscure

central, longitudinal, carinate line; corium somewhat evenly and regularly punctate; sternum more or less coarsely punctate, the three ultimate abdominal segments finely irregularly tuberculate.

Long. 10 mm.

*Hab.* Burma; Karennee.

*Usilanus denotatus*, sp. n.

Piceous black; less than basal half of pronotum and anterior and lateral pronotal margins (narrowly), clavus and corium, lateral margins (narrowly) of sternum and posterior lateral angles of prosternum, abdomen beneath, first and second joints of antennæ (remaining joints mutilated in type) castaneous brown; rostrum and legs ochraceous, basal joint of rostrum and the anterior femora castaneous brown; margins of the clavus paler; inner apical area to corium piceous, containing two small pale spots (one at its anterior margin, the other on the apical margin); membrane fuscous brown; head with the apex of the central lobe prominent; first joint of antennæ considerably shorter than second; rostrum with the first joint slightly passing base of head; pronotum shorter than breadth at base, the lateral margins obliquely rounded, faintly transversely impressed a little behind middle, the basal pale area somewhat coarsely punctate, the posterior angles margined with piceous, the posterior margin moderately concavely sinuate; scutellum sparingly punctate, more strongly punctate along the lateral margins; clavus longitudinally punctate; corium more irregularly punctate; membrane slightly passing the abdominal apex; anterior femora obtusely spined beneath.

Long.  $9\frac{1}{2}$  mm.

*Hab.* Burma; Bhamo.

LUA, gen. nov.

Head about as long as breadth between eyes, robust, deflected on each side, anteriorly subangularly produced; antennæ robust, pilose, first joint about or almost reaching apex of head, second joint a little longer than third, third and fourth subequal in length; rostrum reaching the intermediate coxæ, first joint about reaching base of head; pronotum nearly twice as broad at base as long, with a strongly punctate anterior collar, the basal area also strongly punctate, lateral margins carinate, convexly rounded towards the eyes, anterior margin truncate, posterior margin a little concave before scutellum; scutellum about as long as broad at base,



where it is a little gibbous, laterally deflected on each side, somewhat coarsely punctate; hemelytra not reaching the abdominal apex, membrane very small and ill-defined, lateral margins a little widened beyond middle and then obliquely narrowed to apex, clavus very coarsely longitudinally punctate, the disk sparingly coarsely punctate; body beneath and legs pilose; legs of moderate length, the femora moderately and uniformly thickened.

Allied to the Neotropical genus *Rhaptus*, Stål. Judging from the description, it also possesses some resemblance or affinity with *Lisepochroa*, Bredd., but from this genus (?) is distinct by the shorter hemelytra.

*Lua tartarea*, sp. n.

Body above and beneath shining black; antennæ and legs pale ochraceous; apical joint of antennæ and base of first joint piceous; femora (excluding apices) more or less pale castaneous; head between the eyes smooth and shining, remaining area punctate; pronotum with the basal area coarsely punctate, before which it is obscurely transversely impressed, between this impression and the anterior punctate collar the surface is smooth and shining; scutellum punctate, the basal area smooth and shining, between which and apex is an obscure central longitudinal line; corium punctate as described in generic diagnosis, an obscure pale brownish spot on each side of clavus near apex of scutellum and a similar subcostal spot on corium a little beyond base; membrane short, indistinct, dull brownish ochraceous, not reaching apex of abdomen; sternum irregularly punctate beneath, as shown in figure.

Long. 3 mm.

*Hab.* Ceylon; Nalanda (*Green*); Minikoi (*Gardiner*).

In the Minikoi specimens the spots to the corium are much brighter than in Ceylonese type, and the extreme lateral margins to the pronotum (sometimes) and the posterior lateral pronotal angles (frequently) are ochraceous.

ATKINSONIANUS, gen. nov.

Head about as long as broad at base, subangularly produced and narrowed before the insertion of the antennæ; ocelli near eyes; antennæ with first joint shorter than head, second joint longest, third and fourth subequal in length; rostrum reaching the intermediate coxæ, first joint not quite reaching base of head, eyes not quite reaching the anterior

angles of the pronotum; pronotum somewhat flat, broader than long, a little narrowed anteriorly, with a very slight or subobsolete transverse impression near middle, a short longitudinal ridge near the posterior lateral angles, the lateral margins very narrowly ampliate and very slightly sinuate, rounded at anterior angles, anterior margin truncate, posterior margin moderately concavely sinuate; scutellum about as long as broad, not impressed; corium laterally convexly rounded and considerably wider than the margins of the pronotum; membrane not reaching the abdominal apex, with strong reticulate markings giving the appearance of reticulate venation; legs simple.

Near *Abdolominus*, Dist.

*Atkinsonianus reticulatus*, sp. n.

Head, anterior area of pronotum, and the scutellum black or piceous, anterior and lateral margins, and posterior area of pronotum castaneous brown, on the subimpressed line dividing the dark and pale pronotal areas are three paler spots; clavus and corium pale ochraceous, thickly brownly punctate, in some places macularly punctate; membrane subhyaline, reticulately spotted and marked, and with prominent black spots at the basal margins; body beneath black or piceous, margins of the sternal segments, rostrum, coxæ, legs, and apical area of abdomen more or less castaneous; head with the apical area finely granulose, the base almost smooth; pronotum thickly finely punctate, with three more or less developed longitudinal grooves; scutellum thickly punctate; other characters as in generic diagnosis.

Long.  $5\frac{1}{2}$  mm.

*Hab.* Sikkim (Atkinson Coll., Brit. Mus.).

*Gonsalvus spinosus*, sp. n.

Head, pronotum, and scutellum black; apex and a more or less developed median line to central lobe of head ochraceous; antennæ piceous or black, basal half of second joint ochraceous, fourth joint greyishly pilose; body beneath and femora black or piceous; rostrum, tibiæ, and tarsi ochraceous or brownish ochraceous; corium dull ochraceous, clavus with longitudinal black lines, corium blackly punctate, the punctures more or less arranged in longitudinal series; membrane piceous, the veins much paler; antennæ with the first joint scarcely half the length of second, which is slender at base and slightly longer than third, fourth slightly shorter than

third; head impunctate, the ocelli at base and near eyes; pronotum with the anterior lobe tumid, impunctate, the lateral margins moderately convex and narrowing to head, posterior lobe sparingly coarsely punctate; scutellum sparingly finely punctate; anterior femora incrassate, finely spined beneath, the anterior tibiæ moderately curved and strongly inwardly amplified at apices; membrane slightly passing the abdominal apex; rostrum reaching the posterior coxæ.

Long. 6-7 mm.

*Hab.* Calcutta.

Differing from *G. typus*, Dist., by the spinous anterior femora and the more dilated apices of the anterior tibiæ, different colour of the legs, &c.

This species was taken at light in November 1907.

#### CORRECTION.

In Faun. Brit. Ind., Rhynchota, vol. iv. p. 432, I described the genus *Armatillus* and unaccountably included it in the Pentatomidæ. This was a wrong location, and it should have been placed in the Pyrochoridæ. I have to thank Dr. Bergroth for calling my attention to this very obvious taxonomical misplacement.

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### XLIII.—Descriptions of Four new Species of Heterocera from Tropical South America. By HERBERT DRUCE, F.L.S. &c.

#### Fam. Limacodidæ.

##### *Langucys nigropuncta*, sp. n.

*Female*.—Head, antennæ, collar, tegulæ, and thorax black, the base of the thorax red; abdomen black; legs black, spotted with white. Primaries black; the costal margin, a submarginal band, and a line crossing the wing near the base all red; a row of black spots edged with red crosses the wing about the middle, the fringe white: secondaries black, with a large red spot at the apex; the costal margin red, the fringe white. Underside very similar to the upperside, but rather paler in colour.

Expanse  $1\frac{3}{4}$  inch.

*Hab.* W. Colombia, San Antonio, 5800 feet (*G. M. Palmer, Mus. Druce*).

This species is allied to *Langucys nigrorufus*, Walker.

## Fam. Noctuidæ.

Subfam. *HADENINÆ*.*Miselia rufilinea*, sp. n.

*Male*.—Head, antennæ, palpi, collar, tegulæ, thorax, and legs dark brown; abdomen black. Primaries dark brown, indistinctly spotted with darker brown; a submarginal red line extends from the apex to the anal angle; the fringe dark brown: secondaries black, becoming greyish at the base. Underside blackish brown.

Expanse  $1\frac{1}{2}$  inch.

*Hab.* S.E. Peru, Santo Domingo, 6000 feet (*Ockenden, Mus. Druce*).

Subfam. *ACRONYCTINÆ*.*Gonodes obliqua*, sp. n.

*Male*.—Head and antennæ brown, collar and tegulæ pinkish grey, thorax and abdomen pale brown, anus yellowish, legs pale brown. Primaries pale brown, with a pinkish shade over the basal half of the wing, slightly irrorated with black scales; a fine reddish-brown line crosses the wing from about the middle of the costal margin to the anal angle; near the apex are two very fine white lines partly crossing the wing; the fringe brown: secondaries very pale whitish brown, with a dark mark at the end of the cell and a submarginal brown line extending from the apex to the anal angle; the fringe pale brown. Underside pale pinkish grey, marked very similar to the upperside.

Expanse  $1\frac{1}{4}$  inch.

*Hab.* Colombia, Minca, 2000 feet (*H. II. Smith, Mus. Druce*).

*Emarginea niphoplaga*, sp. n.

*Female*.—Head, collar, and tegulæ greenish white; thorax and abdomen black, with some white hairs at the base; the underside of the abdomen white; legs black, spotted with white; antennæ black. Primaries greenish white, broadly shaded with brown across the middle of the wing; a large white spot on the costal margin, beyond which several fine waved black lines cross the wing from the costal to the inner margin; the apex is white, the fringe black: secondaries white, with a faint submarginal black line extending from the apex to the anal angle.

Expanse 1 inch.

*Hab.* Colombia (*Mus. Druce*).

**XLIV.**—*Descriptions of Three new Species of Heterocera from Dutch New Guinea.* By HERBERT DRUCE, F.L.S. &c.

Fam. **Arctiidæ.**

*Diacrisia arctichroa*, sp. n.

*Female.*—Head above and collar cream-colour; tegulæ black, edged with cream-colour; antennæ, palpi, and thorax black; abdomen above bright red, with a central band of black spots; underside yellow, with a double row of black spots on each side; legs and underside of the thorax black; anus yellow. Primaries dark cream-colour; three black spots on the costal margin; a large square-shaped spot at the bottom of the cell; a black dot close to the base; a large spot at the end of the cell; a row of black spots of various sizes crosses the wing from the apex to the middle of the inner margin and two black spots at the anal angle; the fringe cream-colour: secondaries bright red, with a double series of black spots close to the anal angle, and several black dots near the apex. Underside similar to the upperside, but darker in colour; the primaries are clouded with red and the ground-colour of the secondaries is chrome-yellow; the black markings are the same as above.

Expanse  $2\frac{1}{2}$  inches.

*Hab.* Dutch New Guinea, Fak Fak, 1700 feet (*E. A. Pratt, Mus. Druce*).

Fam. **Notodontidæ.**

*Nadata gigantea*, sp. n.

*Male.*—Head, collar, tegulæ, and thorax orange-red; palpi and antennæ pale brown; abdomen pale reddish brown; the underside pale brown; legs blackish. Primaries orange-red at the base, shading to brown and yellow to beyond the middle of the wing, the outer margin broadly bordered with darker brown; a black dot at the end of the cell; six pale brown waved lines cross the wing from the costal to the inner margin; the fringe dark brown: secondaries orange-red, brownish round the outer margin; the fringe dark brown. Underside: both wings pale yellowish brown, with a sub-marginal row of brown spots extending from the apex to the inner margin of both wings; the primaries shaded with pink at the base; the fringes as above.

Expanse  $5\frac{1}{4}$  inches.

*Hab.* Dutch New Guinea, Fak Fak, 1700 feet (*E. A. Pratt, Mus. Druce*).

## Fam. Noctuidæ.

## Subfam. QUADRIFINÆ.

*Pterocyclophora pratti*, sp. n.

*Male*.—Head, palpi, antennæ, collar, and tegulæ dark brown; thorax and base of the abdomen grey; abdomen above dark brown; the underside and legs pale greyish brown; the anus fawn-colour. Primaries dark purplish brown, broadly bordered with fawn-colour on the outer margin from the apex to the anal angle, the apex broadly suffused with purplish grey; an elongated fawn-coloured spot at the end of the cell; a small white dot close to the base, the inner margin edged with white; the fringe fawn-colour: secondaries bright yellow; a blackish-brown band irrorated with purplish-brown scales extends from the anal angle almost to the apex, the outer margin purplish grey. Under-side: primaries fawn-colour, thickly irrorated with brown and black scales; the basal half of the wing pale yellow, two distinct black bands crossing the wing, but neither extending to the costal or inner margin; a marginal row of black spots extends from the apex to the inner margin: secondaries pale fawn-colour, irrorated with brown scales and crossed by three black lines.

Expanse  $2\frac{3}{4}$  inches.

*Hab.* Dutch New Guinea, Fak Fak, 1700 feet (*E. A. Pratt, Mus. Druce*).

This species is allied to *Pterocyclophora pictimargo*, Hampson., from Ceylon.

XLV.—On *Mammals* collected by Mr. S. A. Neave, M.A., B.Sc. (Oxon.), in Katanga, Congo Free State. By GUY DOLLMAN, B.A.

THE collection is of interest both on account of the new geographical ranges established for many of the species and, in addition, for the discovery of a new form of *Anomalurus* allied to *A. cinereus*, Thos.

1. *Eidolon helvum*, Kerr.

♀. 99. Lufira River.

2. *Epomophorus zenkeri*, Matsch.

♂. 1; ♀. 28. Kambove.

"The fruit-eating bats, which are not uncommon, especially in the well-wooded districts, are called by the natives 'Mulima' or 'Kamlima.'"

3. *Scoteinus schlieffeni*, Peters.

♂. 32; ♀. 33. Katanga.

♂. 47; ♀. 48. Upper Lufira River.

"Small bats are called 'Kasasusu' by the natives in Katanga, a name sometimes also applied to butterflies."

4. *Petrodromus* sp.

♂. 49; ♀. 18. Katanga.

In size and general proportions similar to *P. tetradactylus*, Peters, but differing from that form in having a more hairy tail and in the absence of any buff-coloured tint on the under surface.

Probably these Katanga specimens are more closely allied to the Nyasaland form, *P. venustus*, Thos., than to the more southern *P. tetradactylus*, though at present sufficient material is not at hand to settle this point.

"Called locally 'Kapata.' An animal which generally frequents the thickets &c. on river-banks in the low country. Consequently comparatively scarce in Katanga, which is mostly high plateau."

5. *Nasilio brachyurus*, B. du Bocage.

♂. 55; ♀. 56. Katanga.

6. *Nasilio brachyrhynchus*, A. Smith.

♂. 7; ♀. 2. Katanga.

This species appears to occur in Katanga side by side with *N. brachyurus*. It is, however, possible that the specimens identified as *N. brachyurus* from this region are only seasonal forms of *N. brachyrhynchus*, as both the *N. brachyurus* were collected in July and the *N. brachyrhynchus* in February. The skulls of the two species are so much alike that it is impossible to decide this question till further specimens are available for examination.

"Generally occurs in hilly and somewhat open country. Native name 'Kalolo.'"

7. *Crocidura* sp.

♂. 70; ♀. 71. Bunkeya River.

♂. 94. Lufupa River.

"Native name in Katanga is 'Mununga,' in reference to their strong smell."

8. *Canis* sp.

♂. 66. Bunkeya River.

♂. 56. Lufira River.

"Jackals are called 'Mumbwe' by the natives in this part of Africa. They are not uncommon, especially on large plains."

9. *Genetta tigrina*, Schreb.

♀. 83. Bunkeya River.

"Called locally 'Kaididi.'"

10. *Nandinia gerrardi*, Thos.

95, 97. Two native skins.

"From the Lubudi River not very far from the Angolan frontier, and not heard of east of this. It is called 'Mbara' by the local natives, the Wandembo, and is said by them to have the greatest aversion to water, never descending to the ground in the rainy season. It seems to be confined to patches of dense forest."

11. *Mungos caffer*, Gm.

♀. 65. Bunkeya River.

12. *Mungos ichneumon*, L.

♂. 63. Bunkeya River.

"The above two species are not distinguished by the natives. They are called 'Chisakanyenga' or 'Mkenge.'"

13. *Mungos paludinosus*, G. Cuv.

♂. 64. Bunkeya, Katanga.

"Lives in long grass and reeds near rivers. It is called 'Chiwuluwulwe' by the natives, in imitation of its curious chattering note."

14. *Crossarchus fasciatus*, Desm.

♀. 44. Near Kambove.



“ A very common species, often in large colonies. Native name ‘ Chipulwe.’ ”

15. *Funisciurus annulatus rhodesiae*, Wrought.

♂. 36, 43. Upper Lualaba River.

♀. 98. Lufupa River.

“ Usually among large trees. Native name ‘ Mshinzi.’ ”

16. *Funisciurus cepapi*, A. Smith.

♂. 23, 37. Katanga.

“ Frequents thin woodland ; is not common. Native name ‘ Kampandwa.’ ”

17. *Anomalurus neavei*, sp. n.

♂. 52. Kambove, Katanga.

Size as in *A. cinereus*, Thos., but with much smaller scales on the base of the tail, smaller feet, and the fur more buff-coloured.

General colour of back grey, washed over with buff. Under surface distinctly buffy. Individual hairs of back slate-coloured, with light yellowish rings at tips. Upper surface of forearms and hands light buffy. Upper surface of feet, including hairs covering claws, greyish buff. In *A. cinereus* the claws are covered with long black hairs, sharply marked off from the grey hair on the backs of the feet. Upperside of tail greyish buff for the basal half ; posterior portion, comprising a little more than half the total length, dark brown.

Scales on underside of tail small, on an average measuring 7 mm. each in length. In *A. cinereus* the scales are much larger, averaging about 12 mm. long. In the Katanga form the whole scaly area is only 55 mm. long, while in *A. cinereus* it extends much further down the tail, the total length being nearly 80 mm.

The skull exhibits a few well-marked characters that distinguish it from *A. cinereus*:—Nasals shorter and palatal foramina not extending back beyond the maxillo-premaxillary suture, while in the other form these foramina are prolonged back beyond the suture for about 1 mm. The cheek-teeth are set so that the two rows converge towards one another anteriorly, not being so parallel as in *A. cinereus*. The teeth are also smaller, the whole tooth-row measuring 1 mm. less in length.

Dimensions of the type (measured in flesh):—

Head and body 287 mm. ; tail 222 ; hind foot 47·5 ; ear 37.

Skull: greatest length 52; zygomatic breadth 36; length of upper molar series 12.5.

*Hab.* Near Kambove, Katanga.

*Type.* Adult male. B.M. no. 7. 12. 13. 37. Collected 27th June, 1907.

This species is sharply marked off from the Nyasa form, *A. cinereus*, firstly, by its much smaller tail-scales, and, secondly, by the general buff coloration of the fur and absence of black hairs on the claws of the hind feet.

In addition to the type specimen, the Museum possesses two other representatives of this species, an adult female collected by Mr. Neave at Ndola in 1905, and a further specimen collected by Mr. Donald MacDonald in North-eastern Rhodesia, west of Madona.

"This animal is not common, and owing to its entirely nocturnal habits is very seldom seen. All the individuals I have met with have been obtained from hollow trees, where it seems to spend the day."

18. *Graphiurus murinus*, Desm.

♀. 5, 13. Kambove.

19. *Gerbilliscus boehmi*, Noack.

♀. 85. Near Ruwe.

"Seems a scarce and local species, inhabiting sandy woodland country. Called locally 'Masakara.'"

20. *Tatera nysæ*, Wrought.

♂. 51. Katanga.

♂. 59, 61; ♀. 60, 62, 67. Bunkeya River.

♀. 90. Lufupa River.

21. *Tatera valida*, B. du Bocage.

♂. 89. Lufupa River, west of Lualaba.

22. *Steatomys pratensis*, Peters.

♀. 78. Bunkeya River.

"Common. Native name 'Kansi.'"

23. *Mus chrysophilus*, de Wint.

♂. 35; ♀. 29. Katanga.

♂. 46. Upper Lufira River.

24. *Mus nyikæ*, Thos.

- ♂. 53; ♀. 54. Near Kambove.  
 ♂. 30. Katanga.  
 ♀. 41. Lualaba River.

25. *Mus walambæ*, Wrought.

- ♂. 16; ♀. 3, 4, 6. Kambove.

26. *Thamnomys surdaster*, Thos. & Wrought.

- ♂. 19, 34; ♀. 27. Katanga.  
 ♀. 68. Bunkeya River.  
 "Not common. Locally called 'Sampauchi.'"

27. *Leggada grata*, Thos. & Wrought.

- ♀. 8. Kambove.  
 ♀. 96. Lubudi River.

28. *Lophuromys aquilus*, True.

- ♂. 86. Lufupa River, west Lualaba district.  
 "Trapped on the edge of dense forest. Not met with elsewhere in Katanga. Called by the local natives (Alunda) 'Cherengirengi.'"

29. *Saccostomus campestris*, Peters.

- ♂. 20, 31. Katanga.  
 ♂. 57; ♀. 12, 14. Kambove.  
 "Common. Local name 'Matuta.'"

30. *Dasymys bentleyæ*, Thos.

- ♂. 74, 75, 76, 77; ♀. 72, 81. Bunkeya River.  
 ♀. 87, 88. Lufupa River, west of Lualaba.  
 "Frequents long grass and somewhat swampy ground. Native name 'Lifutu' or 'Chifumfutu.'"

31. *Arvicanthis dorsalis*, A. Smith.

- ♂. 93. Lufupa River, west of Lualaba.  
 "Seems scarce in Katanga. Called 'Yendakadzua' everywhere."

32. *Pelomys fallax*, Peters.

♀. 15. Kambove.

♂. 80; ♀. 73, 82. Bunkeya River.

“Native name ‘Liwendi.’ Resembles *Dasymys bentleyæ* in its habits.”

33. *Georychus mellandi*, Thos.

♂. 40. Lualaba River.

♂. 42. Upper Lualaba River.

“Native name ‘Mfuko’ or ‘Malevi.’”

34. *Georychus amatus*, Wrought.

♂. 21, 22, 26; ♀. 24, 25. Katanga.

“Also called ‘Mfuko.’”

XLVI.—*Notes on Locomotion and the Use of Slime-threads in the Marine Mollusca.* By NATHANIEL COLGAN, M.R.I.A.

WHILE engaged last year in studying the Nudibranch fauna of County Dublin the writer of these notes was induced to make some observations on the locomotive powers of certain species of marine Mollusca chiefly belonging to the Gastropoda, and as the results arrived at appear to be in some respects sufficiently novel to merit permanent record, they are set out here in some detail. In all 18 species were dealt with, 10 Prosobranchs, 7 Opisthobranchs, and 1 Filibranch, and the aim of the inquiry was not so much to determine the rate of travel of the various species as to ascertain whether any of them were accustomed to make use of suspensory slime-threads as an aid in locomotion.

Every student of the marine Mollusca is familiar with the fact that the Gastropods in general have a strong propensity to float foot upwards on any still-water surface they may be enabled to reach by crawling, and that many of them are accustomed to suspend themselves beneath that surface by means of slime-threads or attenuated strings of the mucus which all of them so freely secrete. But hitherto observation does not appear to have very conclusively established the fact that the power of re-ascending by such threads to the water surface is possessed by many of our native species of marine Mollusca. H. Wallis Kew, indeed, in his well-known paper on Spinning Molluscs in the ‘Zoologist’ for July 1900, states

that "most spinning Pectinibranchs no doubt are able to ascend to their former positions by crawling up the suspensory thread: this has been observed in *Litiopa*, in *Valvata*, and perhaps in *Rissoa*." The reference to *Rissoa* in this connexion is apparently drawn from Gray's account of the behaviour of *Rissoa parva* given in 1833 to the Zoological Society of London, where he states that the animal "has the power of emitting a glutinous thread by which it attaches itself to floating sea-weeds and is enabled when displaced to recover its previous position." Gray, too, in a later communication, published in these 'Annals' fifty years ago, (3) iv. 1859, p. 239, appears to attribute the power of re-ascension to the Opisthobranch *Elysia viridis*; but in this case, as in his note on *Rissoa parva*, his language is not quite clear.

Of the 18 County Dublin species placed under observation by me last year no less than 10 were seen to climb up along their suspensory slime-threads to the water surface from which they had descended; and I have little doubt that had material and opportunity been forthcoming for further observation, many others of the 18 would have shown themselves to possess the same power. As for the method of observation adopted, in all cases the living animals were placed in graduated tubes or phials of convenient size filled with fresh sea-water, which was renewed from time to time. For the smaller species tubes 2 inches high by  $\frac{3}{4}$  inch in diameter were used, for the larger species phials 3 inches high by  $1\frac{1}{2}$  inch in diameter, so that all of the individuals dealt with had ample water surface to float and travel upon. Several of the species were observed to drop, to all appearance voluntarily, from the water surface, and hang suspended beneath it by slime-threads; but in order to shorten the period of observation most of them were induced to assume this position by smartly tapping the bottom of the tube against the table on which it stood. As a rule there was little difficulty in so gauging the force of the tap and of the resultant jar as to dislodge the animal's foot from the slime-raft on which it had travelled out from the wall of the glass tube without altogether severing its connexion with that raft and causing the animal to sink to the bottom.

In all cases the animal was found to hang suspended from the posterior end of the foot, and the slime-thread by which it hung, fine and diaphanous though it was, could usually be detected by holding up the tube and examining the water with a hand-lens, while varying the strength of the light and the direction of its incidence on the tube. The graduation of the tubes and fluids was effected by narrow strips of white

paper gummed vertically along the outside of the glass and divided to eighths of an inch by heavy black lines clearly visible through the water, the white strip throwing out into relief the animal hanging suspended in front. The scale thus served to measure the rate of ascension of the animal, whether along its suspensory thread or in the more usual mode of locomotion along the glass wall of the tube.

With these few words on the method adopted, details will now be given as to the behaviour of the species observed to climb by their suspensory threads.

**Runcina hancocki**, Forbes.—Several specimens were collected at low water on the shore near Bullock Harbour on the 16th May last. One of the largest of these, nearly  $\frac{1}{4}$  inch long when in motion, was transferred to a graduated glass tube, and while floating on the water surface was caused by a gentle tapping of the tube to sink to a depth of half an inch and hang there by its mucous thread. In two minutes it had regained the water surface, the front end of the foot being again and again brought into contact with the thread, so as apparently to grip it.

**Limapontia nigra**, Johnston.—One of several specimens collected at low tide near Bullock on the 2nd May last was observed on the 4th to mount a short way by a suspensory thread, but failed to reach the surface. Further particulars of this abortive attempt will be found farther on in the paragraph dealing with *Rissoa cingillus*.

**Doto coronata**, Gmelin.—A specimen of this rather common species dredged at Malahide on the 16th June last was observed on the same day to ascend by its thread from a depth of 1 inch in two minutes, the front of the foot during the operation being curled up and applied to the thread.

**Eolis farrani**, Ald. & Hanc.—Two specimens of this interesting species, which has its *locus classicus* at Malahide, Co. Dublin, where it was first discovered by Alder in 1844, were captured on *Zostera*-beds at Shennick's Island, Skerries, last year, one on the 1st and the other on the 18th July. The first specimen was seen to mount by its suspensory thread to the surface of the water from a depth of 1 inch in the space of one minute; the second specimen mounted by its thread in two minutes from a depth of 1 inch and a half. During the ascension the fore end of the foot was from time to time brought into contact with the thread, while the tentacles and papillæ kept up a vigorous motion.

**Eolis drummondi**, Thompson.—One of several fine specimens fully 1 inch long, dredged at Skerries, was transferred to a phial of sea-water on the 24th of July last. This was an extremely lively animal, its tentacles and numerous slender papillæ being in perpetual serpentine motion. Mounting rapidly to the water surface, it floated there foot upward until a gentle tap of the phial disengaged it and left it suspended from its slime-thread 2 inches below the surface. With what must have been a strenuous muscular effort the animal, while thus suspended by the tip of its slender tail, brought its head, or, rather, the fore front of its foot, again and again into contact with the slender suspensory thread, and vigorously working its tentacles and bristling papillæ in such a way as to render exact observation of its climbing method impracticable, it regained the water surface and resumed its floating position there in the space of one minute. Though the precise method of climbing was not perceptible, the ascent was clearly effected along and by means of the thread and by the application to it of the fore part of the animal's foot.

**Skenea planorbis** (Fabricius).—This diminutive species appears to be peculiarly addicted to the use of the suspensory thread both for descending from and ascending to the water surface, and though its absolute rate of progression is slow, yet in comparison with the size of the animal it is quite rapid. *Skenea* climbs by its thread fully four times its own length in one minute, while the much more swiftly moving *Eolis drummondi* accomplishes only twice its own length in the same time. Many specimens of *Skenea* collected at Bullock were placed under observation on the 19th April last, and several of these were seen to mount by their suspensory threads, the quickest rate of climbing being half an inch in two minutes, while the average of a number of such climbs by different individuals was found to be 1 inch in six minutes.

As with all the other species observed, the foot and tentacles of *Skenea* were in constant vigorous motion while the animal mounted by its thread to the water surface. Again and again one or other of the many floating individuals was seen to lower itself by its thread for  $2\frac{1}{2}$  inches. On one occasion an individual having lowered itself by a series of jerky drops almost to the bottom of the tube, remounted one-eighth of an inch along its thread before it finally resumed its descent and reached the bottom; another, having descended in the same manner, remounted its thread for half an inch, or, say, for eight times its own length.

The slime-thread in this, as in all the species observed, was distinctly elastic. When one of the floating animals was gently pushed outwards by a needle-point from the side of the glass tube by which it had ascended, it would spring backwards towards the side as soon as the needle was withdrawn. The thread or film was evidently continuous along the side of the tube and over the water surface to the point where the animal floated. This was more than once made apparent in this way:—An individual floating quite close to the side of the tube would drop and suddenly come to rest about half an inch below the water surface and against the side of the tube. If the tube were then quickly moved from a vertical to an almost horizontal position the animal would be found hanging suspended across the tube from a point in the side. This suspension was evidently from a portion of the slime-thread formed by the animal in ascending, as the change of position of the tube was effected so quickly as to prevent the animal applying its foot afresh to the glass surface, and so producing a new attachment and a new thread.

The peculiar jerky method of descent by its slime-thread frequently observed to take place with this species appears to me to negative the idea that such motion is accidental or involuntary, as has been suggested by G. Sheriff Tye \* and H. Wallis Kew † in their well-known papers on the subject of thread-spinning in the Mollusca. The abrupt pauses in and resumptions of the downward motion of *Skenea* appear to me to be explicable only on the assumption that the animal while descending, voluntarily and at intervals, inhibits and sets in action the discharge of mucus—in other words, that it makes its suspensory thread of set purpose. The appearances are inconsistent with an accidental lengthening of an elastic film, caused by the animal suddenly losing its foothold on the water surface, and so throwing its weight on that film at one point.

**Rissoa striata** (Adams).—This rather sluggish species, as it proved to be, was observed several times on the 1st May last to drop from the water surface and hang suspended by its thread. On one occasion the thread was seen to issue from the edge of the closed operculum, as if the animal had released itself from the water surface on which it crawled by withdrawing its foot. One individual was seen to mount its thread for three-quarters of an inch in two minutes, the

\* Quarterly Journ. of Conchol. vol. i. p. 402 (Molluscan Threads).

† 'Zoologist,' no. 709, July 1900 (Spinning Molluscs).



motions of the foot during the process being similar to those observed in the species already mentioned.

**Rissoa parva** (Da Costa).—Several specimens of this very common littoral species were placed under observation on the 29th April last. It proved to be more active than its congener *R. striata*. Again and again, when by smartly tapping the tube a floating individual was caused to sink below the surface on its suspensory thread, it was seen to regain its floating position by climbing up the thread. On one occasion the anterior part of the foot was observed to be brought into contact with the thread as the animal ascended, and the water surface was seen to be drawn downwards into an inverted cone at the point of suspension. The quickest rate of thread-climbing observed in this species was half an inch in one minute.

**Rissoa cingillus** (Montagu).—A single specimen of this species along with six specimens of *Limapontia nigra*, all gathered in rock-pools at Bullock on the 2nd May last, were placed two days later in a glass tube of the usual dimensions, 2 inches by  $\frac{3}{4}$  inch. In a short time all of the animals had crawled up the side of the tube and assumed the floating position foot upwards on the water surface. The tube was laid aside for a short time, and when the observation was resumed the *Rissoa* was found suspended by its thread at a depth of  $\frac{7}{8}$  inch, and vigorously working its foot and tentacles as if engaged in climbing. Half of the *Limapontias* were missing, only three of the six placed in the tube being visible on the surface. On holding the tube against the light and bringing a hand-lens to bear on the suspended animal I found that the three missing *Limapontias* had attached themselves to the shell of the *Rissoa*, which was striving hard to lift itself and its living burden to the surface. Although one of the *Limapontias* was fully as large as the *Rissoa*, hardly three minutes had elapsed before the *Rissoa* had climbed up three-eighths of an inch. At this juncture one of the smaller *Limapontias* set out climbing the thread in advance on its own account. It had mounted only a short way, however, when it fell back on the *Rissoa*'s foot, and so hampered its action that the animal soon gave up its laborious efforts to reach the surface and sank slowly with its burden to the bottom of the tube.

**Modiolaria discors** (Linné).—This common species,

often found swarming in its juvenile state in the littoral zone of the Dublin coast, is the only Pelecypod whose habits of locomotion I have observed. A number of young individuals collected at Bullock on the 21st April last, and averaging  $\frac{1}{8}$  inch in the longer diameter of the shell, were found to be expert climbers. Their method of climbing to the water surface, though in principle no doubt the same as that employed by the Gastropods, was utterly different in appearance. Instead of mounting the tube with an even gliding motion whose phases eluded observation, the young *Modiolaria*s hoisted themselves by intermittent and violent muscular contractions of an inordinately long foot, whose tip was anchored in advance of the animal, no doubt by a stiff mucus, as a preliminary to each upward lift of the animal and its shell. Watched with a hand-glass this operation conveyed a grotesque suggestion of a sailor climbing a rope hand-over-hand.

When halfway to the water surface one of the individuals, having withdrawn its foot completely into its shell, was seen, notwithstanding, to maintain its position on the side of the tube. A close scrutiny showed that the animal was fixed by a single delicate byssus thread neatly soldered to the glass by a terminal expansion. Before long I had the pleasure of watching the operation of byssus-making going on. The animal's foot was protruded to full length beyond the anterior end of the shell near to where the byssus-thread was fixed. For some seconds the foot was worked to and fro over the glass and then quickly withdrawn, when a second byssus-thread was seen to be fixed in position. After an interval of about a minute the foot was again shot out to full length, this time from the posterior end of the shell. Then for nearly half a minute the tip of the foot kept working over the side of the tube in a nervous, hasty, irresolute fashion, fumbling, in fact, and when it was at length withdrawn left three radiating byssus-threads fixed by their knobbed extremities to the glass.

In addition to the power of spinning a byssus, which it possesses in common with all the *Mytilidæ*, *Modiolaria discors* can produce a suspensory slime-thread and employ it in climbing. On the 24th April last one of many specimens left floating on the water surface in a tube was found to have lowered itself by a slime-thread to a depth of  $\frac{3}{4}$  inch. When watched this individual was seen to climb slowly up its thread by applying to it the tip of its long foot, the whole ascent being made in four minutes.

The foregoing observations are, perhaps, sufficient to show that the practice of climbing by suspensory threads attached to the water surface, or, rather, to the mucous film supported by that surface, is quite usual amongst the littoral or shallow-water species of our marine Gastropods. Though the difficulties in the way of observing the motions of animals usually minute, and in all cases in violent action on an almost invisible thread, were too great to enable me to demonstrate the precise method of climbing adopted in any of the cases here recorded, there can be hardly any doubt that it was essentially the same as that described by Taylor in the following passage from his 'Monograph of the Land and Freshwater Mollusca of the British Isles.' Speaking of the well-known climbing habit of the land-slug, *Limax arborum*, he says (page 318):—"The same mucous filament can also be made use of if necessary to re-ascend to the point of suspension, this being accomplished by bringing the extremities of the body together and transferring the point of attachment of the suspensory filament from the tail to the head."

The rates of vertical travel up the sides of the graduated glass tubes of 16 out of the 18 species placed under observation were noted with some particularity, and a brief *résumé* of the results may be given here. Taking 1 inch as the standard distance, and giving to each species its quickest observed rate of travel, they may be arranged in order of slowness as follows:—First come *Rissoa striata*, *R. parva*, and *Modiolaria discors*, each crawling its inch in 3 minutes; *Trochus tumidus*, *Skenea planorbis*, and *Polycera lessonii* come next, each with 2 minutes to the inch; then *Cypræa europæa*, with  $1\frac{1}{2}$  minute, *Littorina obtusata*,  $1\frac{1}{3}$  minute, and *Rissoa cingillus*,  $1\frac{1}{7}$  minute. Next we have *Trochus zizyphinus*, *Limapontia nigra*, and *Actæonia corrugata*, each with 1 minute to the inch, closely followed by *Nassa incrassata*, with 50 seconds. The elegant little *Trochus helycinus* takes only 35 seconds, and last and quickest of all come *Eolis farrani* and *E. drummondi*, each travelling at what may be accounted a dizzy rate for a marine Gastropod, accomplish an inch in 15 seconds and 13 seconds respectively.

All of these rates are rates of climbing rather than of simple travelling, since they were made on a vertical surface of smooth glass, and no doubt were considerably slower than the rates for the same species would have been on a horizontal surface. Taylor, in his Monograph already quoted from, has been pleased to calculate the mileage rate of several land and freshwater mollusks. Some of the more active land-slugs

he gives a rate of a mile in about 8 days, presumably on a horizontal surface, while *Ancylus fluviatilis*, he tells us, has been recorded to travel at the rate of a mile in 2 years and 10 months. It seems doubtful whether any of our marine Gastropods will be found to excel *Ancylus* in the deliberateness of its movements, while it is not improbable that *Eolis drummondi*, on the level, might be found to rival the speed of the Limaces, since the observations recorded in these notes show that the Nudibranch can climb at the rate of a mile in about 9 days 18 hours. To compare the small things of the organic world with the great things of the inorganic, the quickest travel rate of *E. drummondi* is some 260 times as great as the summer motion of the central and most rapidly moving portion of that famous ice-stream, the Mer de Glace.

XLVII.—*Alcyonarians from the Gulf of Cutch*. By Prof. J. ARTHUR THOMSON and Mr. GEORGE CRANE, B.Sc., University of Aberdeen. (Preliminary Note.)

IN the course of an investigation of the shallow-water fauna of part of the Gulf of Cutch, Mr. James Hornell made a small collection of Alcyonarians which presents some features of interest. The precise district was the coast of Okhamandal, which forms the N.W. extremity of the Kattiarwar Peninsula, and Mr. Hornell has called our attention to the fact that specimens of *Dendronephthya* (better known as *Spongodes*), of *Lophogorgia*, &c. could be collected at low tide.

The collection includes eight species, one of which—*Astromuricea stellifera*—is new. There is also a new variety of a remarkable species of *Echinomuricea* previously found in the Indian Ocean.

The position of the various species may be indicated as follows:—

Order ALCYONACEA.

- Family ALCYONIDÆ . . . . (1) *Sclerophytum polydactylum* (Ehrenberg).
- Family NEPHTHYIDÆ . . (2) *Dendronephthya* (*Spongodes*) *dendrophyta* (Wright and Studer).  
 (3) *Dendronephthya* (*Spongodes*) *brevirama* (Burckhardt).

## Order AXIFERA.

- Family MURICEIDÆ . . . . (4) *Astromuricea stellifera*, sp. n.  
 (5) *Echinomuricea uliginosa*, Thomson  
 and Simpson, var. *tenerior*, nov.
- Family GORGONIDÆ . . . . (6) *Lophogorgia lutkeni*, Wright and  
 Studer.  
 (7) *Juncella juncea*, Pallas.

## Order STELECHOTOKEA, Section PENNATULACEA.

- Family VIRGULARIDÆ . . (8) *Virgularia rumphii*, Kölliker.

(1) *Sclerophytum polydactylum* (Ehrenberg) is a well-known widespread species, previously reported from the Red Sea, Maldives, Gulf of Manaar, China Sea, Zanzibar, British New Guinea. It is characterized by the absence of siphonozooids, the small size of the autozooids, and the tough fleshy texture. The specimens from the Gulf of Cutch were large, the maximum dimensions being 5 cm. in height by 14 in length and 8 in breadth.

(2) *Dendronephthya* (*Spongodes*) *dendrophyta* (Wright and Studer), a species of the flattened umbellate type in Kükenthal's *dendrophyta* group, previously recorded from Philippines and China Sea. It is represented by loosely branched and close-set types of polyparium, as figured by Wright and Studer and by Kükenthal respectively; the anthocodiæ show the characteristic eight double rows of curved spicules, 4 or 5 in each row; a trivial feature, noted by Wright and Studer, namely the occurrence of numerous superficial x-shaped spicules on the branches, is very marked. The specimens were collected in the month of December, and they show abundant reproductive bodies—probably sperm-sacs—up to 0·25 mm. in diameter, attached to the mesenteric bands far below the polyp-stalks. Some specimens show a few small polyp-bearing twigs on the top of the stalk below the foliate branches.

(3) *Dendronephthya* (*Spongodes*) *brevirama* (Burckhardt), a species of the flattened umbellate type in Kükenthal's *florida* group, previously recorded from China Sea and Torres Strait. A peculiarly fine specimen has a polyparium 12·5 cm. in height, with diameters of 10·5 cm. and 5 cm., with a very short stalk 1 cm. in height, and root-like attachments of about 6 cm. The anthocodiæ show the characteristic eight double rows of spindles in chevron, with 5–7 in each row,

the uppermost projecting slightly. A feature of some interest on several specimens is the occurrence of a number of small twigs on the short stem portion almost down to the level of the stolons, each twig bearing two or three polyps.

(4) *Astromuricea stellifera*, sp. n.—A reddish, fan-like, flexible colony (14 cm. in height by 28 cm. in breadth in maximum dimensions) with very abundant anastomosis. The axis is dark glossy brown and almost smooth. The cœnenchyma is very rough. The verrucæ are crowded on all sides of the axis; they are cylindrical and their apex is fringed by about a dozen projecting spicules: The anthocodiæ are completely retractile within the verrucæ; there is a low, almost horizontal, tentacular operculum; two colourless converging spindles lie on the aboral surface of each tentacle, and there is a single or double ring at the base of the tentacles; otherwise there seem to be no spicules in the polyps. The spicules of the cœnenchyma are (1) irregular warty stars and toothed plates, (2) stout spindles with tuberculate warts, and (3) small irregular bodies—all of a rose-red colour. This species differs from the other members of the genus in many details, e. g. in the absence of long needle-like processes on the spicules fringing the mouth of the verruca.

*Localities.* Low water at Kiu Okha, and dredged off S.W. coast of Beyt Island.

(5) *Echinomuricea uliginosa*, Thomson and Simpson (1909), var. *tenerior*, nov.—The 'Investigator' collection of littoral Indian Ocean Alcyonarians includes a new species of *Echinomuricea* (*E. uliginosa*) which is described in detail by Thomson and Simpson in a memoir just about to be published. A variety of this species occurs in Mr. Hornell's collection. The diagnosis of the species is as follows:—A pinkish-red colony branched in one plane; the cœnenchyma is thick and very rugose, with spicules projecting in all directions; the verrucæ are thickly disposed, covering most of the surface; their walls bristle with the long smooth spines of projecting spicules; there is an elevated conical operculum composed of two bent spindles which touch for over three-quarters of their length, but diverge near the collaret, the interspace being almost completely filled by a short, curved, transversely disposed spindle; the horny axis is brown, cylindrical, and chambered, firm and flexible below, soft and collapsible above; the spicules include a variety of forms: (a) some showing a projecting smooth spine with branching warty arms

at the base; (b) spindles covered with irregular warts; (c) spindles bearing in addition to warts a number of smooth projecting spines on one side; (d) irregular forms with warty branches on one side and smooth spines on the other; (e) bifurcate spindles; (f) irregular plates with warty branches; and (g) smooth spindles in the anthocodixæ.

*Locality.* Laccadives (Kalpeni Bank) and Arakan coast, 13 fath.

The specimen from Cutch differs from the type in the following particulars:—It is unbranched (65 mm. in height, with a diameter of 3 mm.) ; it is more delicate in appearance and lighter in colour ; the large pointed spicules surrounding the mouth of the verruca are pink to white, instead of deep red ; the ground-colour of the cœnenchyma is white, instead of red or pink ; the spicules are more delicate and bear longer spines ; the superficial spicules of the cœnenchyma are white spindles with prominent rough warts, and reaching dimensions of  $0.61 \times 0.19$  mm., while the corresponding spicules in the type are thick red spindles with short close-set warts, and of larger size, viz.  $0.91 \times 0.23$  mm.

*Locality.* Off Dwarka, 16 fath.

(6) *Lophogorgia lutkeni*, Wright and Studer.—The representatives of this species are much larger and more copiously branched than those described in the 'Challenger' Report ; the largest specimen reaches a height of 45 cm. and the main stem has a diameter of about 7 mm. The verrucæ show eight triangular marginal lobes bent over the retracted tentacles, and it is of some interest to note that while the verrucæ of some branches stand out to a height of 1 mm., the openings on other branches are flush with the general surface of the cœnenchyma.

*Locality.* Off Beyt Island, 3-4 fath.

(7) *Juncella juncea* (Pallas).—Unbranched and slightly branched colonies, yellowish white (with a touch of red) to buff in colour, with very crowded verrucæ without definite arrangement. The spicules are clubs and double stars, intermediate forms between clubs and double stars, and a few single stars. We have referred the specimens to *J. juncea* rather than to *J. gemmacea* because the former is the older species. Prof. Hickson has suggested that *J. juncea* and *J. gemmacea* should be united in one rather variable species, and a study of various representatives of *Juncella* has led us to the same

conclusion. We think that *J. gemmacea* should be merged in *J. juncea*.

*Locality.* S.W. of Beyt Island.

(8) *Virgularia rumphii*, K lliker.—We have referred two specimens to this species, although they differ in some obvious features, which appear to us, however, to have only quantitative importance. They agree with *V. rumphii* in having close-set pinnules with crowded polyps and with peculiar interlocking on the metarachidial surface, in having very numerous undeveloped pinnules (96–120 on each side), and in many other respects. They differ in having 55–70 polyps on a pinnule instead of 40–44, in showing no distinct siphonozoids (probably because of imperfect fixing), in having a more slender axis, and so on, but they are much nearer to *V. rumphii* than to any other species. In their very numerous polyps they suggest *V. multicalycina*, Thomson and Henderson, but the calices of the latter are exceedingly well defined, whereas they are indistinct in those from Cutch.

XLVIII.—*Two new Species of Gryllacris in the University Museum, Oxford.* By Dr. ACHILLE GRIFFINI (R. Istituto tecnico, Genova, Italy).

I HAVE recently received for identification from the Hope Department, University Museum, Oxford, owing to the courtesy of Professor E. B. Poulton, F.R.S., and Mr. R. Shelford, a series of undetermined Gryllacridæ. In a memoir of some length, communicated to the Società Italiana di Scienze Naturali in Milano at its session of January 31st, 1909, I have described the African, Indo-Malayan, and Australian species of this family of Locustodea in the Oxford Museum collection. The following account treats of the only two Neotropical species in this collection; the species evidently are new to science, and one (*Gryllacris longstaffi*) is highly remarkable on account of the extraordinary structure of the apex of the abdomen, and of the external genitalia of the male.

I seize this opportunity to express my sincere thanks to Professor Poulton for permitting me to examine this interesting collection, and in particular to Mr. R. Shelford for the trouble he has taken in transmitting the specimens to me and in



supplying me with all the information concerning them that I required.

*Gryllacris longstaffi*, sp. n.

Apud *Gryllacridem ablutam*, Brunn., locanda. Statura modica: testacea nitida; capitis vertice antarius cum fastigio, cum parte supra frontis et cum primis 4 articulis antennarum colore atro, hoc colore præcipue inferius a colore testaceo reliqui capitis bene diviso, maculis ocellaribus nullis; pedibus unicoloribus testaceis, spinulis pedum posticorum fuscis basi pallidioribus; elytris apicem femorum posticorum tantum attingentibus, testaceis, venis venulisque concoloribus, leviter pallidioribus; alis albido-hyalinis, venis venulisque albidis.

♂. Abdomine segmentis dorsalibus brevibus, excepto ultimo abnorme permagno, cujus lateribus inflatis posterioribus subtusque magis productis; parte supra hujus segmenti posterioribus in medio lobum supraanalem perlongum, retrorsum versum gerente, hoc lobo basi petiolato, dein laminam magnam subtriangularem angulis rotundatis, lateribus et margine postico deflexis, apicem cercorum tegentem, efficiente; parte postica magni segmenti ultimi abdominalis sub lobo ample excavata; lateribus inferis eiusdem segmenti in appendices cerciferas magnas bicornutas posterioribus inter se cruciatis, retrorsum et sursum versas, partim a lobo supraanali tectas, productis; lamina subgenitali transversa, margine postico latissime sinuato, lobis omnino lateralibus posterioribus versis, apice angustis, stylos breves depressiusculos, apice rotundatos, gerentibus, vel (forsan per exceptionem) interdum stylis destitutis.

	mm.
Longitudo corporis .....	20·6-21·5
„ pronoti .....	4·5-4·7
„ elytrorum .....	16·5-17·2
„ femorum anteriorum .....	6·3-7
„ „ posticorum .....	11·1-11·9
„ segmenti abdominalis ultimi cum lobo .....	7·6

*Habitat.* Jamaica.

*Typi:* 2 ♂ (Musæi Universitatis in Oxford) a D. G. B. Longstaff anno 1907 collecti et donati.

*Typus A* (fig. 1, 5, 6), indicationem: "Jamaica, below 50 feet, Portland, Port Antonio, capt. Feb. 26-07" gerens.

*Typus B* (fig. 2, 3, 4, 7), indicationem: "Jamaica, about 2700 ft., Manchester, Walderston, capt. Feb. 7-07, at light" gerens.

Species propter notas sexuales ♂ valde miranda, forsitan typus novi generis sine cognitione ♀ tamen adhuc non instituendi.

Color testaceo-flavidus nitidus, pulcher; corpus parum robustum.

Caput ab antico visum ovoideum, pronoto minime latius. Occiput et vertex convexa: fastigium verticis rotundatum, articulo primo antennarum parum latius, hujus latitudinem  $1\frac{1}{2}$  non attingens. Frons inferius supra clypeum depressa, præcipue utrinque; sulci suboculares nulli; clypeus et labrum subelongata.

Occiput pallide testaceo-cinereum. Vertex cum fastigio verticis, cum fastigio frontis et cum dimidia (vel fere dimidia) parte supra frontis, colore atro nitido, sine maculis ocellaribus; hoc colore subtiliter etiam oculos supra subtusque partim circumdante, a colore pallido bene diviso (seu in colorem pallidum haud dilute transeunte). Pars infera coloris atri frontis in medio sinuata vel in medio utrinque angulo brevi inferius producta. Genæ, dimidia pars infera frontis, cum clypeo, labro, mandibulis, palpisque, testacea, leviter nebulosa; labrum interdum leviter fuscus. Articuli 3 primi antennarum toti atri; articulus quartus atro-fuscus, articuli 5-7 testacei interdum leviter fuscii, cæteri testacei.

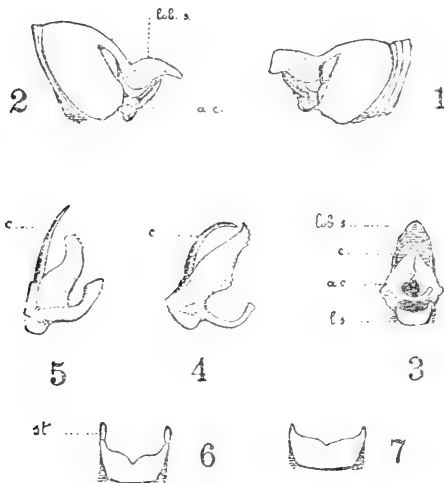
Pronotum a supero visum subquadratum, convexum, robustiusculum, marginibus antico et postico leviter et late rotundatis; sulco antico valliforme bene expresso; sulculo longitudinali abbreviato parum distincto, antice posticeque fossulari; sulco postico nullo seu ante limbum extremum marginis postici sito; metazona non ascendens. Lobi laterales humiles, subrectangulares, multo longiores quam altiorem, parum adpressi, angulis rotundato-truncatis, margine infero sensim sinuato, margine postico subrotundato-verticali, leviter obliquo, sinu humerali nullo (metazona postice minime producta). Sulcus V-formis et sulcus posticus sat bene expressi; intervalli gibbulosi. Color pronoti pallide testaceus, nitidus, leviter nebulosus, supra incertissime pallide trivittatus.

Elytra modica, fere lanceolata, apicem femorum posticorum ægre superantia, testacea nitida, venis venulisque concoloribus vel partim pallidioribus, latitudinem maximam mm. 6.5 parum post medium subattingentia, apice subacute rotundata. Alæ cycloideæ, albido-hyalinæ, leviter roseo tinctæ, venis venulisque albidis.

Pedes modici, testacei, imo condylo articulari tibiarum posticarum tantum interdum incerte dilute fusciorum. Tibiæ 4 anticæ solito modo spinosæ, spinis utrinque 4 modice longis, apicem versus longitudine parum decrescentibus. Femora postica breviuscula, basi valde incrassata, apice breviter attenuata sed ibi angustata, subtus margine externo 6-7 spinuloso, margine interno 4-6 spinuloso, spinulis apicalibus

fortioribus, fuscis vel tantum apice fuscis, basi pallidis. Tibiæ posticæ superne longe post basim leviter planiusculæ, ibique in utroque margine spinis 4, apice fuscis, armatæ; necnon spinis apicalibus solitis instructæ. Tarsi longiusculi, modice lati.

Abdomen concolor, testaceum, nitidum. Segmenta dorsalia ♂ ante-ultima inusitate brevissima, præcipue superne; segmentum dorsale ultimum ♂ inusitate permagnum, nitidissimum, convexum, utrinque posterius et inferius magis



1. Apex abdominis speciminis *A*, a latere visus.
2. Apex abdominis speciminis *B*, a latere visus: *lob. s.*, lobus supra-analis; *a. c.*, appendix cercifera.
3. Apex abdominis speciminis *B* ab infero visus: *lob. s.*, lobus supra-analis; *c.*, cercus; *a. c.*, appendix cercifera; *l. s.*, lamina subgenitalis.
4. Appendix cercifera sinistra speciminis *B*: *c.*, cercus.
5. Appendix cercifera sinistra speciminis *A*: *c.*, cercus.
6. Lamina subgenitalis speciminis *A*: *st.*, styli.
7. Lamina subgenitalis speciminis *B*.

(Figuræ omnes magnitudine auctæ.)

productum. Pars supera hujus magni segmenti (fig. 1, 2) posterius lobum supraanalem longum (fig. *lob. s.*) retrorsum versum præbet, petiolatum (petiolo sensim decurvo), in laminam irregulariter subtriangularem convexam, angulis rotundatis, lateribus deflexis, apice in specimine *A* (fig. 1) etiam cucullato deflexo, in specimine *B* (fig. 2) multo minus

deflexo, fere horizontali, semper tamen apicem cercorum tegentem et subamplectentem, terminatum. Sub basi huius majusculæ laminæ appendiculus medius videtur oblique in intimis partibus descendens, subtilis, verisimiliter cum basi laminæ ipsæ superne coniunctus. Sub lobo supraanali nunc descripto apex segmenti ultimi magni dorsalis ample excavatus. Utrumque latus (inferius et posterius productum) huius segmenti appendicem cerciferam (fig. a. c.) magnam retrorsum et sursum versam præbet. Appendices cerciferæ sunt bicornutæ, primo intuitu videntur tricornutæ, quia cercum (fig. c) in latere externo sursum versum etiam præbent; hæ appendices partim inter se sunt cruciatæ (fig. 3), sinistra semper supra dextram partim superposita, apicem versus, et partim a lamina lobi supraanalis apice sunt tectæ. Forma appendicis cerciferæ sensim differens in duobus typis (vide fig. 4 et 5); in utroque specimine tamen cornus inferum angustius, curvatum, subfalcatum, basi decurvum, apice incurvum, apice obtuso vel leviter dilatato; cornus superius latius, fere laminare, contortum, sursum versum, apice et intus minute pluridenticulatum, denticulis partim fuscis; huius basis superne extus cercum longum pilosum gerens.

Lamina subgenitalis ♂ transversa, margine postico latissime sinuato, in medio leviter angulariter inciso, lobis omnino lateralibus posterius versis, apice angustis, brevibus; hi lobi in specimine A (fig. 6), quod typicum normale esse puto, stylos breves, depressiusculos, apice subrotundatos (fig. 6, st.) præbent; in specimine B (fig. 7), quod anormale esse puto, magis acuti, stylis sunt destituti.

Hæc species, propter nonnullas notas, speciebus generis *Dibelonæ*, Br., appropinquatur.

*Gryllacris sancti-vincentii*, sp. n.

♂. Parva; testaceo-ferruginea concolor (vel pedibus intermediis saturatius ferrugineis?), graciliuscula; elytris hyalinis sensim testaceo tinctis, venis venulisque concoloribus; alis albido-hyalinis, venulis pallidis; tibiis anticis et intermediis subtus utrinque tantum spinis 2-3 breviusculis armatis; tibiis posticis, exceptis spinis apicalibus, inermibus.

	mm.
Longitudo corporis . . . . .	16
„ pronoti . . . . .	3·6
„ elytrorum . . . . .	15
„ femorum anticorum . . . . .	5·7
„ „ posticorum . . . . .	9·8
„ segmenti octavi abdominis . . . . .	1·9

*Habitat.* Insula Sancti Vincentii (W. Indiæ, teste *Shelford*).

*Typus:* 1 ♂ (Musæi Universitatis in Oxford), nonnihil læsus.

Inter *Gr. eximiam*, Karsch, et *Gr. exiguam*, Br., locanda.—Corpus statura parva, parum robustum, testaceo-ferrugineum, pedibus (exceptis intermediis in typo forsan per notam individualem saturatius ferrugineis) concoloribus.

Caput unicolor, pallide testaceo-ferrugineum, ab antico visum ovoideum, pronoto modice latius. Vertex nitidus, convexus; fastigium verticis rotundatum, latitudinem  $1\frac{1}{2}$  primi articuli antennarum subsuperans; maculæ ocellares nullæ. Frons inferius in medio impressa. Organa buccalia, solito modo confecta, et antennæ cum reliquo capite concolora.

Pronotum (in typo læsum) forsan posterius in medio et utrinque dilute fusco pictum, nebulis obliquis; a supero visum subquadratum; margine antico rotundato, sed in medio non producto; sulco antico valliforme, in medio subnullo. Lobi laterales parum longiores quam altiores, postice leviter altiores, angulo postico subtruncato, margine postico subverticali leviter retrorsum obliquo, sinu humerali subnullo; sulci bene impressi, intervalli gibbulosi.

Elytra parum longa, subhyalina, leviter testaceo tincta, venis venulisque concoloribus. Alæ albido-hyalinæ, venis venulisque pallidis.

Pedes testaceo-ferruginei (intermedii fusco-ferruginei). Tibiæ 4 anticæ subtus utrinque spinis parvis 2-3 præditæ. Femora postica basi crassa, apice breviuscule sed distincte attenuata, subtus margine externo 5-spinuloso, margine interno 2-3-spinuloso, spinulis in dimidio apicali sitis, apice brevissime incerte fuscis. Tibiæ posticæ exiles, fere teretes, superne inermes, vel rudimento tantum spinulæ unicæ circiter in medio marginis interni, vel etiam, sub lente, gibbulis quibusdam minutissimis, locum spinularum perpaucarum omnino rudimentalium indicantibus, præditæ.

Abdomen concolor. Segmentum octavum dorsale modice productum; segmentum nonum productum, parum cucullatum, posterius in medio bispinulosum. Lamina subgenitalis ♂ verisimiliter subquadrata, apice latiuscule rotundato, margine apicali in medio sat acute exciso.

Genoa,

Feb. 4th, 1909.

XLIX.—On the N. Australian Rats referred to the Genus  
Mesembriomys. By OLDFIELD THOMAS.

WHILE working out a very distinct new rat from Kimberley, N. Australia, sent to the British Museum by Mr. B. H. Woodward, of Perth, I have had occasion to examine all the species referred by me in 1906 to the genus *Ammomys*\*, whose name, being preoccupied, has since been altered to *Mesembriomys*.

Apart from the group-characters then described these species are of a very heterogeneous nature, and I am now convinced that they should be further divided into three genera, whose differential characters would be as follows:—

I. MESEMBRIOMYS.

*Ammomys*, Thos. l. c. (nec Raf.). Type *Mus hirsutus*, Gould.

Size very large. Form normal; feet narrow, fairly long. Tail very long, jerboa-like, heavily tufted terminally.

Skull large and stout, peculiarly high and heavy in the anterior frontal region, its highest point at or in front of the front edge of  $m^1$ , and its upper profile strongly bowed at this point.

Molars comparatively normal in structure, not specially laminate; inner cusp of anterior lamina of  $m^1$  situated, as is usual, behind the level of the middle cusp, opposite the gap between the latter and the middle cusp of the second lamina. Lower molars ( $m_1$  and  $m_2$ ) each with a well-marked re-entrant concavity behind, in which a distinct median supplementary cusp is placed.

Species. *M. hirsutus* (*Mus hirsutus*, Gould) and *M. macrurus* (*Hapalotis macrura*, Peters).

II. ZYZOMYS.

Genus novum.

Type *Mus argurus*, Thos.

Size quite small. Form delicate. Tail slender or thickened, lightly pencilled terminally, not heavily haired.

Skull light and delicate, not bowed in the frontal region, its highest point above  $m^3$ .

\* Ann. & Mag. Nat. Hist. (7) xvi. p. 84 (1906). I may take this opportunity of drawing attention to an important *lapsus calami* in this paper. On p. 83, bottom line, for *Conilurus* read *Notomys*.

Teeth as in *Mesembriomys* (see figure in original description of *Mus argurus* \*).

Species. *Z. argurus* with its subspecies *Z. a. indutus*, Thos.

The delicate slender build of this animal and its low flat skull will distinguish it from the large convex-skulled *Mesembriomys*, to which, however, in the essential characters of tooth-structure it undoubtedly bears a near affinity.

### III. LAOMYS.

Genus novum.

Type *Laomys woodwardi*, sp. n.

Size medium. Form comparatively short. Fur crisp, almost spinous. Feet short and broad. Tail short, thickened basally, tapering, heavily haired throughout.

Skull flattened above, its highest point above  $m^3$ , its general shape rather recalling that of *Leporillus*.

Teeth with the laminae very distinctly transverse and separated, the inner cusp of each of the two first lamina of  $m^1$  in line with the middle cusp, so that the transverse grooves between the laminae are complete, straight, and uninterrupted. The teeth therefore tend towards the distinctly laminate structure found in *Phlæomys*, *Otomys*, &c. Lower teeth also simply laminate, the laminae not or scarcely pinched in at their middle point, and the posterior lamina of  $m_1$  and  $m_2$  without any posterior concavity in which a supplementary cusp might stand.

Species. *L. woodwardi*, sp. n., and *L. pedunculatus* (*Conilurus pedunculatus*, Waite). The more extreme of the two is selected as the type.

The species of this genus are remarkable-looking animals, quite unlike ordinary Muridæ, and more suggesting members of the South-American Octodontinæ.

The following is the description of the new species:—

#### *Laomys woodwardi*, sp. n.

A greyish species, with a short, hairy, but untufted tail.

Size larger than in *L. pedunculatus*. Fur peculiarly coarse and crisp, almost spinous. General colour coarsely lined pale greyish, rather paler than "drab-grey." Individually the hairs are pale grey basally (grey no. 8), becoming drab-grey terminally, about half of them with black tips. Under surface white, the stiff bristly hairs white to their bases; line of demarcation on sides not sharply marked. Ears large, broad, pale grey. Upper surface of hands and

\* Ann. & Mag. Nat. Hist. (6) iii. p. 434 (1889).

feet greyish white, the fingers and toes pure white. Tail short, tapering, heavily haired throughout, "slate-grey" (arising from a mixture of blackish and white hairs) above, dull whitish below.

Skull markedly larger than that of *L. pedunculatus*, but of similar shape. Supraorbital edges sharply square, not ridged. Palatal foramina long and narrow. Bullæ smaller than in the smaller species.

Molars much larger than in the allied form, but of quite similar structure.

Dimensions of the type (measured in the flesh):—

Head and body 167 mm.; tail 114; hind foot 29; ear 21.

Skull: greatest length 41; basilar length 32.5; zygomatic breadth 21.3; nasals 14; interorbital breadth 5; palatilar length 18.7; diastema 11.5; palatal foramina 8.3; length of upper molar series 7.2.

*Hab.* Parry's Creek, near Wyndham, E. Kimberley, N.W. Australia. Alt. 100'.

*Type.* Old female. B.M. no. 9. 2. 16. 3. Original number 29. Collected 9th October, 1908, by J. P. Rogers. Presented by the Perth Museum through B. H. Woodward, Esq. Two specimens.

"Trapped in a rough stony gorge."—*J. P. R.*

This species is readily distinguishable from *L. pedunculatus* by its larger size, shorter tail, and greyer colour.

L.—*New Species of Paradoxurus, of the P. philippinensis Group, and a new Paguma.* By OLDFIELD THOMAS.

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HITHERTO the Palm-Civets of the Philippines, North and South, and of Borneo, have been considered as all belonging to one species, for which the name *P. philippinensis*, Jourd. (first locality mentioned, Luzon), has been used.

But a comparison of the material in the British Museum shows that the Mindanao animal is materially larger than that from Luzon, that the Bornean one is quite peculiar in colour, and that an additional form of the group occurs in the Tawi-Tawi Islands, between N. Borneo and Mindanao.

I also take this opportunity to describe the Hainan representative of *Paguma larvata*.



*Paradoxurus minax*, sp. n.

Size markedly larger than in the Luzon *P. philippinensis*, about equalling that of the Indian *P. niger*. General colour uniform dark brown, less mottled than in *philippinensis*; three broken lines of black spots fairly well defined on the back. Light frontal band little conspicuous. Crown and backs of ears blackish brown. Limbs, feet, and tail uniformly dark.

Skull similar to that of *philippinensis*, but conspicuously larger throughout. Teeth of the same general rounded shape, the carnassial with a heavy postero-internal ledge.

Dimensions of the type (measured in skin):—

Head and body 580 mm.; tail (broken in type, 440 mm. in another specimen of about equal size); hind foot 75.

Skull: basal length 98; condylo-basal length 105; greatest breadth 60; length of nasals in middle line 19.5; interorbital breadth 19; breadth of brain-case 34; palatal foramina 5.5; palatal length 47;  $p^4$ , length on outer edge 8.4, greatest diagonal diameter 9.6.

*Hab.* (of type). Davao, S. Mindanao.

*Type.* Adult male. B.M. no. 7. 2. 2. 6. Original number 766. Collected by M. P. Anderson. Presented by His Grace the Duke of Bedford, K.G.

This species is readily distinguishable from any of the other species in the neighbourhood by its markedly larger skull.

I also refer to this species the adult and young specimens collected by Cuming in the Islet of Camiguin, just N. of Mindanao, which were called "*P. zeylanicus*" (fortunately as a *nomen nudum*) in Gray's 'List of Mammals' of 1843\*.

*Paradoxurus torvus*, sp. n.

Size about as in *P. philippinensis*. General colour dark coppery brown (between mummy-brown and vandyke-brown), approaching that of the S.-Indian *P. jerdoni*. Face wholly blackish, without lighter markings, as are also the backs of the ears, the nape to the withers, and the rump. Back with three inconspicuous black lines. Fore and hind limbs and tail blackish brown. Under surface dark chocolate-brown.

Skull most like that of *P. philippinensis*, the teeth of

\* List Mamm. B. M. p. 55 (1843).

similar rounded character, larger individually than those of *P. sabanus*, the nearest species geographically. Posterior edge of palate of the reversed V-shape found in the genus *Paguma*, although it is at about the same distance behind the molars as is usual in *Paradoxurus*.

Dimensions of the type (measured in skin):—

Head and body 490 mm.; tail 410; hind foot 64.

Skull: basal length 39; condylo-basal length 94; greatest breadth 57.5; length of nasals in middle line 14; interorbital breadth 15.5; breadth of brain-case 33.5; palatal length 42; palatal foramina 5; front of  $p^1$  to back of  $m^2$  30;  $p^4$ , length on outer side 8, greatest diameter 8.7.

*Hab.* Bangao Island, Tawi-Tawi Group.

*Type.* Old male. B.M. no. 94. 9. 28. 9. Collected July, 1893, by A. Everett.

Even if the peculiar coppery-brown colour of this *Paradoxure* should prove to be due in any degree to a melanoid suffusion (and there is no evidence for this suggestion), the continuation of the dark colour of the head down to the withers, the large size of the teeth as compared with those of *P. sabanus*, and the *Paguma*-like shape of the posterior nares will distinguish the species from any of its allies.

#### *Paradoxurus sabanus*, sp. n.

Size smallest of the group. General colour a peculiar greyish olivaceous tinged with buffy, being far the most distinctly olivaceous of the *Paradoxures*. The usual lines and spots on the back visible, but not conspicuous or sharply defined. Underside brown, the hairs broadly tipped with buff or pale tawny. Muzzle, back of ears, and crown black, a variable amount of light greyish grizzling on the forehead and area in front of the ears. In some specimens there is a complete frontal light band, and in others not. Limbs and tail blackish as usual.

Skull like that of *P. philippinensis*, but the teeth smaller throughout.

Dimensions of the type (measured in skin):—

Head and body 465 mm.; tail 360; hind foot 68.

Skull: basal length 88; condylo-basal length 92; greatest breadth 57; length of nasals in middle line 16; interorbital breadth 17; breadth of brain-case 32; palatal length 42; front of  $p^1$  to back of  $m^2$  28.5;  $p^4$ , length on outer edge 7, greatest diameter 8.4.

*Hab.* North Borneo. Type from Spitang.

*Type.* Old male. B.M. no. 93. 3. 4. 5. Collected July, 1892, by A. Everett.

Its peculiar buffy-olivaceous colour and small size will readily distinguish the Bornean *Paradoxure* from *P. philippinensis*, with which it was united by Blanford.

*Paguma larvata hainana*, subsp. n.

Markings particularly prominent. Tail nearly all black. Molars large.

Size about normal. Fur coarse and harsh, not nearly so rich as in true *larvata*. Ends of dorsal hairs strong buffy. Head-markings very strikingly contrasted, sharply defined; median white line pure white to between the ears, and then continued, rather less pure, down the nape nearly to the end of the black nuchal area; black bands bordering it on forehead broad, very deep black; supraorbital white spots small, infraorbital fairly large, sharply defined; anteaureal spots small. Chin black, succeeded behind by a well-marked whitish collar. Belly dull brownish white. Hands and feet black. Tail black, all but its basal three inches above and six below.

First upper molar larger than in true *larvata*, conspicuously larger than in subsp. *taivana*; its surface, in the unworn state, comparatively flat, the postero-external cusp obsolete. Carnassial scarcely or not larger than in *larvata*.

Dimensions of the type (measured in skin):—

Head and body 470 mm.; tail 425; hind foot 76.

Upper carnassial, length on outer edge 7.6, greatest diameter 8;  $m^1$  6.8 × 7.6.

*Hab.* Five-Finger Mountains, Hainan.

*Type.* Immature male. B.M. no. 99. 9. 2. 1. Collected April or May, 1899, by Mr. John Whitehead.

Dr. Matschie has suggested that the Formosan form of *P. larvata*, *P. l. taivana*, Swinh., may be the same as the original *larvata*, but it has not the well-marked whitish collar mentioned in Hamilton Smith's description and present in examples from the Lower Yang-tse. Its first upper molar is much smaller than in the mainland specimens, in marked contrast to that of the present animal, in which this tooth is much larger.

LI.—*New Species of Ecomys and Marmosa from Amazonia.* By OLDFIELD THOMAS.

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AMONG some Amazonian mammals sent to us for determination by Fraulein Dr. E. Sneathlage, of the Goeldi Museum, Para, there are examples of a new *Ecomys* and a new *Marmosa*, which are here described. The type specimens have been generously ceded to the British Museum by the authorities at Para.

*Ecomys tapajinus*, sp. n.

A large species of a rich tawny-rufous colour.

Size about as in the larger members of the group, *marmosurus*, *roberti*, and *mamoreæ*. General colour brightest of all, a rich tawny or cinnamon-rufous colour, about equal to the brightest members of the genus *Nyctomys*; this colour is browner on the head and fore back, richer on the rump and hips, where it nearly matches Ridgway's "tawny," but is brighter and glossier. Under surface white, the hairs of the throat, chest, narrow middle line of belly, and whole of inguinal region white to the roots, those of the side of the belly slaty grey basally; but none the less the passage from the tawny colour of the flanks and the white of the belly is nearly as sharply defined as in *E. roberti*, not gradual as in *marmosurus*. Hands and feet greyish white. Tail, as usual, long, uniformly brown, finely pencilled.

Skull most like that of *E. roberti*, but rather more heavily built; outer plate of zygoma-root narrower; palatal foramina longer, tooth-row shorter.

Dimensions of the type (measured in flesh):—

Head and body 126 mm.; tail 158; hind foot 25; ear 17.

Skull: tip of nasals to front corner of interparietal 28·6; zygomatic breadth 16; nasals 11·8; interorbital breadth 5·9; zygomatic plate 2·8; diastema 9·2; palatal foramina 5·8 × 3; length of upper molar series 4·7.

*Hab.* Santa Rosa, R. Tamauchim, right bank of the Upper Tapajoz R.

*Type.* Old female. B.M. no. 9. 3. 9. 9. Original number 21. Collected by Fraulein Dr. E. Sneathlage.

This species may be readily distinguished from the other

three equally large members of *Ecomys* by its much richer colour, in marked contrast to its white belly.

In 1906 \* I formed the subgenus *Ecomys* for a number of rats which combined something of the external appearance of *Rhipidomys* with the characteristic palate of *Oryzomys*; but, as I failed to find any cranial distinction from the latter genus, I only considered it as a subgenus. Now, however, I find that, as is still more marked in *Rhipidomys*, the outer plate of the anterior zygoma-root is hardly projected forward in front of the upper bridge, while in *Oryzomys* there is always a strongly marked projection. As the group is undeniably a natural one, easily recognizable externally, I think this character, slight though it is, will justify our treating *Ecomys* as a full genus. A list of the known species is published in the paper above referred to.

*Marmosa emiliae*, sp. n.

Smallest of the known species; tail excessively long.

Most nearly allied to *M. pusilla*, Desm., but even smaller (combined length of three anterior molariform teeth 4.2 mm. instead of 4.4). Fur soft and fine; hairs of back about 6.5 mm. in length. General colour above dull fawn, the extreme tips of the hairs washed with dark brown. Under surface buffy white (rather paler than Ridgway's cream-buff), the hairs pale to their roots, without slaty bases. Black eye-rings well-marked. Ears rather larger than in *M. pusilla*. Hands and feet dull whitish above. Tail nearly twice the length of the head and body, its extreme base only hairy, the remainder practically naked, uniformly dark brown above and below.

Skull much as in *M. pusilla*. Teeth as in that animal, except that the secator, instead of being fully as large as or larger than the tooth next in front of it, is distinctly smaller, its vertical height from the cingulum being about 0.7 mm. as against 0.9 mm. in the anterior tooth.

Dimensions of the type (measured in the flesh):—

Head and body 75 mm.; tail 142; hind foot 13; ear 16.

Skull: greatest length 23.5; basal length 21; zygomatic breadth 13; interorbital breadth 4.2; palatal length 12.2; combined length of three anterior molariform teeth 4.2.

*Hab.* Para.

*Type.* Subadult male. B.M. no. 9. 3. 9. 10. Original number 30. Collected 13th February, 1909, by Fraulein

\* Ann. & Mag. Nat. Hist. (7) xviii. p. 444.

Dr. Emilie Snethlage, in whose honour the species is named.

This pretty little opossum, the smallest marsupial of the New World (with the exception of *Peramys sorex*), may be readily distinguished from its only near ally, *Marmosa pusilla*, Desm., with which *M. agilis*, Burm., would seem to be identical, by its still smaller size, smaller secator, and much longer tail.

LII.—*Two new Macaques from W. Java.*

By OLDFIELD THOMAS and R. C. WROUGHTON.

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IN a report recently presented by us to the Zoological Society on the magnificent collection of mammals obtained in Western Java by Mr. G. C. Shortridge, and presented to the British Museum by Mr. W. E. Balston, the series of Macaque Monkeys is referred to *M. fascicularis*, Raffl. Now, however, in working out some mammals sent us by Mr. H. C. Robinson from the Malay Peninsula and Islands, we have come to the conclusion that these Monkeys are not referable to *fascicularis*, but belong to two species, neither of which appears to have a name.

The first of these is a Javan representative of *fascicularis*, while the second has quite a different skull, more like that of the South-Indian *M. sinica*.

*Macaca mordax*, sp. n.

A large-sized macaque of the long-tailed type, rather larger than *M. fascicularis* and with larger teeth than in that species.

Fur coarse, 26–30 mm. long on lower back, 46–50 mm. on shoulders. General colour a coarse mixture of brown and buff. Arms and legs greyer, the grizzling less marked. Cheeks and lower surface dirty white. Tail like back, gradually shading, at half its length, into a grey-brown like that of the arms and legs. A black line across the face above the eyes.

Skull about as in typical *fascicularis*, but somewhat larger and with markedly larger teeth. The posterior nares comparatively large.

Dimensions of the type:—

Head and body 600 mm.; tail 610; hind foot 155; ear 43.

Skull: greatest length 124; basal length 90; zygomatic breadth 84; palatal length 52; longest axis of posterior nares 13·5; upper premolar and molar series 33; second molar 8·2 × 6·8.

*Hab.* W. Java (type from Tjilatjap; sea-level).

*Type.* Adult male. B.M. no. 9. 1. 5. 27. Original number 613. Collected 19th October, 1907.

This species is easily distinguished from the typical *fascicularis* of Sumatra by its greater size, duller colouring, coarser fur, and, above all, by its much larger teeth.

### *Macaca resima*, sp. n.

Smaller than the last, with much shorter tail, broad molars, and concave nasal profile.

Fur rather fine and soft, 30–35 mm. on lower back, 50–55 on shoulders. Colour above a coarse mixture of brown and buff, producing a general effect near “isabella-colour.” The usual transverse black line above the eyes; cheeks dirty white. Arms and legs grey, the former darker, the latter very pale. Tail almost black at the base, merging into grey distally. Lower surface of body and tail and inner surface of limbs greyish white.

Skull comparatively narrow; orbits and orbital septum nearly vertical, the latter joining the horizontal nasals nearly at a right angle. Muzzle more elongate. Posterior nasal openings small, markedly so when compared with those of *M. mordax*. Molars very broad, as broad as long.

Dimensions of the type:—

Head and body 520 mm.; tail 360; hind foot 135; ear 42.

Skull: greatest length 123; basal length 95·5; zygomatic breadth 75; palatal length 55; longest axis of posterior nares 11·5; upper premolar and molar series 33·5; second molar 8·5 × 8·5.

*Hab.* Tasikmalaja, W. Java. Alt. 1145'.

*Type.* Adult male. B.M. no. 9. 1. 5. 31. Original number 1219. Collected 18th January, 1908.

The short tail of this species, though proportionally longer than that of any member of the *M. nemestrina* group, serves to distinguish it at a glance from *M. mordax*, its nearest neighbour, while the skull-characters noted above separate it both from that species and from *nemestrina* and its allies.

## BIBLIOGRAPHICAL NOTICE.

*Catalogue of the Lepidoptera Phalaenæ in the British Museum.*  
 Vol. VII. *Noctuidæ*. By SIR GEORGE F. HAMPSON, Bart. Printed  
 by Order of the Trustees. 8vo. London, 1908. Pp. xv, 709.  
 Plates cviii.-cxxii. & 184 Text-illustrations. Price: Text 17s.,  
 Atlas 13s.

THE seventh volume of this great work, or the fourth of the *Noctuidæ*, includes the first of three volumes to be devoted to the subfamily *Acronyctinæ*, and includes descriptions of 843 species, divided into 96 genera, a considerable number of both genera and species being here described as new. The *Acronyctinæ*, as here employed, are characterized in Mr. C. O. Waterhouse's Preface "by the trifid neuration of the hind wing combined with spineless tibiæ and smooth eyes not surrounded by bristle-like hairs, and it is the least specialised of the subfamilies of the *Noctuidæ* *Trifinæ*."

How completely the classification of the *Noctuidæ* has been revolutionized of late years may be seen by the number of well-known genera now included in the *Acronyctinæ*, but referred by previous authors to *Apamidæ*, *Cosmidæ*, *Hadenidæ*, *Amphipyridæ*, &c. Among these we may note the genera *Amphipyra*, *Mania*, *Dipterygia*, *Trachea*, *Euplexia*, *Perigea*, *Eremobia*, *Luperina*, *Trigonophora*, *Eriopus*, and *Thalpophila*.

But while entomologists may congratulate themselves on living at a time when it is possible for so extensive and elaborate a work to be published, they must not forget that it has been led up to by the labours of a long series of previous authors, without which its inception and fulfilment would have been impossible. It may be well to remember that the last complete *Catalogue of Moths* by Francis Walker was published by the British Museum in thirty-five volumes from 1854 to 1866, and though out of print and out of date at the present time, was of great value when it appeared, notwithstanding numerous defects and errors, if only as a compendium of the then existing literature of the subject. Whether thirty-five volumes will now suffice to complete the much more elaborate work undertaken by Sir G. F. Hampson is hardly to be expected; but we hope the author will succeed in completing at least the groups including the larger moths, in which he has already made such good progress, before the advance of old age necessitates his resigning the remainder of the work to other hands.



## PROCEEDINGS OF LEARNED SOCIETIES.

## GEOLOGICAL SOCIETY.

February 24th, 1909.—Prof. W. J. Sollas, LL.D., Sc.D., F.R.S.,  
President, in the Chair.

The following communications were read:—

1. 'Palæolithic Implements, etc. from Hackpen Hill, Winterbourne Bassett, and Knowle-Farm Pit (Wiltshire).' By the Rev. Henry George Ommanney Kendall, M.A.

Implements are described from the localities mentioned in the title, which lie at heights of 885, 576, and 450 feet above O.D. respectively. Hackpen Hill forms a ridge of Chalk running north and south, capped by patches of Tertiary clay. Trimmed stones of eolithic nature were obtained from fields ploughed in Drift-gravels, together with abraded Upper Greensand chert, quartzite-pebbles, and small flints. The greater number of the flaked stones were found within and near shallow pits excavated in yellow Drift-clay, apparently newer than the Red Clay with Flints, exposed at the edges of the larger hollows. The implements are unabraded, abraded, and striated; some stained brown, some green, others unstained; evidently some are *in situ*, others were brought with the Drift. Implements taken from the clay are described, and a distinction is made between the palæoliths and neoliths obtained from the same surface. The similarity in the mineral condition of the former to palæoliths from Knowle-Farm Pit is pointed out, and both are referred to the Chelléen period.

It is noteworthy that, while implements and flakes are numerous on the top of Hackpen Hill as compared with good, trimmed pieces, yet at this 570-foot level on the Winterbourne-Bassett plain implements and flakes are very scarce, while trimmed pieces are very numerous, although the level of the Winterbourne stones is 300 feet lower. Many of the latter, however, have been evidently rechipped, and are therefore of later date. The Author concludes that implements of at least three palæolithic periods are found at Knowle, and these three periods may be compared with the Chelléen, Lower Acheulien, and Upper Acheulien of Prof. Comont at St. Acheul. Still older implements (possibly earlier Chelléen) seem also to occur.

2. 'Plant-containing Nodules from Japan, considered structurally in their Relation to the "Coal-Balls" and "Roof-Nodules" of the European Carboniferous.' By Marie C. Stopes, D.Sc., Ph.D.

These nodules are of interest, because of the plant and animal fossils that they contain. The plant-petrifactions are of a type

unknown from the Mesozoic, and will be described separately. The nodules are of Cretaceous age. They enclose numerous marine shells and various plant-remains, well petrified. Unlike the 'coal-balls' and 'roof-nodules,' they are not contained in coal-seams or in the roof thereof, but occur in a thick series of shales below the coals, which appear to be of Tertiary age. The microscopic aspect of the matrix shows that it is highly granular, unlike the matrix of coal-balls and roof-nodules. Chemically they consist of about 60 per cent. of carbonates, both lime and magnesia being present, with 30 per cent. of silicates; the large proportion of silicates is an important point of difference from the Carboniferous nodules. In having numerous plant-fragments in a single nodule and in the type of petrification the nodules are like coal-balls; in having marine shells included in the matrix they are more like roof-nodules. They probably represent fragments of tangled debris, which drifted out to sea but a short distance, and then were speedily petrified. The Authoress acknowledges help from the Government Grant Committee of the Royal Society in carrying out the research, and also from the Japanese Government, the Imperial University, and the local Government of Hokkaido, together with the Tunko Kaisha of Hokkaido.

#### MISCELLANEOUS.

*On some new Steneosaurs from the Oxford Clay of Peterborough.*

*To the Editors of the 'Annals and Magazine of Natural History.'*

GENTLEMEN,—Since the publication of my paper on the above subject in the last number of this Magazine (March 1st), a part of the 'Palæontographica' (Bd. 55, Lief. 5 & 6) has been issued, containing a memoir by Dr. E. Auer, also on some Steneosaurs from the same horizon and locality. In this the author describes as a new species *St. teleosauroides*, the form which I named *St. leedsi*, and as a new variety, *St. larteti*, var. *kokeni*, the animal which I regarded as specifically distinct under the name *St. durobrivensis*.

It seems unfortunate that Dr. Auer should have been anticipated by my brief note after he has taken such pains to produce so excellent a memoir.

CHARLES W. ANDREWS.

17th March, 1909.

# THE ANNALS

AND

## MAGAZINE OF NATURAL HISTORY.

[EIGHTH SERIES.]

No. 17. MAY 1909.

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LIII.—*Descriptions of new Genera and Species of New-Zealand Coleoptera.* By Major T. BROUN, F.E.S.

[Continued from p. 233.]

### Group Colydiidæ.

#### *Bitoma picicorne*, sp. n.

*Slender*, elongate, opaque, nigrescent; legs testaceo-fuscous; antennæ piceous; sparingly clothed with fine variegated setæ.

*Head* nearly as large as thorax, with ill-defined granular sculpture and greyish or yellowish setæ. *Eyes* moderately convex, with a few short setæ which are almost minute spines. *Thorax* small, subtruncate, and widest in front, gradually yet a good deal narrowed behind, its sides not at all lobate, not distinctly crenate, but somewhat explanate near the front; there are two very small elevations near the front, it seems depressed along the middle, and its granular sculpture is not easily seen; the setæ are rather short, coarse, and yellowish principally. *Elytra* elongate-oblong, parallel, evidently wider than thorax at the base; there is a depression at the middle of the base which is bordered by slight elevations; the suture appears faintly yellow owing to the setæ there, the space along each side of the suture seems

dark or slightly depressed, its sculpture is granular but ill-defined ; on each near the base there is one distinct white spot, there are two more spots in line with the first, but are not white and distinct ; the sculpture near the sides consists apparently of series of granules and linear longitudinal interstices ; there are a few minute grey spots near the apex.

*Antennæ* finely and sparingly setose, basal joint just visible above ; second stout, longer than broad, suboviform but truncate at apex ; third elongate, 4-7 each rather longer than broad, ninth broader than the preceding one, tenth strongly transverse, eleventh nearly twice as long as the tenth.

*Tarsi* with very few fine setæ, second and third joints more prolonged underneath than the first, but not lobed, the terminal rather longer than the basal three combined.

*Tibiæ* straight, finely setose ; claws yellow.

*B. rugosa* is the only near ally ; it varies from testaceous to rufo-fuscous, and lacks the narrow raised longitudinal interstices of *B. picicorne*, the basal joint of the antennæ is more exposed and the terminal one is shorter and more rotundate, and the sides of the thorax are more jagged.

Length  $1\frac{1}{4}$  ; breadth  $\frac{3}{8}$  line.

Broken River. One individual from Mr. J. H. Lewis.

#### *Coxelus elongatus*, sp. n.

*Elongate*, slightly convex, subopaque, concolorous, fusco-rufous ; antennæ clear red, club picuous ; sparingly clothed with distinct pale yellow setæ, those on the tibiæ more slender.

*Head* only slightly narrowed in front, finely but very definitely and closely granulate ; clypeus nearly smooth. *Thorax* of equal length and breadth, the front angles attain the middle of the eyes ; disc slightly transversely convex, with a linear impression along the middle, which, however, does not reach the base, its whole surface rather closely and distinctly granulate ; it is widest before the middle, where the marginal channels are a little expanded, but nearly straight though a little narrowed towards the base ; the margins are studded with granules, and appear therefore finely serrate ; the base is oblique towards each side, so that the posterior angles are not sharply defined. *Elytra* incurved at base, with somewhat rounded crenulate shoulders which hardly exceed the thorax in breadth ; they are a little narrowed posteriorly ; there is a broad shallow scutellar depression, bordered by a slight elevation of the interstices ;

they bear series of granules, which become confused at the extremity. *Legs* simple, of moderate length. *Antennæ* sparingly and finely pubescent; basal articulation quite hidden from above, second stout and longer than third; eighth small and bead-like, ninth distinctly larger, tenth strongly transverse, eleventh rotundate.

*Underside* opaque, pitchy red, minutely setose; metasternum and basal ventral segment more distinctly granulate than the succeeding ones. The antennal furrows well marked.

A very distinct species, owing to the uniformity of colour and sculpture. One example has two indistinct impressions on the thorax near the base, and the shoulders are not evidently granulate or crenulate, but there is no other material difference.

Length  $1\frac{1}{2}$ ; breadth  $\frac{1}{2}$  line.

Broken River. Another of Mr. Lewis's discoveries; three examples.

*Coxelus variegatus*, sp. n.

*Opaque*, suboblong, subdepressed, medially narrowed, variegate; head and thorax fusco-rufous, the former the darker; elytra fuscous black, but with a broad oblique space from the scutellum to near the hind thigh, not including the dark shoulder, and another oblique interrupted band from near the suture to the side and top of posterior declivity on each elytron reddish, but paler than thorax; antennæ and tarsi red.

*Head* rather broad, granulate, rather thickly studded with coarse squamiform setæ. *Eyes* prominent, coarsely faceted, setose. *Thorax* about one-third broader than long, closely and distinctly granulate; the longitudinal furrow does not attain the base, near which two narrow oblique foveæ and an indistinct scutellar impression may be seen; the sides are only slightly rounded and gradually narrowed backwards; near the obtuse front angles the marginal channels are expanded; there are no well-defined posterior angles; it bears numerous coarse yellow setæ, which along the sides stand out beyond the margins. *Elytra* oblong, their sides and apices nearly vertical; they bear series of granules, there are two broad median depressions and a narrow sutural one at the base; on the dark areas the setæ are almost black, on the lighter parts they are yellow; at the suture on top of the declivity there are two small, narrow, black elevations or crests. *Legs* with moderately coarse setæ.

After a careful comparison with each of the described species, I find that no. 2354 (*C. oculator*) most nearly resembles this species. In *C. oculator*, however, the head is much more narrowed anteriorly, so that it seems subtrigonal, its sculpture and setæ are very much finer, the setæ borne by the legs are finer, and the rounded black spots on the hinder part of the elytra are entirely different.

Length  $1\frac{1}{5}$ ; breadth  $\frac{1}{2}$  line.

Invercargill. One from Mr. Alfred Philpott.

*Coxelus bicavus*, sp. n.

*Elongate*, obscure ferruginous; elytra with some ill-defined dark spots; antennæ and tarsi red; sparingly clad with moderately short, distinct, mostly erect and stout, greyish setæ.

*Head* granulate, each granule with a minute puncture. *Eyes* rather small. *Thorax* of about equal length and breadth, without distinct lateral margins, but serrate, a little rounded towards the not at all prominent anterior angles, gradually narrowed backwards, posterior angles indistinct, base and apex a little rounded; its sculpture like that of the head, the granules evidently separated from each other, the median groove well marked in front, but not prolonged backwards much beyond the middle; at the base there are two elongated foveæ. *Elytra* oblong, rounded posteriorly, without obvious inequalities of surface, striate-punctate or granulate according to light during examination. *Legs* finely setose.

A rather small species, which may be identified by the two elongate basal foveæ situated about halfway between the middle and sides of the thorax.

Length  $1\frac{2}{5}$ ; breadth  $\frac{3}{5}$  line.

Invercargill. One forwarded for examination by Mr. A. Philpott.

*Gathocles obliquicostatus*, sp. n.

*Suboblong*, moderately convex, a little narrowed posteriorly; sparingly clothed with fine, short, curled, yellow setæ; rufous-fuscous, a large area near the middle of elytra piceous; the front of the head, the antennæ, and legs red.

*Head* setose behind, with a few very minute granules; the basal suture of clypeus oblique towards each side, the apical truncate; labrum smooth. *Thorax* one-third broader than long, its sides rounded, but a little, almost sinuously, narrowed near the base, channelled, the margins thick, somewhat reflexed, and granulate; the front at the middle is obtusely

prominent and has two short elevations, at the base two distinct oblique costæ enclose a triangular depression; it is finely but distinctly granulate. *Elytra* quite as broad as thorax at the base, the sides and apex nearly vertical; the suture slightly raised behind; on each elytron there is a distinct granular costa, which is curved outwards near the base and becomes nodiform on the summit of the posterior declivity, between it and the suture there are two series of granules or punctures when examined in different lights; the external sculpture, though similar, is less definite.

*Antennæ* 11-articulate; second joint obconical, stout, quite as long as exposed part of the basal one, third longer than fourth, joints 5-8 bead-like, ninth distinctly broader than eighth and about half the breadth of the strongly transverse tenth, the terminal subrotundate.

This can be distinguished from *Heterargus rudis* and the species of *Gathocles* by the distinct oblique elevations near the base of the thorax.

A variety occurs in which the sculpture is less definite. One antenna has only nine joints, the basal and terminal three are normal, as is the club; the missing intermediate ones are atrophied and coalesce so as to form one joint almost as thick as the second and about one-third as long as the whole length of the antenna.

Length  $1\frac{1}{2}$ ; breadth  $\frac{5}{8}$  line.

Otara, Southland (*Mr. A. Philpott*).

*Obs.*—The genera *Heterargus* and *Gathocles*, described almost simultaneously at opposite sides of the earth, the former by Dr. Sharp, the latter by myself, are, I think, synonymous; but as Dr. Sharp did not state whether the antennæ are 10- or 11-jointed, some uncertainty still exists.

*Protarphius tricavus*, sp. n.

*Body* pale rufo-castaneous, obscured by sappy matter; antennæ and tarsi red.

*Head* with granular sculpture, the lateral prominences cover half of the basal joint of the antennæ. *Thorax* broader than long, the disk transversely convex and uneven, with two broad irregular ridges which are less elevated in front than near the middle; the intervening spaces assume the form of an elongate frontal and two foveiform basal impressions, near the sides there are a few minute granules; the lateral margins are thick, not much expanded and but little rounded, with obtuse angles. *Elytra* rather short, broader than thorax, transversely convex, the apex and sides vertical; on

each elytron, including the suture, there are three slight ridges, the external one is nodiform on top of the declivity, they are apparently formed of granules; there are two series of punctures between each two of these and an equal number nearer each side; when looked at in certain ways these serial punctures seem like granules; the lateral sculpture is ill-defined.

*Antennæ* with the basal joint oviform rather than cylindric and attached to the head by a slender stalk; joints 3-5 obconical, longer than broad, third slightly longer than the others; 6-8 small and moniliform, ninth rather larger, transverse; tenth abruptly enlarged, transverse; eleventh also large, rotundate. *Antennal cavities* large, apparently not prolonged below alongside the eyes. *Eyes* minute, with coarse facets. *Tibiæ* finely setose, the anterior somewhat expanded externally near the middle, but a good deal narrowed or almost notched near the extremity. *Mandibles* bifid at apex. *Mentum* oblong, narrowed anteriorly. *Prosternum* widely incurved in front, its flanks flattened but not in the least excavate. *Coxæ* moderately separated. *Metasternum* of moderate length. *Epipleura* very narrow near the extremity. *Abdomen* with the basal segment nearly twice as long as the second, which is but little longer than the third or fourth, their sutures broad and deep.

The thorax is less rounded and prominent at the middle of the apex than in *P. ruficornis*.

Length  $\frac{7}{8}$ ; breadth  $\frac{1}{2}$  line.

Broken River, Canterbury (Mr. J. H. Lewis).

*Protarphius posticalis*, sp. n.

*Body* moderately transversely convex, covered with greyish scaly or sappy matter, and bearing fine, short, yellow setæ; it is fuscous, with pitchy-red legs and antennæ.

*Head* minutely granulate. *Thorax* rather large, about a third broader than long, with a frontal channel which, on the middle, becomes a large angular depression; two oviform depressions behind, a large one near each posterior angle, and an oblique transverse one towards each side in front, the intervals more or less obtusely elevated; its sides curvate, rather thick, and a little expanded; the sculpture indistinct, consisting apparently of shallow punctures. *Elytra* medially emarginate at base, slightly broader there than the base of thorax, a good deal curvedly narrowed behind; at the base there are two moderate elevations, the intervening space being broadly depressed; in line with these, near the middle,



there is a pair of less distinct nodosities; on top of the declivity there are four, the two nearest the suture being the largest; their sides are vertical, but the posterior declivity is not as vertical as in other species, being a little prolonged; some slighter inequalities may be seen; the sculpture near the suture is serial, and may be termed either granular or punctiform according to different points of observation.

*Tarsi* finely setose. Anterior *tibiæ* seemingly slightly grooved along the front face. *Antennæ* very sparingly pubescent, second joint obconical and stout, longer than the uncovered portion of the first; third slender, evidently longer than the succeeding ones; fourth and fifth longer than broad.

This species is most like *P. indentatus* as regards superficial inequalities, but the thorax is without indentations, the posterior slope is more gradual, and the insect itself is smaller. It is extremely difficult to determine the exact affinities of these species when one example only is available for examination.

Length  $1\frac{1}{2}$ ; breadth  $\frac{1}{2}$  line.

Otara, Southland. One of Mr. A. Philpott's discoveries.

#### SYPHYSIUS, gen. nov.

*Antennæ* 11-articulated, club abruptly two-jointed. *Tarsi* very scantily pilose, almost bare underneath; the basal three joints slightly longer below than above, the first joint rather longer than second.

The *head* behind the mentum is broad and plane, with sharply limited quite straight sides just outside, but inside of the eye there is a cavity, not a groove, wherein the basal joint of the antenna is accommodated.

In *Ulonotus* the oblique antennal furrow just passes, without encroaching on, the *rounded* inner margin of the eye, and passes uninterruptedly to the sculptured part of the head. The *tarsi* are thickly clothed and the claws thickened at the base.

In *Recyntus* the antennal groove is straight, but so expanded that the inner margin of the eye is shaved off and polished, so as to be quite *truncate*; it is limited behind by a distinct oblique ridge, thus separating the smooth deep groove from the sculptured portion of the head.

#### *Symphysius serratus*, sp. n.

*Convex*, suboblong; fuscous, the *antennæ* and legs red; covered with greyish sappy matter and bearing fine setæ.

*Head* with granular sculpture, dilated and elevated over the antennal cavities. *Thorax* transverse, with broadly explanate sides; the anterior angles project to the front of the eyes; near the middle each side is so perforated as to indicate two lobes, the hinder one abbreviated, so as to be distant from the shoulder outside, but its inner termination forms a distinct posterior angle; the disk has two elongate prominences projecting over the head, and two nodosities behind which are almost continuous with the frontal ones; the interval appears to be a broad channel. *Elytra* as wide as the thorax, their margins apparently serrate, the sides and apex nearly vertical; disk rather flat but uneven, at the base there are two curvate ridges extending backwards nearly to the middle, apparently with granules on their summits; a little further back, on each elytron, near the side a straight granulated elevation is seen, and there are two nodosities near the suture on the top of the declivity; on a small denuded space the suture is sharply defined, and there are two rather broad longitudinal lines which cannot be termed distinct flattened granules or punctures; the sides, near the margins, bear two series of granules; the shoulders project slightly, but there is an obvious gap between each of these and the thoracic lobes.

*Tibiæ* straight, externally serrate and finely setose. *Antennæ* sparingly pubescent, basal joint stout, scarcely visible from above; second also stout, longer than broad; third more slender, nearly as long as the fourth and fifth combined; joints 6-8 small and moniliform; ninth broader than the preceding one; tenth large and transverse, at least twice the width of the ninth; eleventh also large and somewhat rounded.

*Underside* fuscous, covered with sappy matter, the ventral segments gradually and slightly decrease in length, with straight deep sutures. *Prosternum* widely incurved in front, subtruncate in *Ulonotus* and *Recyntus*. *Metasternum* short, much more so than in *Ulonotus*. *Scutellum* large.

Length 2; breadth 1 line.

Southland. Two from Mr. A. Philpott; and one from Mr. J. H. Lewis, numbered 5237, so caked with dried sap and dirt that its sculpture cannot be discerned.

*Symphysius lobifer*, sp. n.

*Oblong*, fuscous, covered with sappy matter, with bright yellow setæ; tibiæ piceous, tarsi chestnut-red.

*Head* immersed up to the eyes, finely granulate, forehead

distinctly truncate in front ; labrum shining, very prominent, strongly rounded and finely setose at apex ; mandibles red, minutely bifid at the extremity and with an inner central tooth. *Thorax* rather broader than long ; from the apex for two-thirds of the whole length the side is formed of one thick, granule-studded curve bearing fine, short, curled yellow setæ, the basal space therefore, though straight, appears abruptly contracted and on a lower plane, the side, within the curved lobe, is broadly channelled ; a pair of ridges start from the apex and are curved outwards at the middle ; the surface is a little uneven, with granular sculpture. *Elytra* oblong, as wide as thorax, sides and apex nearly vertical, lateral margins indistinct and not perceptibly serrate ; disk nearly flat, studded with series of granules ; third interstices smooth, a little elevated, nodiform and setose on top of the declivity, at the base there are two longitudinal, but not very elongate elevations, the humeral angles are obtusely rectangular. *Tibiæ* straight, fringed with short yellow setæ, but not serrate.

*Antennæ* rather short and exhibiting malformation ; second joint stout, about as long and thick as the exposed portion of first ; the third longer than broad, longer than fourth ; fifth distinctly longer than third ; joints 6-8 short ; in this case the fifth is probably made up of two joints. The other antenna has two distinct basal joints like those first described, then follows one long joint composed, I believe, of three coalesced articulations, the succeeding three are bead-like ; ninth indistinct. *Club* stout, pubescent, biarticulate.

As there is only one specimen extant it is not easy to decide, by superficial examination alone, whether it is congeneric with the typical species. The antennæ, indeed, in perfect examples may be 10-articulate, in which case this species would become the type of a new genus near *Chorasus*. It may be identified by the peculiarly curved, lobe-like sides of the thorax.

Length  $1\frac{5}{8}$  ; breadth  $\frac{3}{4}$  line.

Invercargill (*Mr. A. Philpott*).

*Pycnomerus suteri*, sp. n.

*Elongate*, subparallel, slightly nitid, nude, fulvescent ; antennæ and tarsi red.

*Antennæ* with yellow pubescence, second joint longer than the exposed portion of the first, but, nevertheless, very short and transverse ; third slightly longer, narrowed at its base ; joints 4-9 transverse ; tenth nearly twice as broad as the preceding one ; terminal joint rather longer and narrower.

*Head* immersed up to the well-developed eyes, its punctuation close and distinct but not deep; the lateral plicæ thick near the antennæ, curved and cariniform near the eyes, frontal impressions small and subrotundate. *Thorax* about as long as broad, truncate in front, but with subacute projecting angles; it is widest near the front, but very gradually and slightly narrowed backwards, posterior angles quite distinct and rectangular; the lateral margins appear somewhat thickened in front, where the channels are broader, towards the base they become thin and are directed inwards so that they terminate at the basal margins inside, but quite free from the posterior angles; its surface distinctly but not closely punctured, the longitudinal impressions distinct but not deep, the space between them nearly smooth. *Scutellum* transverse, smooth. *Elytra* broader than thorax at base, with somewhat prominent shoulders, very gradually yet a good deal narrowed posteriorly, evidently punctate-striate, the three sutural interstices, on each, appear elevated behind, with minute indistinct serial punctures; they are not at all explanate near the apices; the setæ in the larger punctures are almost imperceptible.

*P. impressus*, from the same locality, is a more slender insect, its thorax has indistinct hind angles, the anterior angles are not prominent, and the apex is medially incurved. From all the other species *P. suteri* is distinguished by its somewhat yellowish colour and details of form and sculpture.

Length  $1\frac{3}{4}$ ; breadth nearly  $\frac{5}{8}$  line.

The Hermitage, Mt. Cook. One individual, named after its discoverer, Mr. H. Suter.

*Pycnomerus ruficollis*, sp. n.

*Subparallel*, elongate, nearly glabrous, moderately shining; head and thorax sanguineous, the antennæ, legs, and elytra pale ferruginous.

*Antennæ* with a few outstanding greyish hairs; second joint as long and stout as the uncovered portion of the basal one; third distinctly longer than fourth, obconical; 4-9 transverse; tenth abruptly broader; eleventh narrower than tenth, rounded, densely and minutely pubescent.

*Head* (eyes included) rather narrower than front of thorax, with two deep frontal impressions, lateral elevations distinct, its punctuation fine and not close. *Eyes* rotundate, moderately large and prominent. *Thorax* slightly longer than broad, gradually narrowed backwards, very slightly

emarginate in front, anterior angles subacute and a little prominent; basal margin broadly rounded, the angles, however, are almost rectangular; its punctuation is distinct, but not close except just near the lateral margins; there are two longitudinal impressions with an almost smooth central linear interval. *Scutellum* smooth. *Elytra* slightly arcuate at the base and rather wider than the thorax, humeral angles not dentiform; their sides nearly parallel, being only slightly and gradually narrowed posteriorly; they are deeply punctate-striate, but the punctures are not approximated, towards the extremity the punctures become obsolete though the striæ are deeper; interstices with fine punctures, the second and fourth confluent at the extremity, the apical margins somewhat thickened; the minute yellow pubescence on the apical segment is quite discernible.

*Underside* nude, moderately shining, with distinct punctures, those on the sternum coarse, but not close, abdominal punctuation less coarse, metasternum with a fine median groove behind.

In most respects similar to *P. minor*, the front angles of the thorax rather more prominent, the dorsal impressions well-marked and divided along the middle, and with the terminal two articulations of the antennæ definitely separated.

Length  $1\frac{1}{2}$ ; breadth  $\frac{3}{8}$  line.

Broken River, Canterbury. A good series from Mr. J. H. Lewis, some a little larger and darker than the type.

#### Group Mycetophagidæ.

##### *Triphyllus pubescens*, sp. n.

*Elongate*, moderately convex, a little glossy; head and thorax and a large humeral space rufo-castaneous, elytra fuscous, legs and antennæ testaceo-rufous, club dull fuscous; covered with conspicuous yellowish pubescence.

*Head* finely but distinctly and moderately closely punctured. *Thorax* subquadrate, but usually narrowed towards the depressed anterior angles, the lateral margins rather fine in front, with six or seven denticles near the base, the hindmost forming the posterior angles; it is distinctly but not very closely punctate; about m.dway between the middle and each side there is a punctiform fovea. *Scutellum* quadrate, with a few minute punctures. *Elytra* of the same width as the thorax at the base, very slightly wider near the middle, shoulders a little elevated; their punctuation distinct near the base, but not exactly seriate, and becoming

nearly obsolete behind the middle, there is a short linear impression near each side of the suture but no well-marked striæ.

*Antennæ* glossy, basal two joints nearly equal, third rather longer than second; fourth obviously shorter than contiguous ones; joints 6-8 become shorter and broader, the eighth being short and about half the width of the ninth; club opaque, evidently pubescent, large, triarticulate. *Eyes* transversely oval. Terminal joint of maxillary *palpi* stout, truncate at apex. *Tarsi* elongate, four-jointed, the basal joint longer than second.

*Underside* a little shining, ventral segments piceo-fuscous, finely punctate, with slender greyish pubescence; metasternum with a linear impression along the middle which becomes wider behind, its flanks closely and moderately coarsely punctured; prosternum distinctly punctured, rugosely at the sides.

In form and colour somewhat similar to *T. serratus*, 404, which, however, has the fourth antennal joint relatively longer, the fifth rather thicker than and as long as the third, whilst six to eight are obconical and hardly at all transverse. One male only with trimerous tarsi seen in either species.

♀. Length 1; breadth  $\frac{3}{8}$  line.

Invercargill (*Mr. A. Philpott*); six specimens.

#### Group *Byrrhidæ*.

##### *Pedilophorus pulcherrimus*, sp. n.

*Compact*, convex, oval; brilliant viridi-æneous, the head, thorax, and base of elytra with metallic-red reflections, and bearing numerous minute, inconspicuous, greyish setæ; femora piceous, tibiæ rufescent, tarsi testaceous, antennæ fusco-testaceous.

*Head* moderately coarsely punctured, more closely and finely near the eyes. *Antennæ* sparsely pilose, basal joint thick, reddish; second cylindrical, shorter and thinner than first; third slender, evidently longer than contiguous ones; 4-6 elongate, each rather shorter than its predecessor; 7 and 8 distinctly shorter and broader than preceding ones; 9 and 10 still broader, transverse; eleventh elongate. *Thorax* nearly thrice as broad as it is long, its sides finely margined, gradually narrowed towards the front, anterior and posterior angles almost acutely rectangular, apex widely incurved near each side, base obliquely truncate outwardly; its punctuation nowhere close but as distinct as that of the

head. *Scutellum* small, triangular, not smooth. *Elytra* widest near the middle, gradually narrowed behind, posterior declivity somewhat flattened; their whole surface with minute, irregular, linear impressions so as to seem coriaceous; their punctuation distinct, a little finer than on the thorax, and more effaced near the sides, the extremity bears a few fine yellowish setæ.

*Tibiæ* slightly curved externally, with fine yellow pubescence, the anterior slightly grooved along the outer face; third tarsal joint with an elongate membrane.

*Underside* sparingly clothed with fine yellow hairs, shining black, with iridescent reflections, closely and very distinctly punctured; abdomen more finely and closely, fifth segment rather more distinctly but not as closely punctured as the others.

From *Morychus coruscans* this may be distinguished by the coloration, &c. In *P. probus* the anterior tibiæ are distinctly curvedly expanded externally between the middle and extremity, thus forming a broad receptacle for the tarsi. *P. puncticeps* has the outer edge of the tibiæ curved, but most dilated near the middle, so that the tarsal furrow is deep and extends from the knee to the apex.

Length 2; breadth  $1\frac{1}{8}$  line.

Invercargill. Two examples from Mr. A. Philpott.

### Group Melolonthidæ.

#### *Eusoma ænealis*, sp. n.

*Subdepressed*, elongate-oblong, somewhat glossy, glabrous, but with elongate lateral setæ, variegate; fusco-testaceous, the clypeus, palpi, and basal four joints of antennæ rufous; thorax infuscate, each side of the middle, and the scutellum in the centre, fuscous; elytra with numerous irregular, more or less glossy æneo-fuscous spots, which become quite æneous or violaceous towards the extremity.

*Head* short, convex, moderately, finely, and not at all closely punctured; clypeus narrowed anteriorly, with reflexed margins, apex truncate, the basal suture oblique towards each antenna, more closely and rugosely punctured than the vertex. *Eyes* large, moderately convex, rounded, above, finely faceted. *Thorax* twice as broad as long, its anterior angles projecting along the basal part of each eye, apical emargination subtruncate in the middle, base widely bisinuate, wider than the front, with obtusely rectangular angles; the sides slightly curved, lateral and basal margins

fine but distinct throughout; the surface distinctly and irregularly but not coarsely or closely punctured. *Scutellum* large, minutely punctured, the dark spot almost smooth. *Elytra* elongate, oblong, somewhat expanded behind the middle, the apices, conjointly, broadly rounded, and finely margined nearly to the suture; each has three more or less definite costæ, which, however, do not reach the apex, the suture is a little rufescent and elevated behind the middle and finely punctate; their whole surface distinctly and irregularly punctured and uneven, the marginal punctation is serial. *Legs* pale brown, sparsely setose, front tibiæ tridentate, tarsi long and slender.

*Underside* nearly nude, shining fuscø-testaceous, the basal four ventral segments about equal, more or less longitudinally striate; metasternum irregularly punctate, medially channelled; prosternal process subtriangular, short, with a red median carina.

*Antennæ* 8-articulate, basal joint cylindrical at the base, knobbed at apex; second short and thick; fourth quite as long as the elongate third, its basal angle distinctly projecting backwards but not elongated as in *Sericospilus advena*; club with four equally elongate, strongly pubescent leaflets.

Very similar to *E. costella*, with a shorter thorax, stouter legs, and differing in numerous details. The elytra more irregularly marked and decidedly more æneous and quite violaceous on some spots. Easily recognisable by the more slender and elongate fourth joint of the antennæ. With the exception of the different structure of that joint, *Sericospilus* can hardly be separated from the older *Eusoma*.

♂. Length  $4\frac{1}{2}$ –5; breadth  $1\frac{3}{4}$ – $2\frac{1}{4}$  lines.

Westport. Two imperfect males from Mr. G. V. Hudson; found by Commander J. J. Walker.

#### LEWISIELLA, gen. nov.

*Body* subovate, moderately convex, almost nude, bearing only some minute inconspicuous setæ. *Head* broad. *Labrum* prominent, nearly horizontal, deeply emarginate. *Clypeus* with reflexed margins, obtusely curvate, its basal suture nearly straight. *Antennæ* 8-articulate, basal joint elongate, rather slender, clavate towards extremity, only about half of its length exposed above, oblique and concave at apex; second slightly longer and much stouter than third; fourth short and stout, oblique at the extremity (sometimes thicker than the third and of the same length); fifth short, prolonged inwardly so as to be half or two-thirds the length of the



club, which is rather short, triarticulate, and finely pubescent. *Thorax* transverse, base widely bisinuate, apex widely emarginate, its sides rounded. *Legs* elongate; femora moderately dilated, grooved underneath: anterior tibiæ expanded, obtusely bidentate externally, the apex, however, prolonged so as to form a third tooth; the others asperate and spinose, the extremity of each with coarse spiniform cilia. *Tarsi* long, with simple claws. Anterior *coxæ* large and prominent, occupying almost the whole space from base to apex of the prosternum except the flanks; they are contiguous at the extremity, but there is an open triangular space in front. *Metasternum* short. *Pygidium* scarcely visible above.

Nearly related to *Odontria*, but lacking the thick conspicuous clothing, and distinguished by the abbreviated metasternum and unexposed pygidium.

This being the third genus of the group discovered amongst the mountains of the South Island by Mr. J. H. Lewis, it is named in his honour.

*Lewisiella modesta*, sp. n.

*Subovate*, a little nitid, fusco-piceous, legs pitchy red, antennæ testaceous.

*Head* convex behind, strongly but irregularly punctured there so as to leave some smooth spots, the forehead closely, coarsely, and somewhat rugosely punctate; clypeus broadly rounded in front. *Eyes* almost hyaline. *Thorax* twice as broad as it is long, lateral margins distinct, the channels distinctly widened near the front, the sides evenly rounded, posterior angles nearly rectangular, but not acute; its surface convex, evidently punctured, interstices minutely sculptured; the anterior angles extend to the back of the eyes. *Scutellum* short, curvilinearly triangular, punctate. *Elytra* convex, shoulders obtuse and of the same width as the thorax at the base, gradually dilated backwards, apices obliquely truncate towards the suture, the pygidium visible from behind when examined horizontally; each elytron has eight distinctly punctured striæ, these, however, are sometimes shallow, interstices with distant punctures.

*Underside* shining, piceous, scantily pilose, femora similarly clothed; epipleuræ quite linear except near the base; posterior coxal laminae projecting behind between the thighs beyond the base of the trochanters.

Length 6; breadth  $3\frac{1}{4}$  lines.

Manorburn, Otago. Found by Mr. J. H. Lewis.

*Lewisella capito*, sp. n.

*Body* transversely convex, suboblong, not pubescent, with some minute brassy setæ only, subopaque, piceous black, antennæ pitchy red, club opaque, densely minutely pubescent.

*Head* relatively large, nearly as broad as front of thorax, coarsely irregularly punctate; clypeus very obtuse, almost truncate in front, its frontal margin less elevated and reflexed than that of *L. modesta*. *Antennæ* short, second joint nearly as long as exposed portion of first, joints 3 and 4 about equal in length, the latter slightly stouter, each longer than broad, neither very elongate; fifth short, only slightly produced inwardly, not pubescent; club triarticulate, rather short. *Thorax* strongly transverse, its sides nearly straight, without distinct marginal channels, but flattened near the anterior angles, apex widely emarginate, base widely but not deeply bisinuate and resting on the elytra, posterior angles nearly rectangular but obtuse, the margins closely and distinctly punctured, no doubt, in perfect examples, fringed with coarse short setæ; its surface with rather shallow, distinct, but not coarse punctures, all much finer than those on the head, none very close to each other, there is an indistinct dorsal stria. *Scutellum* smooth. *Elytra* ovate-oblong, very slightly rounded laterally, obliquely truncate at the extremity towards the suture, the pygidium, however, entirely concealed; the suture is just perceptibly elevated posteriorly; their striæ rather shallow, their punctuation also not clearly defined; interstices distantly punctured.

The five ventral segments of nearly equal length, on a different level than the metasternum, so that they are not on the same plane as the epipleuræ, they are sparingly punctured and setose, basal segment almost longitudinally rugose. The metasternum short. Femora grooved underneath.

Superficially very different from *L. modesta*, owing chiefly to the almost uncontracted front of the thorax and large head, but without well-marked structural characters that would warrant generic separation from *Lewisella*.

Length 6; breadth 3 lines.

Old Man Range, Otago, elevation 4000 feet. A single specimen from Mr. J. H. Lewis.

*Odontria prælatella*, sp. n.

*Testaceous*; a transverse inter-ocular space, some irregular marks on the thoracic disk, the serial elytral punctures and

irregular marks occupying most of the fifth interstices and curved inwards towards the suture, besides other spots, fuscous.

*Head* almost uninterruptedly curved, the lateral margins being exactly continuous with the eyes, the space between the eyes with few but rather large punctures, the punctuation of the clypeus similar but closer and somewhat rugose. *Thorax* transverse, regularly and gently rounded at the sides, yet more narrowed in front than behind, anterior angles not acute, but covering the back part of the eyes, base bisinuate, posterior angles obtuse; its sculpture, except the marginal setigerous punctures, quite indistinct; clothed with fine decumbent greyish hairs. *Scutellum* pallid, rounded, nearly glabrous. *Elytra* of the same width as thorax at the base, widest near the hind thighs, considerably narrowed behind, apices truncate; suture reddish; their serial punctures fine, the clothing similar to that of the thorax, but not so thick. *Pygidium* much exposed, a little shining, very sparingly pilose, smooth on the middle, but with coarse shallow punctures elsewhere.

*Antennæ* testaceous, second joint as stout as, but only half the length of, the basal one; third slender and elongate; fourth nearly as long as third, with a spiniform process about one-third of the length of the club, which is elongate and quadri-articulate.

*Underside* testaceous, only sparingly pubescent.

♂. Length  $5\frac{3}{4}$ ; breadth  $3\frac{1}{4}$  lines.

Invercargill (*Mr. A. Philpott*). One male of this well-differentiated species.

### Group Telephoridæ.

#### *Asilis pilicornis*, sp. n.

*Depressed*, elongate, quite black, legs infuscate; head and thorax glossy, elytra less so.

*Head* finely and indistinctly punctured at the sides. *Thorax* transverse, subtruncate and finely margined in front, base similarly marginate, truncate in front of the scutellum, but oblique towards the sides; lateral margins reflexed and broad, but becoming quite thin near the front; close to the base a minute sinuosity causes the posterior angle to appear rectangular; the punctuation is extremely fine, not at all close, and most easily seen near the sides; there is a transverse depression near each hind angle, and a lighter one before the scutellum. *Elytra* of the same width as the thorax at the base, very slightly wider behind, their margins

indistinct near the shoulders ; their punctuation close, somewhat rugose, fine but distinct, and rather shallow ; they are sparingly clothed with slender ash-coloured hairs, the sides, however, are more evidently pilose.

*Antennæ* stout, clothed with short, rather thick pubescence ; second joint evidently shorter than third, all longer than broad, eleventh slightly narrower than the preceding one ; they reach backwards almost to the posterior femora.

Very much like *A. lævigata*, but with the antennæ less serrate, and without the longitudinal central thoracic groove seen in that species, which, moreover, has less-defined sculpture on the elytra, so that these are more shining.

Length  $1\frac{3}{4}$  ; breadth  $1\frac{5}{8}$  line.

Broken River (*Mr. J. H. Lewis*). One only.

*Asilis sinuellus*, sp. n.

*Depressed*, moderately elongate, closely covered with fine ashy pubescence ; head and thorax shining black, elytra rather dull ; legs infusate, the knees and claws castaneous, antennæ quite opaque.

*Thorax* transverse, very finely punctured, nearly quite smooth on the middle, with a fovea near each side at the base prolonged inwardly to the middle, this basal depression has a transverse series of small but distinct punctures, there is also a slight broad median depression near the base ; lateral margins a little rounded, thickened or flattened at the middle only, a little narrowed but not sinuated behind, posterior angles almost acutely rectangular ; base medially emarginate, and widely slightly sinuated towards the sides. *Elytra* finely but distinctly and a little rugosely punctate. *Antennæ* hardly attain the hind thighs.

On comparison with *A. tumida*, 1195, it will be noticed at once that the thoracic punctuation of that species is quite close and distinct, that the ante-basal depression between the swelling on either side of it has a fine groove, that the basal margin is raised but not sinuate in front of the scutellum, and that there are three impressions on the head which are wanting in *A. sinuellus*, which, moreover, is smaller and less glossy.

Length  $2\frac{1}{2}$  ; breadth 1 line.

Otira Gorge. One individual from Mr. J. H. Lewis.

*Asilis granipennis*, sp. n.

*Subopaque*, elongate, subdepressed, rather densely clothed with very slender cinereous pubescence ; black, legs and

antennæ nigro-fuscous, joints 3-7 of these latter greyish at the extremity, mandibles and claws infusate red.

*Antennæ* densely pubescent, reaching backwards to middle thighs; basal joint stout and distinctly longer than third, which is hardly longer than second; 4-6 equal and rather thicker than the following ones; 7-10 very slender at the base; eleventh as long as tenth, elongate-oval. *Head* short, quite half the width of front of thorax, indistinctly and minutely sculptured. *Thorax* nearly twice as broad as long, very slightly rounded, with raised frontal margin, the anterior angles obsolete; its sides curved, with thick reflexed margins; base marginated, very slightly rounded, not medially emarginated, its angles indefinite; the surface closely and minutely punctate and covered with very slender pubescence, depressed at the base. *Scutellum* broadly triangular, not smooth. *Elytra* as wide as thorax, their sides subparallel, distinctly margined except at the shoulders, apices individually rounded; their whole surface closely and rugosely but not coarsely punctured, and studded with minute granules on the intervals. *Tarsi* elongate, fourth joint of the posterior with elongate lobes, claws thickened and angulate.

*Underside* dull black, closely and finely punctate and pubescent. Front and middle coxæ contiguous. *Metasternum* with a slight mesial groove. Sixth ventral segment strongly incurved at the apex.

Larger and more opaque than *A. sinuellus*, the elytra with less sharply definite punctures, but with granulate interstices, this last character being quite distinctive.

Length 3; breadth  $1\frac{1}{8}$  line.

Kaitoke. Four examples from Mr. G. V. Hudson.

#### *Asilis interstitialis*, sp. n.

*Elongate*, moderately shining, thorax glossy; black, legs and antennæ piceo-fuscous, claws and mandibles fusco-rufous.

*Head* with two shallow inter-ocular punctures. *Thorax* widely bisinuate at the base, and with a slight angular excision in front of the scutellum, basal region depressed, with a punctiform fovea near each side, there is also a broad median impression behind, posterior angles subrectangular; its surface with very fine, sharply defined, but not close punctures. *Scutellum* medially impressed. *Elytra* moderately coarsely and rugosely punctured.

Easily separated from *A. granipennis* by the coarser elytral

punctuation, with smooth shining intervals, and from *A. sinuellus* by the large size, &c.

Length  $3\frac{1}{2}$ ; breadth  $1\frac{3}{8}$  line.

Kaitoke (*Mr. G. V. Hudson*). A single specimen.

*Asilis apicalis*, sp. n.

*Slender*, parallel, depressed, moderately shining, with very fine greyish pubescence; black, legs and antennæ piceous.

*Head* rather dull, with minute rugosities. *Thorax* transversely quadrate, with obtuse but not broadly rounded angles, front and lateral margins of nearly equal thickness throughout, with a rather broad, ill-defined, abbreviated, discoidal groove, its punctuation not close and rather fine. *Elytra* very elongate, very gradually and slightly expanded backwards, rather finely and rugosely punctured, their apices strongly rounded singly so as to leave a sutural gap. *Antennæ* relatively stout, joints 2-10 differing but little from each other.

Closely allied to *A. piliventris*, but distinguishable from it and the other species by the almost dehiscent elytral apices.

Length  $1\frac{3}{4}$ ; breadth  $\frac{5}{8}$  line.

Karori, Wellington. Another of *Mr. G. V. Hudson's* discoveries.

Group *Melyridæ*.

*Dasytes aurisetifer*, sp. n.

*Elongate*, narrow, subopaque, black, covered with decumbent, rather short and slender, yellow setæ.

*Head* wider than front of thorax, its frontal portion short and glabrous, antennal tubercles slightly elevated. *Thorax* as long as it is broad, the middle widest, constricted near the front so as to be rather narrower there than at the base; its punctuation, like that of the head, rather indistinct. *Scutellum* black. *Elytra* evidently broader than thorax at the base, moderately incurved there, so that the obtuse shoulders seem prominent, apices rounded, sutural region depressed, somewhat closely and finely punctured. *Legs* elongate; tarsi slender, the posterior nearly as long as the tibiæ; claws thickened, but with only minute pallid membranes.

*Antennæ* elongate, bearing minute dark pubescence, first joint slender at the base, but strongly clavate at the extremity; second stout, shorter than the basal one; third and fourth

of equal size; 5-9 moderately serrate; tenth as long as the preceding, but less dilated at the apex; eleventh elongate-oval and acuminate.

*Fem.*—Thorax shorter and relatively broader.

Length  $2\frac{1}{4}$ ; breadth  $\frac{7}{8}$  line.

Central Otago. One pair of this handsome species from Mr. J. H. Lewis.

*Dasytes anacharis*, sp. n.

Rather narrow, elongate, not dilated posteriorly, slightly nitid, sparingly clothed with fine suberect, greyish pubescence; cyaneous, antennæ and tarsi piceo-fuscous, legs piceous tinged with blue.

*Head* densely and minutely sculptured, with a few very small punctures and two broad interocular impressions; it is, eyes included, rather wider than the front of the thorax. *Antennæ* pubescent, joints 3 and 4 nearly twice as long as broad, the terminal rather slender. *Thorax* about as long as broad, much constricted in front, lateral margins distinct except in front, posterior angles rounded; its surface densely and minutely sculptured, and with some distant small punctures. *Scutellum* black. *Elytra* elongate, subparallel, only slightly expanded behind, somewhat broader than thorax at the base, shoulders moderately elevated; their punctuation close and fine yet distinct, the interstices indistinctly rugose. *Tarsi* as long as the tibiæ; claws castaneous, with distinct membranous appendages.

*Underside* shining, blue, minutely punctate, with distinct pubescence. *Metasternum* distinctly broadly medially grooved behind.

When compared with *D. oreocharis*, its nearest ally, its distinct elytral punctuation is at once apparent, the body is uniformly blue without any green tinge, and the head and thorax are rather broader. In *D. oreobius* the punctures are quite shallow.

Length  $2\frac{1}{2}$ - $3\frac{1}{4}$ ; breadth  $\frac{7}{8}$ -1 line.

My three specimens were given to me by Mr. E. W. Anderson, without any indication of locality.

Group Cleridæ.

*Phymatophœa lugubris*, sp. n.

*Elongate*, narrow, slightly glossy, fuscous black; legs pale brown, base of femora and the knees fusco-testaceous.

*Head* (including the large and prominent eyes) rather

wider than the broadest part of the thorax, very coarsely and closely punctured so that the intervals are quite linear. *Thorax* nearly as long as it is broad, obtusely dilated laterally behind the middle, more abruptly narrowed behind than in front; its sculpture like that of the head, except that on the disk the interstices are perceptibly broader, the apex is infusate and more finely and distantly punctured, before the middle there are two small, smooth, slightly raised spots and two less distinct ones near the base; it is sparingly clothed with outstanding elongate greyish hairs. *Scutellum* opaque. *Elytra* hardly double the breadth of thorax at the base, their sides slightly and widely incurved; their punctuation coarser than that on the thoracic disk, but somewhat seriate near the suture; apex somewhat depressed and with the fine grey pubescence rather concentrated there.

*Underside* with fine pubescence, ventral segments shining blue, the breast more infusate, coxæ testaceous; metasternum convex, with fine transverse linear sculpture at the sides and base.

*Antennæ* elongate, reaching to beyond the base of thorax, the basal eight joints are shining fuscous above, but the first two or three are testaceous underneath, and the long club is quite dark and opaque, but in a reversed specimen testaceous below. *Palpi* testaceous, the apical joints are, however, usually fuscous.

There is but one species, *P. atrata*, at all like this, but it is only about half as large, it has no scutellar depression, and the elytral punctuation is continued almost to the extremity of the apices, where there is no concentration of pubescence, their sides are very nearly straight and just appreciably and gradually narrowed towards the shoulders, and the thorax is proportionally longer.

Length  $2\frac{3}{4}$ –3; breadth  $\frac{7}{8}$  line.

Paparoa, near Howick. Described from three examples in my own collection.

#### *Phymatophœa apicale*, sp. n.

*Elongate*, slightly nitid, sparingly pilose, elytra more thickly; head and thorax piceo-fuscous, the front of the latter somewhat rufescent; elytra fuscous, apex fulvescent, the shoulders and two more or less distinct marks near the middle of each paler; legs fuscous, knees paler, front tibiæ somewhat violaceous; antennæ and palpi pale brown.

*Head* very closely and distinctly punctured, the intervals



usually longitudinally rugose. *Thorax* evidently widest behind the middle, considerably obliquely narrowed behind, closely and distinctly punctured, with two slightly raised smooth spots before the middle, two others and a linear space near the base. *Elytra* slightly widened backwards, coarsely punctured nearly in longitudinal series, there is a sutural depression near the base bordered with slightly obtuse elevations, apex impunctate.

*Var.*—Smooth spots on thorax and testaceous marks near elytral suture indistinct, antennæ and legs paler.

Length  $2\frac{1}{2}$  lines.

*P. opiloides* is the nearest ally.

Length 3; breadth 1 line.

Waitakerei Range, Auckland. Described from specimens in my own collection.

#### METAXINA, gen. nov.

*Palpi* short, robust; terminal articulation of the labial subtriangular or securiform, truncate at apex; the maxillary longer, their last joint quite oblique at the extremity. *Tarsi* pentamerous; basal joint abbreviated above, its lobes prolonged below; joints 2–4 of nearly equal length, their lobes also prolonged but without perceptible lamellæ underneath; fifth simple, nearly as long as the preceding four conjointly; basal joints of the anterior furnished with long slender, brush-like setæ underneath. *Eyes* prominent, distinctly faceted, apparently rotundate, in reality transversely broadly oviform, not emarginate. *Prosternum* truncate in front. *Coxæ* with trochanters; the anterior prominent, separated only by the thin prosternal process; intermediate rather less prominent, almost contiguous; the posterior small, only moderately separated. *Metasternum* moderately elongate. *Abdomen* composed of six segments, the basal rather larger than the others, 2–5 about equal; sixth short, deeply emarginate, with a supplementary conical segment protruding therefrom. *Antennæ* 11-articulate, not clavate; inserted, not in cavities, but on slight prominences, or articulations, in front of the eyes; basal joint stout, pyriform, third slightly longer than second or fourth; joints 4–8 nearly equal, each longer than broad and narrowed at the base; 9 and 10 distinctly broader than the preceding, but little longer; eleventh rather larger and oviform; these organs therefore more nearly resemble those of our *Paupris* and *Parmius* than of *Phymatophæa*.

The type of this genus is quite unlike any Australian or

New Zealand species known to me, and is certainly an aberrant form, owing to the absence of tarsal lamellæ, the unnotched eyes, &c.

*Metaxina ornata*, sp. n.

*Subdepressed*, elongate, shining; pubescence scanty, but near the sides consisting of long outstanding greyish hairs; variegate, fuscous; the basal two and the terminal joint of the antennæ, the palpi, knees, tarsi, and a spot on each side and base of thorax fusco-testaceous, in one example the disk of the thorax only is fuscous, the other parts being of the lighter colour; on each elytron an ivory-like lunule proceeds from the shoulders almost to the suture before the middle, it then extends backwards, and, in line with the posterior femur, bends obliquely behind it but does not quite attain the lateral margin.

*Head* (eyes included) nearly as large as thorax, forehead limited between the antennæ by a slightly raised suture; its surface has but few distinct small punctures, the intervals, except on the middle, are densely and minutely sculptured. *Thorax* somewhat cordiform, transverse, apex truncate, base rounded, the lateral margins are fine and curved towards the base, without forming posterior angles; its sculpture similar to, but slightly coarser than, that of the head. *Scutellum* elongate. *Elytra* parallel-sided, broader than thorax, with obtusely prominent shoulders; their punctuation moderately coarse, not close, and subseriate, apices not quite smooth.

*Underside* glossy pitchy-brown, pubescence scanty but elongate, flanks of metasternum distinctly punctured.

Length  $1\frac{3}{4}$ ; breadth  $\frac{5}{8}$  line.

Broken River. Discovered by Mr. J. H. Lewis.

Group *Heleidæ*.

*Cilibe lateralis*, sp. n.

*Nude*, opaque, fuscous black, antennæ and tarsi pitchy-red; ovate-oblong, slightly transversely convex.

*Head* slightly convex behind, finely and moderately closely punctured there, slightly longitudinally rugose near the eyes; forehead more finely and not so closely punctured on the middle, somewhat depressed towards each side where the punctuation is quite dense. *Thorax*  $5\frac{1}{3}$  mm. broad by 4 long at the sides, apex deeply arcuate, anterior angles obtuse but extending to the front of the eyes, base widely bisinuate; widest behind the middle, very slightly rounded

yet distinctly but gradually narrowed anteriorly, rather less narrowed behind, posterior angles distinct but not at all divergent, lateral margins distinct, the lateral slope is rather gradual, so that the channels are but little concave; its punctuation distinct throughout, not very coarse, very close and with narrow intervals towards the base, at the sides there are some minute granules. *Scutellum* broadly triangular, closely finely rugosely punctate-granulate. *Elytra* only slightly wider than thorax at the base, humeral angles almost rectangular but obtuse, their sides nearly straight as far as the hind thighs, but curvedly narrowed behind; the suture slightly elevated behind the middle; there are no obvious striæ, but there are some ill-defined broad interstices which can hardly be termed costæ, two discoidal ones on each elytron are, however, most apparent; the punctuation along the middle is rather close but not so coarse and intermingled with small granules; posteriorly the sculpture becomes more granular, and is similar though coarser towards the sides; the lateral margins are well developed and reflexed almost to the apex; the marginal channels concave, widest from the shoulders to near the hind thighs; there are no large punctiform impressions, the sculpture being granular but more transversely rugose behind.

*Underside* slightly shining, moderately closely and finely punctate, scantily and finely pubescent. Prosternal process with a deep groove at each side, its central portion rugose; front of prosternum evidently granulate, its flanks coarsely obliquely or longitudinally rugose, granular near the coxæ, coarsely transversely rugose at the sides.

*Legs* simple; tarsi with yellow pubescence; the antennæ with similar pubescence from their fourth joint onwards; labrum with yellowish setæ.

The species most resembling this is, undoubtedly, *C. granulosa*, which, however, may be recognised by the much coarser punctuation, rather longer thorax, flatter elytral suture, less reflexed elytral margins, and less concave channels.

Length  $5\frac{1}{2}$ –6; breadth 3– $3\frac{1}{4}$  lines.

Hanmer. Three examples from Mr. J. H. Lewis.

#### *Cilibe smithiana*, sp. n.

*Body* slightly transversely convex, oblong-oval, a little shining; head and thorax fusco-niger, elytra of a more chocolate hue, lateral margins somewhat rufescent; the labrum, palpi, antennæ, and legs infusate red.

*Head* closely and distinctly punctured, most closely and

rugosely between the eyes, with a distinct transverse depression close to the front of each eye; labrum finely punctured, and bearing numerous conspicuous yellow setæ; epistome medially broadly convex. *Thorax* deeply emarginate in front, anterior angles blunt and extending beyond the middle of eyes, evidently and widely bisinuate at base, so that the subacute posterior angles appear to be directed backwards and to extend over the base of the elytra just within the humeral margins; it is slightly wider at the middle than elsewhere, but without the least angulation there; the sides behind are nearly straight, but more, though gradually, curvedly narrowed anteriorly, lateral margins equally thick and a little reflexed; there is a broad basal impression at each side of the middle; the surface is moderately finely and closely punctured, less closely on the middle. *Scutellum* simple. *Elytra* gradually and slightly dilated towards the middle, gradually narrowed posteriorly, marginal channels broad and concave, not so closely punctured as the disk, without large impressions, and not studded with granules; disk moderately finely and closely punctured, interstices smooth, much narrower and more irregular near the sides, not granulate; their costæ ill-defined.

*Legs* shining, dark red above, tibiæ with fine yellow pubescence, much more finely and not as closely sculptured as those of *C. opacula*, and densely ciliated at the extremity with short coarse fulvescent setæ.

*Underside* shining, rufo-piceous, finely punctate, and minutely setose; flanks of prosternum longitudinally rugose and rather distantly punctured, the raised middle portion finely and distantly punctured but distinctly granulate near the eyes, lateral margins slightly transversely rugose; head irregularly punctate but not granulate; femora finely but not closely punctate and bearing yellow pubescence; anterior tibiæ closely and coarsely punctured, the others more finely. Epipleura nearly smooth before the middle, feebly transversely rugose behind.

When placed alongside my type of *C. opacula* it is seen that this species (*C. smithiana*) is obviously larger; the elytra are more narrowed towards the base and still more evidently towards the extremity; the ill-defined costæ are more distinct, the punctuation is rather deeper and coarser, there are no granules or marginal foveæ; the hind angles of the thorax are more protuberant behind, and it is one-fifth longer in the middle. The eyes are larger. The tarsi (posterior) are a third longer. The antennæ are more finely pubescent. The general surface less opaque.

Length 10; breadth 5 lines.

Manawatu Gorge. Named in honour of Mr. W. W. Smith, who has lately contributed to our knowledge of the insect-fauna of that region.

### Group Helopidæ.

#### *Adelium hudsoni*, sp. n.

*Elongate-oblong*, moderately convex, sparsely clothed with minute greyish setæ; shining cupreo-fuscous, the sides more rufescent; legs castaneo-rufous, tarsi and antennæ ferruginous.

*Head* narrower than thorax, forehead evenly curved; rather finely and irregularly punctate. *Thorax* quadrate, almost as long as broad, its sides finely marginate and nearly parallel, being only gently rounded near the slightly prominent anterior angles, apex a little incurved, base subtruncate, posterior angles nearly rectangular and resting on the elytra; its punctuation distinct, rather fine, somewhat irregular, nowhere close, rather finer at the sides, a basal impression near each side most closely punctured; there is a slight elongate lateral impression before the middle, and about a dozen foveiform punctures are distributed over the disk. *Scutellum* broad, minutely punctate. *Elytra* elongate, rather wider than thorax at the base, very gradually narrowed backwards, but evidently more attenuate apically; each elytron with about twelve distinctly punctured striæ, these are not always regular, sometimes the punctures are more conspicuous than the striæ, yet even these are interrupted on certain spots, all, however, are much deeper and confused towards the extremity; the interstices bear series of minute punctures, they are only of moderate width and, on some parts, partake of the partial irregularity.

*Underside* glossy fuscous; the sides of prosternum, coxæ, epipleura, and terminal ventral segment rufo-castaneous; abdomen rather finely reticulate-punctate; middle of the prosternum compressed, its flanks finely irregularly strigose.

Near *A. cheesemani* and *A. simplex*. In the former the elytral striæ are more distinct and numerous, about twenty on each elytron, the thorax differing in form, being more deeply incurved at the base and apex and more rounded laterally. *A. simplex* I have not seen, but its description indicates a much less brightly coloured insect, with different sculpture.

Length 4-4 $\frac{1}{4}$ ; breadth 1 $\frac{1}{2}$  line.

Paradise Lake, Wakatipu.

Discovered by Mr. G. V. Hudson, whose name has been given to it.

### Group Melandryidæ.

#### DOXOZILORA, gen. nov.

*Body* elongate, almost parallel-sided, very Eucnemid-like. *Head* not deflexed and concealed. *Eyes* distinctly faceted, transverse, subreniform, their greatest bulk at the sides and below. *Epistome* with fine curvate suture. *Labrum* transverse and quite exposed. *Palpi* short, the labial especially; the maxillary not serrate, terminal joint subcultriform. *Antennæ* inserted in cavities just in front of the eyes, reaching backwards nearly to the apex of metasternum in the male, shorter in the female, filiform; basal joint moderately stout, second about half the length of the third; joints 3-10 elongate-obconical, terminal slightly longer than tenth. *Thorax* much narrowed anteriorly, with distinct basal foveæ, posterior angles rectangular but not acute. *Elytra* of nearly same width as thorax at the base, very slightly attenuate posteriorly. Anterior *coxæ* contiguous, the prosternal process not extending between them, with trochanters; the intermediate not prominent, the narrow mesosternal process interposed. *Metasternum* transversely convex, elongate, with a central groove behind the middle. *Abdomen* composed of five nearly equal segments. *Legs* rather short. *Tibiæ* slender, the apical calcar of the anterior stout, those of the others small and slender. *Tarsi* elongate and slender, penultimate joint of the anterior not truly bilobed but excavate above, basal joint longest; in the posterior pair the first joint is nearly double the length of the other three combined. *Claws* divergent, distinctly dentate near the base.

The small typical species is very different from our New-Zealand *Orchesia* allies from no. 710 to 717 inclusive; *Ctenoplectron* bears but little resemblance, whilst no. 708 more nearly resembles the Australian *Talayra*. From all the other genera of the true Melandryidæ this is distinguished by the distinct tooth near the base of each claw.

#### *Doxozilora punctata*, sp. n.

*Body* slightly nitid, black, clothed with fine ash-coloured pubescence; antennæ and tarsi fuscous.

*Head* immersed up to the eyes, nearly vertical in front, its punctuation moderately fine and close but rather shallow.

*Thorax* relatively small, rather broader than long, without distinct lateral margins above, the base widely but feebly bisinuate; when examined sideways the sides are seen to form a curve from base to apex, the most prominent and deflexed portion being near the middle; when looked at from above the apex appears nearly half the breadth of the base; there is an oblique constriction or impression at each side in front, and a large well-marked fovea near each side at the base, posterior angles not projecting, the whole surface moderately closely and finely but distinctly punctate. *Scutellum* indistinct, obscured by minute greyish pubescence. *Elytra* slightly but broadly longitudinally depressed behind, the suture simple but well developed, their surface closely, distinctly, and rugosely punctured.

*Underside* nigro-fuscous, with decumbent greyish pubescence, rather finely punctured, metasternum most distinctly.

If the thoracic posterior angles projected backwards this insect might be easily mistaken for a small black Eucnemid or Elater.

Length 2; breadth  $\frac{5}{8}$  line.

Broken River.

We are indebted to Mr. J. H. Lewis for bringing this interesting little beetle to light.

### Group *Ædemeridæ*.

#### *Selenopalpus rectipes*, sp. n.

*Subopaque*, cyaneous; the palpi, antennæ, and legs nigro-fuscous; pubescence inconspicuous, cinereous.

*Head* immersed up to the eyes, narrowed anteriorly, with a broad groove along the middle of the clypeus; inter-antennal impressions shallow, vertex slightly longitudinally elevated, finely and closely punctured in front, more distinctly but not so closely behind. *Thorax* widest before the middle, sinuated behind; the basal margin, however, not contracted, and a little prominent at the sides; the surface finely and closely punctate, with a small antescutellar impression. *Scutellum* small, medially grooved. *Elytra* wider than thorax at the base, slightly and very gradually expanded behind, their sculpture rather fine and close, yet ill-defined, not evidently punctiform nor granular, slightly rugose, the suture distinct, the two discoidal lines on each also ill-defined.

*Legs* rather slender, tibiæ very nearly straight.

The clavate posterior femora and thick, curvate, apically prolonged tibiæ distinguish *S. cyanea*. In *S. aciphyllæ* the

head is very oviform, the eyes rather distant from the thorax, flat, and strongly transverse, the basal margin of the thorax is more distinct and more protuberant at the sides, the hind tibiæ are stout and curvate, and the notch of the maxillary palpi is wide but not deep; in *S. rectipes* the apical emargination of the palpi is more like that of the typical species, *S. cyanea*, but the insect itself is smaller.

♂. Length  $3\frac{1}{2}$ ; breadth  $1\frac{1}{8}$  line.

Otira Gorge. One; found by Mr. J. H. Lewis.

*Baculipalpus maritimus*, sp. n.

*Elongate*, subdepressed, slightly nitid, testaceous; tips of mandibles and the tibial spurs piceous; elytra sometimes with a pale fuscous vitta along each side; clothed with fine, slender, decumbent hairs similar in colour to the derm.

*Head* not constricted behind, vertex convex, depressed anteriorly, and finely setose there, with an angular infusate space behind each eye; its surface not very closely punctured, interstices minutely sculptured; epistome and labrum truncate in front, both a little depressed in the middle. *Thorax* subcylindric, moderately narrowed behind the middle, base and apex slightly incurved; its surface a little uneven, its sculpture like that of the head, rather shallow. *Scutellum* curvilinearly triangular, not smooth. *Elytra* elongate and subparallel, rather wider than thorax at the base, apices rather sharply rounded individually, so that the apical ventral segment is visible between them—it does not, however, protrude; inside each shoulder an indistinctly elevated line proceeds backwards, the sculpture is shallow, rather coarser than that of the thorax, and a little rugose. *Legs* long and slender.

*Tibiæ* finely bicalcarate. *Front tarsi* rather narrow, basal joint elongate and cylindrical; second and third triangular; penultimate rather short, hardly at all expanded, excavate above but not truly lobate; fifth slender, claws thickened and angulate at base; basal joint of the posterior longer than the remaining three combined. *Eyes* large, transverse, not rotundate, almost truncate in front and behind, distinctly faceted, extending downwards, and not prominent as in *Thelyphassa* and *Dammarobius*. *Mandibles* bifid at apex. *Maxillary palpi* elongate, basal joint short, second elongate, third short, oblique at extremity; the terminal attached to the preceding one by a short stalk near its hinder part, so that the long frontal portion extends forwards three or four times as much as the other part is prolonged backwards; the



outer edge is widely incurved throughout its whole length, the inner is straight for two-thirds of its length, but forms a curve towards the extremity, the width barely exceeds a fourth of the length. *Antennæ* filiform, extending backwards to the hind thighs, inserted on the front just before the eyes; basal articulation slightly bent, gradually thickened, rather longer than third; second nearly twice as long as broad.

*Male*.—Abdomen finely sculptured and pubescent; penultimate ventral segment with a semicircular line in the middle which, in some lights, might be mistaken as indicating an excision, the extremity with a series of small setigerous triangular projections; terminal segment deeply medially cleft.

*Female*.—Terminal ventral segment simple, much narrowed towards the extremity. Last joint of the maxillary palpi subtriangular, its apex oblique. Middle of head and thorax more or less infuscate longitudinally. Apices of elytra sharply rounded.

Differs from the corresponding sex of *B. rarus* by the absence of the longitudinal sulcus on the vertex, by its longer thorax not being narrowed near the anterior angles, and by the elytra being more dehiscent at the extremity.

♂. Length  $4\frac{3}{4}$ ; breadth  $1\frac{1}{2}$  line.

Invercargill.

This interesting species was found under logs on the seabeach by Mr. A. Philpott, about forty years after my unique specimen of *B. rarus* was found on the Waitakerei Range.

Mount Albert, Auckland, N.Z.,  
26th June, 1908.

#### LIV.—*Twelve new European Mammals.*

By GERRIT S. MILLER.

THE collection of European mammals in the British Museum contains representatives of ten hitherto unnamed forms. These are here described, together with two new races of *Sorex* included among some material sent to me for examination in London by the authorities of the United States National Museum.

*Sorex araneus fetalis*, subsp. n.

*Type*.—Adult female (skin and skull). B.M. no. 8. 9. 2. 1.  
Collected at Trinity, Jersey, Channel Islands, July 14, 1908,

by R. H. Bunting, Esq. Original number 3. Presented by Oldfield Thomas.

*Characters.*—Like *Sorex araneus araneus*, but skull with rostral portion shortened, broadened, and deepened, and anterior teeth ( $i^1$ ,  $i^2$ ,  $i^3$ , and  $i_1$ ) more robust than in the mainland animal. Colour essentially as in true *araneus*, except that the underparts in several of the Jersey specimens are a pale, almost whitish buffy grey, decidedly lighter than in any skins of the other races yet examined.

*Measurements.*—Type. Head and body 63 mm.; tail 48·2; hind foot 13; condylo-basal length of skull 18·8; mandible 10·0; upper tooth-row 8·4.

*Specimens examined.*—Five, all from the island of Jersey.

*Sorex araneus bergensis*, subsp. n.

*Type.*—Adult female (skin and skull). No. 84664 U.S. National Museum. Collected at Gravin, Hardanger, Norway, June 10, 1898, by Thora Stejneger. Original number 13.

*Diagnosis.*—Larger than *Sorex araneus araneus* (hind foot 13·6 to 14·4 mm.; condylo-basal length of skull 19 to 20 mm.) and colour in summer pelage darker, the dark brown or blackish dorsal area sharply defined from yellowish brown of sides.

*Measurements.*—Type. Head and body 80·5 mm.; tail 44·5; hind foot 13·6; condylo-basal length of skull 19·4; mandible 10·2; upper tooth-row 8·6. Average and extremes of eleven specimens from the Bergen district, Norway: head and body 78·7 (76–83); tail 49·3 (44–56); hind foot 13·8 (13·6–14·4).

*Specimens examined.*—Twenty-six, from the following localities in South-western Norway:—Skjærdal, Nordtjord, 7; Opheim, Bergen, 4; Gravin, Bergen, 8 (U.S. N. M.); near city of Bergen, 7 (B. M. and U.S. N. M.).

*Remarks.*—This large race of *Sorex araneus* differs noticeably from the small true *araneus* of Sweden and Eastern Norway, and more nearly resembles the Pyrenean and Alpine races. From these large forms, however, it is distinguishable by its darker colour. Its range appears to be confined to the Atlantic slope of Western Norway. On the eastern watershed it is replaced by true *araneus*, even as far north and west as the upper portion of the Gudbrandsdol.

*Sorex araneus pyrenaicus*, subsp. n.

*Type.*—Adult female (skin and skull). B.M. no. 8. 8. 4. 301.

Collected at P'Hospitalet, Ariège, France (altitude 4700 ft.), August 25, 1903, by G. S. Miller. Original number 7076.

*Characters*.—Very similar to *Sorex araneus tetragonurus*, but distinguishable by the duller, less evidently tricoloured summer pelage (winter coat not known), in which the back rarely if ever assumes the blackish tints often seen in the Alpine form\*.

*Measurements*.—Type. Head and body 72 mm.; tail 51; hind foot 14; condylo-basal length of skull 20·0; mandible 10·0; upper tooth-row 8·8. Average and extremes of six specimens from the type locality: head and body 70·6 (69–72); tail 47 (44·4–51); hind foot 13·3 (13–14).

*Specimens examined*.—Thirty-two, from the following localities in the Pyrenees:—Porté Pyrénées-Orientales (Spanish watershed), 9; P'Hospitalet, Ariège, 12; Ax-les-Thermes, Ariège, 2; Barèges, Hautes-Pyrénées, 9.

*Sorex minutus lucanius*, subsp. n.

*Type*—Adult (skin and skull). B.M. no. 8. 9. 1. 5. Collected at Monte Sirino, Lagonegro, Italy, by A. Robert. Original number 2585.

*Diagnosis*.—Similar to *Sorex minutus minutus*, but with molars and anterior upper incisor noticeably enlarged.

*Measurements*.—Head and body —; tail 42 mm.; hind foot 10·4; condylo-basal length of skull 16; mandible 8·0; upper tooth-row 7·0.

*Specimen examined*.—The type.

*Sorex alpinus hercynicus*, subsp. n.

*Type*.—Adult male (skin and skull). No. 112928 U.S. National Museum. Collected at Mäuseklippe, Bodethal, Harz Mountains, Germany, October 18, 1901, by F. L. J. Bœttcher. Original number 265.

*Diagnosis*.—Similar to *Sorex alpinus alpinus*, but with smaller skull and teeth (condylo-basal length of skull 19 to 19·6 instead of 19·4 to 20·6 mm.; upper tooth-row 8·6 to 9 mm.).

*Measurements*.—Type. Head and body 71 mm.; tail 67; hind foot 15·4; condylo-basal length of skull 19·2; mandible 10·0; upper tooth-row 8·4.

*Specimens examined*.—Eleven (all in the U.S. National

\* *Sorex tetragonurus*, Hermann, = *S. araneus nudus*, &c., Fatio, and *S. a. alticola*, Miller.

Museum) from the following localities in Germany:—Bahrenberg, Harz Mts., 2; Mäuseklippe, Bode Valley, Harz Mts., 2; Eulengrund, Silesia, 3; Wolfshau, Silesia, 2 (the last two localities in the Riesengebirge).

*Remarks.*—In external measurements the Alpine shrew of the Harz Mts. and Riesengebirge agrees with the Swiss animal; but the differences in length of skull and of tooth-rows seem enough to warrant the recognition of the two forms as distinct.

*Crocidura canea*, sp. n.

*Type.*—Adult male (in alcohol). B.M. no. 84. 3. 14. 2. Crete (no exact locality).

*Diagnosis.*—Size and general appearance as in the smaller forms of *Crocidura russula*, and skull with similarly deep cranium; but second upper premolar as large as third, and entire anterior portion of upper tooth-row unusually long relatively to cheek-teeth.

*Measurements.*—Type. Head and body 65 mm.; tail 42; hind foot 11.8; condylo-basal length of skull 18.4; upper tooth-row 8.2.

*Specimens examined.*—Two, both from the island of Crete.

*Sciurus vulgaris segura*, subsp. n.

*Type.* Adult female (skin and skull). B.M. no. 8. 9. 24. 3. Collected at Molinicos, Sierra de Segura, Jaen, Spain, October 2, 1907, by M. de la Escalera.

*Characters.*—Similar to *Sciurus vulgaris infuscatus* (Cabrera) of Central Spain, but back less blackish, its underfur light grey, tail less red and with white area on under surface less well developed (essentially absent in three among eleven skins), and cheeks light grey, not noticeably contrasted with white of throat.

*Colour.*—Summer pelage: upperparts a fine inconspicuous grizzle of wood-brown and blackish, the general effect resembling the mars-brown of Ridgway, blackening on flanks, across posterior half of back, and on postero-external side of thighs (in some specimens the light element is more nearly russet and the black is essentially absent); ears and crown like back, but face with a rusty wash, and muzzle and cheeks to behind base of ears light clear ecru-drab, so pale as to form no marked contrast with white of throat; underfur of head, back, sides, and limbs pale ecru-drab like that of cheeks, appearing conspicuously at surface in specimens with abraded pelage; feet a dull ferruginous, this colour extending up

outer side of thigh and over entire fore leg, in both regions diluted by the ecru-drab of underfur; entire underparts and inner surface of legs buffy white to base of hairs; tail blackish, slightly tinged with dull red, the hairs becoming ecru-drab at base; whole tail sprinkled with pure white hairs, more numerous along median line below than elsewhere, and usually forming a distinct white median area as in *S. v. infuscatus*.

*Skull and teeth*.—The skull and teeth do not differ appreciably from those of the Central Spanish form.

*Measurements*.—Type. Head and body 245 mm.; tail 195; hind foot 61; condylo-basal length of skull 51·8; zygomatic breadth 33·4; mandible 35·6; maxillary tooth-row (alveoli) 10·4; mandibular tooth-row (alveoli) 10·0.

*Evotomys glareolus isticus*, subsp. n.

1900. *Evotomys hercynicus hercynicus*, Miller, Proc. Washington Acad. Sci. ii. p. 100, July 26, 1900 (not *Hypudæus hercynicus*, Mehlis, 1831).

*Type*.—Adult male (skin and skull). B.M. no. 4. 4. 6. 72. Collected at Bustenari, Roumania, May 3, 1899, by W. Dodson. Original number 88.

*Characters*.—Audital bullæ more abruptly inflated on inner side than in the typical subspecies (= *Evotomys hercynicus rubidus*, Miller, 1900); colour lighter and brighter (dorsal area rather narrow, clear yellowish rufous or a little more brownish, slightly varied by dark hair-tips; sides a noticeably contrasted buffy grey, produced by a grizzling of cream-buff mixed with blackish and whitish hairs; underparts varying from creamy white to a yellowish cream-buff; feet buffy white; tail distinctly bicolor, dark brown above, buffy white below).

*Measurements*.—Type. Head and body 96 mm.; tail 43·5; hind foot 17·4; condylo-basal length of skull 23·2; zygomatic breadth 13·0; mandible 14·2; maxillary tooth-row (alveoli) 5·0; mandibular tooth-row (alveoli) 5·0.

*Specimens examined*.—Forty-one, from the following localities:—Bustenari, Roumania, 1; Hatszeg, Hunyad, Austria-Hungary, 11; Somorja, Western Hungary, 1; Marxheim, Bavaria, Germany, 28.

*Remarks*.—Contrary to my supposition in 1900, the red-backed vole of the Harz Mountains, together with that of Denmark, proves to be the dark form named *rubidus* by Baillon. This being the case, the supposed discrepancies in

the original description of *Mus glareolus*, Schreber\*, disappear †, and the name *Evotomys glareolus* becomes available for the small European red-backed voles, and in a subspecific sense for the dark western continental form. The *Evotomys hercynicus* of my preliminary revision is thus left unnamed. Its range appears to be about coincident with the drainage system of the Danube.

*Microtus sarnius*, sp. n.

*Type*.—Adult male (skin and skull). B.M. no. 8.9.2.27. Collected at St. Martin's, Guernsey, Channel Islands, July 23, 1908, by R. H. Bunting. Original number 52. Presented by Oldfield Thomas.

*Characters*.—Like the large forms of *Microtus agrestis* (condylo-basal length of skull about 28 mm.), but middle upper molar with second inner triangle absent; colour above essentially as in *M. agrestis agrestis*, though somewhat less dark and reddish; underparts a strongly contrasted light grey (nearly the grey no. 9 of Ridgway).

*Measurements*.—Type. Head and body 118 mm.; tail 42; hind foot 18.5; condylo-basal length of skull 27.8; zygomatic breadth 16.0; mandible 17.4; maxillary tooth-row (alveoli) 6.8; mandibular tooth-row (alveoli) 6.8.

*Specimens examined*.—Eight, all from the island of Guernsey.

*Remarks*.—While its external and cranial characters show that this species is a member of the *Microtus agrestis* group, the pattern of its enamel folding is exactly similar to that of *M. arvalis*. In the suppression of the second inner triangle of  $m^2$  it shows the extreme of a tendency the exact opposite to that which has produced the local Hebridean form, *M. agrestis exsul*. The eight specimens, though representing all ages from less than half-grown young to fully adult, show no noteworthy variation in colour or in teeth.

*Pitymys provincialis*, sp. n.

*Type*.—Adult female (skin and skull). B.M. no. 8.8.4.265. Collected at St. Gilles, Gard, France, April 26, 1908, by G. S. Miller. Original number 7605.

*Characters*.—A small member of the *Pitymys ibericus* group (hind foot about 14.6 mm.; condylo-basal length of

\* 'Säugethiere,' iv. p. 680.

† Specimens collected by Mr. Oldfield Thomas at Hilleröd, Zealand, exactly agree with the indication "cinnamon-brown" (zimmtbraun) of Schreber's account.

skull 22·6 to 23 mm.; upper tooth-row about 5 mm.) ; skull essentially as in *P. duodecimcostatus*, except for its much smaller size ; audital bullæ very small and flat ; colour pale (type: upperparts a light wood-brown, becoming paler and more cream-buff on sides ; underparts a light grey, formed by the blending of slate-grey under-colour with creamy white of hair-tips ; feet soiled whitish ; tail whitish throughout, the upper surface sprinkled with brown hairs).

*Measurements.*—Type. Head and body 96 mm. ; tail 22 ; hind foot 14·6 ; condylo-basal length of skull 22·4 ; zygomatic breadth 14·4 ; mandible 15·3 ; maxillary tooth-row (alveoli) 5·3 ; mandibular tooth-row (alveoli) 6·2.

*Specimens examined.*—Five from the type locality ; two skulls from Var, France (no exact locality) ; a skull labelled "Provence" and another marked "France."

*Remarks.*—From its nearest geographical ally, *Pitymys duodecimcostatus*, this species is at once distinguishable by its much smaller size, a character in which it resembles the small Iberian forms related to *P. lusitanicus*. From these latter it differs, however, in the conspicuously projecting upper incisors and very narrow interorbital region.

#### *Mus spicilegus hispanicus*, subsp. n.

*Type.*—Adult female (skin and skull). B.M. no. 8.8.4.101. Collected at Silos, Burgos, Spain, October 12, 1906, by G. S. Miller. Original number 7272.

*Characters.*—Like the Hungarian *Mus spicilegus spicilegus*, but general colour paler and more yellowish (back and sides ranging from buff to a pale buffy grey, lighter and less yellow than the cream-buff of Ridgway, the median dorsal region faintly "lined" with black, the sides gradually becoming clear buff or buffy grey, this colour continuing forward over cheeks and above eye to muzzle ; basal portion of hairs slate-grey ; underparts sharply defined buffy white, slightly clouded by slate-grey under-colour ; feet and tail like belly, the tail with a narrow dusky dorsal area extending to tip ; ears thinly clothed, their colour buffy or greyish in harmony with surrounding parts).

*Measurements.*—Type. Head and body 79 mm. ; tail 50 ; hind foot 14·4 ; condylo-basal length of skull 19·4 ; zygomatic breadth 11·0 ; mandible 11·4 ; maxillary tooth-row (alveoli) 3·4 ; mandibular tooth-row (alveoli) 3·2.

*Specimens examined.*—Seventy-one, from the following localities in Spain:—Silos, Burgos, 12 ; Castrillo de la Reina, Burgos, 3 ; Venta del Baul, Granada, 7 ; Elche, Ali-

cante, 24; Alcoy, Alicante, 12; San Cristobal, Minorca, 7; Inca, Majorca, 6.

*Remarks.*—The yellowish form of *Mus spicilegus* characteristic of the central and southern portions of Spain is readily distinguishable from the clear greyish-brown animal of Hungary. Skins from the Balearic Islands, while not so yellow as those from the mainland, appear to be referable to the same race.

*Mus spicilegus lusitanicus*, subsp. n.

*Type.*—Adult male (skin and skull). B.M. no. 98. 2. 2. 30. Collected at Cintra, Portugal, January 28, 1896, by Oldfield Thomas. Original number 52. Presented by the collector.

*Characters.*—Essentially as in *Mus spicilegus spicilegus* and *M. s. hispanicus*, but colour of upperparts a light yellowish wood-brown with an evident russet tinge, the sides paler and more buffy; a narrow clear buff area on sides bordering the pale cream-buff of underparts and accentuating the line of demarcation.

*Measurements.*—Type. Head and body 77 mm.; tail 60; hind foot 16.2; condylo-basal length of skull 19.8; zygomatic breadth 10.6; mandible 11.6; maxillary tooth-row (alveoli) 3.6; mandibular tooth-row (alveoli) 30.

*Specimens examined.*—Six, all from the neighbourhood of Cintra.

LV.—*Descriptions of new African Lepidoptera.*

By G. T. BETHUNE-BAKER, F.L.S., F.Z.S.

**Lycænidaë.**

*Oberonia trypherota*, sp. n.

♂. Both wings white, with blackish markings. Primaries with apex and termen broadly blackish, apex extending for two-thirds towards the end of the cell, termen shortly invaded upwards very finely with white from the tornus: secondaries with a postmedian curved row of fine grey dashes, closely followed by the subterminal grey scalloped line, the scallops extending into the narrow black termen, and so enclosing a series of terminal black spots with white irides; a dusky patch at the apex; fringes whitish. Underside: primaries with a curved postmedian row of fine, grey, isolated, inter-



nervular dashes, followed by a very fine, slightly scalloped, grey line, closely succeeded by a terminal row of blackish spots; termen finely black: secondaries with two basal black spots, one in the cell, one above it, a black spot at the apex, and a smaller one about halfway along the inner margin; an irregular series of isolated grey dashes, broken inwards below vein 3; the upperside terminal markings showing through very finely.

Expanse 32 mm.

*Hab.* Makala, Congo Free State, July.

In my collection and that of Major Powell-Cotton.

### Notodontidæ.

#### ELAPHRODES, GEN. NOV.

♂. Palpi upturned, barely reaching vertex, roughly and thickly scaled; antennæ fasciculate; legs roughly haired. Neuration: primaries, vein 2 at a quarter before the lower angle, 3 just before, 4 from the angle, 5 from just above the middle of the discocellulars; 6, 7, 8, 9, 10 stalked, 8 and 9 on a very long stalk just in front of the apex, 9 and 10 about midway between end of cell and apex, 11 from two-thirds along the cell; 12 long, terminating only a little before 11: secondaries with 3 and 4 stalked from the lower angle, 5 from the middle of the discocellulars, 6 and 7 stalked from the upper angle (the stalks in both cases are short), 8 appressed on to the cell for a third.

Type, *Elaphrodes nephocrossa*, B.-B.

This is near *Phalera*, but the neuration is not quite similar and there is no areole.

#### *Elaphrodes nephocrossa*, sp. n.

♂. Primaries ochreous grey, with the base broadly dark grey; a broad wedge-shaped band in the median area of the ground-colour, its broadest side being on the costa; a broad dark band from the apex to the inner margin up to the tornus, hollowed slightly in the middle externally, with its internal edge very deeply serrated; reniform dark: secondaries pale straw-colour, with termen very broadly dusky, indefinite as to its internal edge.

Expanse 56 mm.

*Hab.* Ituri Forest, between Makala and Beni.

In the Powell-Cotton collection.

*Gargetta concolora*, sp. n.

♂. Both wings uniform dark brown. Primaries rather darker than secondaries, with the least trace of a dark dotted median line and a trace of an angled postmedian line, also a trace of a paler scalloped subterminal line: secondaries markless.

Expanse 40 mm.

*Hab.* Makala, Congo Free State, May.

In the Powell-Cotton collection.

## METOPOLOPHOTA, gen. nov.

Palpi thickly scaled, end segment minute, barely reaching the apex; antennæ bipectinate to the tips; face roughly scaled, with a projecting tuft below the socket of each antenna; thorax probably tufted (but the single specimen is rubbed). Primary with extreme base of costa curved, then straight to near apex, when it is suddenly depressed; termen rounded at apex, receding and slightly hollowed; wing narrow, expanding but slightly: secondaries subtriangular, with arched costa. Neuration: primaries with vein 3 from just before the apex, 4 from the apex, 5 from just above the middle of the discocellulars; 6, 7, 8, 9, 10 stalked, 8 and 9 on a very long stalk just in front of the apex, 9 terminating on the costa; 11 long, from two-thirds along the cell: secondaries with 3 and 4 from the lower angle, 5 from the middle, 6 and 7 on a short stalk from the upper angle.

Type, *Metopolophota epinephela*, B.-B.

*Metopolophota epinephela*, sp. n.

♂. Head and thorax whitish grey. Primaries creamy grey, with a broad dark brown costal dash extending into the cell towards the middle; inner margin scaled with brownish; a broad dark streak below the cell from vein 2 to vein 4; termen broadly brownish except at apex; a trace of a costal spot beyond the cell and two small ones below each other in front of the apex; fringe tessellated white and brown: secondaries uniform spotless dull brown.

Expanse 34 mm.

*Hab.* Ituri Forest, between Beni and Makala.

In the Powell-Cotton collection.

## Arbelidæ.

*Marshalliana nubifera*, sp. n.

♂. Primaries grey, dusted more or less all over with darker grey, densely and darkly in a broad line below the cell, with an L-shaped extremity; a very broad and dark postmedian area from the costa to below vein 2, extending inwards below the cell into the angle of vein 2; costa darkly dusted, as also the termen, but the latter is interrupted by paler veins; a dark elongate lozenge patch in the cell: secondaries uniform brownish grey.

Expanse 32 mm.

*Hab.* Nairobi, April.

Type in my collection.

*Metarbela endomela*, sp. n.

♂. Frons pale grey, vertex dark brown, antennæ pale brownish grey, collar pale brownish, thorax and dorsal tufts dark brown, abdomen pale greyish brown with darker dorsum. Primaries pale greyish brown, reticulated more or less distinctly all over with dark lines; the only lines at all prominent are an oblique one from the costa at a quarter from the apex and a short oblique one from the centre of vein 2 to the inner margin at a third from the tornus; these and all the other reticulatory lines are fine; a short, broad, dark basal dash below vein 1: secondaries pale grey, finely reticulated. The reticulations in both wings are very irregular.

Expanse 34 mm.

*Hab.* Kamililo, Nandi Country, January.

Type in my collection.

*Metarbela obliqualinea*, sp. n.

♂. Head and thorax ochreous grey; abdomen dirty pale grey. Primaries pinkish ochreous, with a dark greyish line along the lower part of the cell to beyond vein 2, from where it descends obliquely to the tornus, the oblique part being edged internally with creamy white; the usual Arbelid dotted lines are more or less present, less in the postmedian area and condensed into the basal area, so that it has a very pinkish shade: secondaries pale creamy white.

Expanse 30 mm.

*Hab.* British East Africa, Nairobi, February; Machakos, Kedong, Mutito-wa-N'du; Uganda, Hoima.

Type in my collection from Nairobi. Specimens in the British Museum from the other localities.

### Limacodidæ.

#### *Miresa melanosticta*, sp. n.

♂. Head and antennæ ochreous brown; thorax and abdomen madder-brown. Primaries madder brownish grey, with a basal, dark purplish-brown, somewhat wedge-shaped patch below the cell, edged externally by a waved, very oblique, ochreous line from the costa at a quarter from the apex to the inner margin at about a third from the base; a shorter, ochreous, rather open  $\sphericalangle$ -shaped mark from about vein 5 to the inner margin near the tornus, in the upper stroke of the  $\sphericalangle$  are two black dots; an oblique ochreous subapical dash from the costa, edged internally by a dark purplish line and externally by a small indefinite similar patch; termen finely ochreous grey; fringes madder-brown; secondaries uniform madder-brown.

Expanse 36 mm.

*Hab.* Kamililo, Nandi Country, June.

Type in my collection.

#### *Parasa charopa*, sp. n.

♂. Head and thorax orange fawn-colour; patagia edged laterally with green; abdomen cream-colour. Primaries bright orange-red, with a broad pale green band from the lower margin of the cell to the middle of the inner margin, externally bordered by a fine black line; veins in postmedian and subterminal area finely blackish; secondaries ochreous creamy. Both wings are very thinly scaled, giving a subhyaline appearance.

Expanse 27 mm.

*Hab.* Mawamba, Makala, Congo Free State, March 1906.

In my collection and that of Major Powell-Cotton.

#### *Narosa nephochloëropis*, sp. n.

♂. Head, thorax, and abdomen whitish; fore legs pale green, ringed with white. Both wings white; primaries more or less clouded with green in the basal area and extending slightly into the median area; a broad postmedian cloudy band of green, angled strongly outwards between veins 5 and 7, and bordered broadly with grey; termen

finely green, edged internally with a narrow white line; fringes white and green interspersed: secondaries shiny white, with white fringes.

Expanse 25 mm.

*Hab.* Elburgon Railway Station (Uganda Railway), July 2, 1903.

In my collection.

*Narosa hedychroa*, sp. n.

♂. Head, thorax, and abdomen white, middle segments of the latter brownish grey. Primaries whitish, slightly scaled more or less all over with pale smoky brown, which colour deepens in the postmedian area into a dark spot, from whence descends a strongly serrated brown line to the inner margin; termen with fine internervular dark dashes: secondaries suffused all over with pale smoke-brown.

Expanse 20 mm.

*Hab.* Makala, Congo Free State.

In my collection.

*Narosa trilinea*, sp. n.

♂. Head and thorax yellowish white, abdomen dirty white. Primaries white, with three orange-yellowish suffused indefinite bands, sharply edged externally with white, viz. a broad band below the cell, an irregular median one angled outwards on the fold, a postmedian one interrupted at vein 3, and a short subterminal cloud from the costa confluent with the latter; a dark terminal spot just above the tornus: secondaries uniform creamy white.

Expanse 16 mm.

*Hab.* Makala, Congo Free State, April 1906.

In my collection.

*Paraphanta rufilinea*, sp. n.

♂. Head, thorax, and abdomen red-brown. Primaries reddish brown, with a darker reddish basal area extending to about the end of the cell and obliquely terminated, edged externally with a fine white line; subterminal line reddish from before the apex, obliquely straight to the inner margin in front of the tornus; termen finely reddish: secondaries uniform pale straw-colour.

Expanse 18 mm.

*Hab.* Entebbe, Uganda; Makala, Congo Free State.

In my collection and that of Major Powell-Cotton.

## Lasiocampidæ.

*Leipaxais ituria*, sp. n.

♂. Thorax pale ochreous, abdomen pale rufous brown. Primaries pale ochreous grey, with an irregular rufous ante-median line, followed by a spot in the cell; postmedian rufous line oblique, serrate, and irregular, followed by a rufous tinge over the pale ground-colour; subterminal line highly irregular and serrated, almost fractured at vein 3, from where it descends obliquely to the inner margin; termen clouded with very pale rufous: secondaries uniform warm rufous, with a very fine dark terminal line.

Expanse 46 mm.

*Hab.* Mawamba, Makala, March 1906.

In my collection and that of Major Powell-Cotton.

## Lymantridæ.

*Olapa makala*, sp. n.

♂. Thorax dirty grey, abdomen yellowish grey, all the legs whitish. Both wings hyaline milky white: primaries with a trace of a grey dash closing the cell: secondaries with a small distinct black spot near middle of the inner margin, but on the basal side of the middle.

Expanse 43 mm.

*Hab.* Makala, Congo Free State, July.

In my collection and that of Major Powell-Cotton.

*Euproctis mediosquamosa*, sp. n.

♂. Head cream-colour, thorax and abdomen pale straw-colour. Both wings creamy white: primaries with base suffused with bright palish straw-colour; a curved straw-colour median line, a similar postmedian line, the interspace being sparingly suffused with dark scales except on the costa, where it is broadly bright straw-colour; a trace of another similar line and a similar interrupted subterminal line somewhat obscure: secondaries uniform whitish.

Expanse 29 mm.

*Hab.* Makala, Beni, July.

In the Powell-Cotton collection.

*Lælia beni*, sp. n.

♂. Head, thorax, and abdomen slightly yellowish; antennæ greyish. Both wings milky white, somewhat diapha-

nous, secondaries more so than the primaries: primaries with two small black spots, a round one in the angle of vein 2 and a longer one closing the cell: secondaries spotless.

Expanse 37 mm.

*Hab.* Makala, Beni, Ituri Forest, July 1906.

In the Powell-Cotton collection.

*Lælia kitchingi*, sp. n.

♂. Head and collar orange-yellow, thorax creamy, abdomen ochreous. Both wings pure white, with a black spot closing the cell: primaries with a small spot of black scales on the costa near the base, with an obscure and very slight dark costal irroration for about half the length of the cell.

Expanse 48 mm.

*Hab.* Patigo, Acholi Country, 4000 feet.

In my collection.

**Hypsiidæ.**

*Soloe disticta*, sp. n.

♂. Head orange-yellow; antennæ yellow, with dark grey pectinations; collar and mesothorax deep orange, with a black lateral spot; metathorax pale smoke-grey; abdomen pale smoke-grey, with the dorsum yellowish on the penultimate segments; ventral surface yellowish. Both wings uniform very pale smoke-grey, with a single black spot at the end of the cell in each wing; the secondaries are rather paler than the primaries.

Expanse 38 mm.

*Hab.* Entebbe, Uganda, December.

Type in my collection.

**Arctiidæ.**

*Estigmene ochreomarginata*, sp. n.

♂. Head and thorax dark brown; abdomen yellow, with black dorsal spots. Primaries uniform spotless dark brown, with costa narrowly ochreous: secondaries uniform pale straw-colour.

Expanse 36 mm.

*Hab.* Patigo, Acholi Country, 4000 feet, and Ituri Forest, Congo Free State.

In my collection and that of Major Powell-Cotton.

## Noctuidæ.

*Borolia confluens*, sp. n.

♂. Head and thorax very pale whitish grey, abdomen cream-colour. Primaries pale ochreous grey, with a very pale slightly brownish stripe along the fold almost confluent with a similar stripe from the termen along vein 4; a similar coloured wedge-shaped dash above the tornus; a similar coloured indefinite dash from the costa at the apex to the reniform stigma; orbicular stigma very pale and small, pupilled with pale brown, confluent with the equally pale reniform, which is also centred with pale brownish: secondaries uniform whitish.

Expanse 30 mm.

*Hab.* Nairobi, April.

Type in my collection.

*Westermannia ochreoplaga*, sp. n.

♂. Head rufous brown, thorax and abdomen dull brown. Primaries dull brownish, with a trace of a waved basal paler line; a broad, oblique, ochreous-grey, median band, curved on its internal edge, excurved rather strongly below the costa on its external edge and then waved; an almost parallel subterminal pale brown line, darkly spotted and dashed on its external edge, with a paler margin to the spots and dashes; termen finely dark: secondaries uniform darkish brown.

Expanse 20 mm.

*Hab.* Makala, Congo Free State.

In my collection, also in that of Major Powell-Cotton.

*Hypothripa sexilinea*, sp. n.

♂. Head and thorax pale grey, collar with a dark bar, abdomen brownish. Primaries clear pale grey, with a curved, sharply defined, black basal line from the costa into the base; a twin, deeply curved (almost angled) on the fold, fine dark median line, the inner of the two being fainter and finer than the outer of the twin lines; a postmedian similarly curved pair of lines, but the curve is in the radial area and the outer line of the two is the fainter; these two lines arise in a large dark grey costal patch; subterminal line sharply defined blackish, waved and slightly serrate; a short curved dark line from the tornus to the postmedian line; termen finely black, with fine black points between



the veins ; a dark short indefinite dash below the apex in the terminal area ; fringes pale grey, with two dark dividing-lines : secondaries darker grey.

Expanse 23 mm.

*Hab.* Makala, Congo Free State, April 1906.

In my collection and that of Major Powell-Cotton.

*Arcyothora mesonephele*, sp. n.

♀. Frons ochreous grey ; vertex and collar pale greyish, the latter tipped with white ; thorax greyish, with ochreous patagia. Primaries pale brownish grey, with a restricted ochreous basal patch, extending but little below the cell ; a dark strongly ex-angled postmedian line edging the brownish-grey area, in the angle of which (line) is a good-sized patch of whitish-grey irroration ; area beyond this line ochreous, with a terminal brownish patch between veins 2 and 6 ; two small brownish costal spots in front of the apex : secondaries brownish grey, with pale costa.

Expanse 24 mm.

*Hab.* Makala, Congo Free State, March.

In the Powell-Cotton collection.

*Ogovia angulata*, sp. n.

♂. Head and thorax pinkish grey, abdomen darker grey. Both wings pale ochreous grey : primaries more or less irrorated with pale pinkish red ; a curved antemedian pale reddish line rising in a dull reddish costal spot ; reniform reddish, a largish costal pale reddish patch before the apex ; costa more or less reddish grey, with a few spots on it ; a trace of a subterminal row of grey internervular dashes ; termen with a row of dark points between the veins, termen finely dark : secondaries with the termen broadly grey.

Expanse 52 mm.

*Hab.* Ituri Forest, Mawamba to Makala, March 1906.

In the Powell-Cotton collection.

*Ercheia excavata*, sp. n.

♀. Head, thorax, and abdomen darkish grey. Primaries darkish grey, with a basal blackish line, sharply waved ; an outwardly oblique, strongly marked, interrupted, dark median line ; postmedian line subrenulate and somewhat obscure ; subterminal double line subserrate, excavated outwardly in the radial area, followed by another serrate line ; termen with a preterminal strongly crenulate dark line ; reniform stigma

obscurely dark ; above the tornal area is a cloudy whitish-grey indefinite patch : secondaries uniform dull brownish grey, with darker, indefinite, waved median, postmedian, and subterminal lines.

Expanse 59 mm.

*Hab.* N'tebi, Uganda, August.

Type in my collection.

*Ophiusa pectinicornis*, sp. n.

♂. Head and thorax pale brownish ; abdomen pale ochreous grey, with darkish grey dorsum. Primaries pale brownish, with a chestnut tinge in parts ; a double dark spot at the base on the costa ; a broad, dark, strongly waved antemedian line, with a pale internal edge ; orbicular stigma traceable, with a dark point in it ; reniform chestnut-colour, with a dark edging ; postmedian line double, dark, with paler infilling, very strongly and acutely angled near the costa, angle filled with pale ochreous ; a chestnut patch on the costa above the angle ; a small grey apical patch divided from the chestnut one by a curved whitish line ; a curved, oblique, subterminal row of dark spots ; all the wing more or less darkly irrorated : secondaries dark grey, paler towards and at the base.

Expanse 50 mm.

*Hab.* Ituri Forest, Congo Free State.

In the Powell-Cotton collection.

*Capnodes pyrochroa*, sp. n.

♂. Palpi red ; head and collar ochreous, irrorated with red ; thorax reddish ochreous ; abdomen grey. Primaries red, with the basal half mixed with ochreous ; a subbasal indefinite line of grey, followed by a dark dot in the cell, which is edged externally by a larger spot of ochreous ; reniform grey, postmedian line dark grey, serrate, excurved below the costa, below which it is waved basewards ; area beyond this line mostly grey with red showing through ; subterminal line serrate and indefinite : secondaries red, with a subbasal, oblique, dark grey line and faint traces of postmedian and subterminal lines ; costa, apex, and termen somewhat clouded with grey.

Expanse 36 mm.

*Hab.* Ituri Forest, Congo Free State.

In my collection and that of Major Powell-Cotton.

*Diomea disticta*, sp. n.

♂. Head, thorax, and abdomen dark brown. Primaries dark umber-brown, with darker indefinite antemedian and median bands; beyond the latter the postmedian area is slightly irrorated with greyish, in which are two small, distinct, cream-coloured spots, one beyond the cell, the other on vein 2; a trace of a very interrupted dark band following these; subterminal line dark velvety, strongly waved three or four times, in which is a small dark patch above the centre; termen with internervular cream dots, edged internally with small dark velvety dentations: secondaries like the primaries, with most of the markings more or less distinctly carried through, but without the two cream-coloured spots.

Expanse 30 mm.

*Hab.* Ituri Forest, Congo Free State.

In the Powell-Cotton collection.

## DELTOIDINÆ.

*Sarmatia indenta*, sp. n.

♂. Head, thorax, and abdomen greyish. Primaries with the base pale greyish brown up to the dark dentate antemedian line; median area rather darker up to the broadish indented white postmedian line, area beyond this whitish grey finely irrorated with whitish, the central portion of it being tinged with deep cream and margined externally by an angled line of the same colour; a darkish, cloudy, apical costal patch and a less dark, smaller, cloudy, curved, indefinite dash around the tornus; termen darkly dotted: secondaries uniform brownish grey.

Expanse 32 mm.

*Hab.* Makala, May.

In the Powell-Cotton collection.

*Hypena leucosticta*, sp. n.

♂. Head and thorax dull chocolate-brown, abdomen greyish brown. Primaries dull pale chocolate brown, with a fine antemedian line broken inwards at the upper margin of the cell and very oblique outwards from the lower margin of the cell; a darkish dot at the end of the cell; pale postmedian line twice indented outwards and waved, a dark patch from thence to the apex edged internally by a short, curved, costal white dash; two velvety, deep brown, irregular small

spots at the bottom of the dark patch; two subapical small white spots below each other; termen very finely dark, edged internally by a fine whitish line: secondaries uniform brown.

Expanse 32 mm.

*Hab.* Ituri Forest, Congo Free State.

Type in my collection.

*Hypena poliopera*, sp. n.

♂. Head and thorax pale madder-brown; thorax madder-grey, with dark dorsal tufts on the two penultimate segments. Primaries pale purplish brown, with an obscure angled and waved paler antemedian line, darkly edged externally; postmedian line oblique, composed of a series of crescents gradually increasing in size, edged internally with rufous, more broadly at the inner margin; two cloudy, dark, obscure, somewhat parallel lines, subterminal line composed of a row of white spots, darkly edged internally, somewhat waved; termen finely dark, edged internally by small lanceolate fawn-coloured internervular dashes; a pale lavender-grey costal patch borders the postmedian line and extends into a large similar apical patch, and on the inner margin near the tornus are two similar spots: secondaries uniform greyish brown.

Expanse 42 mm.

*Hab.* Ituri Forest, Congo Free State.

In my collection and that of Major Powell-Cotton.

*Hypena orthogramma*, sp. n.

♂. Head, thorax, and abdomen dull olive-brown. Primaries uniform dull olive-brown, with a slightly oblique and slightly incurved white postmedian line; an obscure trace of a waved row of subterminal dark dots, edged in some cases internally with whitish: secondaries uniform dull brown.

Expanse 32 mm.

*Hab.* Makala, Congo Free State.

In the Powell-Cotton collection.

Agaristidæ.

*Ægocera tricolora*, sp. n.

Palpi porrect, second segment with a broad fringe of long black hairs below, ringed beyond with a creamy fine line, end segment dark brown; head and thorax black; abdomen,

dorsum narrowly black, laterally and ventrally chrome-yellow. Primaries black, inner margin broadly bright crimson-red for over three-quarters, base black, with a cream dot at the roots; a very oblique broadish cream band across the antemedian and median areas, interrupted in the former area by the black ground; a small subcostal creamy spot in the middle of the costa; a large, subovate, oblique, postmedian, creamy patch; a metallic leaden-blue line edges the main markings: secondaries bright crimson-red, with termen broadly deep black, very slightly tapering, narrower near the anal angle.

Expanse 48 mm.

*Hab.* Makala, April and June.

In my collection and that of Major Powell-Cotton.

*Rhanidophora septipunctata*, sp. n.

♂. Head and thorax yellow; palpi black, with restricted yellow bases; abdomen rose-pink. Both wings dove-grey: primaries darker than secondaries, with three white cell-spots, that in the middle and the one at the end of the cell being large; a white spot above, the last of the three, a small white spot between the first and second but below the cell, a white spot on the inner margin at a quarter from the base, and another just beyond the middle, all the spots more or less round: secondaries with a pale pink suffusion at the base, in the cell, and along the inner margin.

Expanse 59 mm.

*Hab.* Makala-Beni, July.

In the Powell-Cotton collection.

Geometridæ.

*Negla iturina*, sp. n.

♂ ♀. Head and thorax whitish, spotted with black; abdomen yellowish, with a row of black spots on each side of the dorsum. Both wings white, spotted with blackish: primaries with a subbasal row of three spots, the largest being that on the costa; beyond this are two larger costal spots; a postmedian waved row of six or seven spots; a large apical black area, terminating abruptly below vein 4, below this the terminal blackish area is continued, the white ground deeply invading it at the veins; cell closed with an oval spot: secondaries with a spot closing the cell; a postmedian curved row of seven roundish spots; termen broadly blackish in deep scallops, caused by the white ground invading deeply

the black, in some cases extending finely through to the fringes.

Expanse 49-51 mm.

*Hab.* Makala and Ituri Forest, March-July 1906.

In my collection and that of Major Powell-Cotton.

### Pyralidæ.

#### PYRALINÆ.

##### *Stemmatophora flammans*, sp. n.

Head and thorax red. Primaries flame-red, with ochreous irroration in parts; a double-angled median line from the cell to the inner margin, in the inner angles of which are small patches of ochreous; postmedian line strongly crenulate and waved, edged externally with ochreous; subterminal and inner marginal areas somewhat ochreous, as also the internervular spaces of veins 2 to 4: secondaries very pale straw-colour; the whole of the wings have a slightly lustrous appearance.

Expanse 38 mm.

*Hab.* Makala, Congo Free State, May.

In the Powell-Cotton collection.

#### PYRAUSTINÆ.

##### *Pilocrocis nubilinea*, sp. n.

♂. Head and thorax pale chrome-yellow, abdomen darker. Both wings pale chrome-yellow, with greyish markings: primaries with a small basal costal spot, followed by a second costal spot; a small subbasal patch below the cell; a median V-shaped mark on the inner margin, with a small dot above the inner stroke of the V and a large one above the outer stroke; a subterminal irregular broad line strongly angled outwards about vein 6; a short broad dash from the apex to near the angle of the previous line, and almost touching it at the lower extremity: secondaries with a small dot in the cell, a short dash below the angle of vein 2, a strongly thrice-waved postmedian line; an apical dash to about vein 5.

Expanse 28 mm.

*Hab.* Ituri Forest, Congo Free State.

In the Powell-Cotton collection.

##### *Phryganodes flavipectus*, sp. n.

♂. Palpi ochreous yellow, terminal segment dark grey; head, thorax, and abdomen dark sooty brown; legs creamy ochreous yellow, hind pair with dense dark tufts. Both

wings uniform dark sooty brown : primaries markless except for a trace of a dark spot at the end of the cell : secondaries with a single small ochreous dash, almost a spot, at the end of the cell.

Expanse 34 mm.

*Hab.* Makala, Congo Free State, April.

In the Powell-Cotton collection.

*Phyganes stygichroa*, sp. n.

♂. Head and thorax dark greyish brown, abdomen slightly paler. Both wings darkish greyish brown : primaries with an antemedian dark line from the upper margin of the cell to the inner margin ; postmedian line very irregular, strongly projected outwards between veins 2 and 5, where the edge is crenulate, receding rapidly basewards along vein 1 and descending to the margin in a short double curve ; this line is somewhat edged externally with creamy, and has three deep cream-coloured dots below the costa : secondaries with the postmedian line only, similar to that in the primaries, but without the three cream-coloured dots.

Expanse 37 mm.

*Hab.* Makala, Congo Free State, May.

In my collection and that of Major Powell-Cotton.

*Sylepta fulviceps*, sp. n.

♂. Head and collar tawny, thorax and abdomen pale grey. Both wings uniform pale slate-grey, with a lustrous bluish-lilac sheen in certain lights : primaries with a very fine small subbasal pencil of dark purplish scales just below vein 1.

Expanse 38 mm.

*Hab.* Makala, Congo Free State, April.

In my collection and that of Major Powell-Cotton.

*Glyphodes incomposita*, sp. n.

♂. Head, thorax, and both wings dove-grey, the latter with pearly diaphanous patches finely and darkly edged. Primaries with a median patch across the cell from the costa, followed by a small costal spot ; a broad postmedian patch to vein 2, deeply indented by the end of the cell : secondaries with a broad median patch projected outwards at its centre and extending slightly towards the anal angle.

Expanse 30 mm.

*Hab.* Makala, Congo Free State ; Lagos.

In my collection and that of Major Powell-Cotton ; also (from Lagos) in the British Museum.

LVI.—*Description of a new Hesperid from Peru, belonging to the Subfamily Pyrrhopyginæ.* By HAMILTON H. DRUCE, F.L.S. &c.

*Yanguna mabillei*, sp. n.

♂. Upperside: fore wing blue-black, with a pure white transverse central fascia commencing broadly just below the subcostal nervure and extending to the submedian nervure, where it becomes narrowed to a point and divided by the black nervules, *i. e.* the median and the lower median nervule; base of wing broadly and unevenly bright red; cilia reddish brown. Hind wing: basal and discal areas bright red; inner margin, apex, outer and abdominal margins broadly and evenly blue-black; extreme basal areas thickly clothed with deep black hairs; cilia from apex to anal angle, where it is longest, reddish brown.

Underside: fore wing blue-black, with the white transverse fascia as above and a slight reddish irroration at the base. Hind wing blue-black, with a distinct, clearly defined, bright red fascia commencing on the costal margin close to the base and extending to the middle of the wing; cilia of both wings as above.

Head black, with two whitish spots between the eyes; collar grey; thorax bright red interspersed with black hairs. Abdomen black, annulated with bluish grey; anal tuft reddish brown. Palpi black, with some grey scales. Legs black, fringed with grey. Antennæ black.

Expanse  $2\frac{4}{5}$  inches.

*Hab.* Huancabamba, E. Peru, 6000–10,000 feet (*Boettger*, type Mus. Druce).

This fine insect, although somewhat like *Y. cometes*, Cr., has not the white fringes of that group, and seems to be allied to the species lately described and well figured by MM. Mabille and Boulet in 'Annales des Sciences Naturelles,' 9th series, Zool. t. vii. p. 186, pl. xiii. fig. 2 (1908). It differs from that, however, by the broad white transverse band on the fore wing and by the more extensive red on the hind wing below. Described from two specimens, one of which has the cilia of the hind wings more concolorous with the border, and which may be its more usual colouring.



LVII.—*Diagnoses of new Mammals collected by Mr. H. C. Robinson in the Malay Peninsula and Rhio Archipelago.*  
By OLDFIELD THOMAS and R. C. WROUGHTON.

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THE National Museum owes to the authorities of the Selangor Museum, and especially to Mr. H. C. Robinson, a further magnificent collection of mammals of all groups, and of these a full account is being forwarded to the 'Journal of the Federated States Museums.' In the meantime, however, to avoid clashing, it is thought better that the following diagnoses should be published at once.

(1) *Presbytis cristata pullata*, subsp. n.

A local race of *P. cristata*, characterized by its darker colouring, especially on the forehead and forearms, and its smaller teeth.

*Hab.* Batam and Bintang Islands, Rhio Archipelago.  
(Type from Batam.)

*Type.* Adult female. Original number 906. Collected 12th July, 1908.

Ten specimens examined.

(2) *Cynopterus (Niadius) harpax*, sp. n.

About the same size as *C. (N.) minor*, Lyon, but the molars, although with the extra cusps typical of *Niadius*, comparatively narrow and tapering backwards, as in true *Cynopterus*.

Dimensions of the type:—

Forearm 72 mm. Front of canine to back of  $m^1$  (alveoli) 10.5.

*Hab.* Semangko Pass, Selangor, Pahang Boundary.

*Type.* Male. B.M. no. 8. 7. 20. 7. Original number 571.

(3) *Sciurus vittatus nesiotus*, subsp. n.

A plantain-squirrel most resembling the mainland *S. v. peninsularis*, from which it differs by its greyer colouring, less conspicuous lateral stripe, and more brightly coloured hands and feet.

*Hab.* Batam Island, Rhio Archipelago. (Type from Tanjong Turut.)

*Type.* Adult male. Original number 920. Collected 14th July, 1908.

Fifteen specimens examined.

(4) *Sciurus vittatus subluteus*, subsp. n.

A local form distinguishable from all others by its dingy pale yellow-coloured abdomen. General colouring greyer and teeth smaller than in typical *vittatus*.

*Hab.* Si Karang, S.E. Johor.

*Type.* Adult male. Original number 1250. Collected 1st August, 1908.

Eight specimens from the mainland and one from Tinggi Island examined.

(5) *Sciurus seimundi*, sp. n.

A squirrel allied to and resembling *S. robinsoni*, Bonh., but having the dark colour of the back prolonged downwards on the flanks, thus greatly narrowing the broad white ventral area characterizing that species.

*Hab.* Kundur Island, Rhio Archipelago. (Type from Bliah.)

*Type.* Old male. Original number 1505. Collected 21st August, 1908.

(6) *Rhinosciurus peracer*, sp. n.

Tail-hairs tipped with buffy ochraceous, white in the geographically neighbouring *R. tupaoides*. Skull with comparatively small bullæ, more as in the Bornean *R. laticaudatus*.

Hind foot of type 41 mm.

*Hab.* Maxwell's Hill, Perak.

*Type.* Female. Original number 89. Collected 1st September, 1908.

(7) *Rhinosciurus leo*, sp. n.

Externally resembling the last, but colours brighter. Specially characterized by its exceptionally large bullæ, which distinguish it from all other forms in the genus.

*Hab.* Singapore Island and adjacent mainland. (Type from Changi, Singapore.)

*Type.* Old male. Original number 1122. Collected 24th July, 1908.

Seven specimens from Singapore and one from the mainland examined.

(8) *Rhinosciurus leo rhionis*, subsp. n.

A local form of the last, from which it differs by its larger size, richer general colouring, more evident shoulder-stripes, and more buffy lower surface.

*Hab.* Rhio Archipelago. (Type from Karimon.)

*Type.* Adult female. Original number 1366. Collected 13th August, 1908.

Seventeen specimens examined from the islands of Karimon, Kundur, Batam, and Bintang.

(9) *Mus rattus rhionis*, subsp. n.

A rat of the *albescens* type of the *rattus* group, but darker than any known Malayan form.

*Hab.* Bintang and Batam Islands, Rhio Archipelago. (Type from Bintang.)

*Type.* Adult male. Original number 739. Collected 8th June, 1908.

A series of eighteen specimens, of both sexes and all ages, from the two islands examined. The general appearance throughout is very uniform.

(10) *Sus andersoni*, sp. n.

A pig of the *S. vittatus* group allied to *S. rhionis*, but with conspicuously smaller teeth.

Upper length of skull 310 mm.  $p^2$   $10 \times 4.3$  mm.;  $p^3$   $11 \times 8.3$ ;  $p^4$   $10.3 \times 12$ .

*Hab.* Islands of the Rhio Archipelago. (Type from Batam Island.)

*Type.* Adult female. Original number 927. Collected 15th July, 1908.

Four specimens examined.

LVIII.—*The Genus Puerulus, Ortmann, and the Post-larval Development of the Spiny Lobsters (Palinuridæ).* By W. T. CALMAN, D.Sc.

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THE genus *Puer* was established by Ortmann\* in 1891 for the reception of *Panulirus angulatus*, Spence Bate, and a new species from Japan described under the name of *P. pellucidus*. The genus was distinguished from *Senex* (= *Panulirus*) by having the antennular segment unarmed and the cephalothorax with a pair of lateral ridges, giving it a prismatic

\* Zool. Jahrb. Syst. vi. pp. 15 & 37 (1891).

instead of cylindrical form. In 1894 the same author\* added a third species, *P. spiniger*, from Amboina, and in 1897 he replaced the preoccupied name *Puer* by *Puerulus* †. In 1905 Bouvier, overlooking the change in the generic name, described a species, *Puer atlanticus*, from the Cape Verde Islands ‡ and Dahomey §. Judging from the very brief description of Bouvier's species, I suspect that it will prove to be identical with *Panulirus inermis*, described by Pocock || from Fernando Noronha, of which the type is in the British Museum.

Among these species, the first-named, *P. angulatus*, stands apart. Although the type specimen described by Spence Bate ¶ was only 36 mm. in length of body and was obviously immature, Alcock\*\* has since described specimens measuring up to 169 mm. in length, and showing in the males the orifices of the genital ducts. In a female specimen, 164 mm. in length, for which I am indebted to Dr. N. Annandale, Superintendent of the Indian Museum, Calcutta, the orifices of the oviducts are distinctly visible. There can be no doubt that these specimens are adult or nearly so, and that *P. angulatus* is a perfectly distinct and independent species, which may be taken as the type of the genus *Puerulus*. Alcock, it is true, ignores the genus altogether, and retains the species in the genus *Panulirus*. It appears to me, however, that *Puerulus*, as represented by this species, may well stand as a valid genus, which is probably more closely allied to *Linuparus* than to *Panulirus*. It resembles *Linuparus* not only in the prismatic form of the carapace, but also in the disposition of the pleopods in the female sex; in *Puerulus* and *Linuparus* the pleopods of the second abdominal somite of the female resemble those of the three following somites, having the endopodite narrow and the appendix interna large; in *Panulirus*, as in *Palinurus* and *Jasus*, the pleopods of the second somite differ greatly from the succeeding pairs, having the endopodite broad and foliaceous like the exopodite, and the appendix interna reduced to a vestige ††.

\* Semon's "Forschungsreisen," v. (Denkschr. Med. Nat. Ges. Jena, viii.) p. 19 (1894).

† Amer. Journ. Sci. (4) iv. p. 290, footnote (1897).

‡ Bull. Mus. Oceanogr. Monaco, xxviii. p. 2 (1905).

§ *Op. cit.* xxix. p. 6 (1905).

|| Journ. Linn. Soc., Zool. xx. p. 516 (1890).

¶ 'Challenger' Macrura Rep. p. 81 (1888).

\*\* Cat. Indian Deep-sea Macrura and Anomala, p. 185 (1901).

†† I may take this opportunity of correcting an error in my recently published volume on Crustacea in Sir Ray Lankester's 'Treatise on Zoology.' On p. 312 the Scyllaridea are defined (following most recent

The remaining three species referred to *Puerulus* (*P. pellucidus*, *P. spiniger*, and *P. atlanticus*) are all described from specimens of small size (not exceeding 22 mm. length), and this circumstance, together with the slight development of the spines on the carapace and the general thinness of the integument, suggests that they are immature forms. Ortmann has discussed this possibility in describing *P. spiniger* (*loc. cit.*), which was found together with small specimens of *Panulirus versicolor* (or, as Ortmann called it, *P. polyphagus*), and which resembles that species in having no exopodite on the third maxilliped. Ortmann notes, however, that the young specimens of *Panulirus* did not exceed in size those of *Puerulus*, although the former had assumed the specific characters of the adult in the spinulation of the carapace and in other respects; he infers that *Puerulus spiniger* cannot be the young form of *Panulirus versicolor*, and he further concludes that the differences between the two genera are so great that *Puerulus*, if not an adult, must be the young of some hitherto undiscovered form of Palinurid.

It appears to have escaped notice that these small species of *Puerulus* agree exactly with Boas's \* description of what he calls the "Natant"-stage of the Palinuridæ. Boas found vestiges of exopodites persisting on the thoracic legs of some of his specimens, and he further notes that they retained larval characters in the relative shortness of the antennular peduncle, in having the third maxillipeds separated from each other at the base, and the maxillipeds and maxillæ soft, sparsely setose, and of embryonic appearance. The absence of the "cervical" groove (*c*), the presence of lateral ridges, and the small number of spines on the carapace are also mentioned, and an important larval character was found in the persistence of coupling-hooks on the appendix interna of the pleopods. The specimens measured up to 25 mm. in length. Boas also mentions that he had examined specimens of young Palinuridæ of about the same size as those in the Natant-stage, but agreeing with the adult except in the absence of sexual characters.

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authors) as lacking the first pair of pleopods. I overlooked the fact that these appendages are described as present in the female of *Palinurellus* by Boas (Kgl. Danske Vidensk. Selsk. Skr. (6) i. pp. 92 & 183 (1880), and Zool. Anz. v. p. 113, 1882) and by Spence Bate (Ann. & Mag. Nat. Hist. (5) vii. p. 220, 1881). I find that they are also present in a male specimen belonging to this genus in the British Museum collection.

\* "Studier over Decapodernes Slaegtskabsforhold," Kgl. Danske Vidensk. Selsk. Skr. (6) i. p. 83 (1880).

Among the *Palinuridæ* collected by Dr. C. W. Andrews, F.R.S., on his recent visit to Christmas Island are five specimens presenting the characters of "*Puerulus spiniger*," Ortmann. They are all about 25 mm. in length of body, and were collected partly on the reef and partly in crevices in the piles of the pier at Flying-Fish Cove. In all of them the first four pairs of legs have, on the outer side of the basipodite, a soft shrivelled process, which is no doubt the vestige of an exopodite. The antennular peduncle is much shorter than the antennal; the third maxillipeds are widely separated at the base, and the other mouth-parts are soft, without setæ, and imperfectly formed; the appendix interna of the pleopods has an apical group of coupling-hooks. In all these characters the specimens agree with those described by Boas, and I see no reason to dissent from his conclusion that they represent a late stage, which may perhaps be called post-larval, in the development of a species of *Palinurid*.

I believe, however, that it is possible to go further, and to assign these specimens, with considerable confidence, to the species *Panulirus versicolor* (Latreille)\*. As in the case of the specimens described by Ortmann from Amboina, those of the present collection were found together with young individuals of the species just named, some of which do not exceed the "*Puerulus*" form in size (25 mm.). The smaller specimens of the *Panulirus* differ from the larger (up to 74 mm. in length) in some small details of structure, *e. g.* in having the antennular peduncle shorter instead of longer than the antennal, in which they resemble the *Puerulus*-form. They also differ from the larger specimens in the less brilliant colouring, the bright purple being replaced, in the smaller spirit-specimens, by brown, and the longitudinal striping of the legs being undeveloped. The general pattern of the coloration remains, however, the same. Ortmann describes (*loc. cit.*) the "*Jugendfärbung*" of this species, mentioning especially a **W**-shaped marking on the carapace formed by a longitudinal white band on each side, and a pair of bands converging to the middle line from the hinder ends of these. He notes that in specimens of 26.5 and 33 mm. length this pattern was no longer visible. It would, perhaps, be more correct to say that the converging bands lose their importance as the colour-pattern increases in complexity, although they can still be recognized even in very large specimens. The

\* As defined by Pfeffer, "*Mitth. Mus. Hamburg*" (*Jahrb. Hamb. wiss. Anst.*) xiv. pp. 255 & 262 (1897).

longitudinal lateral bands are always conspicuous. In the general pattern of their coloration the *Puerulus*-forms agree exactly with the youngest specimens of *Panulirus*. In three out of the five specimens collected by Dr. Andrews this pattern is very conspicuous, and in the other two, which are much paler, it can still be traced. In all, the ground-colour is a more or less rich brown and the lighter bands and spaces are yellowish or light buff. The lateral longitudinal bands (which do not coincide with the lateral ridges of the carapace) and the convergent bands completing the **W** are very well marked; the abdominal somites have each a light band posteriorly, with a fainter indication of the narrow marginal dark band seen in the young *Panulirus*. Further, if the carapace of one of the more darkly pigmented specimens of the *Puerulus*-form be examined under a lens, numerous darker spots can be seen, which correspond exactly in their arrangement with the spines on the carapace of a *Panulirus* of similar size. These spots no doubt represent the rudiments of the spines in course of development under the semi-transparent cuticle.

Boas states that the specimens of the Natant-stage examined by him represented several species belonging to both the longicorn and the brevicorn types of Palinuridæ. It does not seem possible at present to refer any of the other "*Puerulus*" species to definite species of adult Palinuridæ. Perhaps the "*Puer atlanticus*" of Bouvier (= *Panulirus inermis*, Pocock) may be the young of *Panulirus guttatus* (Latr.), in company with which it has been found (Pocock, Bouvier), and which it resembles in having a reduced exopodite on the third maxilliped.

In the British Museum collection are four specimens of a Palinurid in the Natant-stage from Stewart Island, New Zealand, which I suppose to belong to a species of *Jasus*. These have the general facies of the "*Puerulus*" forms described above, the integument being soft and semitransparent, the carapace somewhat depressed, with a longitudinal ridge on each side and with a small number of spines anteriorly. There is, however, a well-marked median rostral tooth, which is bent downwards, but does not reach the antennular segment as it does in the adult *Jasus*. Traces of exopodites are found on all but the last pair of legs.

The conclusions reached may be summed up as follows:—

(1) *Puerulus*, Ortmann, 1897 (= *Puer*, Ortmann, 1891), is a valid genus of Palinuridæ, of which the type species is *P. angulatus*, Spence Bate. It agrees with *Linuparus*,

White, and differs from the other genera of the family in the character of the pleopods in the female sex.

(2) The remaining species assigned to *Puerulus*, *P. pellucidus*, Ortm., *P. spiniger*, Ortm., and *P. atlanticus*, Bouvier (= *Panulirus inermis*, Pocock), are founded on specimens in a stage of development intermediate between the *Phyllosoma* and the adult form, called by Boas the "Natant-stage."

(3) *Puerulus spiniger*, Ortmann, is the Natant-stage of *Panulirus versicolor* (Latreille), and it passes into the adult form without any perceptible increase of size, while preserving unchanged the general pattern of coloration.

(4) *Jasus* passes through a Natant-stage differing from those which have been referred to *Puerulus* in possessing a median rostral tooth.

LIX.—*Preliminary Notice of the Cephalopoda collected by the Fishery Cruiser 'Goldseeker,' 1903-1908.* By E. S. RUSSELL, M.A., Research Student, University of Glasgow.

THE collection of Cuttlefish made by the 'Goldseeker' under the International Committee for the Investigation of the North Sea (Scotland), and entrusted to me by Professor D'Arcy W. Thompson for description, contains representatives of sixteen species, of which three are new. The collections were made on the east and north coasts of Scotland, round the Shetlands, and between the Shetlands and the Faeroes.

OCTOPODA.

*Polypus arcticus* (*Prosch*).  
 — *piscatorum* (*Verrill*).  
 — *faeroensis*, sp. n.  
*Moschites cirrosa* (*Lamarck*).

DECAPODA.

*Loligo forbesii*, *Steenstrup*.  
 — *media* (*L.*).  
*Rossia macrosoma* (*Delle Chiaje*).  
 — *glaucopis*, *Lovén*.

*Sepiola rondeletii*, *Leach*, var. *scandica*, *Stp.* (= *S. oweniana*, *Pfeffer*, 1908).  
 — *atlantica*, *D'Orbigny*.  
 — *aurantiaca*, *Jatta*.  
*Calliteuthis reversa*, *Verrill*.  
*Brachioteuthis boymani*, sp. n.  
*Tracheloteuthis riisei*, *Steenstrup* (including *T. behnii*, *Stp.*).  
*Desmoteuthis hyperborea* (*Steenstrup*).  
*Taonidium pfefferi*, sp. n.

*Polypus faeroensis*, sp. n.

The body is very plump and is much larger than the head. There is a distinct constriction between head and body. The breadth of the head is about three-quarters that of the body, its depth about three-fifths.

The colour is a fine reddish purple, of a deep shade on the



back and sides, becoming paler on the ventral surface and on the funnel. The colour is due to minute chromatophores, which are closely crowded together on the dorsal surface of the head, body, arms, and web, more scattered on the ventral surface, and sparsely dotted on the funnel. Chromatophores occur also to a slight extent on the sides of the arms outside the limit of the web, especially on the inner (dorsal) aspect. Chromatophores are completely absent from the internal (oral) surface of the arms and web, except for a few at the tips of the arms.

The skin is of a firm consistency and there is no lateral fold of the mantle.

The papillation is characteristic. All over the dorsal surface of head, body, and web there are papillary areas; these are more or less circular patches of a lighter colour than the surrounding skin, having in the centre a low conical papilla, while round the periphery stand six or seven smaller papillæ. In a large female these areas are as much as 7 mm. in diameter, and the peripheral papillæ are distant from the central one; but in two smaller males the areas are smaller and less well defined, and the peripheral papillæ are set close round the base of the central papilla. The papillæ are whitish in colour, owing to the absence of chromatophores from their tips. These papillary areas are not found at the sides nor on the ventral surface of the web.

Above the eyes, which are small, there is a large conical cirrus, 2-3 mm. high, on which are set a number of small papillæ (much as in some specimens of *Polypus arcticus*, figured by Verrill). Round the eyes, but not extending to the lower lid, are a number of large papillæ, which may have subsidiary papillæ at their base.

It is not improbable that the "papillary areas" are directly comparable with the papillated cirrus above the eyes. One has only to suppose them erectile to have the homology clearly demonstrated. In the two small males the areas have indeed much the look of half-collapsed papillated cirri.

The ventral surface is perfectly smooth.

The funnel is large, 1.6 cm. long in the smallest male. The free margin below the mantle-flap shows a broad sinus.

The arms are stout and well developed. The order of size is 1, 2, 3, 4, but the differences are not great. The dorsal arms (measured from the beak) are a little more than three times the length of the mantle (measured dorsally to the eye). There is a strong web which occupies from one-quarter to one-third of the length of the arms. It is more or less equally developed between all the arms, except between the ventral

pair, where it is less developed. The suckers are in two rows slightly alternating, and are perfectly formed, though small, at the extreme tips of the arms. Near the mouth three or four suckers stand in a single row. There are about 60-70 suckers on each arm of the large female, and the largest of them measures 4 mm. in diameter.

The hectocotylistation closely resembles that of *P. arcticus*, but it is, relatively to the length of the arm, very much smaller. Thus it measures 14 mm. in length on an arm measuring 11.4 cm. The calamus brachialis is small and triangular, the ligula copulatoria is broadly oval and comes to a blunt point. There are 11-13 ridges on the ligula. The hectocotylisted arm is little shortened; the web is developed especially on the ventral side; there is a sperm-canal (21 mm. long) running down the ventral edge of the web to midway between the third and fourth arms.

I give below the dimensions of a large female and of a male:—

*Dimensions (in cm.).*

	♀.	♂.
Length of mantle, dorsally, to eyes . . . . .	4.8	4.2
Breadth of mantle . . . . .	4.0	3.6
"    head, dorsally, across eyes . . . . .	3.0	2.5
Depth of body . . . . .	3.7	3.0
"    head . . . . .	2.2	1.8
Length of first arm, from beak . . . . .	17.0	13.2
"    second arm, from beak . . . . .	16.0	12.6
"    third (non-hectocotylisted) . . . . .	15.0	12.5
"    "    (hectocotylisted) . . . . .	..	11.4
"    fourth arm . . . . .	14.0	11.0
"    web between first pair of arms . . . . .	4.2	3.8
"    "    fourth pair of arms . . . . .	3.0	3.3
Number of suckers on first (right) arm . . . . .	73	67

The hectocotylisted arm of the male measures 11.4 cm. in length, of which 10 cm. bear suckers (to the number of 40). The hectocotylisted part is 1.4 cm. long and 9 mm. broad. The ligula bears 13 transverse ridges.

*Polypus faeroensis* is fairly closely allied to *P. arcticus* (Prosch), but it differs in certain well-defined ways. The body is not so broad, and the distinction between head and body is very much better marked. The arms are longer in proportion to the body. The hectocotylisted arm is much longer and the hectocotylisted part much shorter than in *P. arcticus* (*Octopus bairdii* of Verrill), in which the hectocotylisted part is one-third the length of the arm. Finally, the papillation is distinctive.

In a large female of *P. arcticus*, measuring in overall length 17 cm., the breadth of the mantle was 5.5 cm., of the head 4.1 cm., while the longest arm was only 12.5 cm. in length (Verrill, Rep. U.S. Comm. Fish. for 1879 (1882), p. 395, pl. xli. figs. 1, 2, 3 a, pl. xlii. figs. 1-5). In a large male (16.3 cm. overall) the hectocotyliised arm was 8.5 cm., the hectocotyliisation 3.3 cm. long.

With the North Atlantic species, *P. ergasticus* (Fischer), *P. sponsalis* (Fischer), and *P. profundicola*, Massy, this species shows no points of special similarity.

One large female and two smaller males were taken by the 'Goldseeker' on Aug. 24th, 1908, in 1030 m. at Sta. 19 A (Faeroe Channel), associated with half a dozen specimens of *P. piscatorum* (Verrill).

*Brachioteuthis bowmani*, sp. n.

The body is fusiform and runs out into a sharp point behind. The anterior border of the mantle is free all round, almost straight or slightly convex above, not produced in an obtuse angle. At the sides, just above the level of the lower border of the eye, the mantle-border projects slightly, the mantle-cartilage, which articulates with the funnel, running to the end of this projection.

The pen is clear brown in colour and is plainly visible along the mid-dorsal line, where it is 1 mm. broad. At the insertion of the fin it broadens out and the margins become folded down; near the tip the margins fuse to form a hollow cone, 11 mm. in length and 2 mm. in breadth at the base.

The fin resembles in shape that of *Ommatostrephes sagittatus*. It occupies the posterior third of the mantle.

The funnel is rather broad and is free only at the tip. The hinder margin is thin and shows a shallow sinus. The connective cartilage exhibits a longitudinal groove, 7 mm. in length, slightly enlarged at the posterior end. The connective on the mantle is a linear ridge, 10 mm. in length.

There is a pair of long and broad adductor muscles.

The sides of the funnel run up as broad bands to the mid-dorsal line, where they fuse with the neck. At the line of fusion there is a longitudinal horny piece with two lateral grooves like those of the connective cartilage on the funnel. This piece is 6.5 mm. long and lies directly below the front end of the pen, whose incurved margins articulate with the grooves.

The head is very large, with enormous eyes. It is broader than the mantle-opening.

The actual visceral sac is very small, being narrowly triangular and not extending back much beyond the insertion of the fins. The gills are very long and slender.

The mantle is covered with small pale red chromatophores, which are present also on the dorsal aspect of the fins. The head is more deeply coloured in shades of brown and crimson, the chromatophores being aggregated especially at the antero-ventral border of the eye. The eye is covered over by a skin set with chromatophores and resembling the skin of the head. In front there is a deep transverse groove with puckered edges; it is 3 mm. long, has a muscular margin, and marks the opening from the anterior chamber of the eye to the exterior.

Chromatophores are present also on the arms and tentacles.

The order of the arms is 2, 3, 4, 1. They are without web or keel, except the ventral pair, which have a narrow fin on their extero-ventral edge. The second pair are about two-thirds the length of the mantle. The suckers are in two slightly alternating rows, and they are not continued right down to the mouth, 2-3.5 mm. being without suckers. The cups of the suckers are nearly globular, inserted very obliquely on pedicels, slender above, swollen below. The horny ring is higher above, has 5-8 square teeth on its upper half, and is smooth on its lower half.

On the second and third arms, and to a less extent on the first arms also, the swollen part of the pedicels of the external row of suckers gives off a slender cirrus, whose length may equal the diameter of the cup. The cirri are not free, but are bound to the arm throughout their length by a fold of thin skin. Tentacles are fairly stout, 60 mm. in length, more or less triangular in cross-section. The club is 13 mm. long, 5 mm. broad, and is thin and flattened from above downwards for 10 mm. of its length, then at the tip the plane of the club is twisted inwards through a right angle, so that its ventral surface becomes vertical and looks inwards. This terminal part is 4.5 mm. long and has a thin vertical suckerless crest. The axis of the tentacle is not itself expanded to form the club, the lateral portions of which are formed rather by the long pedicels of the marginal suckers, which are bound together in a membranous expansion of the axis. In the terminal portion the axis is without suckers, but its ventral expansion bears three rows, of which the lowest are the largest. At the twist of the club there are two irregular transverse rows of large suckers, about five suckers in each row. These are the largest suckers on the club. The main body of the club bears on its ventral surface numerous thin-stalked minute suckers irregularly disposed in about 12-15

rows. Towards the proximal end of the club the suckers stand in fewer rows. Sessile suckers extend in about four scattered rows halfway down the internal face of the tentacle; these are very minute and become very sparsely scattered as they reach the middle of the tentacle.

The cups of the suckers on the club are hemispherical and the horny ring bears in its upper half fine pointed teeth.

There is a well-developed buccal membrane with about eight ill-defined angles.

A single specimen, apparently a female, was taken on June 9th, 1908, at Sta. 15 c in 778 m.

#### *Dimensions.*

	mm.
Length of mantle (and pen) .....	61
Breadth of mantle at collar .....	16
Length of fin in middle line .....	29
Breadth of fin .....	41
"    head across eyes .....	17
"    "    in front of eyes .....	12
Vertical diameter of eyeball .....	11
Horizontal diameter of eyeball .....	13
Length of head .....	12
"    first arm .....	24
"    second arm .....	40
"    third arm .....	36
"    fourth arm .....	35
"    tentacles .....	60

This species, which is named after Dr. Alex. Bowman, naturalist on board the 'Goldseeker,' is very close to the only other species of the genus, *B. beanii*, Verrill. It is described as new because it seems to offer several points of difference and because it does not resemble at all closely Verrill's figures (Rep. U.S. Comm. Fish. for 1879 (1882), p. 424, pl. xlv. figs. 3-3 b, pl. xlvi. figs. 2, 2 a). The great size of the eyes, the pigmented cornea, the shape of the anterior margin of the mantle, the peculiarities in the structure of the suckers and of the tentacular club seem to warrant its separation from *Brachioteuthis beanii*.

#### *Taonidium pfefferi*, sp. n.

The body is flattened dorso-ventrally. It is oval in outline, the sides curving in sharply at the posterior end, where the terminal part of the pen runs out, fringed by the small fins, which together form a broad ellipse. This terminal portion is 3 mm. long by 2.7 mm. broad. The tip of the pen extends a very little way beyond the fins. The length

of the mantle mid-dorsally to the insertion of the fins is 16.5 mm.; its greatest breadth is about halfway along the back, where it measures 11.5 mm. In front the dorsal edge of the mantle is transverse, with a sinuous margin, and measures 6.5 mm. across. It is distinctly produced at the corners and curved sharply back in the middle line, where it is fused with the head. The ventral margin of the mantle exhibits two deep bays laterally where it is fused with the siphon, and in the middle it is produced forward in a small flap-like process. The mantle is very delicate and translucent, of a clear whitish tinge in formalin, probably quite transparent during life. On the back there are a few oval chromatophores of large size (up to 2 mm.): one is situated at the fusion of mantle and neck, and along the lateral margins there are about five on each side. On the ventral surface the chromatophores have a similar arrangement—a pair opposite the base of the funnel, a pair behind and external to these, then two or three on each lateral margin, and three or four near the base of the tail.

The organs of the body seem confined to the anterior two-thirds of the mantle-sac. The musculature is reduced. In the posterior third there are delicate transverse bands or hoops of muscle; the anterior two-thirds are more muscular.

The neck and head are continuous and very narrow; the distance from the mantle to the circle of arms is 3 mm., and the head is only slightly swollen at the insertion of the large stalked eyes. It is only 1.4 mm. broad below the arms. In the median line dorsally are two chromatophores, and another lies close below the origin of the first pair of arms. Ventrally the funnel covers over another small chromatophore.

The eye-stalks are very large, 3 mm. in length, 1.8 mm. broad in the middle, while external to their insertion on the head they exhibit a swelling. There is a large and conspicuous squarish chromatophore on the dorsal surface of each stalk, red round the edges, but appearing dark in the centre owing to the pigment of the eye shining through. The eyes show iridescent pigments—red, yellow, green, purple, and dark blue.

The funnel is large and reaches forward to about half the length of the eye-stalks. It measures 4.5 mm. across at its base.

The arms form a circle round the mouth, which in this specimen protrudes a little and is surrounded by a thick frilled sheath. The arms are very small, and are unwebbed and without fins. The two lateral pairs are the largest. The lengths of the arms are 2 mm., 2.5 mm., 2.7 mm., and

2 mm. The suckers are in two irregular rows and have a smooth horny ring.

The tentacular arms are long (17 mm.) and stout, not expanded distally to form a club. On the terminal 3.5 mm. there are four rows of subequal suckers, which bear mostly a few irregular blunt teeth on the upper half of their horny ring. All along the ventral aspect of the stalk there are 2-3 rows of very small suckers. These are not too well preserved, but they seem to have had minute cups and delicate stalks.

There are half a dozen chromatophores on the back of the "club" and one or two on the back of the stalk. The pen is apparently very delicate, being clearly visible only at the posterior end between the fins, where it forms a cone. It is traceable up the mid-dorsal line as a transparent streak.

A single specimen was taken on Aug. 31st, 1907, in 60° 3' N., 3° 53' W., in 505 m. It is, however, very probably a surface form.

*Taonidium pfefferi* is not unlike *Taonidium suhmi* (Lankester), and, indeed, Dr. Hoyle, who examined the specimen, put it down to that species. Dr. Pfeffer, however, was of opinion that the specimen was specifically distinct, and examination of the question has led me to share his opinion. It differs from *Taonidium suhmi* in its broader shape, in the order of the arms, structure of tentacle-stalk, arrangement of chromatophores, and in the outline of the anterior mantle-margin. In *T. suhmi* (Hoyle, Chall. Rep. xvi. (1886) p. 192, pl. xxxii. figs. 5-11) the body is fusiform, with the length more than three times the breadth; the order of the arms is 4, 3, 2, 1, there are no suckers on the stem of the tentacles, the chromatophores are in about eight rows, and the mantle-margin is straight.

In some respects *Taonidium pfefferi* approaches close to the genus *Owenia*, Pfeffer, with its single species *Owenia megalops* (Prosch); but the two genera are probably hardly distinct from one another.

The species is named in honour of Dr. Georg Pfeffer, Hamburg.

#### *Moschites cirrosa* (Lamarck).

Examination of specimens from Naples and from Plymouth has convinced me of the identity of the common *M. cirrosa* of our shores with the Mediterranean *M. aldrovandi*. Among the specimens of *Moschites* collected by the 'Goldseeker' there are two distinct types—one the true *aldrovandi* form, with its reddish colour and its arms all closely bound

together to form a deep conical "umbrella-cavity"; the other a greyish form, with the arms connected up by a loose web, so that the "umbrella-cavity" is very flat and open. The latter form seems to occur chiefly in the north of Scotland and in the Shetlands. I hesitate to assign to it specific rank, but it will be described and figured in the complete account as a new variety.

The majority of the specimens were females, but one or two small males also occurred. One male of the *aldrovandi* type showed a small hectocotylation exactly resembling that figured by Jatta for *M. aldrovandi*. I have had an opportunity of examining also a male of this same type, 11 cm. in length, in the Museum of University College, Dundee. It had been taken at Aberdeen in October 1893, and showed quite clearly the hectocotylation typical of *M. aldrovandi*. One small male belonging to the other form of *M. cirrosa* showed a slight hectocotylation of the same general character. In no case did I observe the paired cirri on the tips of the arms of the male which are described by Steenstrup and by Posselt as distinctive features of *M. cirrosa*. There can be no doubt, I think, that Lamarck's *Octopus cirrhosus* and Rafinesque's *Eledone aldrovandi* are identical, and that the *Eledone cirrosa* described by Steenstrup and by Posselt is quite a different species, probably a northern form.

It is unfortunate that the rule of priority demands the naming of our common British species *Moschites cirrosa*, when the identical Mediterranean form has been so beautifully described and figured by Jatta under the name of *Moschites aldrovandi*.

#### *Rossia glaucopsis*, Lovén.

This is distinctly a northern form, being recorded from the Norwegian coast, Spitzbergen, Greenland, and in British waters hitherto only from the Shetlands and (as *R. sublevis*) from 250 fath. to the south-west of Ireland (*Smith*). It was taken by the 'Goldseeker' chiefly in deep water in the Faeroe Channel and near the Shetlands, but one small specimen was taken in 200 m. as far south as Kinnaird Deeps. Eggs of this species, imbedded in a mass of soft sponge and containing the remarkably large embryos (6-7 mm. long), were taken in 110 m. at 60° 23' N., 0° 14' W.

#### *Sepiola aurantiaca*, Jatta.

This is undoubtedly a good species of *Sepiola*. About



twenty specimens were taken at various localities on the east coast of Scotland, near Shetland, and in the Faeroe Channel, which agree closely with Jatta's descriptions and figures. The only point of difference which should be mentioned is that the two adult males in my possession show foliaceous processes at the base on the first left arm only. Jatta describes these as occurring to a slight extent on the first right arm also. The distinctive characters of this beautiful species are the full red colour of the back, due to the numerous small and crowded chromatophores, the deeply sinuous outline of the inferior margin of the mantle, the deeply incut fins, and in the male the foliaceous hectocotylisation. The tentacular club bears in my specimens 8-10 rows of small suckers.

*Sepiola aurantiaca* has hitherto been recorded only from Mediterranean waters.

*Calliteuthis reversa*, Verrill.

Two small examples of this remarkable species were taken with the Petersen young-fish net at Sta. 59° 54' N., 7° 6' W., in 250 m. They are only 14 mm. and 17 mm. in length. They lack the dark brown colour inside the arms, on the buccal membrane, and along the edge of gill, which Verrill describes for this species, but they show the typical arrangement of the luminous organs on the ventral surface and on the ventral and ventro-lateral arms. Dr. G. Pfeffer, who very kindly examined my specimens of Oigopsida, has confirmed this identification.

*Calliteuthis reversa* has not previously been recorded from British waters. Verrill records it from the deep water off the north-eastern coast of America in 365-2369 fath. It has been found in New Zealand and Japanese waters (*Hoyle*) and also in the Mediterranean (*Pfeffer*).

The collection was worked over in the Embryological Laboratory of Glasgow University during the winter sessions 1907-8 and 1908-9. A full account of the collection, with figures of the new species, will appear in connexion with the 'Reports of the North Sea Fisheries Investigation Committee (Northern Area).'

March 1909.

## BIBLIOGRAPHICAL NOTICE.

*A Naturalist in Tasmania.* By GEOFFREY SMITH, M.A.  
Oxford: The Clarendon Press. 1909.

MR. GEOFFREY SMITH, a Fellow of New College, Oxford, in this most delightful book has set down the results of a six-months' survey of Tasmania, carried out during the spring and summer of 1907-8. The expedition was undertaken at the suggestion of Prof. G. C. Bourne, the Linacre Professor of Comparative Anatomy at Oxford, and the aim thereof was to survey the freshwater fauna of Tasmania. The Author has done this, and much more, and in these pages the results of his trip are set forth after a most charming and lively fashion.

A fortnight was spent in dredging work on the Great Lake and incursions into the surrounding bush. This lake has earned a considerable reputation among fishermen for the size and number of the trout which it contains; and this is not surprising; for these trout are giants, scaling 25 pounds. They are, the Author remarks, the "ordinary English Brown Trout," introduced in 1864, which, by dint of good living and freedom from enemies, have nothing to do but wax and grow fat—which they do, having a superabundance of ground food in the shape of small Crustacea. But this diet can be varied at will, since the lake abounds with two species of native trout belonging to the genus *Galaxias*, which, swimming in large shoals, afford an easy prey to the alien race.

Of the Crustacea Mr. Geoffrey Smith had the good fortune to find a new form of the very remarkable ground-shrimp (*Anaspides tasmanicæ*), common at a high elevation on Mount Wellington and in clear tarns on Mount Field and the Harz Mountains. This new form, to which he has given the name *Paranaspides lacustris*, differs conspicuously from the typical *Anaspides*, and appears to be more of a free-swimming type and confined to the Great Lake. Here also he found several species of the peculiar Crustacean genus *Phreatoicus*. Several distinct species of the genus occur here and in great abundance. This genus is "confined to the alpine regions of Southern Australia and New Zealand." These two genera, it would seem, stand in the same relation to other Crustacea "as the Platypus does to ordinary Mammals."

Of the Giant Crayfish (*Astacopsis franklinii*), the largest freshwater crayfish in the world, some interesting facts are given here. All the specimens he found were "smothered with a parasitic flat-worm (*Temnocephala*) about a quarter of an inch long," and crowded together "in such numbers as to appear like a green foam covering the animal."

Of the larger and more interesting mammals, the Thylacine and the Dasyure, he has much to say that is worth reading, if not new. The Thylacine, at any rate, appears to be on the verge of extinction.

But as to these, and much more, we must refer the reader to the book itself, which is in every way a most entrancing volume.

W. P. P.

# THE ANNALS

AND

## MAGAZINE OF NATURAL HISTORY.

[EIGHTH SERIES.]

No. 18. JUNE 1909.

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LX.—*Descriptions of some new Species of Heterocera, chiefly from Tropical South America.* By HERBERT DRUCE, F.L.S. &c.

Fam. Syntomidæ.

*Bombiliodes simulans*, sp. n.

*Female*.—Head, palpi, antennæ, collar, tegulæ, thorax, and abdomen black, the sides of the abdomen green, the base of the abdomen white; legs black, spotted with white. Primaries black, the cell and a streak below the cell hyaline, the fringe black: secondaries black, hyaline at the base. The underside of both wings the same as above.

Expanse  $1\frac{1}{2}$  inch.

*Hab.* Cayenne (*Mus. Druce*).

*Napata bættgeri*, sp. n.

*Male*.—Head, palpi, and antennæ black, front of head spotted with white; collar bright carmine; tegulæ and thorax black; abdomen metallic blue; the underside of the thorax and abdomen white; legs black. Primaries black, the apex white; a large square hyaline spot at the end of the cell and two hyaline spots beyond the cell nearest the anal angle; the fringe at the apex white, on the outer margin

black: secondaries hyaline white, broadly bordered with black; the fringe black. Underside very similar to the upperside, but with wings shot with bright blue.

Expanse  $1\frac{1}{2}$  inch.

*Hab.* E. Peru, Huancabamba, 6000–10,000 feet (*Bættger, Mus. Druce*).

Allied to *Napata cincticollis*, Felder, from which it differs in having the spots white instead of yellow and the apex of the primaries white.

*Correbia flavata*, sp. n.

*Male*.—Head, antennæ, palpi, abdomen, and legs black, the legs banded with white; back of the head, collar, tegulæ, and thorax orange-red. Primaries orange: secondaries black, slightly hyaline at the base. Underside of both wings black, the base and costal margin of the primaries orange-red.

Expanse  $1\frac{3}{4}$  inch.

*Hab.* W. Colombia, San Antonio, 5800 feet (*G. M. Palmer, Mus. Druce*).

Fam. Arctiadae.

*Idalus viridis*, sp. n.

*Male*.—Head, collar, tegulæ, and thorax pale green; the palpi and underside of the thorax red; antennæ black; abdomen and legs red. Primaries pale green, the costal margin yellow; two small black streaks on the margin; the fringe green: secondaries pale green, the inner margin and anal angle red; the fringe greenish white. The underside very similar to the upperside.—*Female* like the male, but considerably larger.

Expanse, ♂  $1\frac{1}{4}$ , ♀  $1\frac{3}{4}$  inch.

*Hab.* E. Peru, Chanchamayo, 2000–7500 feet (*Mus. Druce*).

*Automolis rosa*, sp. n.

*Female*.—Head yellow, palpi red, collar pink; tegulæ yellow, edged with pink; thorax and abdomen pale yellow; abdomen clothed with pink hairs at the base; antennæ black, yellow at the tips; legs pale yellow. Primaries pink, the costal margin from the base to the middle yellow; a wide yellow band crosses the wing about the middle from the costal margin to the inner margin; the outer margin broadly yellow; the fringe yellow: secondaries pale cream-colour,

slightly shaded with pink on the inner margin; the fringe cream-colour. Underside very similar to the upperside.

Expanse 2 inches.

*Hab.* W. Colombia, San Antonio, 5800 feet (*G. M. Palmer, Mus. Druce*).

*Opharus palmeri*, sp. n.

*Male*.—Head, collar, tegulæ, thorax, and base of abdomen orange-brown; the tegulæ edged with dark brown; palpi and antennæ black; abdomen black, banded with orange-brown; the anus yellow; legs dark brown. Primaries dark brown, thickly streaked with fine orange-coloured lines; the veins orange-brown; the fringe dark brown: secondaries blackish brown, whitish at the base. Underside dark brown, the costal margin and apex of the primaries orange-yellow.

Expanse  $2\frac{1}{2}$  inches.

*Hab.* W. Colombia, San Antonio, 5800 feet (*G. M. Palmer, Mus. Druce*).

This species is allied to *Opharus rhodosoma*, Butler.

Fam. Noctuidæ.

Subfam. ACRONYCTINÆ.

*Macronoetua dolens*, sp. n.

*Male*.—Head, collar, tegulæ, and sides of thorax dark grey; antennæ black, the centre of the thorax and the sides of the abdomen silvery grey; the centre of the abdomen and anus dark blackish grey; the legs, underside of the thorax, and abdomen dark grey. Primaries very dark blackish grey, the apex and inner margin pale silvery grey; several very fine black waved lines cross the wing from the costal to the inner margin; the fringe dark grey: the secondaries pure semihyaline white, the veins black at the apex. Underside: primaries greyish white, darkest along the costal margin: secondaries as above.

Expanse  $2\frac{1}{2}$  inches.

*Hab.* E. Peru, Huancabamba, 6000–10,000 feet (*Bœttger, Mus. Druce*).

Allied to *Macronoetua onusta*, Grote, from North America.

*Calymniodes acamas*, sp. n.

*Male*.—Head, collar, and tegulæ reddish brown, speckled with minute white dots; antennæ dark brown; thorax and

upperside of the abdomen dark brown; underside of the thorax, abdomen, and legs pale reddish brown, the legs speckled with white. Primaries dark brown; a large silver-white spot at the base of the cell; a white streak below the basal spot and three small silvery-white dots at the end of the cell; a double row of small black spots cross the wing from near the apex to the middle of the inner margin; a waved reddish-brown line extends from the apex to the anal angle; a marginal row of small greyish spots extends from the apex to the anal angle; the fringe dark brown: secondaries pale brown, palest at the base; a dark brown spot at the end of the cell; the fringe pale brown.—*Female* very similar to the male, but paler in colour.

Expanse  $1\frac{1}{4}$  inch.

*Hab.* Bolivia (*G. Garlepp, Mus. Druce*).

*Geroda leucocycla*, sp. n.

*Female*.—Head, antennæ, collar, tegulæ, thorax, abdomen, and legs pale brown. Primaries pale reddish brown, crossed from the costal to the inner margin by three waved whitish-brown lines edged with black dots; a white spot at the end of the cell; the fringe dark brown: secondaries dark brown, the marginal line pale reddish brown.

Expanse  $1\frac{1}{4}$  inch.

*Hab.* Colombia, Minca, 2000 feet (*H. H. Smith, Mus. Druce*).

Subfam. *ERASTRIANÆ*.

*Mictochroa albirena*, sp. n.

*Female*.—Head, collar, tegulæ, thorax, and base of abdomen greenish white; abdomen pale brown; antennæ black; legs black, banded with white. Primaries brown, greenish at the base; a large white spot at the end of the cell irrorated with greenish scales; the anal angle and part of the outer margin white; the fringe pale brown: secondaries blackish grey, the fringe grey. The underside of both wings blackish grey.

Expanse  $1\frac{1}{10}$  inch.

*Hab.* Colombia, Sierra del Libane, 6000 feet (*H. H. Smith, Mus. Druce*).

*Mictochroa harmonica*, sp. n.

*Male*.—Head and antennæ brown; collar, tegulæ, and thorax pale brown, thickly irrorated with white scales and hairs; the base and underside of the abdomen grey; the upperside of the abdomen brown; the legs brown, banded with white. Primaries dark brown, irrorated with purplish-grey scales at the base; a waved black line crosses the wing from the costal to the inner margin; a large pale brown spot edged with white at the end of the cell, beyond which a pinkish-green curved line crosses the wing; the marginal line spotted with black; the fringe alternately brown and white: secondaries pale brown, with a submarginal dark line extending from the apex to the inner margin; the fringe pale brown.

Expanse  $1\frac{3}{10}$  inch.

*Hab.* Colombia, Sierra del Libane, 6000 feet (*H. H. Smith, Mus. Druce*).

*Mictochroa thermoptera*, sp. n.

*Male*.—Head, collar, tegulæ, thorax, and abdomen reddish brown; palpi red; antennæ black; underside of abdomen and legs pale brown. Primaries red-brown, crossed about the middle from the costal to the inner margin by a wide dark brown band, edged on the outer side by several very indistinct, narrow, waved, greyish-white lines; a large reddish-brown spot on the costal margin close to the apex; the fringe red-brown: secondaries blackish grey; the fringe red.

Expanse  $1\frac{1}{2}$  inch.

*Hab.* S.E. Peru, Santo Domingo, 6000 feet (*G. Ockenden, Mus. Druce*).

*Chalenata ustota*, sp. n.

*Male*.—Head, antennæ, collar, tegulæ, thorax, abdomen, and legs brown. Primaries sordid white, thickly irrorated with brown scales at the base of the wing; a wide dark brown band crosses the wing about the middle from the costal to the inner margin; the outer margin spotted with black; the fringe brownish white: secondaries brownish white, with marginal black spots; the fringe white.

Expanse 1 inch.

*Hab.* Colombia, Minca, 2000 feet (*H. H. Smith, Mus. Druce*).

*Eublemma rhodocraspis*, sp. n.

*Female*.—Head, collar, tegulæ, thorax, abdomen, and legs white. Primaries white, shaded along the costal margin with very pale fawn-coloured scales; a large elongated fawn-coloured spot at the anal angle; the fringe very pale fawn-colour: secondaries white, very broadly bordered with fawn-colour from the apex to the anal angle; a few black scales near the anal angle; the fringe pale fawn-colour.

Expanse 1 inch.

*Hab.* Borneo, Elopura (*Pryer, Mus. Druce*).

*Tarache micropis*, sp. n.

*Male*.—Head, collar, tegulæ, thorax, abdomen, and legs white; antennæ pale brown. Primaries: the base and costal half of the wing white, crossed by bluish-grey lines; a small round black spot at the end of the cell; the apex and outer half of the wing greyish brown; the fringe brown and white: secondaries pure white, slightly dusky at the apex. Under-side very similar to the upperside, but paler in colour; the costal margin of the primaries blackish brown.

Expanse 1 inch.

*Hab.* Parana, Castro (*E. D. Jones, Mus. Druce*).

*Tarache ochrochroa*, sp. n.

*Male*.—Head, collar, tegulæ, thorax, abdomen, and legs yellowish white; antennæ black. Primaries yellowish white, clouded along the costal margin and at the base with pale brown; a broken wide brown band irrorated with bluish-white scales crosses the wing from the apex to the inner margin nearest the anal angle; the marginal line spotted with black dots; the fringe yellowish white and black: secondaries yellowish white, the fringe the same colour.

Expanse 1 inch.

*Hab.* Brazil, Goya (*Perrens, Mus. Druce*).

*Tarachidia semibrunnea*, sp. n.

*Male*.—Head, collar, tegulæ, thorax, and abdomen white; antennæ black; legs brown, banded with white. Primaries: the basal half white, crossed from the costal to the inner margin by a narrow brown line; the apical half of the wing brown, with a whitish spot on the costal margin close to the



apex; the fringe dark brown: secondaries white, clouded with pale brown near the apex; the fringe pale brown. The underside very similar to the upperside, but the brown on the primaries much paler.

Expanse  $\frac{3}{4}$  inch.

*Hab.* Paraguay (*W. Reeve, Mus. Druce*).

*Erastrionides albiguttata*, sp. n.

*Male.*—Head, collar, tegulæ, thorax, and abdomen greenish white; antennæ and palpi black; legs black, banded with white. Primaries pale olive-green, pinkish at the base; a small spot in the cell, one below the cell, and a large elongated spot at the end of the cell; a large angular-shaped spot on the inner margin close to the apex all white; a rather wide dark brown submarginal band crosses the wing from the apex nearly to the anal angle; the fringe alternately black and pale olive-green: secondaries sordid white, the apex, outer and inner margins clouded with dusky brown. The underside dusky grey.

Expanse 1 inch.

*Hab.* S.E. Peru, Santo Domingo, 6000 feet (*G. Ockenden, Mus. Druce*).

*Parangitia veluta*, sp. n.

*Male.*—Head and palpi dark brown; collar and tegulæ dark brown, thickly irrorated with greyish hairs; thorax and abdomen pale fawn-colour; anal tuft black; antennæ pale brown; legs dark brown. Primaries very dark brown, with a large black mark across the wing near the apex; the fringe dark brown: secondaries dark brown, palest at the base. The underside of both wings dark brown.

Expanse  $1\frac{1}{2}$  inch.

*Hab.* Peru, La Oroya, Carabaya, 3000 feet (*G. Ockenden, Mus. Druce*).

*Parangilia rufa*, sp. n.

*Male.*—Head, palpi, collar, tegulæ, thorax, and abdomen reddish brown; antennæ black; legs dark brown. Primaries dark brown, irrorated with lighter brown scales near the base; a minute white dot at the end of the cell and some waved black streaks near the anal angle; the fringe dark brown: secondaries dark brown, the fringe alternately light and dark brown. Underside: primaries dark brown, palest

at the apex and along the outer margin: secondaries uniformly dark brown.

Expanse  $1\frac{1}{2}$  inch.

*Hab.* S.E. Peru, Santo Domingo, 6000 feet (*G. Ockenden, Mus. Druce*).

*Parangilia cana*, sp. n.

*Female*.—Head and palpi reddish brown; collar grey; tegulæ, thorax, and abdomen pale brown, thickly irrorated with grey scales and hairs; legs reddish brown. Primaries pale reddish brown, thickly irrorated with grey scales; a distinct black spot at the end of the cell; a dark brown patch beyond the cell; a reddish-brown patch at the apex and anal angle; the fringe alternately pale and dark brown: secondaries dark blackish brown, palest at the base; the fringe pale brown.

Expanse  $1\frac{1}{4}$  inch.

*Hab.* S.E. Peru, Santo Domingo, 6000 feet (*G. Ockenden, Mus. Druce*).

*Parangilia virescens*, sp. n.

*Female*.—Head, collar, tegulæ, thorax, and abdomen brownish grey; antennæ and palpi black; legs dark brown, banded with pale brown. Primaries dark brown, the basal half of the wing heavily spotted with bright green; three small black dots in the cell; a white spot at the end of the cell; a black streak and dot beyond the cell; four green spots on the outer margin close to the anal angle; the fringe alternately green and brown: secondaries dark brown, the fringe pale brown.

Expanse  $1\frac{1}{4}$  inch.

*Hab.* S.E. Peru, Santo Domingo, 6000 feet (*G. Ockenden, Mus. Druce*).

*Angitia albirufa*, sp. n.

*Female*.—Head, palpi, collar, tegulæ, and thorax dark red-brown; abdomen paler brown; antennæ black; legs dark brown, banded with greyish white. Primaries dark reddish brown; the anal angle and half the outer margin fawn-colour; an indistinct spot at the end of the cell paler brown: secondaries black, the fringe reddish brown.

Expanse 1 inch.

*Hab.* S.E. Peru, Santo Domingo, 6000 feet (*G. Ockenden, Mus. Druce*).

*Paracodia albiceps*, sp. n.

*Male*.—Head, palpi, and collar fawn-colour; tegulæ, thorax, and abdomen dark brown; antennæ and legs brown. Primaries dark brown, crossed from the costal to the inner margin by two waved reddish lines, the first near the base, the second beyond the cell, the marginal line dotted with black; the fringe dark brown: secondaries brownish white, thickly irrorated at the apex with brown scales; the marginal line dotted with black; the fringe brownish white.

Expanse  $\frac{3}{4}$  inch.

*Hab.* Colombia, Valparaiso, 4500 feet (*H. H. Smith, Mus. Druce*).

Fam. *Lasiocampidæ*.*Ormiscodes mota*, sp. n.

*Male*.—Head, collar, tegulæ, and thorax orange-yellow; palpi black; antennæ pale yellow; legs black, clothed with yellow hairs; abdomen black, each segment edged with white; the anal tuft orange-yellow. Primaries red, the costal margin edged with black; a large >—-shaped white mark, edged with black on the upperside, at the end of the cell; the veins all yellow; the fringe yellow: secondaries red, the veins yellow, the fringe white. Underside very similar to the upperside, but rather darker in colour; the costal margin of the secondaries white, below which is a broad black line from the base to the apex.

Expanse  $3\frac{1}{2}$  inches.

*Hab.* W. Colombia, San Antonio, 5800 feet (*G. M. Palmer, Mus. Druce*).

This species is allied to *Ormiscodes radama*, Druce, from S.E. Peru.

Fam. *Notodontidæ*.*Poresta striata*, sp. n.

*Female*.—Head, antennæ, palpi, collar, tegulæ, and thorax black-brown; abdomen above dark brown; underside and legs reddish brown. Primaries dark brown, thickly striated with fine black lines; a fine pale brown line crosses the wing from the apex to the middle of the inner margin; the fringe

dark brown: secondaries reddish brown, the fringe pale brown. The underside of both wings brown.

Expanse 2 inches.

*Hab.* E. Peru, Huancabamba, 10,000 feet (*Bættger, Mus. Druce*).

*Poresta albonotata*, sp. n.

*Male.*—Head, palpi, collar, and tegulæ black; antennæ black; thorax and upperside of abdomen reddish brown, the sides of the abdomen black; a white line extends from the base to the anus, which is thickly clothed with black hairs; the underside of abdomen and legs reddish brown. Primaries reddish brown, striated with fine yellowish lines; a large white spot at the base; a white line crosses the wing from the apex to the middle of the inner margin; a wide greyish line extends from the base to the anal angle; the fringe dark brown: secondaries red-brown, palest at the base; the fringe white. Underside of both wings brown, thickly irrorated with grey scales.

Expanse  $2\frac{1}{4}$  inches.

*Hab.* S.E. Peru, Santo Domingo, 6000 feet (*G. Ockenden, Mus. Druce*).

*Lepasta argentilinea*, sp. n.

*Male.*—Head, palpi, antennæ, collar, tegulæ, and thorax brown; tegulæ and thorax streaked with pale yellowish brown, the base of the thorax dark brown; abdomen and legs reddish brown. Primaries dark brown, the costal margin pinkish, with a silver line extending from the base to the apex; a submarginal line extends from the apex round the outer margin to the anal angle and from the anal angle to the base; three silvery streaks cross the wing, almost reaching the outer submarginal line; the marginal line yellow; the fringe dark brown: secondaries pale brown, palest at the base and along the inner margin; the fringe pale yellowish brown. Underside pale brown, with a marginal row of black spots on the primaries.

Expanse  $1\frac{1}{2}$  inch.

*Hab.* S.E. Peru, Santo Domingo, 6000 feet (*G. Ockenden, Mus. Druce*).

Allied to *Lepasta grammodes*, Felder.

*Dicentria florella*, sp. n.

*Male.*—Head, collar, and thorax olive-green; antennæ

pale brown; tegulæ white; abdomen black; the underside and the legs grey. Primaries white, crossed near the base from the costal to the inner margin by a wide olive-green band, edged with black on the inner side; this band narrows in the middle; an elongated olive-green spot on the costal margin near the apex; the fringe green and white: secondaries white, shaded with brown at the apex and along the inner margin. Underside of both wings white, the costal margin of the primaries pale brown.

Expanse  $1\frac{1}{2}$  inch.

*Hab.* S.E. Peru, Santo Domingo, 6000 feet; Oconeque, Carabaya, 7000 feet (*G. Ockenden, Mus. Druce*).

This species is allied to *Dicentria peruda*, Druce.

*Meragisa rufipuncta*, sp. n.

*Male*.—Head grey; palpi black, the third joint yellowish brown; antennæ black; collar black; tegulæ grey, tipped with black; thorax grey; abdomen blackish brown, the base clothed with yellow hairs; the anus grey; the underside of the thorax, abdomen, and legs yellow. Primaries silvery grey, crossed by fine waved black lines and irrorated with black scales; a large reddish-brown spot close to the base, one in the cell, two near the apex, and one at the anal angle; the fringe alternately black and grey: secondaries greyish black, the base and inner margin yellow; the fringe yellow and black. Underside: primaries blackish grey, the base and outer margin from the apex to the anal angle yellow: secondaries pale yellow, clouded with dark grey beyond the middle.

Expanse  $2\frac{1}{4}$  inches.

*Hab.* S.E. Peru, Santo Domingo, 6000 feet (*G. Ockenden, Mus. Druce*).

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LXI.—*The Generic Arrangement of the African Squirrels.*  
By OLDFIELD THOMAS.

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IN the Journal of the Bombay Natural History Society for last year \* I ventured to give a list of the Asiatic Squirrels,

\* xviii. p. 246.

sorted into their respective genera, in the modern restricted sense of the word, and the present paper is an attempt similarly to arrange the African species.

These latter are in a sense much more complicated and difficult than their Asiatic allies, as the groups are less obvious in general character, so that a careful study of the teeth of every species has had to be made and the animals sorted accordingly.

It proves unfortunately that a larger number of genera than is either pleasant or convenient demand recognition, if we are to uphold the sound principle enunciated by Forsyth Major that squirrels should be classified by their dental and cranial characters just as other rodents are, and do not rely on such superficial characters as the presence or absence of stripes, or similar external characters. I have tried to be as conservative as possible, but there seems no stopping-place between the present arrangement and the wholesale and inconvenient lumping of all the forms in a single genus. Such a lumping would conceal the natural relationships of the different species and ignore all the important structural characters now dealt with.

The basis of this work is the classical paper of 1893\*, by Dr. Forsyth Major, adopted and modified by myself in 1897 †, but now become more or less obsolete, and needing bringing up to date by the examination of the skulls and teeth of all the species known.

The following is a synopsis of the genera which appear to be recognizable:—

- I. Size not minute, skull-length at least 30 mm. Skull normal; anterior zygoma-root slanted, its anterior face looking downwards and forwards. (Sciurinae.)
  - A. Fur soft, not spinous. Palate not or little produced behind molars. Postorbital processes well developed, directed outwards, near middle of combined orbito-temporal fossa.
    - a. Size small or medium; greatest skull-length less than 62 mm.
      - a<sup>2</sup>. Lower molars basin-shaped as in *Sciurus*.
      - a<sup>3</sup>. Skull normal, forehead flat. Anteorbital foramen in front of level of premolars.
      - a<sup>4</sup>. Cheek-teeth  $\frac{5}{4}$  †..... 1. *Sciurus*.

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\* P. Z. S. 1893, p. 179; classification on p. 189.

† P. Z. S. 1897, p. 933.

‡ *S. persicus*, with only  $\frac{4}{4}$  cheek-teeth, but similar to true *Sciurus* in all other characters, should form a special subgenus, which might be called *Tenes*.

- $b^4$ . Cheek-teeth  $\frac{4}{4}$ ..... 2. *Heliosciurus*.  
 $b^3$ . Skull high, forehead level. Anteorbital foramen above  $p^1$ .  
 Cheek-teeth  $\frac{5}{4}$ ..... 3. *Myrsilus*.  
 $b^2$ . Lower molars more or less ridged transversely. Teeth  $\frac{5}{4}$ .  
 $c^3$ . Lower molars regularly and deeply ridged, without high  
 cusps. Muzzle very long..... 4. *Funisciurus*.  
 $d^3$ . Lower molars irregularly ridged, with high cusps. Muzzle  
 not specially elongated..... 5. *Paraxerus*.  
**b**. Size very large, skull-length exceeding 64 mm.; zygoma-root  
 bowed over as in *Xerus*, its front edge surpassing the maxillo-  
 premaxillary suture. Cheek-teeth  $\frac{4}{4}$ .  
 $c^2$ . Skull normal. Muzzle short; bullæ large; anteorbital  
 foramen rounded..... 6. *Protoxerus*.  
 $d^2$ . Skull elongate. Muzzle long; bullæ small; anteorbital  
 foramen slit-like..... 7. *Epixerus*.  
**B**. Fur spinous. Palate produced in middle line some way behind  
 molars. Ridge of zygoma-root strongly bowed forwards. Post-  
 orbital processes directed backwards, near the hinder end of the  
 combined orbito-temporal fossæ.  
**c**. Brachyodont, or very slightly hypsodont. (Size smaller, skull-  
 length below 53 mm.)  
 $e^2$ . Cheek-teeth  $\frac{5}{4}$ . Skull flattened..... 8. *Atlantoxerus*.  
 $f^2$ . Cheek-teeth  $\frac{4}{4}$ . Skull more arched..... 9. *Xerus*.  
**d**. Strongly hypsodont. (Length of skull above 55 mm.)  
 $g^2$ . Cheek-teeth  $\frac{4}{4}$ . Skull arched, broad and heavy.  
 10. *Geosciurus*.  
 $h^2$ . Cheek-teeth  $\frac{5}{4}$ . Skull high, narrow..... 11. *Euxerus*.  
**II**. Size minute, skull-length about 25 mm. Skull highly abnormal;  
 anterior zygomatic plate vertical; postorbital processes minute;  
 orbits occupying practically the whole of the orbito-temporal fossæ.  
 (Nannosciurinae.)  
**e**. Cheek-teeth  $\frac{4}{4}$ . Ectopterygoid suppressed.... 12. *Myosciurus*.

1. SCIURUS.

Type.

Linn. Syst. Nat. (10) i. p. 63 (1758)..... *S. vulgaris*.

Three African species, with distinctly basin-shaped lower molars and  $\frac{5}{4}$  cheek-teeth, may be provisionally referred to *Sciurus*. They are not very uniform among themselves in their skull-shapes, nor is any one of them closely similar to *S. vulgaris*, but the many forms of *Sciurus* found in the East present so great a range of variation that no tangible or constant characters can be found to separate off these African species.

The three are *S. poensis*, Smith, *lucifer*, Thos., and *ruwenzorii*, Schwann.

It is rather a surprise to find *S. poensis* is not a *Funisciurus*, but has *Sciurus*-like basin-shaped molars. *S. lucifer* is more doubtful, and may perhaps be a *Paraxerus*, but no specimens with unworn teeth are as yet available.

## 2. HELIOSCIURUS.

Trouessart, Le Nat. ii. no. 37, p. 292 (1880) ..... *H. gambianus* \*.  
*Sciurus* b, α, Major, P. Z. S. 1893, p. 189. Type.

Skull square and strongly built. Anteorbital foramen well in front of the level of the cheek-teeth. Anterior ridge of zygoma-root strongly marked, stopping abruptly just at the maxillo-premaxillary suture.

Teeth  $\frac{4}{4}$ ; the single premolar large, its anterior cusp very prominent and evidently taking on the function of  $p^3$ . Molars of typical *Sciurus* structure, the lower ones clearly basin-shaped, without trace of transverse ridges.

*Range.* Ethiopian Region except South Africa.

List of species below.

## 3. MYRSILUS.

Genus novum ..... *M. aubinnii*  
Type.  
(*Macroxus aubinnii*, Gray).

External form normally Sciurine, but tail unusually long and slender.

Skull unusually shaped, very high, strongly convex in the naso-frontal region; maxillary masseteric fossa large, its upper ridge extending some way past the maxillo-premaxillary suture, as in *Protoxerus*; anteorbital foramen large, rounded, open, its hinder edge above  $p^4$ , the part of the zygoma-root behind it reduced to a broad bar, an approach to this structure being shown by *Protoxerus*.

Cheek-teeth  $\frac{5}{4}$ .

Lower molars rather of the irregular basin-shaped structure found in *Protoxerus*, not transversely ridged.

*Range.* W. Africa; Liberia to Ashantee.

*Myrsilus* is a very peculiar form whose affinities I feel by

\* *H. annulatus*, Trouessart et auct. al., but the evidence for the identification of Desmarest's non-localised *S. annulatus*, of which the type no longer exists, with the Gambian squirrel is so insufficient that I am not prepared to accept it.



no means sure about. Probably it is most akin to *Protoxerus*, in which Dr. Forsyth Major included it, but the shape of its skull is so very different that there can be no doubt it should be allowed generic rank.

#### 4. FUNISCIURUS.

Trouessart, Le Nat. ii. no. 37, p. 293 (1880) . . . . . Type.  
*F. lemniscatus*.  
*Xerus*, subg. *Paraxerus*, Major, t. c. p. 189 (in part.;  
 not the type).

Skull elongate, smooth, rounded above, with a long muzzle; anterior ridge of zygoma-root falling far short of the maxillo-premaxillary suture; infraorbital foramen narrow, slit-like, in front of the level of  $p^3$ .

Cheek-teeth  $\frac{5}{4}$ , hypsodont, rounded in section.  $P^3$  proportionally well developed.  $P^4$  without specially marked anterior cusp. Lower molars consisting of four well-marked transverse ridges, subequal in height, with well-defined (usually blackened) clefts between them; no individual cusps much surpassing the general level of the teeth. (See figures by de Winton, Ann. & Mag. N. H. (7) ii. p. 10, 1898.)

*Range.* West African Subregion only\*.

This genus would seem to be the representative of *Paraxerus* in the West African Forest region. The teeth of *Funisciurus* are very highly specialized, far more so than in *Paraxerus*, and may be readily recognized by the characters above given.

#### 5. PARAXERUS.

*Xerus*, subg. *Paraxerus*, Major, P. Z. S. 1893, p. 189 . . . . . Type.  
*P. cepapi*.

Skull somewhat elongate and rounded, but less so than in *Funisciurus*, the muzzle intermediate between that of the latter and normal squirrels. Anteorbital foramen and zygomatic ridge as in *Funisciurus*.

Cheek-teeth  $\frac{5}{4}$ .  $P^3$  well developed;  $p^4$  rounded in section, without prominent anterior cusp. Molars rather hypsodont, and with a tendency to the development of the transverse ridges found in *Funisciurus*, but less specialized than those of the latter. Lower molars similarly with four transverse

\* Unless *Sciurus flavivittis*, Peters, proves to belong to this genus.

ridges, but these are irregular in development and shape, and are considerably surpassed in height by the lateral cusps, especially that at the antero-internal corner of each tooth.

*Range.* Ethiopian Region, most numerous in the east and south.

#### 6. PROTOXERUS.

*Xerus*, subg. *Protoxerus*, Major, P. Z. S. 1893, p. 189 . . . Type. *P. stangeri*.

Size very large. Skull heavily built, of normal shape; upper part of anterior zygoma-root bowed over as in the Spiny Squirrels (*Xerus*, &c.), its ridge carried forward beyond the maxillo-premaxillary suture; anteorbital foramen rounded, often very large.

Cheek-teeth  $\frac{4}{4}$ , in structure somewhat intermediate between those of *Xerus* and the true Squirrels. (*Cf.* figures by Major, *l. c.*)

*Range.* West African Forest region, eastwards into Uganda.

The six known forms of *Protoxerus* were worked out by me in 1906\*, and considered all to be subspecies of *P. stangeri*.

#### 7. EPIXERUS.

Genus novum. . . . . Type. *E. wilsoni*  
(*Sciurus wilsoni*, du Ch.).

General characters as in *Protoxerus*, but the skull elongated, with a long muzzle, as in *Funisciurus*. Anteorbital foramen narrow, compressed, slit-like. Bullæ comparatively very small. Palate produced behind molars further than in any of the previous genera, more approaching the *Xerus* group.

Cheek-teeth  $\frac{4}{4}$ . Lower molars simple, basin-shaped, each with four well-marked cusps at the corners.

*Range.* West Africa.

The two Giant Squirrels that I refer to this genus, *E. wilsoni* and *ebii*, were transferred by de Winton from Major's *Protoxerus* to *Funisciurus*, a transference which I accepted in my paper on African Giant Squirrels, but I now think that, judging by the characters of the zygomatic ridge and molar structure, their resemblance to *Funisciurus* is merely accidental, and that they ought to constitute a group by themselves.

\* Ann. Mag. N. H. (7) xviii. p. 295 (1906).

8. ATLANTOXERUS.

*Xerus*, subg. *Atlantoxerus*, Major, P. Z. S. 1893, p. 189.. Type. *A. getulus*.

Skull broad, low, and depressed; the forehead flat. Zygomata widely expanded.

Cheek-teeth  $\frac{5}{4}$ ,  $p^3$  well developed, standing in front of the middle of  $p^4$ , which is much smaller than  $m^1$ .

Molars brachyodont, at least as compared with those of *Geosciurus* and *Euxerus*, simple in structure.

Range. N. Africa, Morocco, &c.

9. XERUS.

*Sciurus*, subg. *Xerus*, Hempr. & Ehrenb. Symb. Phys. Type. *X. brachyotus*.  
i. text to pl. ix. (1832) .....

Skull much more bowed than in *Atlantoxerus*, its upper profile convex. Zygomata rather less expanded.

Cheek-teeth  $\frac{4}{4}$ ,  $p^4$  little smaller than  $m^1$ .

Molars brachyodont, simple.

Range. N.E. Africa (Abyssinia, Somali, and E. Africa).

10. GEOSCIURUS.

*Geosciurus*, A. Smith, S. Afr. Quart. Journ. ii. p. 128 Type. *G. capensis*\*.  
(1834) .....

Skull large, heavy, bowed, with very thick zygomata. Postorbital processes thick, short, directed backwards close to the hinder end of the orbito-temporal fossa.

Cheek-teeth  $\frac{4}{4}$ ;  $p^4$  large, rounded.

Molars very heavy, hypsodont, rounded.

Range. South Africa, western half.

11. EUXERUS.

Genus novum † ..... Type. *E. erythropus*  
(*Sciurus erythropus*, Geoff.).

Skull high, long, narrow; the zygomata very little expanded, in marked contrast to those of the other three genera

\* Palmer (Index Mamm. p. 294) states that the type of *Geosciurus* is Geoffroy's *Sciurus erythropus*, but he must have been deceived by the somewhat unusual typography of Smith's paper. The S. African species is clearly the type.

† In Palmer's Index (p. 668) Rafinesque's genus *Tenotis* is stated to have "*Sciurus erythropus*" as its type, but I fear that the rules do not admit of this allocation. For, firstly, that species (which Rafinesque

of this group. Postorbital processes much reduced, directed backwards.

Cheek-teeth  $\frac{5}{4}$ ;  $p^3$  disproportionally small as compared with the large  $p^4$ , which is of nearly the same size as the molars.

Molars highly hypsodont.

Range. West African Forest region, extending eastwards into British East Africa.

## 12. MYOSCIURUS.

Genus novum ..... Type.  
*M. minutus*  
 (*Sciurus minutus*, de Chaillu).

Size very small, the single species not larger than a house-mouse.

Skull as in the Oriental *Nannosciurus*, with the exception that the ectopterygoid is aborted and the tooth-row is a little further back, the lower edge of the zygoma-root coming opposite the premolar instead of the anterior or middle molar.

Cheek-teeth  $\frac{4}{4}$  as against  $\frac{5}{5}$  in *Nannosciurus*.

Molars smaller than in *Nannosciurus*, but similar in structure.

Range. West Africa (Gaboon).

The absence of  $p^3$ , present in all the Asiatic *Nannosciuri*, and the suppression of the ectopterygoid, well-developed in the members of that genus, as in nearly all other squirrels, indicate that the African Pigmy Squirrel should be separated generically from its Asiatic allies.

The following is a list of the African Squirrels placed in their respective genera. The species are arranged alphabetically in each genus. Forms which have been described

had not seen, but was merely quoting from Geoffroy) was said to be "perhaps a species of my genus *Tenotis* . . ."; and the rule ('Science,' 1907, p. 521) says distinctly (*e. γ*) that a species which the author doubtfully refers to his genus cannot be taken as the type of it. Nor can *Tenotis* be taken as a monotypic genus (rule *c*), though "*T. griseus*" is the only species mentioned, for the genus is distinctly formed for "all the squirrels with pouches . . ."; so that all the pouched squirrels known in 1817 would have been included in it, and it would have been equally valid had the doubtfully included *T. griseus* not been mentioned.

Secondly, the definite quotation of *Tenotis* as a synonym of *Tamias* by Allen (Mon. N. Am. Rod. p. 779, 1877) appears to me in such a case to bear the authority of a "first reviser," and so to settle the question.

I fail to see any reason why Geoffroy's obvious misprint of "*erythropus*" should not be corrected into *erythropus*.

as subspecies are not included, unless there is a probability of their deserving specific rank :—

1. *Sciurus*, Linn.

lucifer, *Thos.*  
poensis, *A. Smith.*  
ruwenzorii, *Schw.*

2. *Heliosciurus*, Trouess.

abassensis, *Neum.*  
bongensis, *Heugl.*  
gambianus, *Og.* (= annulatus,  
*aut.*)  
isabellinus, *Gr.*  
kaffensis, *Neum.*  
keniæ, *Neum.*  
multicolor, *Rüpp.*  
mutabilis, *Pet.*  
punctatus, *Temm.*  
rufobrachiatus, *Waterh.*  
undulatus, *True.*

3. *Myrsilus*, Thos.

aubinni, *Gray.*  
salæ, *Jent.*

4. *Funisciurus*, Trouess.

akka, *de Wint.*  
anerythrus, *Thos.*  
auriculatus, *Matsch.*  
carruthersi, *Thos.*  
congicus, *Kuhl.*  
erythrogenys, *Waterh.*  
isabella, *Gray.*  
lemniscatus, *Le C.*  
leucostigma, *Temm.*  
mandingo, *Thos.*  
mystax, *de Wint.*  
pembertoni, *Thos.*  
pyrrhopus, *F. Cuv.*  
raptorum, *Thos.*  
substriatus, *de Wint.*

5. *Paraxerus*, Maj.

alexandri, *Thos. & Wr.*  
antoniæ, *Thos. & Wr.*  
aruscensis, *Pag.*  
boehmi, *Reich.*  
cepapi, *A. Smith.*  
emini, *Stuhl.*  
ganana, *Rhoads.*  
jacksoni, *de Wint.*  
ochraceus, *Huet.*  
palliatius, *Pet.*  
pauli, *Matsch.*  
sponsus, *Thos. & Wr.*  
yulei, *Thos.*

6. *Protoxerus*, Maj.

stangeri, *Waterh.* (with five subspecies).

7. *Epixerus*, Thos.

ebii, *Temm.*  
wilsoni, *du Chaillu.*

8. *Atlantoxerus*, Maj.

getulus, *Linn.*

9. *Xerus*, Hempr. & Ehr.

brachyotus, *H. & E.*  
rutilus, *Cretzschm.*

10. *Geosciurus*, A. Sm.

capensis, *Kerr.*

11. *Euxerus*, Thos.

erythropus, *Geoff.*  
microdon, *Thos.*

12. *Myosciurus*, Thos.

minutus, *du Chaillu.*

Owing to want of skulls I am unable definitely to place :—

*flavivittis*, Peters, whose external appearance is that of *Funisciurus congicus*, but whose geographical position and shape of skull (as figured by Peters) suggest *Paraxerus*.

*bayonii*, Bocage, probably related to *Sciurus poensis*, but *Funisciurus substriatus* has a similar indistinct lateral band, and perhaps a real relationship to it.

LXII. — *Remarks on some Genera of the Scoliidæ, with Descriptions of New Species.* By ROWLAND E. TURNER, F.Z.S., F.E.S.

Genus ISWARA, Westw.

*Iswara*, Westw. Trans. Ent. Soc. London, (2) i. 7, p. 232 (1851), ♂.

*Myzine*, Radosz. Horæ Soc. Ent. Ross. xx. p. 40 (1886), ♂.

*Komarowia*, Radosz. l. c. p. 41, ♀.

*Milluta*, André, Bull. Soc. Ent. Fr. p. 143 (1898), ♂.

*Magrettina*, Ashm. Proc. Ent. Soc. Washington, iv. p. 144 (1901), ♂.

There is considerable variation in different species of this genus in the neurulation, especially in the shape of the second cubital cell, which is sometimes pointed on the radial nervure as in typical *Milluta*, but longer than the third in *I. tartara*, Sauss. There seem, however, to be so many intermediate forms that I cannot regard the character of generic importance. The radial cell also varies in length and is more or less truncated at the extremity; Ashmead says that it is lanceolate in *nocturna*, Mor., but in the original description Morawitz distinctly says "die Spitze mehr oder weniger deutlich abgestutzt." The antennæ also vary much in length, but this might be expected in insects which have become adapted to nocturnal habits. I have not seen specimens of *Milluta chobauti*, André, or of *Magrettina nocturna*, Mor., the species given as typical of those genera; but a specimen in the British Museum from Ormarah, Baluchistan, corresponds well with André's description in most respects, the intermediate coxæ are, however, narrowly separated. Radoskowsky gives good plates of the male genitalia, which differ much from typical *Myzine*, but do not seem to show any affinity to *Methoca*. The only female I have seen, *Komarowia victoriosa*, Radosz. = *I. tartara*, Sauss., seems to me to show conclusively that the genus is nearest to *Myzine*. Much more material is required for a thorough study of the genus, but until this is available it is better to abstain from any attempt at generic subdivision. Mons. André has probably overlooked *Iswara* owing to Westwood's mistake in placing it in the Thynnidæ. I agree with him in treating the distinctions given by Ashmead for *Magrettina* as specific and not generic; but I cannot consider the genus correctly placed in the Mutillidæ.

*Myzine clavicornis*, sp. n.

♂. Clypeus short, very minutely punctured, convex, and longitudinally subcarinate at the base, the apical margin

truncate, a smooth obliquely depressed triangular truncation from the centre to the apex. Head closely and rather finely punctured, most closely on the front; the inter-antennal prominence absent, only represented by a small tubercle on each side above the base of the antennæ; eyes widely and rather deeply emarginate; the ocelli small, the posterior pair rather nearer to the eyes than to each other. Antennæ as long as the thorax and median segment combined; the scape shining, very sparsely punctured beneath and no longer than the third joint of the flagellum; the joints of the flagellum gradually increasing in thickness to the apex, the apical joint nearly twice as thick as the basal. Thorax deeply but sparsely punctured, the mesopleuræ more coarsely punctured; pronotum a little shorter than the mesonotum, considerably narrowed anteriorly; scutellum large and subtriangular, very narrowly truncate at the apex. Median segment a little shorter than the scutellum, almost vertically truncate at the apex, more closely punctured, with a longitudinal depression in the middle, the sides rugose. Abdomen slender, tapering slightly at the extremities, about one quarter longer than the head, thorax, and median segment combined; the basal segment smooth and shining, depressed anteriorly, with a short petiole; the other segments deeply but sparsely punctured, broader than long; the seventh dorsal segment deeply and narrowly emarginate at the apex for the reception of the long recurved aculeus; the ventral segments shining, with a few fine scattered punctures. Radial cell more than two and a half times as long as its greatest breadth, extending for about two-fifths of its length beyond the third cubital cell; the stigma a little more than half as long as the radial cell on the costa. Second cubital cell rhomboidal, more than twice as long on the cubital as on the radial nervure, the third cubital cell twice as long as the second on the radial, and more than half as long again on the cubital nervure; the two recurrent nervures received slightly beyond the middle of the second and third cubital cells.

Black, with sparse white pubescence; the mandibles (except at the apex), a triangular mark at the apex of the clypeus, a minute spot above the base of each antenna, the pronotum with a large black mark reaching from the anterior margin to beyond the middle, the tegulæ, a broad transverse band at the apex of dorsal abdominal segments 1-6 slightly sinuate anteriorly on the first segment, the tibiæ, tarsi, and the apex of the femora yellow; the first dorsal abdominal segment and the second more obscurely, ferruginous. Wings

hyaline, nervures colourless, the stigma and costa pale lutaceous.

Length 7, exp. al. 10 mm.

*Hab.* Deesa, N.W. India (*Nurse*). October.

Type in coll. *Nurse*.

The antennæ are proportionally shorter and much more strongly clavate than in other species of *Myzine*.

*Myzine subpetiolata*, Cam.

*Plesia subpetiolatus*, Cam. Journ. Bombay Nat. Hist. Soc. xviii. p. 135 (1907), ♂.

♀. Mandibles falcate, acute at the apex. Head smooth and shining, sparsely punctured on the front; the clypeus slightly produced and truncate at the apex; the antennæ as long as the thorax without the median segment, the scape smooth and shining on the inner side, punctured and with long setæ on the outer side, the first joint of the flagellum concealed, the second distinctly shorter than the third; the head subrectangular, slightly rounded at the posterior angles, a little broader than long and slightly convex; the ocelli in a triangle on the vertex, the posterior pair more than half as far again from each other as from the anterior, and nearly twice as far from the eyes as from each other. Thorax and median segment shining, with a few scattered setigerous punctures, the pleuræ very sparsely punctured; a few fine oblique striæ on the sides of the median segment near the base; the pronotum one-third broader posteriorly than anteriorly, as long as the breadth on the anterior margin and narrower than the head; mesonotum short, the scutellum a little shorter than the median segment. Abdomen as long as the head, thorax, and median segment combined, smooth and shining, with a few scattered hairs on the sides and on the apical margins of the ventral segments, the apical segment triangular. The second cubital cell is almost as long on the cubital nervure as the first, and extends along the transverse cubital nervure for rather less than half its length.

Ferruginous red; the apex of the mandibles, eyes, ocelli, and the dorsal abdominal segments black; the ventral segments of the abdomen, apex of the pygidium, mesosternum, and femora fusco-ferruginous; a large spot on each side of the second and third abdominal segments, and a smaller one on the fourth creamy white. Wings hyaline, nervures fusco-ferruginous.

Length 9, exp. 12 mm.



*Hab.* Quetta (*Nurse*). May.

This species and *Plesia baluchistanensis*, Cam., are undoubtedly incorrectly placed in *Plesia*. The male of the present species seems to be near *Meria ciliata*, Mor., which is only known to me by description, but *subpetiolata* is much more strongly punctured.

*Myzine baluchistanensis*, Cam.

*Plesia baluchistanensis*. Cam. Journ. Bombay Nat. Hist. Soc. xviii. (1907), ♂.

♀. Head nearly half as broad again as long, almost rectangular, smooth and shining, with a few punctures above the base of the antennæ; the clypeus advanced and rather broadly truncate at the apex. Scape above clothed with long fulvous hairs, the second joint of the flagellum scarcely longer than the first or third. A fringe of long pale fulvous pubescence on the posterior margin of the head. Pronotum smooth and shining, with a few scattered punctures near the anterior margin, much broader than long, and very little narrowed anteriorly; propleuræ sparsely punctured, with long, thin, greyish pubescence. Mesonotum and scutellum shining, the latter with a few large punctures near the apex, the mesopleuræ punctured and clothed with long greyish pubescence; a small round depression on each side near the base of the scutellum covered with very short greyish pubescence. Median segment shining, with a deep longitudinal sulcus. Abdomen shining, very sparsely and shallowly punctured, with sparse greyish pubescence on the sides. The second cubital cell extends along the transverse cubital nervure for less than one-third the length of that nervure.

Black; the abdomen bright ferruginous; mandibles and tarsi ferruginous; calcaria whitish; tegulæ testaceous; an obscure creamy spot, obsolete in some specimens, on each side of the second and third abdominal segments. Wings pale fulvo-hyaline, nervures fuscous, the stigma almost black.

Length 9 mm.

*Hab.* S.W. Persia (*Escalera*); Quetta (*Nurse*).

*Pæcilotiphia albomaculata*, Cam.

*Pæcilotiphia albomaculata*, Cam. Journ. Bombay Nat. Hist. Soc. xiv. p. 274 (1902), ♂.

A specimen sent by Colonel Nurse has three cubital cells

instead of two, as in the type. Colonel Nurse remarks: "It should therefore stand as *Myzine albomaculata*, Cam., and the genus *Pæcilotiphia*, founded on an abnormal specimen, must be suppressed." The same insect has been described by Nurse as the male of *Myzine apimacula*, Cam., which has the neuration of *Plesia*, and although this association of the sexes is not quite certain, it does not seem improbable; though the male differs from other oriental species of *Plesia* in the short petiole and the deep slit in the apical dorsal segment. The female *apimacula* differs from most species of *Plesia* in the very feeble development of the sculpture of the apical dorsal segment, agreeing in this with the peculiar female, *P. tricolor*, Sm. The latter species may prove to be the female of *Myzine dimidiaticornis*, Bingham, which agrees with *Plesia* in the almost complete absence of the slit for the reception of the aculeus on the seventh dorsal segment, which is present in all true *Myzine* known to me. *Dimidiaticornis* agrees with *tricolor* in the length of the second cubital cell, the elongate head, and the colour of the antennæ. Specimens of *P. tricolor* from Assam have the head distinctly longer in proportion than the typical Borneo form. I fully agree with Nurse in sinking *Pæcilotiphia*.

*Plesia nursei*, sp. n.

♂. Clypeus slightly produced and very narrowly truncate at the apex, almost smooth, thinly covered with short white pubescence. Antennæ stout, as long as the head, thorax, and median segment combined; the scape closely and rather finely punctured, shorter than the third joint of the flagellum. Interantennal prominence bilobed, covering the base of the scape. Head closely and deeply punctured, more shallowly on the vertex than on the front, with sparse white pubescence, the eyes widely but not deeply emarginate. Thorax rather sparsely punctured; the pronotum nearly as long as the mesonotum, less than twice as broad as the length in the middle, narrower than the head, the anterior margin straight with slightly prominent angles. Median segment punctured-rugose, rounded, much longer than the breadth at the base. Abdomen elongate, slender, petiolate, the first segment as long as the second and third combined, the basal third of the segment very narrow and flattened, the apical two-thirds nodose, constricted at the extreme apex; all the segments shining and very sparsely punctured, the seventh dorsal segment not emarginate at the apex.

Black; the mandibles (except at the extreme apex), the

clypeus, the apex of the interantennal prominence, a very narrow transverse band at the apex of abdominal segments 2-5, broadly interrupted on the second segment, the anterior coxæ beneath, the apex of the mesosternum between the intermediate coxæ, the apex of the anterior femora, the anterior and intermediate tarsi and the tibiæ above, the base of the posterior tibiæ and the basal joint of the posterior tarsi pale yellow. Tegulæ yellow at the base. Wings hyaline, nervures black.

Length 13-14 mm.

*Hab.* Simla (*Nurse*). September.

Described from two specimens.

Near *P. mandalensis*, Magr., but the head is rather more coarsely punctured, the angles of the pronotum are more prominent and the first abdominal segment much longer. Also very near *P. extensa*, Turn., from Burma, but that species has a carina on the clypeus and the pronotum narrowed anteriorly; the third cubital cell in the present species and in *mandalensis* is only slightly longer than the second on the radial nervure, whereas in *extensa* it is nearly half as long again.

*Plesia (Mesa) asmarensis*, sp. n.

♂. Clypeus broad, very slightly produced, punctured and clothed with grey pubescence, the anterior margin subtruncate. Antennæ rather slender, as long as the head, thorax, and median segment combined. Head small, coarsely and closely punctured, the interantennal prominence raised into an oblique carina on each side above the base of the antennæ; the eyes broadly emarginate on the inner margin. Thorax shining, more finely and sparsely punctured; the pronotum narrower than the head, the anterior angles prominent; mesopleuræ and median segment coarsely punctured rugose; the median segment rounded, longer than the breadth at the base, and narrowed to the apex. Abdomen very slender, half as long again as the head, thorax, and median segment combined; the basal segment as long as the second and third combined, very slender, very narrow at the base, the apical two-thirds swollen and clavate, constricted at the apex, where the breadth is not more than one-fifth of the length of the segment; second segment longer than the third, gradually broadened to the apex, narrower than the third segment. All the segments shining, very minutely punctured, the seventh dorsal segment narrow, with a few large punctures near the apex, and a distinct, median, longitudinal

carina, the apex scarcely emarginate. The second and third cubital cells are about equal in length on the radial nervure; the first recurrent nervure is received just beyond the middle of the second cubital cell, the second at one-quarter from the base of the third cubital cell. The basal joint of the posterior tarsi is nearly equal in length to the second and third joints combined.

Black; a small spot at the apex of the clypeus, a small spot on each side at the apex of the second to fifth abdominal segments, continued in a very narrow band, interrupted in the middle, on the apical margin of the fourth and fifth segments, the anterior tibiæ and tarsi above, the basal joint of the intermediate tarsi and the spines of the tibiæ yellowish white. Wings hyaline, slightly iridescent, nervures black.

Length 10, exp. 14 mm.

*Hab.* Asmara, Erythrea (purchased from *H. Rolle*).

This is not a *Myzine*, but the male of a *Plesia*, and seems to be nearest to *clavata*, Sauss., from the Transvaal. The almost total absence of a deep slit in the seventh dorsal segment to receive the recurved aculeus of the hypopygium is noticeable in this group as in most of the Oriental species of *Plesia*.

#### *Tiphia rufofemorata*, Sm.

*Tiphia rufofemorata*, Sm. Cat. Hym. B. M. iii. p. 83 (1855), ♀.

*Tiphia cassiope*, Cam. Mem. Manchester Phil. Soc. xli. p. 46 (1896), ♀.

Described by Smith from Northern India. I have seen specimens from Simla (coll. Nurse) and Masuri, all much smaller than the type.

Length 6–12 mm.

#### *Anthobosca moderata*, sp. n.

♂. Clypeus short, not advanced, and very broadly truncate on the apical margin; minutely punctured, with a short, delicate, longitudinal carina which does not extend either to the base or the apex, thinly clothed with grey pubescence. Head rounded, finely and closely punctured, sparsely clothed with long grey pubescence; the antennæ inserted rather nearer to the eyes than to each other, shorter than the thorax and median segment combined, stout, slightly tapering to the apex and very finely pubescent; the third joint of the flagellum longer than the second. Posterior ocelli further from the eyes than from each other. Thorax and median segment very finely and closely punctured, opaque, the propleuræ shining and more sparsely punctured, the pronotum

very little narrowed anteriorly; scutellum more than half as long as the mesonotum and rounded at the apex; median segment nearly three times as broad as long, obliquely sloped posteriorly. Abdomen finely shagreened, fusiform, as long as the head and thorax combined. Second abscissa of the radius half as long again as the first and fully half as long as the third; the first recurrent nervure received just before the middle of the second cubital cell, the second just before the middle of the third cubital cell. The cubital nervure of the hind wing originates at the apex of the submedian cell.

Black; clypeus, posterior margin of the pronotum, a spot on the posterior margin of the mesonotum, a large spot on the postscutellum, the base of the tegulæ, two spots on each side at the apex of the median segment, a spot on each side of each of the five basal abdominal segments, the base of the seventh segment, the apex of the anterior femora, the anterior tibiæ above, the base of the intermediate and posterior femora, and the basal joints of all the tarsi yellowish white. Wings hyaline, the anterior pair with a faint fuscous tint, nervures black. The division of the first cubital cell is indicated by a colourless scar.

Length 12, exp. 17 mm.

*Hab.* Townsville, Q.

*Anthobosca flavicornis*, Sauss.

*Cosila flavicornis*, Sauss., Grandidier, Hist. Madagascar, xx. p. 233 (1892), ♀.

*Hab.* Victoria (*C. French*); Tasmania; Cairns, Q.

The specimen from Victoria seems to be typical; that from Tasmania has the scape and all the tibiæ and tarsi fulvous; that from Cairns whilst differing little in colour from the typical form has the second abscissa of the radius fully as long as the first, whereas the two southern specimens have it distinctly shorter. The wings are darker in the Victorian specimen than in the others.

As there is a good deal of confusion in connection with some of the Fabrician species of *Tiphia* and *Scolia* in the Banksian collection, a list of them with remarks may be useful.

Genus TIPHIA, Fabr.

1. *T. femorata*, Fabr.—The well known European species.
2. *T. quinquecincta*, Fabr.—Type in Banksian collection. This is

a female of the common North-American *Plesia* subsequently described by Fabricius as *Tiphia namea*, which name must sink. The locality given by Fabricius is of course erroneous.

3. *T. variegata*, Fabr.—Type in Banksian collection. This is the European *Palarus flavipes*, Fabr., described by Fabricius as *Crabro flavipes*. Both names appeared in the same work, but *variegata* has priority. The species must therefore stand as *Palarus variegata*, Fabr. The type has the scutellum and postscutellum yellow.
4. *T. hæmorrhoidalis*, Fabr.—The specimen in the Banksian collection, not the type, agrees with the short description, but is a *Stizus* which I identify with little doubt as *S. chrysorhæus*, Handl.
5. *T. radula*, Fabr.—Type in Banksian collection. A common Australian species, now known as *Dielis radula*.
6. *T. collaris*, Fabr.—The specimen in the Banksian collection is marked, probably erroneously, as the type. It is the Oriental species now known as *Dielis fimbriata*, Burm.
7. *T. pedestris*, Fabr.—Type in Banksian collection, without the abdomen. A female *Thynnus* of the typical group. It seems to be still unique.

#### Genus SCOLIA.

1. *S. nigrita*, Fabr.—Type in Banksian collection. A common African species.
2. *S. quadrimaculata*, Fabr.—Previously figured by Drury as *Vespa maculata*.
3. *S. septemcincta*, Fabr.—Type in Banksian collection. A common Australian species. I have no hesitation in sinking the name, considering it to be the male of *Dielis radula*, Fabr.
4. *S. flavifrons*, Fabr.—A common South European species.
5. *S. ferruginea*, Fabr.—Type in Banksian collection. Locality, Cooktown, Queensland.
6. *S. quinquefasciata*, Fabr.—Type in Banksian collection. I am not sure that this is the same insect described by Saussure under the name, the description being too short for certainty.
7. *S. radula*, Fabr.—Previously figured by Drury as *Sphex plumipes*.
8. *S. morio*, Fabr.—Type in Banksian collection. This is a female of the species now standing in the British Museum collection as *Scolia cyanea*, Lep.
9. *S. bicincta*, Fabr.—Type in Banksian collection. A common North American species.

10. *S. verticalis*, Fabr.—Type in Banksian collection. I have been unable to find specimens of this male in recent Australian collections.
11. *S. quadripustulata*, Fabr.—Type in Banksian collection. A common Oriental species.
12. *S. quadripunctata*, Fabr.—A well-known species.
13. *S. sexcincta*, Fabr.—The specimen in the Banksian collection, not the type, is the male of *Plesia quinquecincta*, Fabr. (*Tiphia* q.). Whether it is identical with the type I cannot say.

### Family Mutillidæ.

#### Subfamily MYRMOSINÆ.

##### *Typhoctes guatemalensis*, sp. n.

♀. Head subquadrate, a little broader than long, broader than the pronotum, punctured closely, the punctures tending to become confluent longitudinally, very thinly clothed with black pubescence; eyes extending rather nearer to the base of the mandibles than to the posterior margin of the head, elongate ovate; ocelli absent. Antennæ filiform, nearly as long as the thorax, the second joint of the flagellum half as long again as the first and a little longer than the third, the apical joints slender but short. Pronotum a little narrower than the head, as broad as the metanotum, from which it is separated by a deep transverse suture; longitudinally striated and sparsely clothed with long greyish pubescence. Pleuræ finely horizontally striate. Metanotum longer than the pronotum, longer than broad, obliquely sloped posteriorly, not truncate, longitudinally striated in the middle and at the base, obscurely punctured at the sides and apex. Abdomen shining, very finely and closely punctured, very sparsely clothed with long cinereous pubescence on the sides and apex, a transverse band of short whitish pubescence at the apex of each segment; first segment triangular, attached to the thorax by a short petiole, the second segment large, twice as long as the third, with a strong constriction between the first and second segments. Intermediate tibiæ with two apical spines.

Black; the two basal joints of the flagellum testaceous; the metathorax (except a large black spot at the base), the first abdominal segment (except a triangular black spot at the apex), the base of the posterior tibiæ, and the intermediate and posterior trochanters and coxæ ferruginous; calcaria white.

Length 7 mm.

*Hab.* San Geronimo, Guatemala (*Champion*).

Type in B. M., ex coll. Godman-Salvin.

I place this species in *Typhoctes* with some doubt, not having seen a typical female of the genus. It appears, however, to approach more nearly to that genus than to *Myrmosa*, especially in the shape of the first abdominal segment and the complete absence of ocelli.

LXIII.—*Two new Mutillidæ from Queensland.*

By the late Lieut.-Col. C. T. BINGHAM.

*Mutilla (Ephutomorpha?) doddi*, sp. n.

♂. Antennæ dark castaneous brown almost black, slightly paler at their apices; clypeus, cheeks, face in front, and head above covered with long dense golden yellow pile, beneath and the space behind the eyes with short black scattered hairs; pro- and mesonotum, the tegulæ, scutellum, post-scutellum, median segment, and abdomen dark castaneous brown covered with short erect hairs, black on the thorax, white on the median segment and 1st abdominal segment; on the 2nd and following segments the hairs are black with a tuft of long snow-white hairs laterally at base and apex of the 2nd and at the bases of the 3rd and 4th segments, apices also of the 3rd and following segments with a broad band of white hairs medially. Wings dark fuscous brown with little or no iridescent gloss, their bases up to the discoidal cell in the fore and to apex of median cell in the hind wing hyaline; the fore wing with one recurrent nervure only. Legs black with black pile, the intermediate and posterior legs with the femora above except at apex and the 1st joint of the tarsi at base with long white hairs. Head small, narrow, much narrower than the thorax; mandibles simple, acute; eyes round, very convex; antennæ minutely punctured, opaque; thorax densely and somewhat coarsely punctured, the prothorax dentate antero-laterally; mesonotum convex, with a deep, smooth, short, transverse sulcus between it and the scutellum, the latter conical, raised, rounded above; median segment depressed, very coarsely cribrate, the sides produced posteriorly into short triangular laminæ; abdomen finely and closely punctured.

*Length*, ♂, 17; *Exp.* 32 mm.

*Hab.* Queensland, North Australia.



This very beautiful insect was collected by Mr. F. P. Dodd at Townsville in Queensland. It is a remarkable form, combining the characters of two genera as given by Mons. Ernest André in Wytzman's 'Genera Insectorum,' 11 Fasc. Mutillidæ. With the eyes of the genus *Ephutomorpha*, André, round, entire, and prominently convex, it has the dentate median segment proper only to *Odontomutilla*, Ashmead. The ♀ is unknown. Type in British Museum.

*Ephutomorpha aurigera*, sp. n.

♀. Antennæ pale reddish yellow, infusate towards apex, the terminal three or four joints black; head dark red; thorax and legs reddish yellow; abdomen metallic purple, with a coppery sheen in certain lights; thorax above sparsely, abdomen more densely clothed with bright metallic golden pile; on the abdomen this is restricted to a broad longitudinal band down the middle, narrowing posteriorly and changing abruptly on the apical three segments to silvery. Head, thorax, legs, and abdomen very sparsely covered also with long erect black hairs. Head transverse, slightly broader than the thorax; eyes very convex, round and prominent; thorax elongate, subrectangular, narrowed somewhat posteriorly; abdomen sessile; head and thorax somewhat coarsely, abdomen more finely punctured.

Length  $5\frac{1}{2}$  mm.

Hab. Queensland, N.E. Australia.

Taken by Mr. F. P. Dodd. Type in British Museum.

LXIV.—*Four new Tabanus Species from India and Assam.*  
By GERTRUDE RICARDO.

THE descriptions of these four *Tabanus* species are now published at the request of Mr. F. M. Howlett, of the Agricultural Research Institute, Pusa, Bengal, as he needs the names for use in a report being prepared in India. They will be incorporated shortly in a paper on all the *Tabanus* species of the Oriental Region. The types are all preserved in the British Museum Collection.

*Tabanus khasiensis*, ♀, sp. n.

Type (♀) and two other females from Khasi Hills, Assam, 1000–3000 ft., in Brit. Mus. Coll. One female from Meerut in Calcutta Coll.

A black medium-sized species, with white bands on the abdomen. Antennæ, palpi, and legs blackish. Wings hyaline, tinged with brown.

Length 15-16 mm.

Nearly allied to *Tabanus justorius*, Rondani, from Borneo, but distinguished by the more hyaline wings, the forehead parallel, and the palpi darker.

*Face* covered with greyish tomentum in the middle, on the cheeks and subcallus with yellowish-brown tomentum, the pubescence black. Beard black. *Palpi* on outside appearing blackish, covered with grey tomentum and with black pubescence, on the inside obscure reddish yellow, long and pointed, stouter at the base. *Antennæ* dull reddish black or black, the first two joints with grey tomentum and black pubescence, the tooth of the third joint small. *Forehead* same colour as subcallus, the same width throughout, with a few black hairs, nearly seven times as long as it is broad; the frontal callus oblong, narrow, brown, not reaching the eyes, furrowed in the middle, with a long, narrow, linear extension. *Thorax*, scutellum, and abdomen brownish black, the former with grey tomentum and traces of two stripes, a tuft of white hairs behind the base of wings; breast black, with grey tomentum and black and white hairs. *Scutellum* on outer border covered with grey tomentum, pubescence black, white on the outer grey border. *Abdomen* with distinct white-haired bands on every segment except the seventh, enlarging slightly in the middle to half-moon spots and wider at the sides; underside similar. *Legs* black or brownish black, with black pubescence; coxæ with white pubescence and a few white hairs on hind femora below; the tibiæ are sometimes obscurely reddish brown at base. *Wings* clear, tinged faintly with brown; in one specimen it is more distinct and borders the longitudinal veins.

*Tabanus leucohirtus*, ♀, sp. n.

Type (♀) and two others from Kanara, Bombay, sent for identification by Mr. F. M. Howlett.

A medium-sized dull reddish-brown species, not unlike *Tabanus fumifer*, Walker, in appearance, but distinguished from it by the absence of spots on the abdomen and by the dark beard and hairs on face. Wings tinged with brown. Legs blackish brown; tibiæ obscurely red.

Length 20-22 mm.

*Face* covered with grey tomentum, pubescence brown, but some white hairs are visible on the sides of face; beard is

similar, but very scanty. *Palpi* dull reddish, thickly covered with black hairs, large, stout, ending in an obtuse point. Subcallus, forehead, and sides of cheeks covered with yellowish-brown tomentum. *Antennæ* bright reddish, the apex black; the first two joints with black pubescence; the third joint long and slender, the tooth near the base distinct, crowned with a few black hairs. *Forehead* narrow, about seven times as long as it is narrow, very slightly narrower anteriorly; the frontal callus dark reddish brown, narrow, oblong, not reaching the eyes, prolonged as a narrow raised line towards the vertex; hairs on forehead black. *Thorax* brown, with yellowish-brown tomentum and scattered black pubescence; a few appressed pale yellow hairs are visible chiefly on the anterior half of dorsum and at sides. *Scutellum* similar. *Abdomen* dull reddish, appearing darker owing to the dense short pubescence; segmentations obscurely yellowish or lighter, a few white hairs at the sides of abdomen; underside brown, but with grey tomentum on the sides and the segmentations, which latter are wider and more distinct; the pubescence black. *Legs* with black pubescence, but the fore coxæ with long white pubescence; the fore tibiæ reddish at base, the others reddish brown. *Wings* with brown veins and stigma, tinged with brown on the fore border, becoming paler on the posterior border.

*Tabanus bicallus*, ♂ ♀, sp. n.

Type (♂) from Pusa, Bengal.

Type (♀) and three other females from the same place.

These specimens were sent to me for identification by Mr. F. M. Howlett from India.

This small species might at first sight be taken for a small specimen of *Tabanus striatus*, Fabr., but is at once distinguished from it by the two separate calli of the forehead. It is very nearly allied to *Tabanus gratus*, Loew, which is distributed over South, Central, and West Africa, reaching up to Egypt, as I had a specimen sent me from the Suez Canal. The wholly yellow legs, narrower median stripe of abdomen the same width throughout (in the African species it is wider on the third and fourth segments), and the prolongation of the thoracic stripes on to the scutellum seem the only differences between the Indian and the African specimens.

Black, with five grey stripes on the thorax and three on the abdomen. Legs and antennæ yellowish. Wings clear.

Length 10 mm.

♀.—*Face* covered with grey tomentum and with white pubescence. Beard white. *Palpi* greyish, with some white hairs at base, and black hairs elsewhere, but these last are not very numerous.

*Antennæ*: the first joint yellow, the second and third red, tooth at base small. *Forehead* broad, quite a third narrower anteriorly, and four times as long as it is wide, covered with yellowish-brown tomentum and with some black pubescence; the frontal callus yellowish brown, nearly square, and almost reaching the eyes; beyond it and sometimes connected by a very fine line is an irregular-shaped black or brownish callus isolated in the middle of the forehead. *Eyes* with three cross-bands. *Thorax*: the median stripe is linear, the other ones broad, sides of thorax greyish, with black pubescence. *Scutellum*: the lateral stripes are continued here, leaving the centre blackish. *Abdomen* narrow, all three stripes reaching from the first to the sixth segment; sides grey, with white pubescence; underside covered with grey tomentum. *Legs* uniformly reddish yellow, only the tarsi a little darker; the femora with grey tomentum and white pubescence. *Wings* clear, the stigma and veins yellow.

♂.—The male is identical. *Eyes* with large facets above; the small ones on the lower third of eyes are continued round the head as a very narrow border.

*Tabanus nemocallosus*, ♀, sp. n.

Type (♀) and another female from Pusa, Bengal, sent to me for identification by Mr. F. M. Howlett.

A medium-sized species, distinguished by the rather broad forehead, not narrower anteriorly, with no callus or spots. *Abdomen* blackish brown, marked with greyish-yellow median and lateral spots.

Length 13 mm.

*Face* and forehead covered with greyish tomentum, the former with white pubescence. Beard scanty, white. *Palpi* yellowish white, with white pubescence, stout, ending in a short point. *Antennæ* reddish yellow, the first two joints pale yellow, the third with hardly any tooth. *Thorax*, *scutellum*, and *abdomen* blackish brown, the former with five distinct greyish-yellow stripes; the dorsum with some grey tomentum and with appressed pale fulvous pubescence; *scutellum* with the same and with grey tomentum. *Abdomen* with an almost continuous median stripe formed of grey, tomentose, narrow, triangular spots, and with irregular-shaped, roundish, grey, tomentose spots on the sides, the

pubescence on these short, pale fulvous; some black pubescence on the dark parts of the dorsum, the sides of the first two or three segments pale reddish; underside lighter, covered with grey tomentum. *Legs* pale yellowish red, the tarsi brown; the pubescence white on femora and tibiæ, black on the tarsi. *Wings* hyaline, with brown veins and yellow stigma; a long appendix on branch of the third vein.

LXV.—*Oriental Rhynchota Heteroptera.*

By W. L. DISTANT.

FIGURES of the genera here proposed and of most of the new species will appear in the Appendix to the Rhynchotal portion of the 'Fauna of British India,' now in preparation.

Fam. *Lygæidæ.*

*Dinomachus indicus*, sp. n.

Head greyish brown, pilose, with some darker spots near base; pronotum brownish ochraceous, darkly punctate, transversely impressed before middle, the anterior area or lobe discally dark castaneous, the margins narrowly ochraceous; scutellum brownish ochraceous, darkly punctate, with a central longitudinal line (not reaching base) and the apex pale ochraceous; corium pale dull ochraceous, longitudinally punctate, the apical angles castaneous; membrane subhyaline, the veins a little darker; body beneath thickly greyishly pilose (imperfectly seen in carded typical specimen); legs brownish ochraceous, posterior tibiæ with three broad dark annulations; antennæ greyish brown, first joint slightly passing apex of head, second joint a little longer than third (fourth mutilated in typical specimen); pronotum with the lateral margins strongly sinuate, the posterior margin concavely sinuate before scutellum, the posterior area or lobe much more strongly punctate than the anterior area, the pale narrow margins impunctate; legs somewhat longly pilose; rostrum imperfectly seen in carded typical specimen.

Length  $6\frac{1}{2}$  mm.

*Hab.* "India" (Vienna Museum).

*Pamera emersoni*, sp. n.

Head and anterior lobe of pronotum black, posterior

pronotal lobe more purplish black, with an ochraceous submarginal line near each lateral angle; scutellum black; corium ochraceous with dark punctures, inner margin and apex of clavus, inner marginal area and apical margin of corium black; membrane fuscous brown, with curved longitudinal whitish lines; body beneath, legs, and rostrum black; second joint of rostrum, apices of anterior femora, apical halves of intermediate femora, and anterior and intermediate tibiæ and tarsi, ochraceous, the latter infuscate at apices; (posterior legs mutilated in typical specimen;) antennæ black, the apical joint with its basal half stramineous, first joint slightly passing apex of head, second and fourth joints subequal in length, each a little longer than third; pronotal collar broad, anterior pronotal lobe about one and a half times as long as posterior lobe and very distinctly narrower; corium with the dark punctures in longitudinal series; anterior femora finely but prominently spined beneath; rostrum reaching the anterior coxæ.

Length 5 mm.

*Hab.* Ceylon (Vienna Museum).

#### ADAUCTUS, gen. nov.

Subovate; head about as long as broad, subtriangular, obliquely narrowed anteriorly, the central lobe prominent; ocelli near base and close to eyes; antennæ with the basal joint slightly passing apex of head, second joint a little longest; rostrum reaching the intermediate coxæ, basal joint not reaching base of head, second joint extending to anterior coxæ; pronotum not transversely constricted, the lateral margins strongly carinate, and anteriorly moderately rounded and narrowed, posterior margin truncate; scutellum a little longer than broad, the lateral margins obliquely straight; corium apically strongly broadened, the apical margin wide, obliquely straight, claval ridges prominent; membrane slightly passing abdominal apex (veins to both corium and membrane will be shown in figure); anterior femora thickened, finely spined beneath, tibiæ somewhat longly spinulose; sternum coarsely punctate, the prosternum more finely punctate.

In the enumeration of the Oriental Lygæidæ to be placed near *Diniella* and *Microcoris*.

#### *Adiauctus cupreus*, sp. n.

Head, pronotum, and scutellum pale cupreous; lateral margins of the pronotum (not extending to the lateral

angles) pale ochraceous; corium stramineous; two small spots in clavus, three on outer margin of claval suture, one beyond middle of costal margin, a large transverse spot at apical angle, and a linear spot near middle of apical margin, fuscous brown; membrane hyaline with the veins pale brownish; antennæ, rostrum, body beneath, and legs pale cupreous; antennæ with the second joint longer than either third or fourth, which are subequal in length and a little darker in hue than first and second, fourth pale at base; pronotum with rather more than basal half thickly punctate, with an anterior broad smooth cicatrice not reaching the anterior margin; scutellum punctate, the disk (so far as can be seen in typical specimen) less punctate; corium sparingly punctate, the scutellum longitudinally punctate.

Length  $4\frac{1}{2}$  mm.

*Hab.* Bengal; Pusa (*Lefroy*).

#### ABANUS, gen. nov.

Head about as long as broad, angularly narrowed anteriorly, the central lobe prominent; ocelli near base and eyes; antennæ with the basal joint shorter than head but projecting beyond it, second joint a little longer than third, third and fourth subequal in length; rostrum reaching the intermediate coxæ, first joint very slightly passing base of head; pronotum elongate, about as long as broad at base, with a narrow anterior collar, the lateral margins nearly straight and moderately laminately reflexed, an obscure transverse impression a little behind middle; scutellum elongate, longer than broad; hemelytra long and narrow, membrane with the venation much as in *Lethæus*; anterior femora moderately incrassate, finely spined beneath near apex; tibiæ spinulose; tarsi with the basal joint as long or longer than the two remaining joints together.

To be placed near the genus *Lethæus*.

#### *Abanus coloratus*, sp. n.

Head, pronotum, and scutellum dull black; extreme lateral margins of pronotum more piceous than black; apex of scutellum ochraceous; body beneath dull black; rostrum piceous brown, its basal joint and apex black; coxæ and legs more or less piceous brown; clavus pale piceous black, corium castaneous, an inner line before clavus, lateral margin for about two-thirds its length, and a transverse fascia before apical area pale ochraceous, apical area black;

membrane piceous black and not quite reaching abdominal apex; antennæ brownish ochraceous; structural characters as in generic diagnosis.

Length 9 mm.

*Hab.* Bengal; Chapra (*Mackenzie*).

*Eremocoris naini*, sp. n.

Head, pronotum, and scutellum dull black; clavus and corium dull ochraceous, punctured and shaded with piceous, the costal margin narrowly ochraceous, a rather distinct piceous spot near middle of costal area, and a similar, rather more obscure spot on disk near apex of clavus; membrane pale piceous, the posterior margin and veins greyish white, forming a looped linear spot near apical margin of corium; body beneath and femora black; tibiæ, tarsi, and rostrum (excluding basal joint) brownish ochraceous; antennæ black, stout, first joint passing apex of head, about subequal in length to third joint, second joint considerably longer than either first or third, fourth joint mutilated in typical specimen; head very thickly punctate; pronotum with the anterior lobe thickly finely punctate, convex and longer than the posterior, which is flat and more coarsely punctate, the lateral margins sinuate at the transverse impression, anteriorly convexly rounded, the posterior angles a little thickened and slightly piceous brown; corium somewhat coarsely punctate, the pale narrow costal margin impunctate except at the region of the piceous central spot; membrane scarcely passing the abdominal apex; rostrum reaching or slightly passing the posterior coxæ.

Length 5 mm.

*Hab.* Kumaon; Naini Tal, 6400 ft.

MANATANUS, gen. nov.

Head about as long as broad, subacutely narrowed anteriorly, somewhat longitudinally conically ridged above; antennæ with the first joint considerably extending beyond apex of head, second joint a little longest, third and fourth almost subequal in length or third only slightly longer than fourth; rostrum almost reaching the posterior coxæ, first joint about reaching base of head; pronotum about as long as broad, transversely impressed a little behind middle, the lateral margins almost straight but roundly narrowed anteriorly, basal margin concave before scutellum; hemelytra scarcely extending beyond middle of abdomen, membrane



small; anterior femora incrassate and spined beneath near apices; scutellum a little elevated.

In my enumeration of the Oriental Lygæidæ I place this genus near *Lua*, Dist.

*Manatanus montanus*, sp. n.

Head, pronotum, and scutellum black; lateral margins of the anterior lobe of pronotum (broadened posteriorly) white; antennæ black; abdomen above and body beneath black; rostrum and legs ochraceous, basal joint of rostrum, anterior femora (excluding apices), more than apical halves of intermediate and posterior femora (excluding apices), and the tibiæ more or less black or piceous; clavus piceous brown, corium greyish white or pale stramineous, two elongate black spots before middle and the apex broadly black; membrane narrow, whitish, sometimes divided by black into two large whitish spots.

*Var.*—Posterior pronotal lobe more piceous brown than black; first and second joints of antennæ piceous brown or ochraceous; intermediate and posterior femora and all the tibiæ ochraceous.

Length  $4\frac{1}{2}$  mm.

*Hab.* Simla Hills; Mantiana (Ind. Mus. & Coll. Dist.); Kumaon; Naini Tal (Ind. Mus. & Coll. Dist.).

This species was found under stones.

Fam. Pyrrhocoridæ.

ABULFEDA, gen. nov.

Head about as long as broad, anteriorly subangularly produced, the central lobe prominent; antennæ robust, basal joint longest, almost as long as second and third joints together; pronotum gradually narrowed anteriorly, the lateral margins sinuate, transversely impressed before middle, anterior lobe raised and smooth, posterior lobe very coarsely punctate, transversely punctate before anterior margin, the anterior lateral margins ridged; scutellum triangular, smooth, almost obsoletely punctate; clavus and corium thickly strongly punctate; membrane not quite reaching abdominal apex; rostrum reaching the intermediate coxæ, basal joint about, or almost, reaching base of head; anterior femora moderately thickened, shortly spined beneath.

This genus has the anterior area of pronotum completely circumscribed by continuous punctures and is allied to *Euscopus*.

*Abulfeda punctatus*, sp. n.

Head dull piceous black; antennæ piceous black, the base of the front joint pale stramineous; pronotum shining black, the lateral margins very narrowly and the posterior lateral angles more prominently ochraceous; scutellum piceous black, opaque; corium black, somewhat shining; membrane piceous black; body beneath dull, greyish black, opaque, the stigmata black; rostrum and legs testaceous brown; structural characters as in generic diagnosis.

Length 9 mm.

*Hab.* Ceylon; Peradeniya (*Green*).

*Euscopus albus*, sp. n.

Body and hemelytra piceous brown; membrane ochraceous brown; lateral margins of the pronotum and corium, and a short broad basal subcostal fascia to corium, ochraceous; an irregular transverse fascia before apex of corium white with dark punctures; abdomen beneath more or less cretaceously tomentose, the stigmata black; legs brownish ochraceous, fourth joint piceous with the base pale stramineous, first joint almost as long as the second and third together, second and fourth subequal in length, each longer than third; head finely granulose and with a slight central longitudinal ridge; posterior pronotal lobe distinctly punctate, the lateral margins strongly sinuate, the transverse impression dividing the lobes profound, the anterior lobe a little raised and almost smooth; scutellum and corium somewhat thickly punctate; rostrum almost reaching the posterior coxæ; anterior femora strongly spined beneath.

Length  $8\frac{1}{2}$  mm.

*Hab.* Bombay (*Dixon*).

## Fam. Phymatidæ.

*Glossopelta lineolata*, sp. n.

Body above black; pronotum with the anterior lateral margins, a transverse fascia (medially interrupted) between the humeral angles, the discal carination, and a small darkly punctate spot at base, ochraceous; scutellum with a central longitudinal line and some macular suffusions on the apical half ochraceous; connexivum, body beneath, legs, and rostrum pale ochraceous; head beneath black; antennæ brownish ochraceous, basal joint (excluding apex) and apex of apical joint black; membrane, as seen on each side of

apical half of scutellum, violaceous; corium, as seen on each side of basal half of scutellum, black, posteriorly outwardly ochraceous; antecular and postocular portions of head almost equal in length, centrally longitudinally sulcately impressed behind eyes, apical joint of antennæ about as long as the two preceding joints together; pronotum coarsely punctate on the posterior half, two anteriorly curved carinations on disk, between which is a fine longitudinal sulcate impression, the lateral angles anteriorly very slightly directed forward, their apical margins a little concave; scutellum thickly finely punctate, coarsely punctate at base; connexivum only visible at middle.

Length 10 mm.

*Hab.* Assam; Khasi Hills (*Lefroy*). Burma (Coll. Dist.).

#### Fam. Aradidæ.

##### *Mezira tenuicornis*, sp. n.

Fuscous; antennæ, spinous antenniferous tubercles, posterior pronotal lobe and lateral margins of the anterior lobe, corium, connexivum, body beneath, and legs more fuscous brown; membrane greyish with dark veins, the lateral basal angles ochraceous; antennæ with the first, second, and fourth joints incrassate, third joint slender and much the longer; head granulose, spines in front of eyes long, acute, behind eyes tumid and distinctly laterally spined; pronotum granulose, the anterior area sculptured, the anterior angles broadly, somewhat roundly, subangularly produced, the lateral margins sinuated before middle and roundly amplified towards base; scutellum granulose and subrugulose; corium granulose, the apical margins strongly sinuate, the lateral margins near base distinctly amplified; membrane not quite reaching posterior margin of penultimate abdominal segment; abdomen above granulose; rostrum scarcely passing base of head.

Length 7-8 mm.

*Hab.* Simla Hills; Mantiana, 8000 ft. (*Annandale*).

Near *M. tenericornis*, Bergr.

Under bark of fir (*Annandale*).

#### Fam. Hebridæ.

##### *Hebrus bengalensis*, sp. n.

Head black, with a greyish marginal line in front of eyes and a more or less ochraceous line at inner margins of eyes

finely pilose on basal area; pronotum dark castaneous, the anterior marginal area greyishly pilose, continued centrally towards middle by a wedge-shaped fascia; scutellum black; corium black, with short coarse pale hairs, a very prominent claval greyish fascia widening posteriorly and a curved more obscure greyish line before basal half of costal margin; membrane shining brownish, with a pale central subapical spot and a pale marginal line; body beneath black, legs pale ochraceous; antennæ dull ochraceous, with fine pale hairs, second joint shorter than first or third, fourth and fifth joints subequal in length; pronotum with the lateral margins strongly sinuate, the lateral angles prominent; scutellum with the apex angularly rounded, not incised.

Length 2 mm.

*Hab.* Lower Bengal (Coll. Dist.).

*Merragata pallescens*, sp. n.

Head, pronotum, and scutellum pale cinnamon-brown; corium ochraceous, the claval area milky white, base of costal margin narrowly black; membrane milky white, head beneath and sternum pale cinnamon-brown; abdomen beneath piceous, legs and rostrum ochraceous; antennæ ochraceous, with fine hairs, third joint a little shorter than second, fourth piceous and about subequal in length to third; pronotum with the lateral margins strongly sinuate, the lateral angles broadly prominent, the basal margin moderately concave before scutellum; apex of scutellum broadly subtruncate, very slightly angulate on each side, the disk transversely foveately depressed.

Length 2 mm.

*Hab.* East Bengal; Rajshai (*Annandale*).

I have only seen a single specimen of this beautiful and distinctly marked species.

TIMASIUS, gen. nov.

Head moderately elongate, a little depressed anteriorly, with two central longitudinal ridges not reaching apex; eyes strongly granulate; antenniferous tubercles spinous externally; antennæ five-jointed; pronotum with the lateral margins strongly sinuate, the lateral angles broadly roundly prominent, transversely impressed before middle, and with two strong central longitudinal ridges; scutellum subtriangular, strongly, centrally, longitudinally ridged; corium and membrane subequal in length.

Allied to *Hebrus*, but differing in the more elongate body, the spinous antenniferous tubercles, and the centrally ridged head, pronotum, and scutellum.

*Timasius splendens*, sp. n.

Head, pronotum, and scutellum black; pronotum with two central small spots of ochraceous hairs on anterior marginal area; corium bluish grey, with the margins, apical angle, a suboblong spot on disk, and the apex of clavus black; membrane dull blackish, with some greyish suffusions, the most prominent of which is a central subapical longitudinal line; body beneath black; legs ochraceous, the tibiæ and apices of femora and tarsi black; antennæ piceous or black, with short fine hairs, second joint slightly shorter than first, third and fourth subequal in length, each a little longer than fifth; pronotum sparingly coarsely punctate; scutellum finely granulose, the central ridge prominent; other structural characters as in generic diagnosis.

Length 3 mm.

*Hab.* Ceylon; Peradeniya (*Green*).

“On rocks in mid-stream” (*E. E. Green*).

*Timasius atratus*, sp. n.

Black; legs pale ochraceous, posterior tibiæ pale piceous; head opaque, with two central carinæ terminating about one-third before apex, antenniferous tubercles spinously produced, eyes strongly granulose; antennæ ochraceous, pilose, first joint longer than second, a little shorter than third, fourth and fifth subequal in length, almost fused; pronotum with its disk considerably mutilated in typical specimen, but apparently bicarinate, the lateral margins strongly sinuate, the lateral angles roundly prominent; scutellum longitudinally carinate; pronotum, scutellum, and corium shining black; membrane piceous black, opaque; legs pilose.

Length  $2\frac{1}{2}$  mm.

*Hab.* Ceylon; Madulsima (*Bainbrigge-Fletcher*).

Fam. **Hydrometridæ.**

*Microvelia albomaculata*, sp. n.

Dull piceous black with a greyish pubescence, which is more pronounced and forms a marginal fascia to head continued inside eyes to base and a submarginal fascia to pronotum; a reddish-ochraceous anterior marginal fascia

to pronotum, not reaching the anterior angles; hemelytra largely spotted with greyish white, of which a large spot occupies the greater part of clavus excluding apex, corium with two large basal marginal spots, three irregularly shaped spots in transverse series a little beyond middle, a large subapical membranous spot and a smaller subapical spot at inner margin; legs pale ochraceous; antennæ fuscous, first joint very slightly longer than second or third joints, which are shortest and subequal in length, fourth longest, its apex distinctly acuminate; head subglobose arching; lateral angles of the pronotum subangularly prominent; lateral margins of the hemelytra concavely sinuate and finely shortly hirsute; apices of tibiæ and tarsi more or less obscurely fuscous.

Length 2 mm.

*Hab.* E. Bengal; Rajshai (*Anmandale*).

*Microvelia kumaonensis*, sp. n.

Head, pronotum, and body beneath dull black; apex of head, anterior margin of pronotum (centrally interrupted and not reaching anterior angles), margin of lateral pronotal angles, legs, and rostrum pale ochraceous; lateral margins of head, continued inside eyes to base, greyish fasciately pubescent; hemelytra pale piceous brown, with prominent greyish-white spots, an elongate spot in clavus, a large subbasal spot to corium, more obscure spots on apical half of corium, and a prominent subapical spot; antennæ brownish ochraceous, second joint slightly shorter than first and distinctly shorter than third, fourth longest; head subglobose arching; pronotum with the lateral angles broadly subacutely prominent; apices of tibiæ and tarsi more or less pale piceous.

Length 2 mm.

*Hab.* Kumaon; Bhim Tal.

*Microvelia diluta*, sp. n.

Head and pronotum dull black; anterior margin of pronotum reddish ochraceous; hemelytra dull greyish white, the veins piceous, the apical area darker and thus exhibiting a large pale apical spot; body beneath and legs dull pale ochraceous; rostrum, disk of sternum, apices of femora, tibiæ (more or less), and the tarsi piceous; antennæ with the first, second, and third joints ochraceous, their apices and the whole of the fourth joint piceous, second joint

slightly shorter than first, more distinctly shorter than third; head globosely arched; pronotum with the lateral margins sinuate, the lateral angles subangularly prominent; hemelytra scarcely reaching the abdominal apex; connexivum granulose and pilose.

Length  $2\frac{1}{2}$  mm.

*Hab.* Bengal; Calcutta, Rajshai (*Annandale*).

"Stridulates when irritated, producing a shrill scraping sound which is perceptible for some yards. Feeds on dead insects. Winged and apterous individuals occurring together." (*Nelson Annandale*, in litt.)

Allied to *M. repentina*, Dist., but colour of antennæ and body beneath different. In some specimens the lateral margins of the abdomen beneath are piceous.

*Microvelia annandalei*, sp. n.

Head and pronotum dull black; pronotum with a transverse dull ochraceous subanterior fascia not reaching the lateral margins (this fascia is frequently discoloured and difficult to recognize); hemelytra piceous, a basal claval streak, and three spots on apical area (the apical spot linear) dull greyish with a greenish tint; body beneath black; head beneath, margins of prosternum, lateral margins of abdomen, and the legs, ochraceous; antennæ with the first, second, and third joints ochraceous, apices of first and second and the whole of the fourth joint piceous, second joint distinctly shorter than either first or third, third and fourth subequal in length; head with the apex ochraceous and a pale longitudinal line at inner margins of eyes; extreme apices of the femora and sometimes the intermediate and posterior tibiæ more or less infusate; lateral angles of the pronotum broadly subprominent.

Length 2 mm.

*Hab.* Lower Bengal; Port Canning (in brackish pools).

Fam. Reduviidæ.

*EMESINÆ.*

*Ploiariola mixta*, sp. n.

Head cinnamomeous, clothed with a greyish pubescence, eyes black; antennæ pale stramineous; pronotum cinnamomeous, the anterior area and lateral margins speckled with greyish; body beneath and rostrum piceous, the apical joint of the latter pale stramineous; anterior legs pale

cinnamon-brown, the femora and tibiæ annulated with pale greyish; intermediate and posterior legs pale stramineous; hemelytra greyish, thickly speckled and spotted with pale brownish, three prominent dark spots on costal margin, the first at about one-third from base, the second near middle, the third before apex; claval area thickly spotted; scutellum spined at base and apex.

Length 7 mm.

*Hab.* Ceylon; Peradeniya (*Green*).

Allied to *P. oculata*, Reut., but with the pronotum narrower and more elongate; intermediate and posterior legs unspotted; hemelytra much darker and altogether differently spotted and marked.

*Ploiariola polita*, sp. n.

Head greyishly pubescent, finely spotted with black; antennæ mutilated in typical specimen; pronotum with the anterior area greyish white spotted with black, the posterior area yellowish grey, with a central line, the lateral margins (narrowly), and the basal margin (broadly and sinuately) ochraceous; rostrum pale stramineous spotted with brown; prosternum chocolate-brown, the margins ochraceous; meso- and metasterna black, greyishly tomentose; abdomen mutilated in typical specimen; anterior legs greyish, coxæ, femora, and tibiæ spotted with brownish, intermediate and posterior legs thickly spotted with brownish; hemelytra pale greyish white, claval and basal areas, the basal divisional membranal veins, and the apical and inner margins spotted with brownish, the pale areas indistinctly and sub-obsolete spotted; scutellum spined at base and apex.

Length 7 mm.

*Hab.* Ceylon; Hakgala (*Green*).

This is to be differentiated from the previous species and those enumerated and described in the Faun. Brit. Ind. by the more subquadrate pronotum, the thickly spotted intermediate and posterior legs, and the very distinct pattern and markings of the hemelytra.

CALPHURNIA, gen. nov.

Head with the postocular area considerably longer than the anteocular area, rounded, convexly narrowed at base, transversely constricted between the eyes, and with a more or less distinct basal collar; antennæ with the first joint as long or longer than the head, pronotum, and scutellum together, second joint a little shorter than third; rostrum



passing base of head, basal joint reaching but not passing eyes; pronotum elongate, narrowed anteriorly, with a prominent anterior lobe distinctly divided above and beneath; scutellum not spined; hemelytra with the corium distinctly transversely veined, the central membranous veins posteriorly and lobately united, membrane slightly passing the abdominal apex; anterior coxæ shorter than the femora, which are again longer than the tibiæ; intermediate and posterior legs long and slender; anterior tarsi three-jointed; legs in typical form somewhat longly spinulose, but this does not appear to be a constant character.

This genus has a superficial resemblance to *Ploiariola*, from which it differs by the different shape of the head, the distinct anterior lobe of the pronotum, the non-spinous scutellum, the transversely veined corium, and the distinctly veined membrane, &c.

*Calphurnia reticulata*, sp. n.

Body and legs pale ochraceous; hemelytra greyish white, the venation fuscous; membrane with the basal area speckled with plumbeous and its apical and inner area spotted with the same colour; antennæ a little darker and more brownish in hue, first joint subequal in length to that of the head, pronotum, and scutellum together, second joint a little shorter than third; head distinctly transversely impressed between eyes and slightly pedunculate at base; pronotum with the anterior lobe about half the length of posterior lobe, which is moderately widened towards base; anterior coxæ faintly and anterior femora distinctly annulated with brownish near apex, intermediate and posterior legs distinctly finely spinulose; hemelytra scarcely passing the abdominal apex; other structural characters as in generic diagnosis.

Length 5 mm.

*Hab.* Calcutta. Ceylon; Peradeniya (*Green*).

*Calphurnia ? aberrans*, sp. n.

Body and legs pale greyish brown; hemelytra greyish white, somewhat thickly spotted and speckled with plumbeous, the venation fuscous; antennæ with the first joint about as long as the intermediate femora, second joint shorter than first, but much longer than third; head narrowed at base, but not distinctly pedunculate, transversely compressed between the eyes; pronotum with the anterior lobe more than half the length of the posterior lobe, which is a little

widened towards base; apex of anterior coxæ and annulations to anterior femora and tibiæ brownish, posterior femora with two blackish annulations—one before, the other near middle; legs not spinulose; hemelytra slightly passing the abdominal apex; sternum and head beneath more or less piceous.

Length  $6\frac{1}{2}$  mm.

*Hab.* Ceylon; Peradeniya (*Green*).

This species, by the longer antennæ and different proportional length of joints, the longer anterior pronotal lobe, and the non-spinulose legs, differs from the typical form of the genus as represented by *C. reticulata*. The distinct venation of the hemelytra is, however, maintained, and I have provisionally included it in *Calphurnia*.

#### ELYMAS, gen. nov.

Head strongly narrowed at base, transversely impressed between eyes, antocular a little shorter than postocular area; rostrum reaching the anterior coxæ, first joint short, not reaching eyes, second longest; antennæ long, slender, first joint longest, about as long as from apex of mesonotum to apex of abdomen, second joint shorter than first and about as long as abdomen; pronotum elongate, a little widened at apex and a little shorter than anterior coxæ; mesonotum laterally sinuate, moderately widened posteriorly; apterous; abdomen above with the lateral margins recurved and ridged, almost meeting on apical area, the apical appendage globosely elongate and apically concavely excavate; anterior femora about one-third longer than the anterior coxæ, slightly attenuated at junction with trochanters, moderately sinuate on basal half, finely spinulose beneath for nearly their entire length; anterior tibiæ about half the length of the femora; anterior tarsi single-jointed, about one-fourth shorter than the tibiæ; intermediate and posterior legs long, slender, posterior femora slightly curved and nearly as long as the whole body, the tibiæ considerably longer than the femora, the posterior legs longer than the intermediate legs.

#### *Elymas presentans*, sp. n.

Body above brownish ochraceous; lateral margins of head behind eyes, lateral margins of thorax above, lateral margins of abdomen above, and the anal appendage black; body beneath black; rostrum brownish ochraceous with black

annulations; anterior coxæ and legs piceous, a subapical annulation to femora and the base of the tarsi ochraceous; intermediate and posterior legs brownish ochraceous, becoming piceous towards apices, apices of femora and bases of posterior tibiæ, and a subapical annulation to intermediate tibiæ, pale greyish; antennæ piceous; structural characters as in generic diagnosis.

Length 12 mm.

*Hab.* Ceylon; Kandy (*Green*).

*Plæaria anak*, sp. n.

More or less pale ochraceous; vertex with a transverse fascia in front of eyes connected with two central lines extending to base, brownish ochraceous; a lateral longitudinal fascia on each side of pronotum and two short central lines to both meso- and metanota brownish ochraceous; abdomen above with more or less distinct central longitudinal segmental lines, on each side of which are small dots and spots to connexivum, fuscous; a spot near apex of anterior coxæ, two large lateral spots on each side of anterior femora, a spot on each side of base of rostrum, and an annulation to basal joint of same fuscous brown, apical joints of rostrum pale brownish; abdomen beneath with the lateral margins irregularly pale brownish; antennæ a little darker in hue, first and second joints subequal in length and each about as long as abdomen; rostrum with the basal joint passing eyes; pronotum elongate, about as long as meso- and metanota together, anteriorly roundly dilated, the anterior margin truncate; abdomen strongly attenuated at base, beyond basal segment gradually ovately widened and again narrowed towards apex; intermediate and posterior femora a little darker in hue with their apices pale ochraceous; anterior trochanters with a single strong prominent spine.

Length 11 mm.

*Hab.* Lucknow (*Aitken*).

*Gardena fasciata*, sp. n.

Head, pronotum, and mesonotum chocolate-brown, pronotum with a broad sublateral greyish fascia on each side, mesonotum with three central greyish fasciæ, the central fascia broadest, the lateral fasciæ narrower; hemelytra greyish brown; head beneath and sternum black, the latter greyishly tomentose; legs greyish brown, coxæ (excluding apices) and trochanters shining black; abdomen above and beneath greyish piceous; antennæ mutilated in typical

specimen; head about as long as mesonotum, shorter than pronotum; hemelytra extending to the base of the penultimate abdominal segment; anterior femora palely annulate near apex, finely spinose beneath from about one-third from base, anterior tarsi three-jointed; rostrum reaching the base of the anterior coxæ, basal joint incrassate, darker than the remaining joints; intermediate tibiæ apically palely annulate, intermediate and posterior tarsi mutilated in typical specimen.

Length 15 mm.

*Hab.* Ceylon; Paradeniya (*Green*).

I have only seen an incomplete specimen of this well-marked species.

#### TRIBELOCEPHALINÆ.

##### *Opisthoplatys cornutus*, sp. n.

Head, antennæ, pronotum, connexivum, body beneath, rostrum, and legs ochraceous; scutellum and corium fuscous brown, basal and apical angles of the latter ochraceous; membrane piceous black; eyes black; antennæ longly pilose, first joint about as long as anterior femora, second joint slightly longer than first, the antenniferous tubercles above produced in short, prominent, slightly forwardly curved tuberculous spines; rostrum with the basal joint reaching but not passing eyes; pronotum with the anterior lobe only a little more than half the length of posterior lobe; scutellum granulose; corium distinctly longitudinally broadly ridged, the costal ridge more prominent and not quite reaching apical angle, a second prominent discal ridge, and a subclaval less prominent ridge, between the ridges the colour is brownish ochraceous; membranal veins a little ochraceous at base.

Length 8 mm.

*Hab.* Travancore; W. Ghats, Tenmalai.

##### APOCAUCUS, gen. nov.

Head with the anterior lobe moderately porrect and a little produced in front of eyes, but clothed with long curled hairs, somewhat flattened on disk but longly produced and apically curled downward at their apices on lateral and anterior margins; antennæ pilose, first joint about as long as head, second shorter than first, remaining joints very slender; rostrum reaching the anterior coxæ, first joint reaching eyes, but not extending behind them; pronotum

narrowed anteriorly, the basal area centrally sulcately impressed, on each side of which are two callosities making a transverse series of four in all, the central ones largest; scutellum callous at base; elytra longly passing the abdominal apex; legs slender, pilose, intermediate and posterior tibiæ almost equally wide apart.

This very peculiar genus is to be readily separated from *Tribelocephala* and *Opisthoplatys* by the long fleecy clothing to the head.

*Apocaucus laneus.*

Head and pronotum castaneous brown, the long fleecy clothing to the former pale brownish; scutellum and elytra fuscous brown, the latter with the marginal areas paler; body beneath and legs pale castaneous brown, the femora paler and more brownish ochraceous; abdomen beneath smooth and shining; legs and antennæ finely pilose.

Length  $5\frac{1}{2}$  mm.

*Hab.* E. Himalayas; Kurseong.

Closely resembles a *Monophlebus* on the wing (*N. Annandale*).

POSTSCRIPT.—The title of this paper, "Oriental Rhynchota," signifies Rhynchota from the Oriental Region as generally understood in zoo-geography. The term, however, appears to be sometimes used inexactly, as quite recently (*Ann. Soc. Ent. Belg.* 1909, p. 184), under the heading "Hemiptera nova orientalia," Bergroth describes species from Australia, Tasmania, and New Caledonia.

LXVI.—*New Land, Freshwater, and Murine Shells from South America.* By H. B. PRESTON, F.Z.S.

[Plate X.]

*Glandina chanchamayoensis*, sp. n. (Fig. 7.)

Shell fusiform, pale flesh-colour; whorls  $6\frac{1}{2}$ , somewhat flattened, regularly increasing in size, coarsely, transversely striate, with lines of growth and sculptured with fine, spiral striæ, presenting a decussate appearance; sutures impressed, narrowly margined, crenulate; columella curved, rather abruptly truncate; peristome simple, whitish; aperture elongately, inversely auriform.

Alt. 68·25, diam. maj. 27 mm.

Aperture: alt. 35·5, diam. 12·5.

*Hab.* Chanchamayo, Peru.

I am unable to find that any species at all approaching this in size and sculpture has yet been recorded from Peru.

*Glandina venezuelensis*, sp. n. (Fig. 10.)

Shell somewhat acuminate fusiform, light reddish brown; whorls 7, the first four smooth, polished, the remainder marked with coarse, closely set, irregular, transverse riblets crossed by fine, wavy, spiral striæ; sutures impressed, crenulate; columella elongate, descending in an oblique curve; peristome thin; aperture elongately, inversely auriform.

Alt. 54, diam. maj. 21 mm.

Aperture: alt. 28, diam. 10 mm.

*Hab.* Merida, Venezuela.

Allied to *G. decussata*, Desh., from Mexico and Texas; the spiral sculpture in the present species is, however, finer, and the transverse riblets are coarser, it is also of a larger size, the aperture is broader and the columella is less twisted above and is longer and straighter than is the case with *G. decussata*.

*Solaropsis venezuelensis*, sp. n. (Fig. 12.)

Shell depressed, thin, reddish horn-colour, painted with three narrow, interrupted, spiral bands and numerous transverse flame-markings of reddish purple; whorls  $4\frac{1}{2}$ , closely hispid; sutures deeply impressed; umbilicus narrow and deep; aperture rather obliquely lunate; peristome reflexed, yellowish white, margins somewhat distant; columella descending obliquely and reflexed, thus partly concealing the umbilicus.

Alt. 7·25, diam. maj. 18·5, diam. min. 12 mm.

Aperture: alt. 7, diam. 6·5 mm.

*Hab.* Merida, Venezuela.

*Epiphragmophora anceyana*, sp. n. (Figs. 14 A, 14 B.)

Shell moderately solid, discoidal, depressed, white, bearing traces of having been encircled by three narrow chestnut bands; whorls  $4\frac{1}{2}$ , striate, with fine lines of growth, the last whorl descending somewhat abruptly; sutures impressed, chalky white; umbilicus wide, open, deep; aperture sub-circular; peristome thickened, dilated, slightly reflexed, the margins joined by a thick parietal callus.

Alt. 12, diam. maj. 25, diam. min. 20·5 mm.

Aperture : alt. 13, diam. 14 mm.

*Hab.* Argentina.

The only species which in general outline approaches the present form is *E. macasi*, Higg., from Ecuador; this, however, is easily distinguished by its much larger size from that now described.

*Bulimus (Eurytus) dissimulans*, sp. n. (Fig. 5.)

Shell imperforate, ovate, thin, brown, painted with very closely set, greyish-yellow, wavy, transverse lines, and indistinct, brownish, spiral bands; whorls  $3\frac{1}{2}$ , rapidly increasing in size, rather flat, smooth; sutures impressed; columella arched; peristome slightly thickened, rose-coloured; aperture ovate, somewhat laterally contracted.

Alt. 30, diam. maj. 15 mm.

Aperture : alt. 18, diam. 11 mm.

*Hab.* Merida, Venezuela.

The extraordinary painting of this species at first gives the impression that the shell is closely, vertically, striate; this, however, is not the case, the appearance being caused by the closely set, greyish-yellow, transverse colour-lines.

*Bulimus (Thaumastus) insolitus*, sp. n. (Fig. 9.)

Shell imperforate, obtusely fusiform, solid, ground-colour dark blackish brown; extreme apex sunken; whorls  $5\frac{1}{2}$ , flattened, the earlier whorls sculptured with very fine, wavy, transverse striæ, presenting an almost finely granular appearance, the later whorls very coarsely sculptured with transverse ridges crossed by fine, spiral grooves, giving to this portion of the shell a finely beaded appearance, the rows of beaded tubercles being of a yellowish-brown colour, last whorl descending rather rapidly, from the point where the last whorl begins to descend there occurs a supersutural band about three millimetres broad, continued as a peripheral band, and increasing to six millimetres in breadth on the last whorl, on this band the beaded sculpture is less marked and the surface of the shell is of a correspondingly more uniform blackish-brown colour; sutures impressed, crenulate, whitish, especially towards the latter half of the last whorl; columella thick, slightly excavated; peristome lightly, varicosely thickened, brownish yellow, somewhat reflexed below; the margins joined by a thick, polished, brown callus; aperture ovate.

Alt. 70, diam. maj. 29.5 mm.

Aperture: alt. 33, diam. 16 mm.

*Hab.* Chanchamayo, Peru.

An extraordinary shell which it is not possible to compare profitably with any species at present known; the sculpture is of the type of that of *Thaumastus melanochila*, Nyst, which also occurred with it, but is much coarser; the much blunter form, sunken apex, and total absence of any trace of perforation are also among the characters which readily separate it from that or any other known species.

Among the shells received from Chanchamayo, Peru, is a good specimen of what is undoubtedly *Bulimus pulcherrimus*, H. Ad.: the only specimen of this fine species hitherto seen is, I believe, the type specimen in the British Museum consisting of the last two and a half whorls of the shell, which are figured in the Proc. Zool. Soc. 1866, p. 442, pl. xxxviii. fig. 3; as this figure is naturally somewhat inadequate I take this opportunity of figuring the specimen (Pl. X. fig. 6) which has recently come to hand.

*Bulimulus latecolumellaris*, sp. n. (Fig. 11.)

Shell cylindrically fusiform, perforate, moderately thin, whitish, indistinctly banded and transversely tessellated with pale reddish brown; whorls 8, slightly convex, embryonic whorls smooth, later whorls lightly marked with lines of growth and very faintly decussate; sutures deeply impressed, slightly crenulate; umbilicus obliquely lunate, very narrow, deep, the whole umbilical region pure white; columella white, outwardly expanded, extended into a very broad twisted plait above, much excavated below; peristome white, expanded, scarcely reflexed, a light callus joining the margins; aperture obliquely inversely auriform.

Alt. 54, diam. maj. 24 mm.

Aperture: alt. 22.5, diam. 15 mm.

*Hab.* Peru.

Allied to *B. tupaci*, d'Orbigny, from Bolivia, but much smoother in general appearance, the umbilical region is quite without colour, and the embryonic whorls are not punctate as is the case in that species, moreover the extraordinary broadly plaited columella easily separates it from *B. tupaci*.

*Bulimulus (Drymæus) expatriatus*, sp. n. (Fig. 4.)

Shell fusiform, acuminate, narrowly perforate, somewhat thin, pale yellow; whorls  $6\frac{1}{2}$ , finely spirally striate, and marked transversely with lines of growth; sutures impressed,



whitish; peristome thin, slightly reflexed; columella descending obliquely over the narrow umbilicus and suffused into a very thin callus, which joins the lip above; aperture inversely auriform.

Alt. 28, diam. maj. 11.5 mm.

Aperture: alt. 12, diam. 5.5 mm.

*Hab.* E. Bolivia.

The above species recalls in many ways *Bulimulus liliaceus*, Fér., from Porto Rico; among the shells received from Bolivia at the same time there are a number of specimens which would appear to be the young of the present species; some of these are stained with bright pink about the umbilical region, a character which is totally lacking in the adult shell.

*Bulimulus (Drymæus) interruptus*, sp. n. (Fig. 1.)

Shell fusiform, thin, semitransparent, yellowish white, painted with five reddish-purple bands, the first four of which are broken up so as to appear as rows of squarish blotches, the fifth uninterrupted; whorls  $5\frac{1}{2}$ , rather flat, transversely sculptured with lines of growth; sutures impressed; columella somewhat arched and reflexed over the very narrow perforation; peristome acute, slightly reflexed, especially towards the base; aperture oval.

Alt. 25.5, diam. maj. 10.5 mm.

Aperture: alt. 11, diam. 6.5 mm.

*Hab.* Merida, Venezuela.

The shell appears to be greatly variable; its principal forms are mentioned below.

*Form "α."*—Painted with transverse bands of reddish purple, interrupted for a space of about  $1\frac{1}{2}$  mm. at the periphery; the last band, which is uninterrupted in the type, is absent in this form.

*Form "β."*—Transverse bands more closely set and uninterrupted; ground-colour of shell flesh-colour.

Var. *pallidus*, nov. (Fig. 2.)—Shell of a uniform yellowish-white colour, smoother than the type, the growth-lines being not nearly so noticeable.

Var. *pallidus*, form "γ."—Flesh-coloured throughout.

Var. *pallidus*, form "δ."—Pale yellow throughout.

*Bulimulus (Drymæus) selli*, sp. n. (Fig. 3.)

Shell fusiform, narrowly perforate, very thin, vitreous,

painted with interrupted bands and transverse zigzag flame-markings of rich chocolate; whorls  $5\frac{1}{2}$ , sculptured with fine regular spiral striæ and marked with fine indistinct lines of growth; sutures well impressed; columella arched, reflexed over the narrow umbilicus; peristome acute, somewhat broadly reflexed; aperture oval.

Alt. 24, diam. maj. 13 mm.

Aperture: alt. 11, diam. 6 mm.

Hab. British Guiana.

*Orthalicus powissianus*, Petit, var. *niveus*, nov.

Shell pure white, bearing only a very faint trace of the infra-peripheral band; lower portion of the columellar callus slightly stained with very pale brown; outer lip and interior of shell pure white.

Taken with the animal alive by Mr. Mervyn G. Palmer at Jimenez, Rio Dagua, West Colombia.

*Planorbis pucaraensis*, sp. n. (Fig. 15.)

Shell suborbicular, very depressed above, basally somewhat convex, blackish brown; spire slightly concave; whorls 3, rapidly increasing in size, sculptured with strong, transverse, arcuate lines of growth; sutures impressed; umbilicus moderately wide above, narrow and deep below; columella oblique, extending into a thin callus above; peristome simple, acute; aperture broadly sublunate.

Alt. 2.5, diam. maj. 6.75, diam. min. 5.5 mm.

Aperture: alt. 2, diam. 2 mm.

Hab. Pucara, Peru, at an altitude of 12,500 feet.

*Nassa flammulata*, sp. n. (Fig. 13.)

Shell fusiform, moderately solid, pale yellowish painted with transverse streaks of reddish brown, which appear as flame-markings on the upper whorls; whorls 6, the first five spirally grooved, the grooves being more noticeable above; the last whorl transversely ribbed, the ribs being formed into rows of tubercles by the spiral grooving, which is more uniform on this whorl; sutures well impressed; columella slightly excavated and extending into a callus, which joins the lip above; peristome simple, but not acute; canal short and wide; aperture inversely auriform.

Alt. 13.25, diam. maj. 7 mm.

Aperture: alt. 5, diam. 2.5 mm.

Hab. S. Peru.

There is a fine series of this species in the British Museum, received in 1854 under the name of "*Buccinum bolivianum*," and labelled as coming from Cobija, which place is now well within Chilian territory, though formerly belonging to the Republic of Bolivia; as I am unable to trace the name "*bolivianum*" in any work, I have thought it well to describe and figure the species as above.

*Paludestrina valenciæ*, sp. n. (Fig. 16.)

Shell small, perforate, fusiform, smooth; whorls 5, very convex; sutures deeply impressed; umbilicus narrow; peristome simple; aperture roundly ovate.

Alt. 2.5, diam. maj. 1.25 mm.

Aperture: alt. .25 mm.

*Hab.* Lake Valencia, N. Venezuela.

*Mycetopus punctatus*, sp. n. (Fig. 8.)

Shell elongate, thin, covered with a pale olive periostracum, and exteriorly sculptured with faint striæ radiating from the umboes; umboes inconspicuous; anterior end rounded, gaping; posterior end produced, acuminate below; dorsal margin straight; ventral margin slightly convex; interior of shell nacreous, marked throughout with very fine radiating punctate striæ.

Long. 21.5, lat. 72 mm.

*Hab.* Rio Chenchi, U.S. Colombia.

EXPLANATION OF PLATE X.

- Fig. 1. *Bulimulus (Drymæus) interruptus*, sp. n.  
 Fig. 2. — (—) *interruptus*, var. *pallidus*, nov.  
 Fig. 3. — (—) *selli*, sp. n.  
 Fig. 4. — (—) *expatriatus*, sp. n.  
 Fig. 5. *Bulimus (Eurytus) dissimulans*, sp. n.  
 Fig. 6. — *pulcherrimus*, H. Ad.  
 Fig. 7. *Glandina chanchamayoensis*, sp. n.  
 Fig. 8. *Mycetopus punctatus*, sp. n.  
 Fig. 9. *Bulimus (Thaumastus) insolitus*, sp. n.  
 Fig. 10. *Glandina venezuelensis*, sp. n.  
 Fig. 11. *Bulimulus latecolumellaris*, sp. n.  
 Fig. 12. *Solaropsis venezuelensis*, sp. n.  
 Fig. 13. *Nassa flammulata*, sp. n.  
 Figs. 14 A, 14 B. *Epiphragmophora anceyana*, sp. n.  
 Fig. 15. *Planorbis pucaraensis*, sp. n.  
 Fig. 16. *Paludestrina valenciæ*, sp. n.

LXVII.—*Four new African Mammals.*

By R. C. WROUGHTON.

IN my note on the forms of the small African mongoose with a dark-tipped tail (Ann. & Mag. Nat. Hist. 1907, xx. p. 110) I arranged those of North-east Africa as subspecies of *Mungos sanguineus*, Rüpp. Recently Mr. L. M. Seth-Smith has presented to the National Collection two specimens from Uganda, which, while differing *inter se*, agree in having unicoloured feet, a character which distinguishes them from all the four forms enumerated by me. In my key therefore all the forms dealt with may be included in a subsection characterized by having grizzled feet, while the two new races, to be now described, constitute a second subsection, as follows:—

Hands and feet unicoloured ochraceous.

Size smaller: hind foot 58 mm. Colour darker (raw umber). (Entebbe.) . . . . . *M. s. ugandæ*, subsp. n.

Size larger: hind foot 64 mm. Colour paler (tawny ochraceous). (Mubende.) . . . . . *M. s. galbus*, subsp. n.

*Mungos sanguineus ugandæ*, subsp. n.

About the size of *M. s. ibeæ*. Fur medium (15 mm. long on back). Colour above "clay-colour," variegated with black, giving a general effect near raw umber, below "clay-colour." Individual hairs of the back basally drab for  $\frac{1}{2}$  their length, distally "clay-colour," with a subterminal black ring (2–3 mm. wide), darkening again towards extreme tip. Crown, face, and cheeks finely grizzled buff and black. Hands and feet "tawny ochraceous." Tail coloured like back, with a black tip 60–70 mm. long.

Skull as in *ibeæ*.

Dimensions of type (measured on the skin):—

Head and body 330 mm.; tail 290; hind foot 58.

Skull: condylo-basal length 66; basilar length 60; zygomatic breadth 33; brain-case breadth 27; palate, breadth across  $p^4$  22, length  $c-m^1$  21.5.

*Hab.* Entebbe, Uganda.

*Type.* Adult male. B.M. no. 9. 5. 12. 1. Collected 18th July, 1908.

*Mungos sanguineus galbus*, subsp. n.

Size larger than any other known form of *sanguineus*. Ground-colour bright ochraceous, variegated on the back with

black, which becomes obsolescent on the flanks and is entirely absent on the throat, chest, and belly. Individual hairs bright ochraceous buff, with a short greyish-white base, and those of the back with a subterminal black ring. Crown and face finely grizzled ochraceous and black, the black obsolescent on the cheek, entirely absent on the upper lip. Entire fore legs and hind feet ochraceous like the belly. Tail coloured like back, with a black tip (apparently mutilated in the type specimen).

Skull unfortunately missing.

Dimensions of the type (measured in the flesh):—

Head and body 345 mm.; tail 270; hind foot 64; ear 28.

*Hab.* Mubende, Uganda.

*Type.* Adult male. B.M. no. 9. 5. 12. 2. Original number 45. Collected 7th April, 1908.

This animal curiously resembles *M. auratus*, from Tette, in colouring, except that the tawny suffusion on head and face, so characteristic of all the forms of this group found south of the Zambesi, is entirely absent. Its size and colouring distinguish it at once from any other subspecies of *sanguineus*.

When working out the Rudd Collection in conjunction with Mr. Thomas, we were able to distinguish two well-marked local races of *Paraxerus cepapi* (P. Z. S. 1908, p. 543), a southern and a northern. An examination of the material in the Natural History Museum Collection shows that there are at least two other races north of the Zambesi which merit description. They are:—

*Paraxerus cepapi soccatus*, subsp. n.

A local form about the same size as typical *cepapi*, less brightly coloured, and with somewhat stouter teeth and a shorter broader skull.

Colour-pattern as in true *cepapi*, but the yellow suffusion, especially on the limbs and flanks, so characteristic of *cepapi* entirely absent. Hands and feet greyish white.

Skull short and broad; nasals short; teeth stout.

Dimensions of the type (measured on the skin):—

Head and body 190 mm.; tail 160; hind foot 41; ear 20.

Skull: greatest length 42; basilar length 32; zygomatic breadth 26.5; brain-case breadth 21; nasals 11.5; palatilar length 17; diastema 9; upper molar series (exclusive of  $p^3$ ) 7.8.

*Hab.* N. Angoniland (type from Vwaza, Hewe R.).

*Type.* Adult male. B.M. no. 7. 2. 4. 6. Original number 863. Collected by Mr. C. B. C. Storey on the 11th September, 1906.

Four specimens, three males and one female (including the type), taken together on the same day, are very like one another in all essential features, one only amongst them showing a rusty suffusion all over the body due to bleaching. The constant absence of buffy colouring on the hands and feet is very noticeable. The disproportionate breadth of the skull is equally present in all four specimens.

Some specimens from the adjoining Nyasa-Tanganyika Plateau appear to belong to this race.

*Paraxerus cepapi quotus*, subsp. n.

About the size of typical *cepapi*. Colouring much darker and suffusion of colour on flanks and thighs wanting.

Colour-pattern as in true *cepapi*, but the marked suffusion of buffy on the flanks and thighs entirely absent, that on fore limbs darker. Hands and feet suffused with buffy, but to a less extent than in *cepapi*.

Skull broad for its length, but not so markedly so as in the Angoni form; nasals longer and narrowed anteriorly; teeth as in the Transvaal form.

Dimensions of the type:—

Head and body 190 mm.; tail 178; hind foot 42; ear 21.

Skull: greatest length 44; basilar length 35; zygomatic breadth 26; brain-case breadth 20; nasals 13; palatilar length 18.5; diastema 10; upper molar series (exclusive of  $p^3$ ) 7.8.

*Hab.* Katanga Dist., Congo State.

*Type.* Adult male. B.M. no. 7. 12. 13. 16. Original number 23. Collected by Mr. S. A. Neave on the 14th March, 1907.

Two specimens, both of which show the markedly dark colouring which makes them distinguishable at sight from any other form.

The forms of *P. cepapi* may be arranged in a key as follows:—

A. Size larger: hind foot 42 mm.

a. Hands and feet suffused with buffy.

a<sup>1</sup>. Shoulders, flanks, and thighs suffused

with orange-buff. (Limpopo Basin.). *P. cepapi*, A. Sm.

- b<sup>1</sup>. Buffy suffusion on flanks and thighs absent, that on shoulders reddish brown. (Katanga Dist., Congo State.) *P. c. quotus*, subsp. n.  
 b. Hands and feet greyish white . . . . . *P. c. soccatus*, subsp. n.  
 B. Size smaller: hind foot 39 mm. (Zambesi Basin.) . . . . . *P. c. sindi*, T. & W.

LXVIII.—On some new Species of Coleoptera from Rhodesia and adjacent Territories. By GILBERT J. ARROW.

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THE following notes and descriptions are incidental to the systematic study of two important collections recently added to the British Museum, that of Mr. S. A. Neave from North-East Rhodesia and the Katanga District of the Congo Free State, and another presented by Mr. Guy A. K. Marshall and made by him or on his behalf in Mashonaland and the part of Portuguese East Africa immediately adjoining.

Copridæ.

*Sisyphus callosipes*, sp. n.

Niger, opacus, undique minute sat dense griseo-setosus; capite grosse punctato, clypei margine antico profunde semicirculariter exciso, dentibus 2 internis prominentibus, externis subobsoletis; prothorace leviter varioloso-rugoso, postice medio lineato-sulcatulo, lateribus ante medium fortiter convergentibus, angulis anticis acutis, deinde paulo sinuatis, dorso convexo; elytris sat regulariter striatis, ad apices valde attenuatis; pedibus gracilibus, haud spinosis, trochanteribus haud productis; metasterno nitido, profunde impresso:

♂, tibiis anticis sat robustis, subtus haud dentatis, pedibus intermediis simplicibus, pedum posteriorum femoribus clavatis, postice medio callo lato, nitido, instructis, tibiis longis, curvatis, intus serratis, extremitate intus abrupte dilatato.

Long. 10-11 mm.; lat. max. 6-7 mm.

*Hab.* German East Africa: Massailand; British Central Africa: Nyasaland; Katanga, 150-200 miles west of Kambove; Mashonaland: Chirinda.

The female of this is like the common *Sisyphus crispatus*, Gory, but it is a larger species, the upper surface is less rugose and clothed with a finer and closer pubescence. In the male the hind trochanters are not produced and the front

tibia is not furnished with teeth beneath; the hind femur is flattened, broad in the middle and bears a broad shining laminar appendix at its lower edge; the hind tibia is strongly curved, serrate within and has also a small laminar inner appendix at its extremity.

*Sisypus gazanus*, sp. n.

Niger, opacus, supra ferrugineo-indutus, setis erectis ferrugineis undique tectus; clypeo antice dentibus 2 acutissimis internis armato, externis subobsoletis; prothorace sat longo, lateribus fere parallelis, paulo ante angulos anticos dentatis et deinde convergentibus, angulis anticis acutis, dorso parum convexo; elytris sat regulariter costatis, pone humeros latis, lateribus deinde leviter arcuatim contractis; pedibus gracilibus, haud spinosis, trochanteribus haud productis:

♂, tibiis posticis curvatis, intus serratis; clypei dentibus 2 internis remotis, intervallo haud angulato:

♀, clypei dentibus 2 internis haud remotis, intervallo angulato.

Long. 5-6 mm.; lat. max. 3-4 mm.

*Hab.* Gazaland: Chirinda, Chibababa (Oct., Nov., Dec., 1901-1906).

This is of similar size and appearance to *Sisypus goryi*, Har., and like it clothed with rusty coarse setæ and earthy matter; indeed it is in all respects extremely like that species, differing only in the rather longer legs, the elytra a little more rounded at the sides and less tapered behind, the very sharp inner clypeal teeth, and feebler outer ones.

The sexual differences are slight in these and the small species of *Sisypus* generally, and the synonymy of these still remains in the greatest confusion. Mr. Péringuey considers *S. goryi*, Har., to be identical with *S. crispatus*, Gory; but the first is described from West and the second from South Africa, and as a species exists in Senegambia to which the description of *S. goryi* can be applied there seems no reason to adopt Mr. Péringuey's view. The latter's species, *S. nanniscus*, is the insect called *S. rugosus* by Roth (a pre-occupied name) and considered by Gemminger and Harold to be the *S. ocellatus* of Reiche. The last appears to me to be another species of which there are representatives in the British Museum from Nyasaland and the interior of Angola. It is peculiar in having denuded spots upon the pronotum, as shown in Reiche's figure. These names should accordingly stand as follows:—

*crispatus*, Gory.

*goryi*, Péring. (nec Harold).

Abyssinia to Cape Colony.



<i>gazanus</i> , sp. n.	Gazaland.
<i>goryi</i> , Harold.	Senegambia.
<i>hirtus</i> , Gory (nec Wiedem.).	
<i>hirtus</i> , Wiedem.	S. India, Ceylon.
<i>nanniscus</i> , Péring.	Abyssinia to Natal.
<i>rugosus</i> , Roth (nec Gory).	
<i>ocellatus</i> , Gemm. & Har. (nec Reiche).	
<i>ocellatus</i> , Reiche.	E. Africa.

*Onitis gazanus*, sp. n.

Brevis, convexus, niger, subopacus, capite prothoraceque vage viridibus vel cæruleis; clypeo crebre punctato, carina frontali arcuata, integra, tuberculoque postico; pronoto rugose et dense punctato, postice medio immarginato, anguste bifoveolato; elytris striatis, interstitiis convexis, minute sat dense punctatis; metasterno fortiter punctato; femoribus omnibus inermibus, tibiis anticis quadridentatis:

♂, tibiis anticis gracilibus, fortiter arcuatis, subtus breviter denticulatis; clypeo rugose punctato:

♀, clypeo transverse strigoso.

Long. 15–18 mm.; lat. max. 9·5–11·5 mm.

*Hab.* E. Mashonaland: Chirinda Forest.

This was found in numbers by Mr. G. A. K. Marshall. It is a small compactly formed species allied to *Onitis caffer*, Bohem., but less shining and differently sculptured, with the femora quite unarmed in both sexes. It is black, with the head and prothorax sometimes faintly steel-blue, closely punctured and dull above, and moderately shining beneath. The head is closely punctured (the clypeus of the female transversely striated), with an arcuate and entire frontal carina and a slight frontal tubercle. The pronotum is densely and rugosely punctured, with the marginal line not complete behind and the basal foveæ elongate and rather close together. The elytra are striated, with the intervals convex and finely punctured.

**Melolonthidæ.**

*Apogonia* (subgenus *Rhynchogonia*) *minima*, sp. n.

Rufo-castanea, modice elongata, capite sat punctato, clypeo triangulari, acutissimo; prothorace fortiter punctato, marginibus antico et postico fere parallelis, lateribus antice rectis, angulis posticis arcuatis; elytris crebre fortiter punctatis, punctis partim

longitudinaliter ordinatis; pygidio grosse punctato, punctis piliferis.

Long. 5 mm.; lat. max. 3 mm.

*Hab.* S.E. Congo Free State: Katanga.

This is the smallest species of *Apogonia* known to me. It is exceedingly like *A. acuminata*, Arrow, but smaller and rather more numerous punctured and the clypeus is still more sharply pointed. The pronotum is more strongly punctured, the front and hind margins are rather more parallel, and the sides appear straighter as seen from above and less convergent towards the front. The pygidium is also rather more punctured. The sexes are alike, except in the dilatation of the front and middle tarsi of the male.

### Cetoniidæ.

#### *Eccoctcnemis mashunus*, sp. n.

Læte viridis vel cyaneo-viridis, nitidus, tarsis cyaneis, tibiis posticis atque intermediis intus flavo-pilosis; capite crebre sat grosse punctato, antice leviter emarginato; prothorace lato, lateribus postice valde divergentibus, sat fortiter punctato, medio fere lævi; scutello vix punctato; elytris lævibus, punctis nonnullis minutissimis sparsutis; pygidio transverse strigoso; corpore subtus medio toto lævi, lateribus paulo punctatis, processu mesosternali circulari.

♂. Pedibus posticis crassatis, tibiis dense flavo-setosis, pygidio minus strigoso.

Long. 24–31 mm.; lat. max. 10·5–14 mm.

*Hab.* Mashonaland.

This species figures in Mr. Péringuey's 'Catalogue of the South-African Coleoptera' under the name of the West-African *E. barthi*, Harold, to which it is closely related. It agrees with it in the fringe of yellow velvety hairs at the inside of the middle and hind tibiæ, very thick in the male, but differs in the more shining and very feebly punctured elytra and the relatively shorter and rather differently shaped pronotum, the sides of which are less angulated at the middle, so that they are more divergent behind, and the base relatively broader. The sternal process is more narrowed between the middle coxæ, and the mesosternal part of it almost circular in shape.

Capt. Moser has described as a variety of *Ceratorrhina* (*Neptunides*) *polychroa*, Thoms., a form, *manowensis*, Moser, which is abundant at Chirinda, feeding upon pineapples. It presents marked and constant differences from Thomson's

species, and is not merely one of the many colour-varieties of it. Its brown coloration is peculiar and practically invariable, and it is very distinctly more elongate than *C. polychroa*. The females are at once distinguishable by the curious prolongation of the tips of the elytra, and the males have the hind femora strongly curved.

*Leucocelis cobaltinus*, sp. n.

Niger, nitidus, prothoracis lateribus anguste rufis elytrisque obscure cæruleis, corpore elongato, subtus parce setoso; capite dense punctato, clypeo angusto, leviter bifido; prothorace leviter punctato, antice paulo densius, marginibus lateralibus medio angulatis, postice fere parallelis, angulis posticis distinctis, basi regulariter arcuata; elytris grosse seriato-punctatis, striis 2 vel 3 posticis; pygidio irregulariter annulato-punctato; metasterni medio parvisime punctato, processu sat lato, rotundato:

♂, abdomine subtus paulo excavato, segmento ultimo medio minute producto, tarsis posticis multo longioribus.

Long. 12-13.5 mm.; lat. max. 6-7 mm.

*Hab.* E. Mashonaland: Chirinda Forest.

This is a rather large species, devoid of white spots, and black, with the exception of the elytra, which are indigo- or cobalt-blue, and a narrow red lateral border upon each side of the pronotum.

*Leucocelis ichthyurus*, sp. n.

Niger, nitidus, clypeo, antennis pygidioque læte rufis, maculis parvis albis inconspicue ornato, quarum 2 prothoracis lateralibus, 2 subbasalibus, elytrorum fascia mediana interrupta transversa punctisque nonnullis posticis; capite toto crebre punctato, clypeo antice leviter inciso; prothorace fortiter punctato, medio læviore, lateribus strigosis, basi omnino regulariter curvato, marginibus lateralibus postice paulo divergentibus, angulis posticis distinctis; elytris fortiter seriato-punctatis, postice distincte striatis, ad suturam spinose productis; pygidio opaco, parce punctato; corpore subtus sat griseo-setoso, processu sternali lato, parum producto:

♂, tibiæ posticæ calcare interno gracilissimo, curvato.

♀, pygidio medio late sulcato, fere bicuspidato, segmento ventrali ultimo postice late fulvo-ciliato.

Long. 10-11.5 mm.; lat. max. 5-5.5 mm.

*Hab.* Mashonaland: Salisbury, Chirinda Forest.

I have seen a considerable number of specimens of this. It is very nearly related to *L. rubriceps*, Raffray, and may possibly prove to be a local race of it. It is a little larger

and much more scantily spotted with white, the spots being always extremely small and not infrequently absent altogether. The antennæ, head, and pygidium are red, but not the last ventral segment, and the pygidium is not spotted with white, whereas in our specimen of *L. rubriceps* there are four marginal spots. The body is a little longer and less sharply narrowed behind, and the striæ on the posterior part of the elytra are less crowded.

In both these species the inner spur of the hind tibia is as long as the first two joints of the tarsus.

Mr. Péringuey has transferred *L. rubriceps* to the genus *Mausoleopsis*, on account of the asymmetrical front claws of the male, thus disregarding not only the general form, but more important characters common to both sexes, *e. g.* the prominent terminal spiracles of *Mausoleopsis*. It appears to me highly inadvisable to base any genus upon a feature found only in one sex.

*Leucocelis opacipennis*, sp. n.

Ænea vel cuprea, nitida, elytris viridi-testaceis, opacis, pygidio, pedibus, corpore subtus prothoracisque lateribus griseo-setosis, punctis prothoracis utrinque 3, elytrorum marginis externi postice 3-4 discisque nonnullis minutis; corpore sat brevi; capite crebre punctato, antice fere bifido; prothorace ubique fortiter punctato, subcirculari, postice omnino arcuato, angulis nullis; elytris antice et extus leviter punctatis, postice intus fortiter geminato-striatis; pygidio varioloso-punctato; mesosterno vix producto.  
Long. 8.5-9 mm.; lat. max. 5 mm.

*Hab.* Katanga: 150-200 miles W. of Kambove, 3500-4500 feet, 24th Sept., 1907.

This is a species allied to *L. spoliata*, Har., which is referred by Dr. Kolbe to his subgenus *Amaurina*, but it differs from all the known species of that section in that the elytra only are opaque. It is of short form, with the pronotum subcircular, very strongly punctured, the hind angles obliterated, and the sides decorated with a border of greyish hairs. There are six white spots forming two diverging straight lines upon the pronotum, three or four at the posterior part of the outer margin of each elytron, and usually a few very minute ones upon the disk. The pygidium and lower surface are fairly well clothed with grey hair, and there are sometimes four basal patches of scales upon the former.

The sexes seem almost identical.

## Erotylidæ.

*Platydacne ferruginea*, sp. n.

Ferruginea, haud nitida, antennis, prothoracis et elytrorum marginibus externis, horumque lineis 4 longitudinalibus apice haud conjunctis nigris; corpore supra toto sat dense et minute punctato, prothorace lato, baseos lateribus sinuatis, angulis posticis acutis, marginibus lateralibus punctatis, haud crassis, regulariter arcuatis; elytris convexis, postice acuminatis, fortiter punctato-striatis, interstitiis modice convexis, crebre punctulatis.

Long. 14–17 mm.; lat. max. 6–7 mm.

*Hab.* N.E. Rhodesia: Serenje District; Katanga: Kambove, Lufira River.

*P. ferruginea* is very closely allied to the typical species of the genus, *P. vittulata*, Fairm., but rather narrower in shape, with the ground-colour rusty brown instead of red. The whole surface is very finely and rather closely punctured, and the elytra are more deeply striate-punctate. Each elytron has the extreme outer edge and four narrow longitudinal lines black, the outermost line extending almost to the suture but not uniting with the others, which also remain distinct at their extremities.

*Platydacne levistriata*, sp. n.

Subopaca, nigra, singulo elytro lineis rufis duabus ante apicem conjunctis, plerumque ante medium haud apparentibus, interdum etiam linea intermedia vestigiali antica ornato; corpore vix punctato, prothorace quam longitudinem vix latiore, lateribus ad basin paulo divergentibus, postice fere rectis, basi regulariter arcuato, angulis posticis acutis; elytris postice acuminatis, lævisime striatis, haud punctatis, interstitiis paulo convexis; antennis gracilibus, haud late clavatis.

Long. 15–17 mm.; lat. max. 6–7 mm.

*Hab.* S.E. Congo Free State: 150–200 miles W. of Kambove.

This is very near *P. rufovittata*, Har. (described as a species of *Megalodacne*). It is rather more oval in shape and more pointed behind, the sides of the prothorax are more divergent behind and the hind angles sharper, and the elytra are very lightly striated, without visible punctures in the striæ or between them.

LXIX.—*New Species and Varieties of Hydroïda Thecata from the Andaman Islands.* By JAMES RITCHIE, M.A., B.Sc., Natural History Department, the Royal Scottish Museum.

IN a collection of Hydroids kindly entrusted to me for identification by Dr. Nelson Annandale, Superintendent of the Indian Museum, there were contained such specimens as had been dredged in the deeper waters of the Indian Ocean. Of the twenty-four distinct forms in this collection I regard four as new species and two as undescribed varieties. Fuller descriptions of these, with figures, will be published, along with the report on the rest of the collection, in an early number of the 'Records of the Indian Museum,' the object of the present notice being merely to chronicle the occurrence of a few interesting undescribed additions to the little-known deep-water Hydroid fauna of Indian seas.

#### Campanularidæ.

##### *Hebella crateroides*, sp. n.

*Trophosome*.—Colony epizoic, with a creeping hydrorhizal tube, which meanders over the stems and branches of other Hydroids. The hydrothecæ, which arise at irregular intervals from the stolon, are small and colourless, like a wine-glass in shape, with firm walls marked in some cases by exceedingly faint corrugations, and gracefully everted round the margin. As the hydrotheca gradually diminishes in diameter from the margin almost until the hydrorhizal tube is reached, the hydranthophore is not distinctly indicated; and the hydrotheca cavity is separated from the common cavity of the colony only by a delicate film. The hydranth bears from about 6 to 8 tentacles.

*Gonosome*.—The gonangia, which are borne on short indefinite stalks, are at least three times as large as the hydrothecæ. They are roughly cylindrical in shape and have irregularly corrugated walls, with an everted margin. Three medusæ, as a rule, develop from each blastostyle. The manubrium is large and four stout tentacles are present ere the medusa is set free.

This species is closely related to *Hebella calcarata* (A. Agassiz), from which it may be distinguished by the much smaller number of tentacles possessed by its hydranth and by the inverted-cone shape of its hydrotheca.

*Loc.* Growing on *Lytocarpus phoeniceus* (Busk), dredged 8 miles west of Interview Island, Andamans. Depth 270-45 fathoms.

### Sertularidæ.

*Sertularella polyzonius* (Linn.), var. *cornuta*, nov.

*Trophosome*.—Stem more definite than in var. *gracilis* of British waters and branches more regular in their alternate origin. The facies of the trophosome on the whole approaches that of var. *robusta*, Kirchenpauer, from the Cape of Good Hope.

*Gonosome*.—While the gonangia have the elongate-ovate shape and the strongly marked corrugations of typical specimens, they are surmounted by four stout spines lying crosswise in a plane at right angles to the long axis of the gonangium. To this character is due the designation of the variety.

*Loc.* (a) Andaman Islands. Depth 490 fathoms.

(b) 8 miles west of Interview Island, Andamans. Depth 270-45 fathoms.

### *Diphasia thornelyi*, sp. n.

*Trophosome*.—Colony delicate, unbranched, with a non-fasciated stem, which springs from a creeping stolon. The stems show no signs of nodes, but bear hydrothecæ from the base upwards. The hydrothecæ are biserial, both rows lying in the same plane, but they vary much in their position relative to one another, for although in most cases they are alternate or subalternate, on occasion an opposite arrangement is simulated. A hydrotheca is deep and narrow, with the inner edge adnate to the stem for practically its whole length, with the exception of a short, horizontal, knobbed ledge upon which the adcauline operculum is hinged. A short upturned intrathecal septum projects into the hydrotheca cavity from the middle of the abcauline wall, which beneath this point becomes much thicker. The distal part of the hydrotheca resembles a bracket projecting from the stem. The margin is smooth and rimmed, in shape arc-like, the curve of the arc bending outwards, and the aperture is tilted somewhat towards the stem. The partition separating hydrotheca cavity from stem cavity lies almost parallel to the abcauline wall, and terminates in a thickened ridge.

*Gonosome*.—Stalkless gonothecæ arise from close below

the hydrothecæ. They are ovate in shape, with a bulging shoulder, a short neck, and a circular aperture. The distal half is ornamented with prominent scattered spines.

*Loc.* Andaman Islands. Collected by J. Wood-Mason.

### Plumularidæ.

#### *Aglaophenia septata*, sp. n.

*Trophosome*.—Stem fascicled and unbranched, 74 mm. high. The hydroclades are borne on the anterior tube of the fascicle, which alone is divided by faint nodes into regular internodes. The hydroclades are biserial, lie on the anterior surface of the stem, from which they project at an angle of  $40^{\circ}$ – $45^{\circ}$ , and reach a maximum of 11 mm. in length. Regularly placed nodes occur on the hydroclades, the internodes being divided by numerous strongly developed septa, four of which project from the posterior wall of the hydrotheca, while three arise from the anterior wall of the internode proximal to the hydrotheca. Of these one traverses the base of the mesial sarcotheca.

The hydrothecæ are rather distant, very narrow at the base, but widening greatly towards the top, almost obconical. The anterior profile is straight but for a concavity opposite the top of the mesial sarcotheca. The margin is horizontal and has a prominent anterior tooth, flanked on each side by four distinct sinuations. There is no intrathecal ridge, but the posterior wall bends inwards just above the base of the hydrotheca. The supracalycine sarcothecæ slightly overtop the margin of the hydrotheca. They are large and cylindrical and possess an internal septum. The mesial sarcotheca is about two-fifths the length of the hydrotheca, to which it is altogether adnate except for a free spout-like tip. A button of chitin projects into its cavity from the wall of the hydrotheca, proximal to the point where it becomes free.

Of cauline sarcothecæ, one lies on the anterior of the stem, proximal to the hydroclade-bearing process, another lies on the inner side of the process—both of these being large and similar to the mesial sarcotheca,—while a third, a mere perforation, lies on the anterior of the process itself.

*Gonosome*.—A kind of corbula, entangled amongst fibres at the base of the colony, I assume to have belonged to the colony. It is of peculiar type. A cylinder, formed of delicate plates of chitin, contains five spherical reproductive bodies, and along each side run two rows of projecting leaves. Each of the lower rows contains about 9 tube-like leaves,



furnished with small sarcothecæ arranged biserially. Each of the upper rows has 10 broader leaves, often contorted, and also bearing sarcothecæ irregularly arranged along the margins. The structure seems to resemble a type of open corbula where, instead of the leaves curling inwards to protect the reproductive bodies, special delicate chitinous wings have arisen between the leaves, these enclosing the gonangia in a cylinder.

*Loc.* Andaman Islands. Depth 490 fathoms.

*Lytocarpus annandalei*, sp. n.

*Trophosome*.—Colony dark brown in colour, unbranched, with a fascicled stem traversed here and there by pale-coloured constrictions slanting from behind downwards and forwards. The anterior tube, which is not divided into nodes, alone bears hydroclades, and these are close set and alternate, and are divided into regular hydrotheca-bearing internodes. The hydrothecæ are closely approximated, deep, and rudely ovate in outline, with an aperture facing outwards from the stem at an angle of about  $45^{\circ}$ . The lower half of their profile is convex, the upper concave, while the margin bears a single prominent anterior tooth, flanked by four sinuations on each side. The mesial sarcotheca is very broad, adnate for more than half the height of the hydrotheca, but with a free spout-like extremity; the supra-calycine sarcothecæ are also very large, reach just above the margin of the hydrotheca, and possess a huge aperture. They are cylindrical in shape, the cylinder being broken by a constriction about midway, which is associated with an internal ridge traversing part of their cavity from the posterior wall.

The intrathecal ridge is little evident, but it projects into the lumen of the hydrotheca from a knob of chitin terminating an angular inbending of the posterior wall near the floor of the cavity. The bases of the two sides of the angle are marked by well-defined ridges projecting into the cavity of the internode, while a third ridge arises just above the bases of the supra-calycine nematophores. A shorter internodal ridge arises from the proximal portion of the anterior wall. Two characteristic ridges are associated with the mesial nematophore: a knob of chitin projects into the nematophore cavity from the hydrotheca wall, while a sinuous septum traverses the base of the nematophore cavity.

Two large, scoop-shaped, cauline sarcothecæ lie at the base of each hydroclade, and on the anterior of the hydroclade-bearing process is a small tubular sarcotheca.

*Gonosome*.—A few structures, apparently phylactocarps, replace hydroclades towards the base of the stem. They are divided into regular internodes each with three nematophores, two lateral and one median and proximal. Unfortunately no gonangia are present. These structures are readily seen to be morphologically equivalent to hydroclades.

*Loc.* 'Investigator,' Station 241, lat. 10° 12' N., long. 92° 20' 30" E., between the Andaman and Nicobar Islands. Depth 606 fathoms.

*Halicornaria hians*, Busk, var. *profunda*, nov.

*Trophosome*.—Considerable variations are exhibited by the trophosome, but these seem in the main to be due to differences in age. The thecate internodes, while they are twice as broad as long at the base of a hydroclade, gradually lengthen till at the distal end their length may be to their breadth as four to one. The mesial sarcotheca in mature colonies is adnate almost to the lip of the hydrotheca, projecting beyond the margin as a short free spout; in young colonies it does not reach even to the intrathecal ridge, and at this stage closely resembles that of young colonies of *H. variabilis*, Nutting\*. In all stages, however, its anterior profile is concave, a character which distinguishes this species from *H. balei* (Marktanner-Turneretscher).

The trophosome of this variety is distinguished from that described and figured by Bale † by the greater length of the thecate internodes compared with their diameter, the greater depth and more erect posture of the hydrothecæ, and the greater distance which separates the intrathecal septum from the base of the hydrotheca. The less prominent nature of the marginal teeth and the small size of the colonies (4 cm.) are variations of little significance.

*Gonosome*.—The gonangia, which have not hitherto been described, are quite unprotected and are borne on very short stalks, one at the base of each hydroclade. In shape they are saucer-like, convex beneath, concave above, appearing as perfect disks, up to 0.38 mm. in diameter, when viewed from the anterior of the colony.

*Loc.* Andamans, 1899.

\* Nutting, C. C., "American Hydroids.—Part I. The Plumularidæ," Smithsonian Institution, Special Bulletin (Washington, 1900), p. 127, pl. xxxiii. fig. 7.

† Bale, W. M., 'Catalogue of the Australian Hydroid Zoophytes' (Sydney, 1884), p. 179, pl. xiii. fig. 6, pl. xvi. fig. 7.

LXX.—*A new Specific Name for an Orectolobid Shark.*

By C. TATE REGAN, M.A.

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I HAVE just received a copy of "A Revision of the Australian Orectolobidæ," by J. Douglas Ogilby and A. R. McCulloch (Journ. & Proc. R. Soc. N. S. Wales, xlii. 1908). In this the authors describe and figure under the name *Orectolobus dasypogon*, Bleek., a shark, from Torres Straits, which appears to be distinct from that species, the type of which, from Waigiou, is in the British Museum. I therefore propose for this new form the name *Orectolobus ogilbyi*, in honour of the Australian ichthyologist who has studied this group of sharks.

The main differences between the two species may be shown thus:—

*Orectolobus ogilbyi.*

Gill-openings decreasing in size from the first to the fourth; last larger; last two closer together than the rest.

Fringes on each side of the head in three separate groups.

Origin of first dorsal fin well behind the middle of the total length.

Distance between origins of dorsals nearly  $\frac{1}{2}$  that from origin of second dorsal to end of tail.

*O. dasypogon.*

First gill-opening slightly smaller than the rest, which are of equal size and equidistant.

Fringes on each side of the head in two groups, the more posterior equivalent to the last two in *O. ogilbyi*.

Origin of first dorsal fin in the middle of the total length.

Distance between origins of dorsals slightly more than  $\frac{1}{3}$  that from origin of second dorsal to end of tail.

*O. ogilbyi* is certainly very closely allied to *O. dasypogon*, and the two species can scarcely be placed in different genera. The genus *Eucrossorhinus*, established by me for *O. dasypogon*, chiefly on account of the form of the gill-openings, becomes a synonym of *Orectolobus*.

## BIBLIOGRAPHICAL NOTICES.

*Guide to the Whales, Porpoises, and Dolphins (Order Cetacea) exhibited in the Department of Zoology, British Museum (Natural History)*. Illustrated by 33 Figures. London: Printed by Order of the Trustees, 1909. Price 4d.

THE Guide-Books to the Zoological Department of the Natural History Museum have been steadily growing, both in size and number, for years past, so that they now provide a fairly complete

survey of the animal kingdom. In their entirety it might justly be claimed for them that they form one of the most popular textbooks of zoology which has ever appeared. Thus they differ from most other books of their kind, which are of little use save as a source of reference to the actual specimens exhibited.

In the Guide to the Whale-Room of the Museum Mr. Lydekker has, in a surprisingly small space, contrived to pack an amazing amount of information concerning these creatures, the most highly specialized of all the Mammalia. Though most of the facts here given have found their way long since into the majority of popular natural history books, much is here included that will be new to the general reader, as, for example, the fact that certain of the whales, notably the Indian Porpoise, have "minute scales embedded in the skin of part of the back; and these suggest that whales are derived from animals furnished with a complete bony armour." We should have preferred the term "bony nodules" in place of "scales"; the nature of these would perhaps have been brought home to the reader the more forcibly if it had been pointed out that they were comparable to the bony plates covering the back of the armadillo.

The short account of the extinct Cetaceans is admirable, and adds immensely to the value of this most wonderful summary of a group of animals of which little is known by the general public.

The illustrations have evidently been selected with the greatest care and are singularly well reproduced.

*Guide to the Specimens illustrating the Races of Mankind (Anthropology) exhibited in the Department of Zoology, British Museum (Natural History).* Illustrated by 16 Figures. London: Printed by Order of the Trustees, 1903. Price 4d.

MR. LYDEKKER'S Guide to the Anthropological Collection is an extremely useful piece of work. The formation and arrangement of this collection, it should be remembered, was entirely carried out by Mr. Lydekker. In the near future we hope to see this collection still further enlarged, for in this particular we are behind our neighbours the Germans. But to return to the Guide. In the preparation of this the Author was confronted with a difficult task, for a guide-book must of necessity be brief, and it could have been no easy matter to condense even the main outlines of anthropology in so small a space. The classification of the races of mankind is a thorny subject, and from its general unfamiliarity an exceedingly difficult subject to present in a popular form; and the Author has certainly come well out of the ordeal.

There is only one slip to which we would direct attention, and this concerns the Bisharis, which on p. 11 are placed in the Semitic group and on p. 12 are included in the Hamitic group, being described as the purest East-African representatives thereof.

The illustrations, as in the Guide just noticed, are excellent.

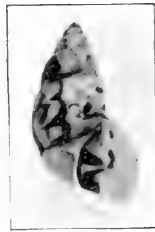




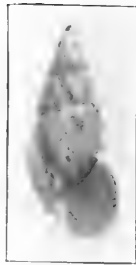
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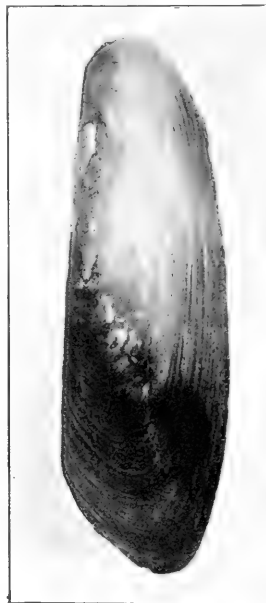




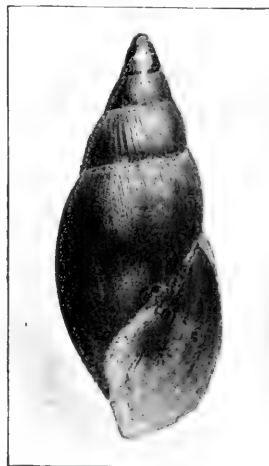
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